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Mobilizing the debt market for climate change mitigation

Experiences from the early Green Bonds market

Master's thesis in Industrial Ecology

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Department of Energy and Environment
CHALMERS UNIVERSITY OF TECHNOLOGY
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ABSTRACT

Climate change will have a significant impact on modern society. The economic impacts from climate change require the involvement of both governments and companies. Green bonds have emerged as tool to earmark capital for green investments, but the question remains whether green bonds accelerate green investments.

This study outlines the advantages and disadvantages of green bond issuances in order to identify why green bonds could result in accelerated green investments. The data is acquired through interviews with investors and issuers, a survey among European issuers as well as a case study at AkzoNobel. The study also asks the question how green bonds could reduce the environmental impacts from the chemical industry.

The results indicate that there are significant benefits in terms of company reputation, access to capital and internal legitimacy linked to the issuance of a green bond. The case study also indicates that a green bond issuance can have implications on the internal hierarchy of decision making by the addition of an environmental dimension to evaluation of investments. A green bond may bridge the historic gap between financial and sustainability departments.

The conclusion is that green bonds accelerate green investments, as green bonds provide issuers with access to capital, increased company reputation, increased internal legitimacy for sustainability issues and shift decision power within companies. The efficiency of green bonds could be enhanced by the development of industry specific criteria, to have an impact along the entire value-chain to ensure significant environmental benefits.

Keywords: Green bonds, green investment, responsible investment, green practices, green bond framework

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Preface

This master´s thesis report (30 Credits) is written as the final part of the Chalmers program, Industrial Ecology (120 Credits). The project has been carried out from January to June year 2015 and was conducted at the sustainability department at AkzoNobel. The department provides sustainability and environmental services for strategic support internally in order to increase the awareness of sustainable development and decrease the environmental impacts. The project has been conducted in collaboration with the three AkzoNobel business areas and corporate level support units. Essential contributions to the project has been provided by Andre Veneman (Corporate Director Sustainability and HSE), Chris Cook (Global Sustainability Director), Caterina Camerani (Sustainability specialist, PPC), Jonathan Atack (Director Investor Relations), Ruud Morssinkhof (Program Manager EE), Derek Rance (Director RD&I Projects), Ivar Smits (Manager Sustainability Reporting), Martijn Van Loon (Project Manager), and Dale Steichen (Business Development Director).

The master´s thesis project has been carried out by Christoffer Falsen and Patrik Johansson as researchers, Conny Overland as supervisor from Gothenburg University, Klas Hallberg as supervisor at AkzoNobel and Prof. John Holmberg as examiner. The project was examined in the *Department of Energy and Environment* at the *Division of Physical Resource Theory* on Chalmers University of Technology.

We would like to express gratitude to the above mentioned people for their contribution which enabled the realization of this report, and to the sustainability group at AkzoNobel for support and cheerfulness. Special thanks to Conny Overland and Klas Hallberg.

Göteborg June 2015

Christoffer Falsen and Patrik Johansson

1 Introduction

This report evaluates how green bonds as a financial tool could accelerate green investments and how green bonds are most efficiently used in the chemical industry to reduce environmental impacts. The following chapter presents the global perspective on climate change and the necessity of collaboration between institutional investors and the chemical industry to mitigate the effects. The obstacle for such collaborative actions is believed to be the absence of added green value to investments, which may be answered by the emergence of green bonds.

1.1 The Background

Rising global temperature due to climate change will severely affect society and the world as we know it, and to avoid irreversible effects on society the UN Framework Convention on Climate Change (UNFCCC) sets the goal for global temperature rise due to climate change to be limited at two degrees Celsius above pre-industrial levels (UNFCCC, 2009). Climate change may without question be the most uncertain and complex issue of global scale that society have faced so far (Tol, 2009; UNWCED, 1987), and UNFCCC states *"We underline that climate change is one of the greatest challenges of our time…"* (UNFCCC, 2009). Yet, climate change is the unforeseen consequence of radical improvements in living and well-being in the modern society. The abundant stock of fossil fuels have contributed to the rapid development in almost all parts of society and thus created a dependency, infrastructure and pattern of living that will be both costly and difficult to break away from (Perkins, 2003).

It is estimated that economic costs due to climate change effects may account for over USD 400 billion a year (UNEP, 2001). Further on, Nordhaus (2013) estimates that an increase from the two degree target to three degrees Celsius would cause additional annual costs of 0.9 percent of global GDP. The World Bank estimates approximately USD 200 billion to USD 1000 billion per annum of investments are required to mitigate the effects of climate change (Della Croce, Kaminker, & Stewart, 2011). Additionally, The International Energy Agency estimates a required 36 USD Trillion of investments until 2050 for a reduction of carbon emissions to stay in line with the 2 degree target (International Energy Agency, 2012). The magnitude is of global scale and therefore the measures for combatting the effects must thus also be of global scale (Tol, 2009).

Innovation and initiatives through private investments are thus urgently needed to supplement scarce government funds and credits. The uncertainty, lack of scientific absolute numbers and constantly changing sustainability emphasis obstruct that environmental improvements are implemented as a strategic initiative within companies (Stern, 2006; Epstein & Buhovac, 2014). Environmental performance must be evaluated on the same basis as financial performance. Nevertheless, conversion of sustainability performance in terms of costs, benefits and risks for companies is performed to a limited extent (Epstein & Buhovac, 2014). In terms of investments, the integration of environmental performance targets may be in conflict with internal financial targets such as return on investments (ROI) (Weybrecht, 2014). Conventionally accepted methods used for guidance in economic decisions do not favour

investments to reduce the environmental impact, since they compete with investments with a potentially higher short-term profit (Kimbro, 2013).

An industry of particular importance with regard to environmental impacts is the chemical industry (Clark, 2007). The old chemical industry paradigm is based on raw materials primarily from fossil resources (Kemp, 1994). The chemical industry therefore holds one of the key roles in the transition to a low carbon economy (Clark, 2007; Perathoner & Centi, 2014; Jenck, Agterberg, & Droescher, 2004). The concern of environmental issues within the chemical industry is regarded as one of the most important issues for future operations (Steger, Ionescu-Somers, & Salzmann, 2007). Innovation is mentioned as the lifeblood of chemical industry and development of sustainable technologies and processes have shown to decouple environmental impacts from growth (Jenck, Agterberg, & Droescher, 2004). Investments, particularly important to spur innovations, have been regarded as an important factor to reduce the carbon footprint for the chemical industry (Jenck, Agterberg, & Droescher, 2004). A multitude of ideas exist on how to invest and transform the current activities both in terms of raw material, but also in downstream processes (Jenck, Agterberg, & Droescher, 2004). The chemical industry holds many properties for leadership in a sustainable transition; it involves many other sectors through the value-chain, it reaches multiple consumer markets and it contributes to a large share of world trade (Jenck, Agterberg, & Droescher, 2004).

Parallel to increased environmental concern from the chemical industry, the financial market's interest in environmentally responsible investments has grown (Della Croce, Kaminker, & Stewart, 2011). The growth of a green financial market and funding vehicles for green investments to reduce and mitigate the effects of climate change and for the transition to a low carbon economy is crucial (Alam & Nizamuddin, 2013; Keefe, 2010). The financial market holds the second key role to influence companies to invest responsibly (Weybrecht, 2014). The last years have seen an increase in the use of financial tools to invest in green projects (Weybrecht, 2014). The World Bank in collaboration with Skandinaviska Enskilda Banken issued the world´s first green bond to finance projects to reduce environmental impacts in 2007 (World Bank, 2009). Development of the green bonds market have resulted in the first corporate issuances in 2013 and corporate green bonds are a rapidly growing market (Della Croce, Kaminker, & Stewart, 2011; World Bank, 2009). However, due to the early stage of the green bonds market, there is a lack of mandatory frameworks for green bond issuances (Climate Bonds Initiative, 2014).

1.2 Problem Formulation

The missing link between green investments and the financial market is the main theme of this report. The focus is to unlock funds to finance green investments. Companies have limited amount of funds to invest and green investments are not prioritized. Even though attractive green investments exist, conventional investments tend to provide a shorter return on investment. The problem for sustainability managers is to capture the green value of green investments and receive funding for investments. The purpose is to evaluate how the green value could be captured by an issuance of a green bond and thereby increase the

attractiveness of green investments, influence stakeholder attention and thus accelerate green investments.

Green bonds are compared to financial drivers linked to proactive corporate sustainability initiatives to identify if a green bond issuance provides financial benefits. Green bonds are also aligned with drivers for corporate green practices to identify if an issuance of a green bond provides benefits linked to green practices. The results will determine if green bonds capture green value and thus have the potential to influence the attractiveness of green investments. Green bonds are a financial tool that recently has emerged on the financial market. Little attention has been given to how green bonds are implemented and the organisational implication. The internal implications linked to a green bond are believed to be an equally important driver for issuance as external benefits.

The second part of the study aims to examine how green bonds could be used to reduce the environmental impacts in the chemical industry. Previous green bonds have been issued by companies in sectors where the environmental impacts to large extent occur in the own operations of the value-chain. The chemical industry has a distribution of environmental impacts along the value-chain distinguished from previous issuers. An integrated life-cycle thinking and value-chain perspective in the analysis of a green bond implementation in the chemical industry is important for efficient environmental performance. Green bonds lack mandatory frameworks and standards; hence the issuer is responsible to shape the green bond for optimal efficiency.

This study intends to investigate the research questions:

- How do green bonds accelerate green investments?
- How could green bonds be used in the chemical industry to reduce the environmental impacts?

The research questions will be answered by interviews with issuers and investors in the Swedish green bonds market, and by a survey among European issuers. The in depth knowledge will be acquired through a case study. The focus of the case study will be to determine how green bonds could play a significant role to reduce the environmental impacts. The knowledge is gained through the active participation in evaluation of a green bond issuance. The purpose of the report is to combine the theoretical viewpoints, survey and interview results and case study results to identify how green bond issuances will accelerate green investments. The purpose is also to analyse how a green bond could be applied to the chemical industry.

1.3 Contribution of the Report

If green bonds contribute to reduce the effect of climate change it could be an important tool to accelerate investments in carbon reduction and mitigation projects. The study contributes to the green bond market by knowledge to both investors and companies in consideration of a green bond issuance. The report may serve as an outline of typical drivers and experiences of an issuance, and point at certain benefits and disadvantages of the issuances. The report also provides knowledge on the efficiency of green bonds as a tool to increase green investments

and may offer suggestions on how to develop green bonds to be applicable in the chemical industry.

Furthermore there is a lack of literature and empirical data on green bonds. The study will contribute to the scientific field of green investments and green bonds by quantitative data from the survey and by qualitative data from the interviews. This report will also add scientific value by the case study where the intra-corporate perception of green bonds is investigated and arguments of consideration prior to an issuance are analysed. The report adds knowledge to the literature of the early green bonds market.

1.4 Limitations

The perception of sustainability is broad. In the study, the perception of sustainability is limited to impacts on climate change from carbon emissions.

The interviews in the study are limited to target Swedish issuers of green bonds and Swedish investors in green bonds. The survey is limited to the geographic region of Europe to contain issuers with similar business culture and courtesy. The survey is also limited to cover issuers with similar competitive pressure, organisational structures and stakeholder expectations and thus excluded issuers such as development banks and institutions.

The purpose of the cast study is to be applicable for the chemical industry in general. However, the data collection in the case study is limited to company specific data from AkzoNobel.

1.5 Outline of the Report

The second chapter presents theoretical background of green bonds and AkzoNobel. The third chapter reviews literature to outline motivations for companies to consider a green bond issuance. The fourth section presents the methods and tools applied in the report and the case study. The results from the interviews and the survey together with results from the case study are presented in the fifth chapter. The sixth chapter ties the strings together by an analysis where the results are analysed with reference to the literature and problem formulation. The sixth section also provides discussion on limitations of the study and recommendations for further research. The seventh section is dedicated to conclusions.

2 Theoretical Background

This chapter presents information required for the reader to understand bonds and background for the case study. First, bonds are explained together with green bonds and how they are distinguished. The green label is explained and third party reviews of green bond issuances are presented. Second, AkzoNobel and how environmental impacts may be distributed along the value-chain are presented.

2.1 Green Bonds and the Green Label

A bond is a financial tool where the issuer is indebted towards a holder for the equivalent amount of money borrowed for a pre-determined amount of time. The issuer in this report refers to a company or organisation that requires external capital and acquires the capital by an issuance of a bond. The holder of a bond is the investor that invests capital in the issued bond, i.e. lends capital to the issuer. Up to the date when the bond matures, the issuer pays interest, the coupon, to the holder of the bond for fixed intervals. The coupon payments are similar to interest payments on conventional bank loans. When the bond matures, i.e. when the pre-determined amount of time expires, the debt is repaid (Brealey, Myers, & Marcus, 2012).

Green bonds are similar to conventional bonds, but are issued with the purpose to support green investments, i.e. to reduce environmental impact through e.g. climate change mitigation or increased energy efficiency. A green bond induces a reciprocal collaboration between investors and issuers to increase the financing of green investments (Kidney & Oliver, 2014). There has been a rapid growth in the green bonds market the past years (Boulle, Kidney, & Oliver, 2014).

