THE LINK BETWEEN CORPORATE ENVIRONMENTAL PERFORMANCE AND CORPORATE FINANCIAL PERFORMANCE

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ABSTRACT

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Abstract
The question of whether companies can do good by doing good has aroused a lot of interest among academics and company managers. The link between corporate social or environmental performance (CSP/CEP) and corporate financial performance (CFP) has been studied a lot – and with several different methods, in both directions and in different industries. Majority of earlier studies have found a positive link between CSP/CEP and CFP but due to challenges in measuring social and environmental performance, there is a lot of inconsistency in the study results. However, earlier studies clearly indicate that companies are not punished for their social and environmental efforts.
The aim of this study was to examine the link between corporate environmental performance (CEP) and corporate financial performance (CFP) in the forest, paper and packaging industry and in the manufacturing of machinery and equipment industry. The study was conducted as a qualitative study although it includes also some quantitative elements. Data consisted of CEP disclosures, mainly corporate social responsibility reports and annual reports. There were five target companies. Environmental data evaluation criteria were developed specifically for this study by utilizing several sources, such as KLD rating framework and GRI reporting framework. Corporate environmental performance of the five target companies was analysed by using content analysis method. Return on equity figures were used as indicators of corporate financial performance. The link was evaluated by utilizing statistical computing. Pearson's correlation coefficiencies were computed for CEP and CFP figure pairs.
Differing from majority of earlier studies, this study indicates that there is no link between CEP and CFP – not from CEP to CFP nor CFP to CEP. Correlation coefficiency figure is significant in some cases but as the figures varies greatly, strong correlation figures are likely caused by coincidence. From CEP to CFP, the correlation varied anywhere between -0.15 and 0.63. From CFP to to CEP, the correlation varied anywhere between -0.16 and 0.90. Although positive link was not found, the results indicate that companies are not punished for high environmental performance.

Keywords
Corporate environmental performance, corporate financial performance, corporate social performance, CEP, CFP, CSP

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Tiivistelmä – Abstract

Kysymys siitä, voivatko yritykset menestyä toimimalla sosiaalisesti vastuullisesti, on herättänyt paljon kiinnostusta sekä tutkijoiden että yritysjohdon keskuudessa. Yrityksen sosiaalisen tai ympäristövastuutuloksen (CSP/CEP) ja yrityksen taloudellisen tuloksen (CFP) välistä linkkiä on tutkittu paljon käyttäen useita eri menetelmiä, tutkimalla useita eri toimialoja sekä tutkimalla linkkiä molempiin suuntiin. Suurin osa aikaisemmista tutkimuksista on osoittanut, että CSP/CEP ja CFP ovat positiivisesti linkittyneitä, mutta merkittävistä sosiaaliseen ja ympäristövastuutulokseen liittyvistä mittaushaasteista johtuen, tulokset ovat epäjohdonmukaisia. Aikaisemmat tutkimukset osoittavat kuitenkin selvästi, että yrityksiä ei ainakaan rangaista korkeasta sosiaalisesta ja ympäristövastuullisuudesta.

Tämän tutkimuksen tavoitteena oli tutkia linkkiä yrityksen ympäristövastuutuloksen (CEP) ja yrityksen taloudellisen tuloksen (CFP) välillä metsä-, paperi- ja pakkausalalla ja koneiden ja tarvikkeiden valmistusalalla. Tutkimus toteutettiin kvalitatiivisena tutkimuksena, mutta se sisältää myös joitain kvantitaviisia elementtejä. Tutkimuksen data koostui CEP julkaisuista, pääasiassa yritysvastuuraporteista ja vuosiraporteista. Tutkimuksessa oli viisi kohdeyritystä. Ympäristödatan arviointikriteeristö kehitettiin tätä tutkimusta varten hyödyntäen useita lähteitä, kuten KLD arvointikehystä ja GRI raportointikehystä. Kohdeyritysten ympäristövastuutulos analysoitiin sisällönanalyysi-menetelmää käyttäen. Oman pääoman tuotto-%:ia käytettiin yritysten taloudellisen tuloksen indikaattorina. Linkkiä arvioitiin tilastollista laskentaa hyödyntäen. Pearsonin korrelaatiokertoimet laskettiin CEP ja CFP lukupareille.