To ensure legitimacy and the green label of an issuance, a set of voluntary process guidelines, the Green Bonds Principles (GBP) has been developed on commission of the International Capital Market Association (ICMA). Though only considered guidelines, the GBP are used by issuers, investors, and third party reviewers. The GBP states that a green bond should have *"quantitative and/or qualitative performance indicators which measure, where feasible, the impact of the specific investments"* (ICMA, 2014). The purpose of the green bond is to gain trust from investors and ensure legitimacy that capital is earmarked for green investments. The legitimacy of an issuance is strengthened through a third party review (Climate Bonds Initiative, 2014). A third party review is an evaluation of the credentials of the use of proceeds of the green bonds and provides a second opinion on the issuers (Climate Bonds Initiative, 2014).

The third party reviewers of green bond issuances are a mixture of independent organisations such as environmental, social and governance research houses and scientific standards groups (Climate Bonds Initiative, 2014). The purpose of third party reviewers is to provide investors with second opinions on the robustness and liability of issuers to meet certain environmental and social objectives (CICERO, 2013). It is believed that a second opinion, even though not required by standards or regulations, is more or less a requirement in the European green bonds market to ensure legitimacy of the issuer (Boulle, Kidney, & Oliver, 2014).

2.2 Description of AkzoNobel

AkzoNobel is a proactive company within sustainable development and operates in the paints, coatings and specialty chemicals market. AkzoNobel has stated targets for carbon footprint reduction to reach at latest 2020 and thus depends on continuous work with improvements and green investments. AkzoNobel is regarded as market leaders within sustainability and ranked as number one in the materials market on the Dow Jones Sustainability Index for 2014 (Dow Jones Sustainability Indices, 2014).

The focus on green bonds and the application within the chemical industry requires that the common methods for describing distribution of environmental impacts in the chemical industry are known. Life-cycle thinking takes into account all parts of a product's physical life-cycle, from raw materials acquisition to end-of-life disposal, to determine the total environmental impact of a product (Heiskanen, 2002). To map the total life-cycle of a product offers opportunities to identify in what processes the largest contribution to environmental impacts are (Mirabeau & Citroën, 2004). Thus, life-cycle thinking focuses on improvements in the system of a product, not in single parts of the system that may lead to sub-optimizations (Mirabeau & Citroën, 2004). The life-cycle of a product from supplier to customer is referred to as the company value-chain. Companies are pressured to involve suppliers and customers to meet stakeholder expectations on environmental issues (Walton, handfield, & Melnyk, 1998). The use of LCA mapping simplifies the process to locate environmental impacts in the value-chain (Trappey, Trappey, Hsiao, Ou, & Chang, 2012).

AkzoNobel has integrated environmental concern and life-cycle thinking in the operations and decision-making, with environmental performance as a criteria for all investment decisions above 5€millions. Measurements and reporting of emissions are performed at all production sites which involves a vast number of employees. The sustainability group is responsible for the governance of emission reporting. The measuring and reporting on environmental performance is integrated in the yearly report and provides understanding of the total carbon footprint of the company. (AkzoNobel N.V., 2013)

AkzoNobel is divided into three business areas with several underlying business units. The three business areas are; Decorative Paints, Performance Coatings and Specialty Chemicals. Measurements of key performance indicators in the business areas provide information regarding performance for the separate business areas and business units. The measurements identify hot-spots of environmental impact in the value-chain. The carbon footprints for the three business areas differ in the value-chain were Decorative Paints and Performance Coatings have the largest impacts in upstream and downstream operations. For Speciality Chemicals the impact is distributed along the value-chain with the highest impact in own operations. The impact is visualised in Figure 1. Scope 1 represents direct emissions from own operations, scope 2 is indirect emissions from own operations and scope 3 are emissions from up- and downstream operations.

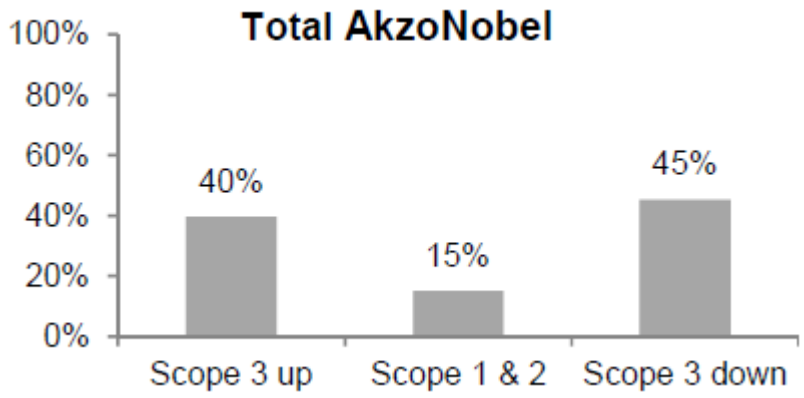

Figure 1 - Carbon footprint along the value-chain for AkzoNobel. (AkzoNobel N.V., 2013)©

A key performance indicator for AkzoNobel with respect to environmental performance is ton CO_2 equivalents per ton produced product ($tCO_{2,eq}$/tp). When the targets for climate change reduction were established in 2012 it was determined that the reduction target for carbon footprint 2020 were to be 25-30% based on 2012 baseline for $tCO_{2,eq}$/tp. The current trend of carbon footprint reduction is not in line with the targets. The carbon footprint has increased for Performance Coatings and Speciality Chemicals, while remained in line with 2012 baseline for Decorative Paints. The current trend and the distribution of impact along the value-chain make it possible to identify where investments have largest impacts, and what type of investments that would be of interest.

3 Literature Review

The literature review presents a theoretical foundation for how green bonds could accelerate green investments. How green bonds accelerate green investments is explained by a combination of different fields of literature. First, access to capital and cost of capital are presented. Financial benefits from lower cost of and access to new capital are believed to be strong drivers for companies to undertake proactive sustainability initiatives. Second, how a green bond could be compared to other green practices undertaken by companies and thus benefit from similar advantages linked to green practices.

The characteristics of the chemical industry are also explained in terms of contribution to carbon dioxide emissions and distribution of cost related impacts along the value-chain due to utilization of fossil resources. The characteristics of the chemical industry explain how significant reduction of environmental impacts calls for an extension of a green bond along the value-chain.

3.1 Cost of capital and access to financing

To understand the pure financial dimension of a green bond issuance it is important to explore advantages linked to the cost of and access to capital. Few studies have been conducted on how corporate environmental responsibility influences the cost of capital and access to capital (Oikonomou, Brooks, & Pavelin, 2014). Investors have traditionally been regarded as actors with one objective; maximize the return at a certain level of risk (Sethi, 2005). However, investors have recently shifted focus to include aspects such as environmental protection, sustainability and corporate responsibility (Sethi, 2005). This development indicates that investors have a multi-objective investment strategy and include other objectives (Bollen, 2007).

Research by Menz (Menz, 2010) suggests that little difference can be identified between conventional and responsible companies in risk. However, a large number of research studies conclude that companies with well-developed environmental management systems receive lower cost of debt (Bauer & Hann, 2010; Sharfman & Fernando, 2008; Ghoul, Guedhami, Kwok, & Misha, 2011). A study by Ge and Liu (Ge & Liu, 2012) shows that bond holders are concerned of corporate CSR work and companies with good CSR performance can issue bonds with lower coupon rates. Regulatory, reputational and legal cost linked to accidents therefore influence the credit rating of borrowing firms (Bauer & Hann, 2010).

Particularly environmental practices related to innovative eco premium products, reductions of carbon emissions, clean energy use and energy efficiency are linked to lower bond spreads (Bauer & Hann, 2010). There is an investor demand for increased company disclosure of carbon footprint and other environmental impacts that may inflict a risk on invested capital (Alam & Nizamuddin, 2013; Hebb, 2012). Increased disclosure of environmental data will thus reduce the risk for bond holders (Schneider, 2011). Increased transparency and the integration of environmental considerations reduce the uncertainty for investors (Hoffman, 2001). Environmental protection and community dialogue is also considered important to reduce the risk of community opposition to acquisition of production sites, or expansion of

current activities (Hoffman, 2001). Capital acquisition is therefore seen by the literature as an important driver for companies to explore the field of sustainability (Weybrecht, 2014).

The concept of responsible investment (RI) has seen a rapid growth the past ten years (Sievänen, Hannu, & Scholtens, 2012). The aftermath of the financial crisis 2007-2009 urge for greater oversight of the financial market and has resulted in a drastic increase of investor concern of risk in their portfolios (Hebb, 2012). With respect to the financial crisis, Hebb (Hebb, 2012) asks the question whether responsible investments could have predicted the crisis, thus could have changed the outcome and protected the assets. Nofsinger and Varma (Nofsinger & Varma, 2013) show in a study that *"Even during the financial crisis (2007-2009), the broad universe of professionally managed assets remained roughly flat, while assets using SRI (socially responsible investment) strategies enjoyed healthy growth of more than 13%".* Institutional investors that seek long-term return and low risk portfolios have taken the lead towards this shift in RI policy (Hebb, 2012).

Access to new investors that focus on RI is believed to be possible if companies label investments as sustainable, as there are a growing number of investors that shift focus to RI (Hebb, 2012). The internal legitimacy of green investments could also be increased by attracting the interest of external actors in control of large repositories of capital dedicated to green investments (Painuly, Park, Lee, & Noh, 2003). The largest investments portfolios are at the hands of institutional investors and contain an estimated 28 USD trillions of assets (Veys, 2010) (Della Croce, Kaminker, & Stewart, 2011). Pension funds, the main shareholder in many OECD countries, have started to include environmental criteria in investment decisions (Riikka & Hannu, 2013). RI is perceived by institutional investors to be a proactive form of investments that emphasizes on opportunities that offer both strong financial performance and positive secondary benefits (Hebb, 2012). It has also shown that the previous short-term focus of investments distracted the investors from identifying long-term risks and hazards (Woods & Urwin, 2010).

The world economic forum states that due to the new development on the financial market, the emergence of green bonds might have a positive impact on the cost of capital for companies. The green label enables companies to access investors with focus on sustainable investment and thereby broaden the investor base. Furthermore, increased transparency linked to the green bond will reduce the risk for investors and thereby reduce the cost of debt. Green bonds enable companies to access deep pools of low cost capital to fund green projects. (World Economic Forum, 2015)

To summarise, lower cost of capital has been identified for companies that undertake proactive sustainability measures. Access to capital in terms of a broadened investor base by inclusion of responsible institutional investors, is also believed to be an important financial driver for companies to undertake such measures.

3.2 Green Practices

The motives for companies to undertake green practices are diverse; reputational benefits, legislation, stakeholder pressure and internal legitimacy (Hoffman, 2001; Paulraj, 2008;

Walker, Sisto, & McBain, 2008; Bansal & Roth, 2000; Dechant & Altman, 1994; Weybrecht, 2014). A short description of these drivers will follow to provide understanding of benefits believed to be the result of green bonds.

Improvement of company reputation refers to company actions with the aim to align corporate actions with current societal norms and values (Bansal & Roth, 2000). The company reputation is regarded as an important driver to increase the marketing value of the company (Jenck, Agterberg, & Droescher, 2004). A positive company brand takes years to build, but can be ruined in a matter of minutes with current media coverage and social media campaigning (Weybrecht, 2014). Investor relation and the marketing departments within companies perceive green practices as a communication channel through which they can display environmental initiatives (Ross, 2015).

There are an increased amount of regulations and standards that global companies have to address; legislation has therefore become an important driver for green practices (Green, Morton, & New, 1996; Paulraj, 2008). To stay ahead of legislation or to be observant on new developments within the environmental field is of high value for companies in the current market situation (Weybrecht, 2014; Dechant & Altman, 1994). Non-compliance with legislation often results in fines, legal costs, additional inspections and effects on company reputation (Epstein & Buhovac, 2014). Companies often regard legislative development as an opportunity to be leaders, and to be viewed by governments as a frontrunner in the area of environmental management is of strategic importance for shaping the legislative development (Carter, 2001).

Communication with stakeholders continues to increase in importance (Weybrecht, 2014). NGO's and other stakeholders are increasingly aware of the impacts from companies on society (Epstein & Buhovac, 2014). Employees and customers are educated and informed to take action against companies if the company actions are not in line with customer values and beliefs (Dechant & Altman, 1994). Green bonds could be analysed as a package for environmental initiatives within companies under a common label. The green package increases the attractiveness of funding and communicates company efforts to external stakeholders (mathews & kidney, 2012).

Another important driver for green practices is to create legitimacy for environmental practices. Legitimacy plays a key role in the creation and the growth of new initiatives within a company. Legitimacy is defined as the perception that an initiative is necessary and appropriate (Ivory, 2013). A green bond issuance may act to connect sustainability departments with financial departments by involving both functions in a combined effort to finance green initiatives. Finance in particular holds a historically strong internal position, and involvement may therefore increase the legitimacy of sustainability issues (Ivory, 2013). It has been suggested that sustainability issues are systematically less prioritized within companies compared to financial targets (Hahn, Figge, Pinkse, & Preuss, 2010). This low priority of sustainability results in a need to increase the internal legitimacy for sustainability issues in order for those initiatives to be regarded as vital company development (Ivory, 2013).

The process of gaining legitimacy is defined using the definition developed by Flynn and Du (Flynn & Du, 2012) *"acquire the participation, enthusiasm and commitment from others that is necessary for managing their activities effectively"*. Some research argues that legitimacy is equally as important as other resources such as capital, personnel and technology when it comes to the success of new ventures (Zimmerman, 2002). Starr and MacMillan argue that securing legitimacy is fundamental to gain access to resources (Starr & MacMillan, 1990). If legitimacy is not acquired initiatives most often get criticized to be unnecessary or irrelevant (Ivory, 2013).

Literature show that implementation of green practices may be beneficial for companies. Five drivers for that could be linked to the issuance of a green bond have been presented; reputational benefits, legislation, stakeholder pressure, internal legitimacy and personal motives.

3.3 The Chemical Industry

The power and industry sectors are dominate sources of global carbon dioxide emissions, which is the greenhouse gas with largest contribution to climate change (IPCC, 2005). The use of fossil feedstock in petrochemical processes and manufacturing are responsible for large shares of the carbon dioxide emissions (IPCC, 2005). The chemical industry sector is accountable for a large share of industry carbon dioxide emissions (Center for climate and energy solutions, 2015). Figure 1 represents the distribution of industry emissions in the United States. Non-combustion emissions are indirect emissions from fossil feedstock, combustion are from utilization of fossil fuels in manufacturing processes and purchased electricity refers to indirect emissions connected to utilization of carbon intensive electricity grid mixes (Center for climate and energy solutions, 2015).

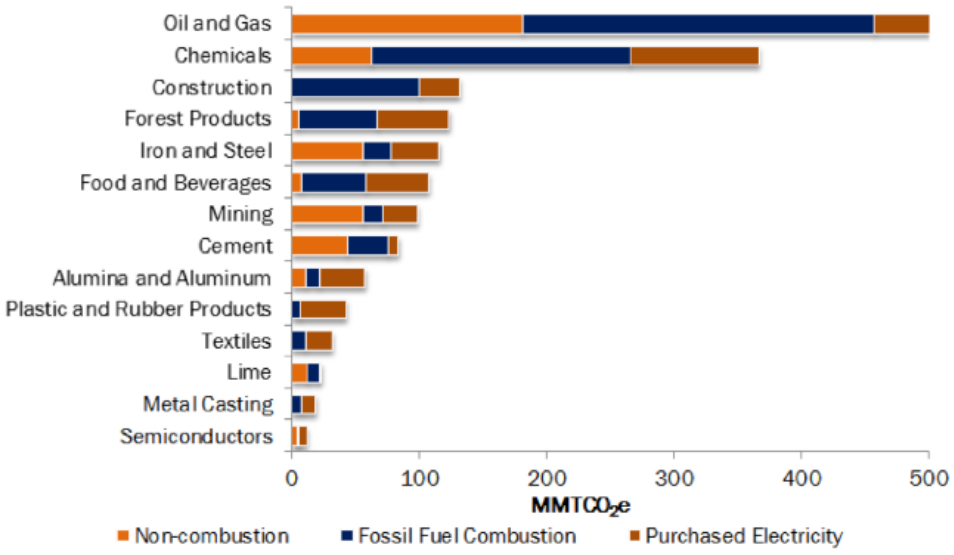

Figure 2 - Industry sector emission distribution and source © (Center for climate and energy solutions, 2015)

The chemical industry thus plays a significant role to achieve the targets for climate change reduction (Perathoner & Centi, 2014). Throughout the 20th century the chemical industry has been cost efficient and supplied the society with products based on fossil feedstock with high

profit margins (Clark, 2007). However, the costs for emissions, energy and disposal of hazardous waste combined with societal awareness of climate change have increased at a rate higher than the price of products (Clark, 2007). For the chemical industry to remain viable it has to decrease the cost linked to carbon dioxide emissions throughout the life-cycle (Clark, 2007).

3.4 Summary Literature Review

The literature review has covered drivers for companies to undertake proactive sustainability measures. A green bond could be described as a proactive sustainability measure and is analysed by the same drivers. If a green bond shows to correspond to some or all of the drivers explained in the literature review, this is believed to result in accelerated green investments. Hence, the research will aim to identify if green bonds results in any of the advantages linked to proactive sustainability measures. If so, green bonds will make green investments more attractive and most likely accelerate green investments. It is believed that if green bonds correspond to important drivers for proactive sustainability measures, green bonds will accelerate green investments.

It has been explained that the chemical industry has a significant environmental impact and that the impacts are distributed along the value-chain. It is believed that an issuance of a green bond in the chemical industry must be distinguished from conventional green bond issuance to cover all aspects of the value-chain for significant reduction of environmental impacts. The implementation of a green bond in a chemical company will be analysed with focus on reduction of environmental impacts and internal implications.

4 Method

This report is a study of how the issuance of green bonds accelerates green investments. The methods chosen to answer the research questions are semi-structured interviews of Swedish issuers of green bonds, investors with capital placed in green bonds and actors concerned by green bonds development, a survey among European issuers and action research in a case study at AkzoNobel.

The purpose is to identify drivers and experiences of green bonds from both issuer and investor perspectives. The ideas and questions raised during the interviews are used to create a questionnaire that forms the core of a survey of European issuers. The results from the interviews and questionnaire are used both to answer the research question of how green bonds accelerate green investments, but also as a complement to the case study to highlight advantages and disadvantages with green bonds that will be of value for the internal processes of an issuance at AkzoNobel.

4.1 Semi-structured Interviews

Semi-structured interviews were conducted to outline typical drivers and experiences from green bond issuances. The drivers and experiences were compared to the financial benefits or drivers for green practices presented in the literature review to evaluate how green bonds accelerate green investments. To conduct personal interviews have many advantages compared to questionnaire surveys; it may overcome poor response rates compared to surveys, it gives the interviewer the opportunity to explore attitudes and values, it provides the opportunity to explore non-verbal indicators, it facilitates comparability as the interviewer may ensure answers to all questions, and it ensures that the interviewee formulates answers without assistance (Barriball & While, 1994). However, as Brink mentions (Brink, 1989), a major challenge with semi-structured interviews is to attain reliability and validity to the research process. Even though the questions remain the same for all interviews, since words may be changed to suit the interviewee, the meaning of each question will be personal for all interviewees (Barriball & While, 1994). There will therefore not be expectations to receive the exact same answer from any of the interviewees (Scheinberg, 2014).

Semi-structured interviews are based on a question framework similar for each interviewee, but questions may be added during the interview to follow up on the interviewee's answers (Berg, 2009). The structure of semi-structured interviews is located between standardised and unstandardized interviews and involves a number of questions and special topics determined in advance (Berg, 2009). The approach of semi-structured interviews is believed to suit the report since the interviewees most likely will vary and have diverse professional and educational knowledge and thus a diverse terminology. In these cases changes can be made in the process of the interview to better suit the interviewee (Berg, 2009; Barriball & While, 1994). Second, the approach is suited to explore the perception and opinion of the respondent, especially for questions regarding sensitive issues (Barriball & While, 1994).

The question frame for the interviews is found in Appendix 1. The interviewees were approached by telephone contact where an interview was scheduled. It was also decided if the interview was to be conducted over telephone or in person. The advantages of telephone

interviews are that they are time efficient both in terms of involved people, but also that it is possible to reach widespread geographical areas (Berg, 2009). The disadvantages are that the emotional connection with the interviewee is lesser and that visual statements of the interviewee will not be read (Berg, 2009).

The interviews were conducted by both authors to ensure that questions on unforeseen matters could be added. The first part of the interview was dedicated to an introduction. The introduction contains a check-in where topics with no relevance for the interview are discussed to relieve stress, presentation of the study and research questions, and ethical concerns such as the interviewee's thoughts on disclosure and recording of the interview (Scheinberg, 2014; Berg, 2009). The second phase of the interview contained the question frame and the third phase was the closure phase. In the closure phase, a summary of the interview was presented by the interviewers to the interviewee (Scheinberg, 2014).

The interviews provided knowledge on the drivers and experiences from green bond issuances and raised further questions. As a large amount of quantitative data is required to draw conclusions for typical drivers and experiences from issuances, the findings from the interviews were used for the survey.

4.2 Survey

The survey was conducted to strengthen the result from interviews with quantifiable data. The survey was sent to 27 green bond issuers on the European market. The ideas and questions raised during the interviews are used as a frame for the survey. The purpose of the survey was to map drivers and experience from issuances of green bonds from a larger group than interviews may cover. As for the interviews, the results from the survey were used with the purpose to evaluate how green bonds accelerate green investments. The questionnaire, which can be found in Appendix 2, is strictly standardized. The first part of the survey aimed to provide knowledge of drivers for a green bond issuance. The second part of the survey was designed to address the benefits of an issuance and to provide arguments for consideration in the case study.

The research strategy of a survey has three strict advantages that justify the choice in this report; it produces empirical data, it may cover a large number of respondents thus produce a representative data collection, and it is efficient to produce a large amount of data at low costs and time (Kelley, Clark, Brown, & Sitzia, 2003).

The choice of sample group was determined by a review of all previous issuers of green bonds (Climate Bonds Initiative, 2015). To ensure similar financial courtesy and non-legislative standards, such as third party reviews (Climate Bonds Initiative, 2015), it was decided that the sample group would consist of European issuers. The group was further narrowed by the removal of banks and institutions to attain respondents with corporate organisation structures or competitive properties similar to corporations. The final sample group consisted of 27 actors that issued green bonds on the European market and the respondents are found in Appendix 3.

4.3 Action Research

The choice of action research methodology is motivated by the active participation of the researchers within the process. The case study evaluates the possible use of a green bond as a financial tool at AkzoNobel and how the tool should be used to achieve significant reduction in environmental impact. The process will therefore depend on identification of how internal concerns and problems are raised. The authors, as outsiders, will have to analyse the different settings to understand what internal drivers and obstacles there are, and the authors have to intervene in the process to resolve or change the problems in order to improve the situation (Berg, 2009; Mertler, 2013). The purpose of the case study was to both identify how green bonds can be used as a tool to accelerate green investments. The case study offered an opportunity to penetrate the company at all levels and thereby gain insights that would not be achieved by interviews exclusively. The case study was also believed to show how the use of a green bond could be broadened to have significant effects on the environmental impacts.

Action research is a method that includes participation, reflections, empowerment and emancipation of people and groups to improve their situation (Berg, 2009). Action research as method is used for research questions that seek the answer *on "What the concerns and problems as perceived by the people in this setting", "How do I, as an outsider, understand what seems to be happening in these situations and settings?"* and *"How can I, as an outsider, assist these participants resolve or change the problems in order to improve the situations?"* (Berg, 2009).

The aim is to gather information with the assistance of both internal and external stakeholders, to share and use this information to actually change the situation (Berg, 2009). The method is used as a means to enact action-oriented investigation of the application of theory to a specific problem in a specific situation – *"Where the goal of the research is not simply research for the sake of research or theory, but is an effort at creating a positive social change […]"* (Berg, 2009).

Action research was implemented in the case study by participation in the development of frameworks and internal processes for a possible green bond issuance. The initial step of the case study was to outline the perception of green investments. Three groups were approached; the sustainability group, the project owners group and the financial group. The idea of the process was to identify common internal barriers for a green bond and provide answers and solutions to how the barriers may be overcome. The concept of green bonds was introduced as a measure to facilitate green investments and to identify the internal perception and knowledge of external funding alternatives. The initial step was a part in the process to identify the gap between sustainability and financial departments and if green bonds could act to bridge the gap. The sustainability group was contacted to understand the link between financing and carbon footprint targets. The project owners group consisted of people responsible for sustainability at different layers within the organisation. Their role is to suggest measures to reduce the carbon footprint at different locations along the value-chain. The final group consisted of the financial department at AkzoNobel.

The initial step required participation and involvement to understand and gain knowledge on how internal stakeholders perceived advantages and disadvantages of green bonds. The knowledge and iterative communication with internal stakeholders was important to identify eligible projects and develop the framework suitable for a green bond issuance. The green bond framework was put in the context of the overall climate change targets for AkzoNobel to assess if the projects eligible for a green bond would have significant effect on environmental impacts.

4.3.1 Formulation of Internal Processes According to The GBP

The second step of the case study was to develop a framework and the formulation of internal processes for a green bond issuance. The method used for formulation of the processes follows the steps described by the GBP to create robust and legitimate processes.

The first step was to formulate project categories for projects eligible for funding. The GBP mentions the use of proceeds as a cornerstone of green bonds and states that *"The issuer should declare the eligible Green Project categories (...) in the Use of Proceeds section of the legal documentation for the security"*. All projects must also state their targeted environmental benefits, preferably in quantifiable measurements (ICMA, 2014). The project categories were decided by a review of past and future investments at AkzoNobel, together with collaboration with project owners. The projects are grouped under common categories.

Another process concerned by the GBP was the reporting on performance of the projects. In addition to the tracking of the use of proceeds, the issuer is recommended to report to the investors on the development of the projects at least annually (ICMA, 2014). This reporting is recommended to enclose quantitative indicators which measure the impact of the investments (ICMA, 2014). The process for reporting was developed together with the sustainability group. As the sustainability group is in charge of governance of sustainability reporting at AkzoNobel it is natural for the reporting process of green bonds to be in their governance as well. As measures and routines for reporting are thoroughly developed at AkzoNobel, this process does not require much work.

The formulation of internal processes according to the GBP will be developed based on previous green bonds frameworks. Third party reviews will be assessed to find common project categories and routines for reporting. A list of assessed reviews is found in Appendix 4.

4.3.2 Author Implication on the Process

Researchers in action research are not objective outside observers (Berg, 2009). The researcher collaborates with the participants of the study, provides opinions and expertise knowledge when suitable and thus is part of the research population (Berg, 2009).

Self-reflection on the contribution from the researchers to the process is therefore of high importance, both for the study, but also for transparency of the report. We will be involved in the process of an issuance of a green bond and therefore may be perceived as biased. Therefore, the implications on the process, the experience of being a part of the elements in

action research, and how the process was developed and shaped by the authors will be discussed as a limitation in section (6.4) of the analysis.

4.4 Analysis of Data

The interviews were analysed to map drivers, experiences and future developments of green bonds to conclude if the drivers in the literature could be linked to a green bond issuance. The analysis of qualitative interviews requires systematic filing of the results (Berg, 2009). The results are divided under certain themes; drivers, experiences and future developments. The drivers are defined as the initial drivers and expectation that made the issuer use green bonds instead of conventional bonds. The experience refers to issues and experiences related to the issuance of the green bonds along with lessons learned, which also could be referred to as benefits and disadvantages. Finally, future development is the statements related to projections and hopes for the future. The process for the content analysis is illustrated in Table 1. The approach was to condensate the interview results into structured data sets. The statements were categorised by the classifications to form three separate data sets for issuers and investors respectively.

Table 1 - Schematic explanation of content analysis of interview data. The data are examples to illustrate how the content analysis was conducted.

	Drivers	**Experience**	**Future**
Issuers	Access to capital Increased company reputation	Lower cost of capital Increased media attention	Long-term relationship with investors Industry specific frameworks
Investors	Risk reduction Increased reputation	Increased transparency Competitive pricing	Standardisation Continuous market growth

The organisation and reduction of data to uncover links and similarities follows a general interpretative research approach. The interpretative approach is used for text materials from interviews with respondents (Miles & Huberman, 1983). It is important to use solid selection criteria so that the study could be repeated by any other researcher obtaining the same result, which ensures the reliability of the results (Berg, 2009). When the interviews are structured, the results are matched against each other to either confirm or discard the statements.

The survey results were summarized in charts to show the distribution of answers. The two parts of the survey are divided into two charts to represent the difference in content. The analysis of these results follows a quantitative research approach which is seen as positive; it has been argued that both a qualitative and quantitative approach should be used in research (Berg, 2009).

The analysis of the action research process in the case study will be conducted through collaborative social research approach. Researchers that operate through action research, in order to accomplish change, analyse data continuously through participation of stakeholders

in the process (Miles & Huberman, 1983; Berg, 2009). Thus, the analytic strategy is similar to the interpretative research approach (Berg, 2009). As mentioned, the analytical process is in itself a continuous process performed through the case study, both subconsciously and consciously, by interpretation of attitudes and arguments. The generation of theory or theoretically connected explanations is derived directly and inductively from the specific case and the process of data in the case study (Berg, 2009).

5 Results

The results from the study of how green bonds could accelerate green investments and how green bonds could be used in the chemical industry to have significant effect on the environmental impacts are presented below. The results show that most drivers for benefits found in the literature review are influenced by the use of green bonds. However, some drivers are more dominant than others. Interviews and the survey indicate that company reputation and access to capital are of highest importance. The case study shows that the most important drivers are internal legitimacy and changes to current investment decision processes. There is no consistent evidence for significant financial benefits and it is thus not regarded as a main driver.

The results from the interviews and survey are connected to the first research question through identification of opportunities by issuance of a green bond. The results from the case study are connected to the first research question by identification of internal drivers and implications of a green bond.

The case study results are also essential for the second research question by identification of how the framework must be extended to cover all aspects of the Value-chain.

5.1 Interviews

The first part of the section presents the results from interviews with issuers of green bonds and the second part the results from interviews with investors. Table 2 shows the interviewees.

Table 2 - The interviewees for the study

Interviewee group	Company, Institution
Issuer	• City of Gothenburg • SCA • Vasakronan • Rikshem
Investor	• Storebrand • Svenska Kyrkan • IF • AP2

Summaries of transcribed interviews can be found in Appendix 5.

5.1.1 Issuers

Interviewees perceived the most important driver for involvement in the green bonds market to be increased reputation and marketing value of the company. The companies perceived an issuance as means to promote the company and show their environmental practices as part of the overall company business strategy.

The issuers had identified an increased demand for green bonds on the fixed-income market, which in some cases even forced the price down a few base points. However, this trend was

not applicable for all issuances and other issuers say that green bonds compete with regular bonds on the same financial conditions. All respondents confirm that a majority of investors prefer green bonds to other types of bonds, but cannot pay any extra for green bonds in terms of a lower coupon rate.

Another important driver for the issuance of a green bond is the risk reduction the company achieves by a broadened investor base. An issuance of a green bond attracted new investors that would otherwise not invest in the company and thus act to strengthen the company position when times are tough and access to capital is limited.

For some of the respondents, the green bond issuance became a symbol to show that the proactive work with sustainable development had started to pay off in terms of an increased marketing value and stakeholder interaction. One of the respondents stated that the issuance secured capital that would otherwise not be secured using regular channels, due to the added value of the green bond from marketing.

An aspect identified by one interviewee was the challenge with transparency from a green bond issuance. One of the added values for investors of green bonds is the increased insight in the company project development. The insight on the projects that are funded through the green bond issuance may however be potentially sensitive if the company wants to keep a level of confidentiality on the information and not communicate specifics about projects to external stakeholders.

Another important experience identified by issuers was that the companies through the issuance perceived an integration of sustainability and financial departments. As mentioned previously, the green bond became a symbol for sustainable development, a totem. Internal actors were gathered around the symbol to promote green investments and systematically categorize projects under the project criteria. This provided the company with information on all investment proposals within the company that may be referred to as sustainability investments.

The issuers did not perceive the extra reporting required as an obstacle for an issuance. One issuer however stated that the implementation of measurement and reporting routines was time consuming and it would have been an advantage to have the processes at place within the organization prior to the issuance.

Some of the issuers believe that the emergence of a green bond market is the first step of a process that will develop into a system where the issuers are labeled as green issuers, instead of issuances of specific green bonds. It is also believed that more specific frameworks are required, and will be developed, as the market continues to grow, to standardize reporting and measurements of project development to reduce the amounts of data investors need to process.

5.1.2 Investors

Representatives of pension funds claim that their policy is to invest in all available green bonds. Both since pension savers are positive to the sustainable character of green investments, but also since green bonds are available at the same price as conventional bonds.

One investor emphasizes the importance of the green bonds to be available at a competitive price as they often are linked to a higher liquidity risk.

Another driver for the investors is the extra attention provided by the green label, which add marketing advantages and value to both the issuers, but also the investors. Many of the institutional investors also have a long-term thinking incorporated into their investment strategy and therefore believe that sustainable investments do pay off in the long run.

The extra reporting received by investors from green bond investments is not perceived as time consuming. However, all the interviewees perceive the reporting as a potential problem if the market continues to grow and becomes a large share of their portfolios. Interviewees stated that standardisation of routines for reporting will be essential for a continued growth of the market.

It is mentioned by one investor that the market will sort out unreliable issuers. Most issuers will consider green bonds as a means to regularly refund the company. If the criteria, reporting and project selection lack robustness and solidity, investors will avoid those actors and thus natural selection will diminish the likelihood of those issuers to be frequent on the market.

One of the investors mentions green bonds as a first important step to be linked with other departments, such as the sustainability department, in the issuer organisations. Treasury department representatives and sustainability department representatives are both present at meetings with investors to communicate development of projects. Hopefully this experience will result in further internal collaboration in companies. The interviewees have positive experiences from actors that have issued green bonds especially as both the sustainability department and treasury are more involved and have more attention to projects. This is believed to result in an increased amount of future projects that target climate change.

5.1.3 Summary interviews

The interviews are summarized in table 2. The table follows the structure presented in section 4.4 in the method chapter.

Table 3 - Summary of interview results with issuers and investors

	Drivers	Experience	Future
Issuers	Increased company reputation Integration of sustainability in business strategy	Increased media attention, marketing value and company reputation A symbol to show company proactive work Access to capital otherwise not accessible	Long-term relationship with investors A demand for industry specific frameworks A green bond evolution into green certification of issuers
Investors	Risk reduction by investments in sustainability Increased reputation	Increased transparency by annual reports on project development Competitive pricing	Standardisation of annual reporting Continuous market growth Market regulates itself to exclude issuers with wrong intentions

5.2 Survey

The questionnaire was sent to 27 European issuers and received 17 responses (see Appendix 3 for a summary of respondents and company description). Figure 2 shows the results with regard to drivers for green bond issuance. Not all alternatives were answered by all respondents. It is clear that possible improvement in company reputation has been a typical driver with high scores in both moderate importance and high importance. Acceleration of sustainability investments and curiosity in the green bond market are also clear drivers. Some companies mentioned other drivers, such as diversification of investor base, highlight the importance of sustainability and funding for green projects as drivers as well. Capital acquisition, expressed as replacement of expiring bonds, is not regarded as a strong driver.

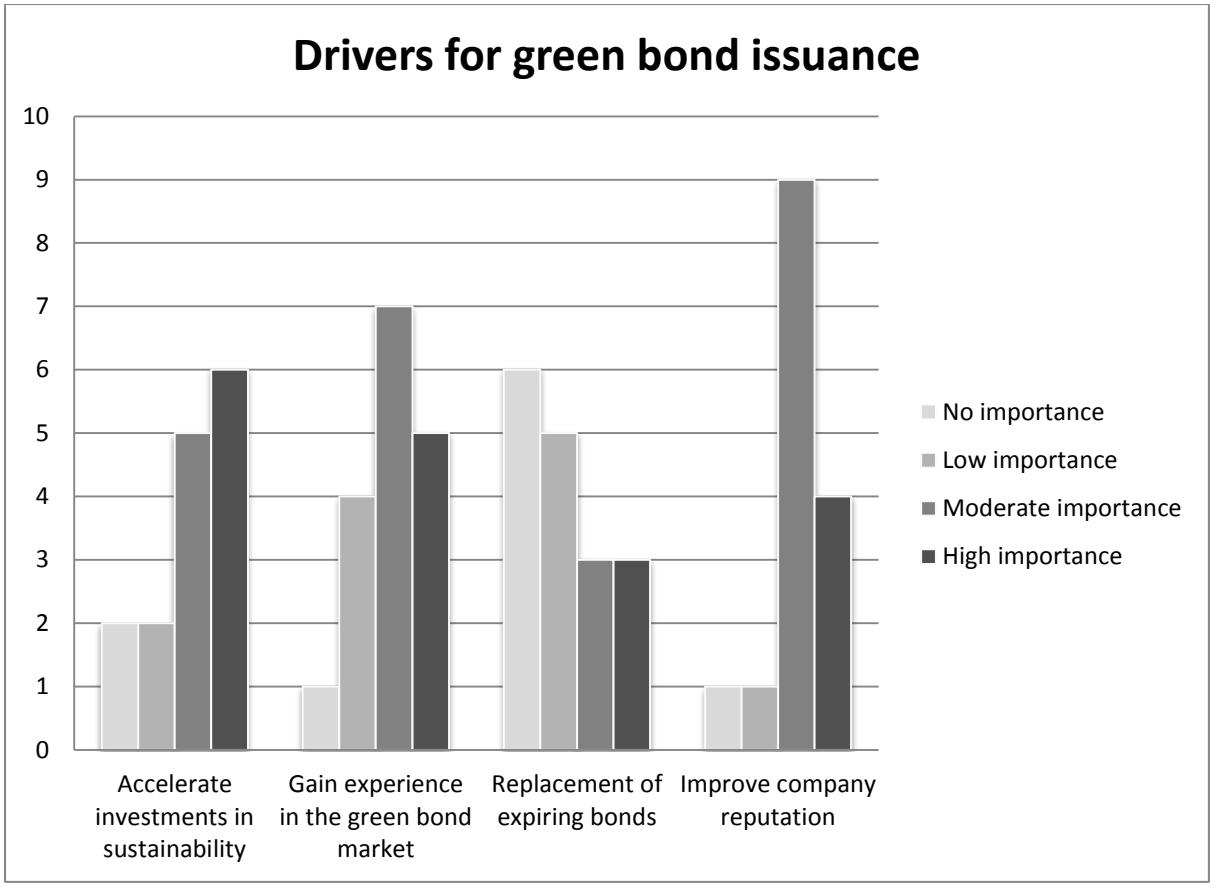

Figure 3 - The drivers of green bond issuances from the survey.

The second part of the survey was designed to map the experiences from an issuance of a green bond. The responses from issuers are visualised in figure 3. The results show that 88% of respondents experienced a reputational benefit from the issuance. 25% of respondents experienced a marginally lower coupon rate than compared to conventional bonds (one respondent declined to answer this question). 88 % experienced a broadened investor base. 31% of issuers felt that the extra reporting processes required extensive extra work and in those cases, many referred to the process prior to the second opinion. Almost all respondents, 94%, also felt that the issuance and the processes before and after the issuance provided new knowledge about the market that would not have been received otherwise, where one respondent specifically mentioned benefits of *"Finance and environmental departments understand each other better now"*. All respondents would consider another issuance of a green bond. Some quotations from the comments section in the questionnaire regarding another issuance are *"Definitely", "most certainly" and "Absolutely".*

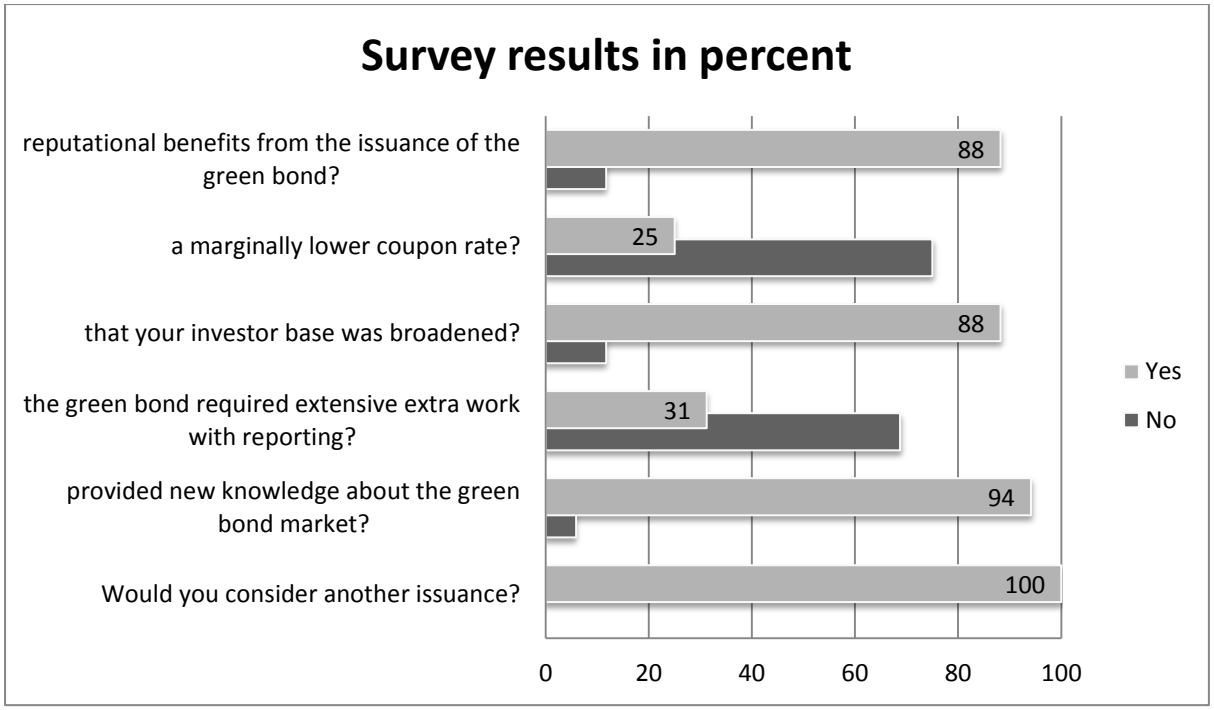

Figure 4 - The experiences from green bond issuances. The results are attained through the survey.

5.3 The Case Study

This section provides results from the case study at AkzoNobel. It follows the structure of the method section with regards to action research. It will both present results related to the first research question, on how green bonds accelerate green investments, but also on how a green bond could be implemented in the chemical industry to reduce environmental impacts.

5.3.1 Implementation Process at AkzoNobel

The sustainability group was interested to understand how a green bond could work as an additional incentive for green investments. The initial questions derived from discussions in the group concerned advantages and disadvantages of a green bond. The sustainability group was also concerned about to which extent a green bond would require extra work with reporting and what role the sustainability group would play in a green bond issuance. It was also questioned if a green bond would be able to provide a shortcut in the approval process for investments, thus accelerate green investments.

The concerns raised by the sustainability group with regard to advantages and disadvantages of a green bond were addressed by interviews and survey results. The absence of major disadvantages resulted in an increased interest. The increased reputational benefits and thereby opportunities to increase communication of sustainability issues, were of high interest. Additionally, the environmental assessment currently performed by the sustainability group would increase in importance if a green bond would be a reality. This is believed to be a main factor influencing the sustainability group to endorse the use of green bonds.

No or little extra work with reporting and measurement would be required at AkzoNobel, as routines and standards for measurements already are integrated into routines. This is also regarded as a main factor for the high interest of a green bond implementation at AkzoNobel.

Due to demands on internal rate of return, the sustainability group inquired if lower cost of capital would be possible. It was therefore regarded as a disappointment that there was no evidence that a green bond would provide any clear financial benefits. It was also believed by the group that a green bond may tilt the power of decision making in favour for sustainability issues, thus in the long run provide a shortcut for green investments and accelerate green investments. To summarise, little extra work combined with an increased influence on investment decisions made the sustainability group overall positive to green bonds.

The project owners group put a lot of effort into approval of projects by top management and perceived green bonds as an opportunity to gain access to project funding. The questions raised in those discussions concerned whether a green bond would either lower the demand for internal rate of return, or increase the profitability of green investments. The project owners were also concerned by the increased transparency of projects linked to a green bond and how project categories for a green bond were to be formulated to include their own initiatives.

The project owners regarded green bonds as an opportunity to gain increased interest to their suggestions. However, large differences were identified due to the distribution of environmental impacts value-chain in the business areas. Personal motives were clear drivers for the group and the question of how project categories could be formed to suit their own initiatives was given much consideration. The project owners believed that capital earmarked for green investments would provide green investments with a shortcut to acquire funding. The business units were however concerned if it would result in extra investments as a green bond would most likely be issued to replace existing expiring bonds. The replacement of existing debt would not increase the overall investment budget and thus not secure extra funds for green investments.

To summarize, projects in own operations, such as energy efficiency and process equipment upgrades, are believed to benefit from a green bond. However, current green bond frameworks are not developed to include partnerships and collaborative initiatives along the value-chain, and will therefore not accelerate such initiatives on its own. Still, a green bond could be used as a complement to fund facilities or R&D of technologies included in such partnerships and collaborations.

The financial department had a different viewpoint than the other focus groups and the topics raised in the discussions concerned cost of an issuance in terms of required time and extra internal processes, external views on corporate issuances, such as if the company market value might be increased, and also what scale of an issuance that would be required to fund projects for the coming years. However, they also inquired if a green bond would provide financial benefits compared to conventional bonds.

The financial department believed public and media attention linked to a corporate issuance as incentives for a green bond issuance. However, the department believed that most attention should be given to pure financial advantages, which decreased the interest of participation in the process of the green bond. The benefits from increased reputation and broadened investor

base are hard to measure in monetary terms and therefore difficult to legitimate within the current objective of the financial department.

All major investment proposals at AkzoNobel were assessed to identify projects eligible for funding through a green bond issuance.

5.3.2 Formulation of Internal Processes

All green bonds issuances are different in terms of types of projects, how they are reported and how the impacts are measured. The similarities that can be found regarding the types of projects are the recurring of renewable energy and energy efficiency projects. These projects are part of the list that is recognized by the GBP. For further information see Appendix 4.

A review of 15 second opinions list categories that have been regarded as eligible for green bond issuances; Renewable Energy, Energy Efficiency, Water Management, Climate Adaption, Sustainable Transportation, Fuel Switching, Fuel from Forest Waste, Waste Management, Sustainable Buildings, Nature Conservation and Sustainable Forestry.

The project categories were matched with implemented and suggested green investments at AkzoNobel. The following project categories are recommended to be included in the green bond framework for a possible AkzoNobel issuance and to have significant effect on the environmental impacts by inclusion of the entire value-chain:

Table 4 - Recommended project categories for a green bond issuance at AkzoNobel.

Project category	Specific Projects
Renewable energy	Renewable electricity production: Wind power, Solar power
	Heat and power production: Geothermal heating, Biomass boilers, sludge incinerators and combined heat and power production (CHP)
Renewable raw materials	R&D renewable raw materials
	Acquisitions
On-site energy efficiency	Production processes: Investments in production technologies and manufacturing processes
	Production infrastructure: Pumps, compressors, fans or lighting, cooling towers, steam processes and insulation
	Development of process technologies
Water & waste management	Site remediation

Internal processes for measurements and reporting already exist at AkzoNobel, thus it is believed that the process to compile data for reporting will fall within governance at the sustainability group. The assessment of projects to include in the green bond would be most

efficient under the existing routines to assess investment proposals. The environmental assessment would also indicate what project category that would be most suited for projects.

6 Analysis

The general analysis of the results confirms that green bonds correspond with many of the drivers presented by literature of why companies would undertake efforts in sustainability. However, the case study indicates that other drivers, such as internal politics and decisions making are equally important. It is believed to be a misalignment of what companies disclose to public in interviews and surveys, and what the internal motive for a green bond issuance actually is.

The first section analyses how green bonds accelerate green investments. The analysis compares the theoretical drivers with the results from interviews, survey and the case study. The second section emphasizes how green bonds could be used in the chemical industry to reduce environmental impacts and discusses a possible extension of green bonds along the value-chain. Unexpected findings, discussion of the results and recommendations for further research are also presented.

6.1 General Analysis

The theoretical approach to the research questions is to compare the drivers for green investments identified within the literature with findings from the survey and interviews. The initial drivers for green investments were cost of capital and access to financing, reputation, stakeholder pressure, personal motives, competitive pressure and internal legitimacy.

6.1.1 Cost of Capital and Access to Capital

Green bonds have the potential to lower the cost of capital if investors would be willing to accept a lower coupon rate for green bonds. It is though unlikely to be the case as investors stated that green bonds must compete on the same terms as conventional bonds. However, it was mentioned in the interviews with issuers that they wish for green bonds to experience lower cost of capital, i.e. lower coupon rates, than conventional bonds. If so, lower cost of capital will most likely have significant effect on company attitude towards issuance of a green bond.

A marginally lower coupon rate was identified by 25 % of the issuers and mainly on the Swedish market. The comparison of the coupon rates is difficult due to the lack of products with similar characteristics and also due to historically low coupon rates. If this is due to either that the market is in its emergence and investor interest has been extremely high, or if this signals a more significant future difference in price, is impossible to draw conclusions on. Yet, most investors state that they invest in green bonds if the price is equal to conventional bonds. Therefore, lower cost of capital from green bonds is not believed to accelerate green investments.

However, the literature review finds that companies with well-developed environmental management systems may receive lower cost of debt-finance. An indirect consequence of a green bond issuance, as identified from interviews with issuers, may be a “green certification” of the issuer itself. This “green certification” may in extension result in lower costs of debt-finance of the entire company. The green label of the bond is thus transferred to cover the company as a whole and ensure investors that capital will be invested in a responsible manner.

Both the survey and interviews indicated that a common experience from issuers was a broadened investor base. One actor mentioned that the green bond provided access to capital that otherwise would not be accessible. Therefore the green bond did in fact accelerate green investments that otherwise would not have been carried out. If green bonds continue to provide access to capital, green bonds accelerate green investments. As the attractiveness of green bonds from investors is high, it is appropriate to believe that green bonds will increase company efforts in sustainability by enabling green investments that otherwise would not be carried out. Access to capital is regarded as the dominant financial driver for a green bond issuance.

6.1.2 Green Practices

Legislation is not regarded as a driver for green bond issuances as legislation has not yet affected the green bonds market.

Increased company reputation and the ability to communicate company efforts were regarded as important drivers for a green bond issuance. Similar explanation is given by literature to explain why companies implement green practices. Some respondents refer to this as the green bond is a label or symbol under which companies gather green investment proposals. A majority of the companies state that the company received additional attention due to the green bond. It is therefore likely that increased attention and marketing value results in increased attractiveness of green investments and thus accelerates green investments. However, initial projects under a green bond issuance have shown to already be approved for investments, where green bonds have been issued to increase the marketing value of those efforts. However, recurring issuances of green bonds will likely result in inclusion of projects that otherwise would be rejected by decision makers.

Stakeholder pressure is important for the issuance of green bonds. The stakeholders pressures companies to increase dialogue and collaboration between financial and sustainability departments. From an investor perspective, green bonds enable investors to have insight within the company. Prior to green bonds, investors found it hard to track invested capital and ensure responsible investments. It is therefore believed that stakeholder pressure generate incentives for companies to accelerate green investments through green bond issuances.

Results show little interest from pension savers in responsible investments so far. If the link between the financial market and corporate behaviour becomes clear, savers might understand the importance of active management of savings. Companies that issues green bonds will have an advantage in communication with this stakeholder group and thereby may secure capital.

Increased communication and transparency force companies to disclose information. It is important to evaluate what information to disclose to avoid public announcement of sensitive information. Consequently, if projects in R&D are included in a green bond issuance, only general information could be announced. The challenge could be overcome by a third party verification of project specifics to ensure external actors that environmental benefits are achieved by the projects.

The green bonds market has experienced a "first fever", during which issuers have benefitted from opportunities to be the first city, first company or first energy company to issue a green bond. Companies see a value to be associated with leadership and to show competitors that they are innovative within the environmental field. It was identified in the case study that the opportunity to be the first chemical company to issue a green bond was of major interest. However, while the first fever soothes it is believed that competitive pressure will reduce in significance.

The internal legitimacy for green investments is strengthened as a result of the involvement of the financial department in a green bond issuance. The inclusion of a department with strong and powerful internal position increases the legitimacy in discussions with executive decision makers. The financial department has a strong connection and communication with investors and external stakeholders. The relationship with investors and external stakeholders are crucial to gain input and feedback for the development of a framework.

Another important aspect for internal legitimacy is the increased legitimacy of green investments at the financial department. The increased communication between sustainability and financial representatives educates actors from both departments. The collaboration will most likely result in a re-evaluation of green investments, and thus increase the attractiveness. It is therefore believed that increased internal legitimacy for green investments will play a significant role in the long run to accelerate green investments. If the company has a dedicated part of the investment budget to green investments, projects will no longer only be evaluated solely on economic criteria. A green bond framework would significantly increase the legitimacy of environmental assessment of performance.

As stated above a green bond issuance will cover many of the drivers for companies to undertake green investments and it is therefore believed that green bonds in the long run will accelerate green investments. Green bonds have initially not increased green investments, but since green bonds increase the reputation and gather departments around the sustainable movement, it will likely result in that effect in the long run. The green bond is a symbol, or totem, of leadership within the field of sustainable development. To maintain this aura of leadership, companies will eventually be forced to "do more". Increased reputation and increased internal legitimacy are regarded as the dominant drivers linked to a green bond issuance.

6.2 Implications on Environmental Impact

The GBP state a list of categories eligible for green bond funding. A majority of projects so far has focused on renewable energy investments, energy efficiency or sustainable building projects. In other words, almost all project categories concern activities within own operations. For the chemical industry in general, and AkzoNobel in particular, improvements of environmental impacts only in own operation will not have significant effect. AkzoNobel has most of environmental impacts linked to upstream and downstream processes, and thus different investments requirements. The extension of responsibility to include the entire value-chain is therefore an important part of AkzoNobel's environmental strategy. A transition to a sustainable company requires both investments, but also collaboration along

the value-chain. For green bonds to fully support the transition, collaborative efforts with actors from the chemical industry, the financial market and organisations responsible for the guidelines on the green bond market is required. The challenge is to develop industry specific frameworks for the use of green bonds that will be adapted for the present situation in the chemical industry.

To reduce the environmental impact in upstream processes, it is of great importance for AkzoNobel to interact with suppliers to substitute raw materials to increase the use of renewable materials. This change could include investments and acquisitions of sustainable chemical start-ups together with investments in new facilities to produce renewable products. Research and development projects are important where substitution of raw materials is expensive or technically not feasible. Acquisition of sustainable companies would be a natural part of a green bond, however R&D could be sensitive to include. As previously mentioned, actions have to be taken to evaluate the information disclosed to external stakeholders to avoid disclosure of sensitive information. R&D projects play a key role in the transition of the chemical industry, but will not result in immediate reduction of environmental impacts.

For some of the business units the impact is large in own operations, but in these part of the company, energy efficiency is core business and of strategic importance. Improvements in energy efficiency are implemented due to energy cost reasons. The potential reduction of environmental impacts from energy efficiency investments within own operations are low compared to other parts of the value-chain. However, own operations could slightly reduce its environmental impact if investments are implemented in process efficiency, equipment upgrades and production of renewable energy where funds from green bond issuance traditionally are used within companies. Efficiency measures have benefits of relatively short return on investment. Therefore, those investments may be important for internal marketing of a green bond. The green bond is also important for external marketing of such initiatives.

Process efficiency and production of renewable electricity suits the framework of a green bond. These are investments with clear and quantifiable environmental impact. A disadvantage is the lack of suitable land area for construction of wind power parks. Both energy efficiency and energy production investment would be a natural part of a green bond.

To develop products with less impact in the user phase requires years of R&D together with customer collaboration. The transparency feature of a green bond is both an advantage, but also a disadvantage. As discussed before, competitive challenges forces AkzoNobel not to disclose information of strategic importance to customers or competitors. Therefore R&D projects are regarded as difficult to finance through a green bond. At the same time, product development together with customers is regarded as of high potential to reduce the total environmental impacts. However, if companies that fund research and development projects only disclose the potential reduction of environmental impacts and the amounts of funds allocated to the projects, one may overcome the issue.

Green bonds have the potential to help companies shift from resource intensive to low carbon business. AkzoNobel and other companies with similar impact distribution will face a great challenge to abate emissions in the value-chain outside company control. Green bonds have broad project categories and could therefore be one piece of the puzzle. Significant reductions of greenhouse gas emissions will require investments together with other initiatives and collaborations.

6.3 Unexpected Findings

An interesting finding from the case study was that a green bond could initiate internal discussions for a structural re-organisation of investment decision making. When green bonds were introduced, both the sustainability and the financial department wanted to understand the implications of the new financial tool. The green bond would replace existing bonds and replace them with an earmarked portfolio for green investment. The required knowledge for the process of project selection is in the hands of the sustainability department. This implies that the sustainability department will gain additional influence over investments. The opposite positions that the sustainability and financial department took in the case study highlights this organisational implication.

The sustainability department was positive to the introduction of a green bond, while the financial department was hesitant. Interesting is that interviews indicated that the financial department was the initiator of green bonds in contrast to the case study at AkzoNobel. This finding may explain the hesitation of the financial department at AkzoNobel. This finding emphasizes the importance of mutual approval from both departments before an implementation.

This shows the importance of influence and internal agendas and might also reflect the low exchange between financial and sustainability departments historically. The green bond is a means to increase the connection between finance and sustainability departments. To understand the resistance it is important to understand the level of internal acceptance of sustainability issues in the overall business strategy. An issuance of a green bond will increase exchange of knowledge and communication within the company, thus increase the integration of sustainability in the company culture.

Another important issue is that many stakeholders involved in an issuance of a green bond only considered it as a replacement of expiring bonds. This means that the yearly investment budget would not change and the space given to green investments would compromise on the total investments budget. Project owners at AkzoNobel anticipated to gain additional funding dedicated to green investments. If not, existing financial demand on return on investment would remain and thus prevent less profitable green investments to be carried out. This would not be the case if green bonds experienced lower coupon rates and thus lower the cost of capital for green investments. Interviews with investors showed the same result, that investors were not willing to accept a lower coupon rate for green bonds. Yet, investments in green bonds were considered more attractive than conventional bond investments. This indicates that even if green investments do not receive any major advantages currently on the financial market, this may change in the future.

The case study has given indications that a green bond issuance has important implication on the organisation. Personal motives for and changes to existing power structures are believed to be influenced by the issuance of a green bond.

6.4 Discussion of the Results

The study provides both a general picture based on interviews and a survey, and specific data from the case study. The combination of the general approach and a case specific approach make the conclusions more valid and applicable to different situations. However, more data on the performance of green bonds is required to identify statistically significant differences between green bonds and conventional bonds. The study was conducted in the early market of green bonds and may thus be influenced by early market indications.

The case study is influenced by company specific data. It may be argued whether or not conclusions from the study are valid in general applications for organisations. The purpose of the study is for results to be applicable for the chemical industry in general, and the results from the interviews and the survey are believed to be applicable. However, the results from the case study are as mentioned company specific and influenced by internal culture and hierarchy of the case study company. Differences in culture and organisation between companies may cause the applicability of the results to be limited. However, the idea of a green bond as a tool to bridge internal organisational gaps is believed to be applicable in organisations in general. The data from interviews, the survey and the case study are from companies in the European market. Interviewees and respondents were European and thus influenced by European political climate and culture. Although most companies in study are global, the data is influenced by the European view on environmental issues.

Some results from the survey have contradicted the results from the interviews. It may be argued that there is a difference between what is communicated to external actors to be the drivers for a green bond issuance, and what the personal drivers in the organisations are. This is believed to be explained by the implications from green bonds on the internal politics and decision making. It may be regarded as sensitive to mention the implication on decision making from green bonds to outsiders. Therefore it is believed that the case study provides knowledge and insights that would not otherwise be stated.

A limitation is the implication from the authors as part of the action research. The authors have been involved in the process as agents to implement green bonds. The results may be regarded as biased and it may be believed that the results have not taken into account disadvantages. It may also be believed that arguments and hesitations that oppose an issuance of a green bond might be less apparent in the report. However, the authors believe that the actual situation is the opposite. Hesitation and counter arguments have been regarded as important input to increase the credibility of the process.

A finding that has been derived from discussions with interviewees is if development of green bonds may be a step to have certified green issuers. A certified green issuer would not require third party reviews of the issuance, rather of the company as a whole, or other assurance for the use of proceeds. Investors would thus be assured that all company activities

are aligned with current sustainability norms. This might result in a lower cost of debt for certified green companies.

6.5 Recommendations for Further Research

No financial benefit linked to a green bond is considered an obstacle for companies to issue a green bond. The occasionally lower coupon rate is difficult to interpret and would require further research. Further research should be targeted at challenging the norm of equal prices to identify if a willingness to accept lower coupon rates for green bonds exists. This would indicate if a green bond adds a significant monetized green value.

Another target for further research is the concept and meaning of sustainability for separate industries. The guidelines for green bond issuances are general and do not distinguish industries from each other. Companies have different impacts on the environment and for green bonds to be applicable on broader spectra of companies, industry specific criteria are required. Further research in the green bonds market must therefore outline separate criteria to avoid that capital accessed by green bond issuances is invested in projects with little or no environmental benefits.

7 Conclusions

The world is facing enormous consequences due to climate change and investors have recognized their responsibility and ability to make a difference by shifting capital from traditional to sustainable investments. Green bonds enable investors to have insights on the use of invested capital and acts to bridge the internal gap between finance and sustainability within companies.

Companies have recognized and started to embrace sustainability issues. However, green investments lack funds. Traditional investments with shorter return on investments are currently prioritized over green investments. Green bonds have shown to capture additional green value of green investments. This value is represented by access to capital, increased company reputation, increased internal legitimacy for sustainability and the shift of decision power within organisations. However, for green bonds to become widely accepted, direct financial benefits or incentives have to emerge. An increased amount of issuers will mobilize the debt market to accelerate green investments.

For green bonds to be effective to reduce environmental impacts within the chemical industry, the green bond must be extended to cover investments and initiatives in the entire value-chain. In addition to conventional project categories included in previous issuances, such as energy efficiency and renewable energy, the framework has to be extended to cover industry specific activities. For the transition of the chemical industry to a sustainable industry, joint R&D with suppliers to substitute fossil raw materials and partnerships with customer to implement the most efficient use of products, have to be included in a green bond framework. However, the conclusion from the study is that in addition to investments, other initiatives are equally as important to reach a sustainable society.

Green bonds may play a role in the transition towards a sustainable society. The financing of green investments is crucial to reduce the environmental impact of companies, and green bonds could have a significant impact on this aspect. The concluding remark of this study is that when it comes to corporate sustainability measures it is not the isolated green investments that make the difference, it is the overall investments and business strategy. Companies will have to make radical changes in their way of doing business to remain competitive in what will be the future sustainable society.

Bibliography

AkzoNobel N.V. (2013). *Report 2013.* Amsterdam: AkzoNobel.

Alam, P., & Nizamuddin, M. (2013). An analytical study of green financial markets for sustainable development. *Internation Journal of Applied Financial Management Perspectives*, 382-387.

Andersson, M. (2015). Senior Investment Manager IF. (Falsen, & Johansson, Intervjuare)

Bansal, P., & Roth, K. (2000). Why companies go green; a model of ecological responsiveness. *Academy of management*, 717-736.

Barfeldt, J. (2015). Asset Manager Svenska Kyrkan. (Falsen, & Johansson, Intervjuare)

Barriball, L., & While, A. (1994). Collecting data using a semi-structured interview: a discussion paper. *Journal of Advanced Nursing*, 328-335.

Bauer, R., & Hann, D. (2010). *Corporate Environmental Management and Credit Risk.* Maastricht: European Centre for Corporate Engagement (ECCE).

Berg, B. L. (2009). *Qualitative Research Methods for the social sciences.* Boston: Pearson Education.

Bollen, N. P. (2007). Mutual fund attributes and investor behavior. *Journal of financial and quantitative analysis*, 683-708.

Borelius, M. (2 2015). Head of group treasury City of Gothenburg. (Falsen, & Johansson, Intervjuare)

Boulle, B., Kidney, S., & Oliver, P. (2014). *Bonds and climate change - The state of the market in 2014.* The Climate Bonds Initiative in association with HSBC Climate Change Centre of Excellence.

Brealey, R., Myers, S., & Marcus, A. (2012). *Fundamentals of Corporate Finace, 7th ed.* New York: McGraw-Hill/Irwin.

Brink, P. (1989). Issues in reliability and validity. i J. Morse, *Qualitative Nursing Research: A contemporary dialogue.* Aspen: Rockville.

Bruzelius, J. (2015). Chief Financial Officer Rikshem. (Falsen, & Johansson, Intervjuare)

Carter, C. R. (2001). Purchasing's Role in Environmental Managmement: Cross-Functional Development of Grounded Theory. *Journal of Supply Chain Management*, 12-27.

Center for climate and energy solutions. (den 1 1 2015). *Industrial emissions in the United States*. Hämtat från Center for climate and energy solutions: http://www.c2es.org/energy/use/industrial den 30 5 2015

CICERO. (den 27 11 2013). *CICERO Second Opinions on Green Bond Investment Frameworks*. Hämtat från CICERO Senter for klimatforskning: http://www.cicero.uio.no/webnews/?id=11984&_sm_au_=iHVqGb0KsTH0QfL7 den 26 1 2015

CICERO. (2013). *'Second opinion' on Vasakronan's Green Bond Framework.* OSLO: CICERO.

CICERO. (2014). *'second opinion' on City of Gothenburg's Green Bond framework.* OSLO: CICERO.

CICERO. (2014). *'second opinion' on fastighets AB förvaltaren.* OSLO: CICERO.

CICERO. (2014). *'second opinion' on Rikshem's Green Bond Framework.* OSLO: CICERO.

CICERO. (2014). *'Second Opinion' on SCA's Green Bond framework.* OSLO: CICERO.

CICERO. (2014). *'second opinion' on SLL's green bond framework.* OSLO: CICERO.

CICERO. (2014). *'Second Opinion' on Örebro Kommun's Green Bond framework.* OSLO: CICERO.

Clark, J. H. (2007). Green chemistry for the second generation biorefinery - sustainable chemical manufacturing based on biomass. *Journal of Chemical Technology and Biotechnology*, 603-609.

Climate Bonds Initiative. (den 01 01 2014). *Second Opinion*. Hämtat från Climate Bonds Initiative: http://www.climatebonds.net/market/second-opinion den 17 04 2015

Climate Bonds Initiative. (den 01 04 2015). *Labelled green bonds data*. Hämtat från Climate Bonds Initiative: http://www.climatebonds.net/cbi/pub/data/bonds?items_per_page=All&=Apply den 07 04 2015

Dechant, K., & Altman, B. (1994). Environmental leadership: From compliance to competitive advantage. *Acadamy of management Excecutive*, 7-27.

Della Croce, R., Kaminker, C., & Stewart, F. (2011). *The Role of Pension Funds in Financing Green Growth.* Paris: OECD Publishing.

DNV, G. (2014). *DNV GL second party opinion.* OSLO: DNV GL.

DNV, G. (2014). *DNV GL second party opinion.* London: DNVGL.

DNV, G. (2014). *DNV GL second party opinion.* Hövik: DNVGL.

DNV, G. (2014). *Vardar Green Bonds- DNV GL second part opinion.* OSLO: DNV GL.

Dow Jones Sustainability Indices. (den 01 09 2014). *Industry Group Leaders 2014*. Hämtat från Dow Jones Sustainability Indices: http://www.sustainability-indices.com/review/industry-group-leaders-2014.jsp den 27 03 2015

Epstein, M., & Buhovac, A. (2014). *Making Sustainability Work - Best practices in managing and measuring corporate social, environmental and economic impacts, 2nd edition.* San Francisco: Berret-Koehler Publishers, Inc.

Flynn, D., & Du, Y. (2012). A case study of the legitimation process undertaken to gain support for an information system in a Chinese university. *European Journal of Information Systems*, 212-228.

Ge, W., & Liu, M. (2012). Corporate Social Responsibility and the Cost of Corporate Bonds. *CAAA Annual Conference*, (ss. 1-55).

Ghoul, S. E., Guedhami, O., Kwok, C. C., & Misha, D. R. (2011). Does corporate social responsibility affect the cost of capital? *Journal of Banking & Finance*, 2388-2406.

Green, K., Morton, B., & New, S. (1996). Purchasing and environmental management: Interactions, policies and opportunities. *Business strategy and the environment*, 188-197.

Hahn, T., Figge, F., Pinkse, J., & Preuss, L. (2010). Trade-Offs in Corporate Sustainability: You Can't Have Your Cake and Eat It. *Business Strategy and the Environment*, 217–229.

Hebb, T. (2012). *The next generation of responsible investing.* Ottawa: Springer science + Business media B.V.

Heiskanen, E. (2002). The institutional logic of life cycle thinking. *Journal of Cleaner Production*, 427-437.

Hoffman, A. J. (2001). Linking Organizational and field-level analyses : The diffusion of Corporate environmental practices. *Organization & Environment*, 133-156.

ICMA. (2014). *Green Bond Principles - Voluntary Process Guidelines for issuing Green Bonds.* ICMA.

International Energy Agency. (2012). *Energy technology perspectives 2012.* Paris: OECD/IEA.

IPCC. (2005). *IPCC Special Report on Carbon dioxide Capture and Storage.* New York: Cambridge University Press.

Ivory, S. B. (2013). *The Process of Legitimising: How practitioners gain legitimacy for sustainability within their organisation.* Edinburgh: University of Edinburgh Business School.

Jenck, J., Agterberg, F., & Droescher, M. (2004). Products and processes for a sustainable chemical industry: a review of achievements and prospects. *Green Chemistry*, 544-556.

Keefe, J. (den 15 6 2010). *Sustainable investing and the next economy.* (J. Keefe, Artist) Federal Reserve Bank of Boston, Boston, Massachussets, United States of America.

Kelley, K., Clark, B., Brown, V., & Sitzia, J. (2003). Good practice in the conduct and reporting of survey research. *International Journal for Quality in Health Care*, 261-266.

Kemp, R. (1994). Technology and the Transition to Environmental Sustainability - The problem of technological regime shifts. *Futures*, 1023-1046.

Kidney, S., & Oliver, P. (2014). *Greening China's financial market.* Winnipeg: The International Institute for Sustainable Development.

Kimbro, M. (2013). Integrating Sustainability in Capital Budgeting Decisions. i P. Taticchi, P. Carbone, & A. Vito, *Corporate Sustainability* (ss. 103-114). London: Springer.

Lindahl, H. (2015). Asset Manager Storebrand. (Falsen, & Johansson, Intervjuare)

Lindblom, L. (2015). Asset Manager fixed-income AP2. (Falsen, & Johansson, Intervjuare)

mathews, j. A., & kidney, S. (2012). Financial climate-friendly energy development through bonds. *Development Southern Africa*, 337-349.

Menz, K.-M. (2010). Corporate social responsibility: Is it rewarded by the corporate bond market? A critical note. *Journal of Business Ethics*, 117-134.

Mertler, C. A. (2013). *Action research improving schools and empowering educators.* Phoenix: SAGE Publications.

Miles, M., & Huberman, M. (1983). *Qualitative data analysis.* Beverly Hills: Sage.

Mirabeau, T., & Citroën, A. (2004). *Why take a life-cycle approach.* Paris: United Nations Publications.

Nerlich, C. (2015). Chief Financial Officer Vasakronan. (Falsen, & Johansson, Intervjuare)

Nofsinger, J., & Varma, A. (2013). Socially responsible funds and market crisis. *Journal of Banking & Finance*, 180-193.

Nordhaus, W. (2013). *The Climate Casino: Risk, Uncertainty, and Economics for a Warming World.* New Haven: Yale University Press.

OEKOM. (2014). *Verification of the sustainability quality of the Green bond issued in 2014 by VERBUND AG.* MUNICH: OEKOM.

Oikonomou, I., Brooks, C., & Pavelin, S. (2014). The effects of corporate social performance on the cost of corporate debt and credit ratings . *The financial review*, 49-75.

Olsen-Rong, T. (den 26 03 2014). *Climate bond initiative*. Hämtat från Climate bond initiative: http://www.climatebonds.net/cbi/pub/data/bonds?items_per_page=All&=Apply den 26 03 2014

Painuly, J., Park, H., Lee, M., & Noh, J. (2003). Promoting Energy Efficiency Financing and ESCOs in Developing Countries: Mechanisms and Barriers. *Journal of Cleaner Production*, 659-665.

Paulraj, A. (2008). Environmental Motivations: a Classification Scheme and its Impact on Environmental Strategies And Practices. *Business strategy and the environment*.

Perathoner, S., & Centi, G. (2014). CO2 recycling: A key strategy to introduce green energy in the chemical production chain. *chemsuschem concepts*, 1274-1282.

Perkins, R. (2003). Technological "lock-in". *International society for ecological economics*.

Riikka, S., & Hannu, R. (2013). The drivers of responsible investments: The case of european pension funds. *Journal of business ethics*, 137-151.

Ross, U. (2015). *Green bond drivers.* London: HSBC.

Rydin, J. (2015). Vice President and Group Treasurer SCA. (Falsen, & Johansson, Intervjuare)

Scheinberg, S. (den 1 11 2014). Program Leader Chalmers. (P. Johansson, Intervjuare)

Schneider, t. E. (2011). Is Environmental Performance a Determinant of Bond Pricing? *Contemporary accounting research*, 1537-1562.

Sethi, S. (2005). Investing in Socially Responsible Companies is a must for Public Pension Funds – Because there is no Better Alternative. *Journal of Business Ethics*, 99-129.

Sharfman, M. P., & Fernando, C. S. (2008). Environmental risk management and the cost of capital. *Strategic management journal*, 569-592.

Sievänen, R., Hannu, R., & Scholtens, B. (2012). The drivers of responsible investment: The case of european pension funds. *Journal of Business Ethics*, 137-151.

Starr, J. A., & MacMillan, I. C. (1990). Resource Cooptation Via Social Contracting: Resource Acquisition Strategies for New Ventures. *Strategic Management Journal*, 79-92.

Steger, U., Ionescu-Somers, A., & Salzmann, O. (2007). The economic foundations of corporate sustainability. *Corporate Governance*, 162-177.

Stenungsund, K. i. (den 2 07 2012). *Stora satsningar på grön kemi från skogen*. Hämtat från Kemiföretagen i Stenungsund: http://www.kemiforetagenistenungsund.se/projekt/2012/07/ den 9 03 2015

Stern, N. (2006). *The Economics of Climate Change.* London: HM Treasury.

Tol, R. (2009). The Economic Effects of Climate Change. *Journal of Economic Perspectives*, 29 - 51.

Trappey, A. J., Trappey, C. V., Hsiao, C.-T., Ou, j. J., & Chang, C.-T. (2012). System dynamics modelling of product carbon footprint life cycles for collaborative green supply chains . *International Journal of Computer Integrated Manufacturing*, 934-945.

UNEP. (2001). The Climbing Cost of Climate Change. *Earth Island Journal*, 19.

UNFCCC. (2009). *Copenhage Accord.* United Nations.

UNWCED. (1987). *Our Common Future: Report of the World Commission.* Switzerland: UN World Commission on Environment and Development.

Vachon, S., & Klassen, R. D. (2006). Extending green practices across the supply chain. *international journal of operations & production management*, 795-821.

Walker, H., Sisto, L. D., & McBain, D. (2008). Drivers and barriers to environmental supply chain management practices: Lessons from the public and private sectors. *Journal of purchasing & Suppply Management*, 69-85.

Walton, S. v., handfield, r. B., & Melnyk, S. A. (1998). The green supply chain: integrating suppliers into environmental management processes. *International journal of purchasing and material management*, 2-11.

Weybrecht, G. (2014). *The Sustainable MBA.* Chichester: Jon Wiley & Sons.

Veys, A. (2010). *The Sterling Bond Markets and Low Carbon or Green Bonds.* London: E3G.

Woods, C., & Urwin, R. (2010). Putting Sustainable Investing into Practice: A Governance Framework for Pension Funds. *Journal of Business Ethics*, 1-19.

World Bank. (2009). *About world bank green bonds*. Hämtat från World bank treasury: http://treasury.worldbank.org/cmd/htm/WorldBankGreenBonds.html?_sm_au_=iHVqGb0KsTH0QfL7 den 26 01 2015

World Economic Forum. (den 09 04 2015). Hämtat från World Economic Forum: http://reports.weforum.org/green-investing-2013/reducing-the-cost-of-capital-for-green-projects/ den 09 04 2015

Zimmerman, M. A. (2002). Beyond survival: Achieving new venture growth by building legitimacy. *Academy of management review*, 414-431.

Appendix 1 – Interview question framework

What was the reason for the issuance of the Green bond?

Have you experienced additional attention to the company linked to the green bond issuance?

What department within your company initiated the process of issuing a green bond?

How did you develop eligible project categories?

How did you decide on which projects to include?

How have you perceived the increased transparency linked to the reporting on eligible projects?

Could you specify the details of your green bond:

- Coupon rate
- Duration
- Amount

What response did you receive from investors?

How did you manage the reporting and measurement of project development?

Do reporting and measurement require extensive extra work?

Appendix 2 – Questionnaire

Questionnaire Green Bonds (2 pages)

The provided questionnaire is part of a master thesis written by Christoffer Falsen and Patrik Johansson, students at the program of Industrial Ecology, Chalmers University of Technology, Gothenburg. The purpose of this questionnaire is to make an evaluation of issuer experience of Green Bonds.

If you would take some time (estimated ca 10 minutes) to fill in the form and send it back, it would be highly appreciated and of great value for the thesis.

What was the reason for the issuance of the Green bond? (More than one alternative could be checked)				
	No importance	**Low importance**	**Moderate importance**	**High importance**
Accelerate investments in sustainability				
Gain experience in the green bond market				
Replacement of expiring bonds				
Improve company reputation				
Other (please specify below with short sentence)				

Could you identify (quantitatively or qualitatively)…	**No**	**Yes**	**Comment (voluntary)**
reputational benefits from the issuance of the green bond?			
a marginally lower coupon rate from the issuance of the green bond compared to a conventional bond?			
that your investor base was broadened by the issuance of the green bond?			
that the issuance of the green bond required extensive extra work with reporting compared to benefits?			
that the issuance provided new knowledge about the green bond market for future issuances?			

Would you consider a new green bond issuance with regards to the knowledge from previous issuance?

Other comments:

Please specify in the response email if you would like your company/organisation name **not** to be displayed in the thesis

Thank you for your participation. The input is of high value for our master thesis.

All the best,

Christoffer and Patrik

Appendix 3 – Respondents to the questionnaire

Issuer	Description
Vardar AS	A Norwegian Energy company
NTE	A Norwegian Supplier of internet and power grid solutions
EDF	A French Energy company
Unilever Plc	A British-Dutch food and daily consumables company
Rikshem AB	A Swedish real estate company
Örebro Kommun	A Swedish municipality
Svenska Cellulosa Aktiebolaget	A Swedish pulp and paper producer
Aligera AB	A Swedish investment company within renewable energy sector
Stockholm läns landsting	A Swedish region
The Hera Group	An Italian water, waste and energy solutions company
Fastighets AB Förvaltaren	A Swedish real estate company
Nord-Pas de Calais	A French region
City of Gothenburg	A group of public companies owned by the city of Gothenburg
Vasakronan AB	A Swedish real estate company
Verbund AG	An Austrian Energy company
Paprec	A French company specialised in recycling
Vestas Wind Systems	A Danish producer wind mills

Appendix 4 - Summary of third party reviews

	Amount	Reviewer	Types of projects	Reporting
Vasakronan (CICERO, 2013)	500 M SEK	CICERO	Renewable energy Energy efficiency Green IT Water management Transportation Climate adaption	Annual letter available on the webpage.
SCA (CICERO, 2014)	1000 M SEK	CICERO	Renewable energy Fuel switching Fuel from forest waste Energy efficiency Water and waste management Sustainable forestry	Annual letter available on the webpage.
Örebro kommun (CICERO, 2014)	200 M SEK	CICERO	Renewable energy Energy efficiency Transportation Sustainable buildings Waste management Water management Nature conservation	Annual letter available on the webpage.
SLL (CICERO, 2014)	230 M SEK	CICERO	Transportation Sustainable building Waste management Water management	Annual letter available on the webpage.
Vardar AS (DNV, 2014)	300 M NOK	DNV	---	No reporting
Rikshem (CICERO, 2014)	250 M SEK	CICERO	Energy efficiency	Annual letter available on the webpage.
Verbund AG (OEKOM, 2014)	500 M EUR	OEKOM	Energy efficiency Renewable energy	Dedicated section in the sustainability report
NTE (DNV, DNV GL second party opinion, 2014)	400 M NOK	DNV	Renewable energy	Annual letter available on the webpage.
Aligera (Olsen-Rong, 2014)	400 M SEK	---	Renewable energy	---
Fastighets AB förvaltaren	400 M	CICERO	Sustainable buildings	Annual letter

(CICERO, 2014)	SEK			available on the webpage.
Hera SpA (DNV, 2014)	500 M EUR	DNV	Renewable energy Energy Efficiency Water management Waste management	Dedicated section in the sustainability report
City of gothenburg (CICERO, 2014)	310 M SEK	CICERO	Renewable energy Bio fuel from forest waste Energy efficiency Smart grids Waste management Development of public transportation More efficient water management Sustainable housing Development of new nature conservation areas	Annual letter available on the webpage.
Unilever (DNV, 2014)	250 M GBP	DNV	Project criteria	---
EDF (Olsen-Rong, 2014)	1400 M EUR	VIGEO		---
Nord-Pas de Calais (Olsen-Rong, 2014)	80 M EUR	---	---	---

Appendix 5 – Summary of interviews

The interviews with Swedish issuers of green bonds and investors are presented in summarised versions.

Magnus Borelius and Danijel Afolter, City of Gothenburg

Magnus is head of group treasury at City of Gothenburg and Danijel is portfolio manager. The city of Gothenburg has issued two green bonds to current date. It was identified that the issuances resulted in a marginally lower coupon rate than conventional bonds, estimated to around 3-4 interest points. The interviewees believed that the lower coupon rate was due to the high demand for green bonds on the market which therefore pressured down the coupon rate. However, they also believe that the majority of investors prefer green bonds to other types of bonds but cannot pay any premium cost for green bonds. The small difference in coupon rate can be explained by a stringent investment philosophy from the investor's side, which may be linked to a small demand from the investor's clients such as pension savers.

Some benefits that have been identified apart from the marginally lower coupon rate is that the green bond issuances have provided the issuer with a risk reduction due to a broadening of the investor base. A large number of investors is of great value when times are tough.

From an investor perspective green bonds provide more information about the projects in which the capital is invested. Investor's letters from emitters to investors are required to communicate project state to increase investor relations. This is also regarded as a challenge due to the fact that your business will be more transparent and there will be one more channel to report to. Therefore the interviewees believed that when in concern to issue a green bond, it is important to plan all the processes in advance. It is also important to include both economic and environmental functions within the company. Additionally, cooperation between economic and environmental functions will create a mutual understanding that is lacking in many organizations today.

When in discussion about future developments of the green bonds market, the interviewees see it as probable that green bonds are a first step towards a system that labels the entire emitter and affect all borrowing activity. Important aspects for further development are that a clear framework is developed on reporting to investors and what measurements to include. Furthermore, a standardized framework is important not only for the emitter but also for the investor when the market is growing. The investor doesn't have sufficient resources to go through large data.

Johan Rydin, Vice President and Group Treasurer SCA

The interviewee described that people both within the treasury department and the company board had been subject to information campaigns about green bonds for a considerable time period before the actual issuance. It was not until the spring 2014 when the company had the need to replace existing expiring bonds that the interviewee was asked by the CEO. The interviewee explains that they agreed on a green bond issuance since it would have the same conditions both when it comes to the documentation and financial terms as conventional bonds. The purpose was to market the company as green and to let the market know that

sustainability was a priority within all departments at SCA including the financial department. The purpose was therefore not to fund specific sustainability projects, since those would have been funded through conventional channels anyway.

The interviewee was certain that the issuance has absolutely paid-off. The company has seen an increase of the marketing value of the company and an increased demand for interviews and invitations to participate in debates and newspaper articles and also more attention from investors that from their side is marketing the green bonds.

The interviewee has also seen a marginal financial benefit when it comes to the coupon rate and it can be seen in the scale of percentage points. Additionally SCA also attracted some new investors that would normally not be involved with the company. SCA used a third part reviewer of the project criteria in the use of proceeds of the bond. The environmental director and the third part reviewer (CICERO) developed a framework for the eligible projects. This framework is added as an attachment to the final terms of the bonds on the Luxemburg bond market.

The first green bond issuance was of 1,5 billion SEK for a 5 year period. SCA has a yearly CAPEX of approximately 6-7 billion SEK and has so far invested 350-400 million SEK of the issuance into eligible projects and it is believed that all funds will be used in the first 3 years of issuance.

The interviewee has not identified any issues with an increased transparency as the specific projects are disclosed a year later in the investors letters. Furthermore, SCA has a well-developed emission measurement program which means that little additional work was required to provide data on project development for the reporting processes.

Christer Nerlich, CFO Vasakronan

The Interviewee mentions that sustainability and environmental performance has been a key factor in new developments of Vasakronan. Vasakronan was the first real estate company in Sweden to offer "green" deals on rent. Therefore green bonds were a natural step for continuous sustainable development. Vasakronan was the first issuer of a corporate green bond in 2013 when through SEB as an intermediary, issued a green bond. The idea of green bonds had been known for some years within Vasakronan, but the terms of the green bonds and the timing was not right until 2013.

The interviewee mentions that he had encountered scepticism towards green investments and that some believed that green investments were not a way to strengthen brand name or to increase the competitive advantage. However, Vasakronan has been determined that green investments will pay off and therefore kept their persistency. They can now identify that their proactive work in sustainability is paying off and that green bonds is one of the factors for increased reputation and competitive advantage. Though, the green investments that have been made through the green bonds would have been made even if no green bond was issued.

The interviewee could not identify a lower coupon rate, but the investor base was broadened from the issuance. If the investor base would not have been broadened, the interviewee is

unsure if the investments could have been realized and the interviewee mentions that this was a key for future development. The green bond was fully subscribed fast and if a conventional bond would have been issued they are uncertain if a conventional bond would have been fully subscribed. No issues with transparency were detected, but this has not been an issue previous since investments in real estate often are publicly disclosed.

The report of project development and performance is on quarterly periods by display on their web site and through an investor's letter. The second opinion was provided by CICERO and Vasakronan collaborated with CICERO before the issuance to determine a framework for the green bond. The respondent believes that in the future when all facilities are "green", they will by definition be a green actor and won't be required to differ between green bonds and conventional bonds. The use of proceeds is explained by a separate documentation.

Jacob Bruzelius, CFO Rikshem AB

Rikshem have for many years focused on responsible activities, both social and environmental. When Green bonds emerged on the market it was a natural step to include green bonds in their activities to support their work with sustainable development of "miljonprogrammen". The projects that have been financed through the bonds are mostly energy efficiency of buildings.

Rikshem perceive it as a benefit for their company to be able to communicate to investors on their development, but they did not identify that the coupon rate was lower than compared to a conventional bond. The framework was developed with SEB and Handelsbanken was also involved in the process.

Rikshem are currently working on the energy efficiency of large projects and those projects were natural to support by green bonds. Regarding the reporting on the projects, the interviewee believes that the extra work is not a large share of daily duties for the organization. The interviewee also believes that the movement of green bonds is characterized by rather vague frameworks, which affects the standards of green bond issuances. The amount of work put into assuring transparency and reporting is determined by the issuer itself. The qualities of the reports develop over time when requisites from investors are identified. The respondent is positive towards green bonds and believes that they will issue a green bond again in the future.

Helena Lindahl, Asset Manager Storebrand

Storebrand is a pension fund manager and manages approximately 500 billion SEK and has actively worked with sustainable companies since the early 90's. Capital is allocated to sustainable companies as their way of influencing development. The only option prior to green bonds has been through the stock market, which is with a relatively high risk. Green bonds have provided an option for green investments within the fixed interest market, where almost all fiduciaries of pensions, insurance companies and funds have a large share of their invested. The first issuances in 2007 were not as favourable as conventional bonds and the investors had to sacrifice return on investment. Since 2012, green bonds are as competitive as conventional bonds. Storebrand's policy is to invest in all available green bonds as long as

they are as competitive as conventional. The people that have their pensions in their funds are very positive to this approach.

The interviewee mentions that the legal structures are the same as for conventional bonds, which increase the legitimacy of a green bond, since the investor possess the same rights to the issuer's assets. The great value of the bond is that investments are concrete and the possibility to follow the investments. The risk is currently not larger than any other interest-rate investment.

The extra effort that is required to follow up on development of the investments from reports is not an obstacle due to the small size of the market. However, when the market grows there will be requirements of a standardized model for reporting. ICMA now have the responsibility of the "Green bond principles" and are therefore believed to be the organ for forming those standards.

Johan Barfeldt, Asset Manager Svenska Kyrkan

Svenska Kyrkan only invests in sustainable companies. Green bonds are therefore of obvious attention in the interest market. Previous low volumes and few issuers have now turned into rapid growth with many issuers, which reduces the risk of investments in green bonds. The growing market and the rumours of an upcoming green bonds-fund (launched by SPP in March 2015, editors note) are increasing the willingness to invest and the ability for risk dispersion.

For Svenska Kyrkan both the issuers as a whole and the different projects are evaluated before investments. Third party opinions and monitoring are important aspects of green bonds. An issuer that has questionable environmental performance may still be of interest for investments depending on the path where the company is heading.

The interviewee mentions other instruments for sustainability investments as conventional investments in the stock market. However, companies that are working with renewable energy and likewise often imply a higher risk. Green bonds are often issued by companies with a high credit rating, which reduces the risk. *"I believe the green bonds market will explode"* the interviewee says.

The growing market and increasing number of issuers causes the reporting to be more important and also to be standardized. The interviewee believes that if AkzoNobel issues a green bond, there is a huge potential to be well received in the market and he recommends that processes for reporting are well at place in prior to an emission.

It is important for green bonds to be competitive compared with conventional bonds. Since the market for trading green bonds is not of the same volume as conventional bonds, the return is a bit higher to reduce the liquidity risk.

Mattias Andersson, Senior Investment Manager IF

IF is an insurance company with a clear ethical framework for investments. Among others, municipalities and high credit rated institutions are of interest within fixed income investments. The interviewee mentions that the investment in green bonds issued by the city

of Gothenburg is equivalent as a conventional investment in the city, but the green labelling may be of advantage in marketing reasons, a little extra twist. The earmarked capital for sustainability investments is in itself a "good cause" to which IF gladly supports. There is goodwill to gain, to be seen as an investor in this context. The interviewee mentions however, that IF is not screening the market for sustainable investments.

The interviewee claims that the reporting of project development is not regarded as extra work since green bonds up to date is not a large share of their portfolio. There are some clients of IF who are interested in where capital is invested. The respondent also mentions that there has been a trend towards marginally lower coupon rates for green bonds.

Lars Lindblom, Asset Manager fixed-income AP2

AP2 has invested in green bonds since the first World Bank issuance in 2007. The respondent has not seen any problem in the fact that the definition of a green bond has been indistinct. He believe that it is important as an investor to have an own opinion concerning what is green especially when no clear definition has been given. But he also mentions that the market will probably regulate this itself as most of the actors continuously issues new bonds. If an issuer has not followed the criteria or goals stated in the first green bond issuance it will be difficult to come back to the market.

AP2 have a sustainability group working with assessments but they lack the resources to do an assessment on every actor. As previously mentioned, when actors come back regularly, it gets easier to follow up projects and to have a dialogue with the issuer. The respondent sees green bonds as an excellent opportunity to integrate sustainability and fixed income products. The green bond requires little adaptation from the pension fund itself and is done on regular financial terms. The drivers have mostly been from a business viewpoint; AP2 is a long term actor and sees an opportunity to gain financial benefits from including sustainability.

The respondent sees the green bond as a first important step, when the treasury department and the sustainability department are working together to present projects to investors. Hopefully this collaboration will later lead to further collaboration internally within the company. The respondent have heard positive experiences from actors that have issued green bonds especially as both the sustainability department and treasury have got attention to projects. This will probably in new projects in the future.