Aikaisempien tulosten enemmistöstä poiketen tämä tutkimus osoittaa, että CEP:n ja CFP:n välillä ei ole linkkiä kumpaankaan suuntaan. Korrelaatiokerroin on merkittävä joissakin tapauksissa, mutta koska luvut vaihelevat reilusti, merkittävät luvut johtuvat todennäköisesti sattumasta. Kun tutkittiin, johtaako korkea ympäristövastuutulos korkeaan taloudelliseen tulokseen, korrelaatiokertoimet vaihtelevat -0.15 ja 0.63 välillä. Toiseen suuntaan tarkasteltaessa luvut vaihtelevat -0.16 ja 0.90 välillä. Vaikka tutkimuksessa ei löytynyt positiivista linkkiä, tulokset osoittavat, että yrityksiä ei ainakaan taloudellisesti rangaista korkeasta ympäristövastuutuloksesta.

Asiasanat
Yrityksen ympäristövastuutulos, yrityksen taloudellinen tulos, yrityksen sosiaalinen tulos, CEP, CFP, CSP

Säilytyspaikka Jyväskylän yliopiston kirjasto

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1 INTRODUCTION

1.1 Research background and motivation

The question of whether a company can do both well and do good has aroused a lot of interest during the history of CSR research. In 1970, Friedman wrote his perspective on corporate social responsibility (CSR) initiatives by stating that "the social responsibility of business is to increase its profits". He considered investments in CSR initiatives as theft and political subversion as that money should be directed to company's shareholders. In the call to legitimize CSR on economic grounds and license companies to pursue good, started the long path of research concerning the relationship between corporate social/environmental performance and financial performance. After 45 years of research, the results still lack clear consistency, although majority indicates a positive association between the two.

In this master's thesis, I will study the link between corporate environmental performance (CEP) and corporate financial performance (CFP) in two industries: forest, paper and packaging industry and manufacturing of machinery and equipment industry. Both industries are important in Finland and both industries also cause significant environmental impacts. Companies chosen from these industries are the biggest companies operating in Finland in the afore mentioned industries. There are altogether five target companies: three from the forest industry and two from the manufacturing industry. Most of the earlier studies investigate how corporate social performance (CSP) and financial performance are linked, including both social and environmental variables in CSP. However, in the empirical analysis of this study, the focus is only on corporate environmental performance. Environmental questions are the second most important CSR theme for companies operating in Finland (FIBS 2017). CEP of the target companies is studied using content analysis method and the link between CEP and CFP is examined with statistical computing method.

The motivation for this study stems firstly from the conflicting study results made on the topic during last decades that indicate that the topic requires further examination. In addition, there is a lack of studies made on the topic among Finnish companies. Even though the link between CSP/CEP and CFP is not clear, FIBS' CSR study (FIBS 2017) indicates that 100% of big companies operating in Finland perceive CSR as highly significant or somewhat significant. In addition, 90% of the companies evaluate that the significance of CSR will increase within the next five years. FIBS' study indicates also that the most important drivers for investing in CSR are other than monetary ones, such as ensuring future operating conditions, responsibility being the prerequisite of all business and improving risk management. Increasing sales or the value of shares, or saving costs are among the least important drivers for CSR. (FIBS 2017.) Even though monetary reasons seem to not be important drivers for companies to invest in CSR, it is interesting to find out if improved financial performance could be one of the business justifications for responsible environmental management. Sustainability has become more and more a business norm and responsible business operations are widely expected by stakeholders. Today, companies perceive that responsible behaviour is a basic prerequisite of all business (FIBS 2017). Can it be justified with financial results for a company management that often struggles with scarce resources?

1.2 Research question

The aim of this research is to find out whether CEP and CFP are linked in the forest, paper and packaging industry and in the manufacturing of machinery and equipment industry. The link is computed in both directions with a one year lag between CEP and CFP figures. Return on equity is used as an indicator of corporate financial performance. Data used in the research consists of secondary data and mainly of corporate social responsibility reports and annual reports. Statistical computing methods are utilized in evaluating the link between CEP and CFP.

This paper differs from earlier studies made on the topic in many ways. Firstly, I only include environmental variables of corporate social performance. Secondly, the largest variables argued to affect in the link, the size of the company and the industry in which it operates, are taken into consideration as I include only the biggest companies of two specific industries. Most of the earlier studies use third party evaluation and specifically investor indices for social and environmental performance evaluation. I have developed my own environmental performance evaluation criteria specifically for the two target industries of this study and by utilizing several differenct sources, such as KLD ratings, GRI framework and earlier studies.

The research question is the following:

- How are corporate environmental performance and corporate financial performance linked in the forest, paper and packaging and manufacturing of machinery and equipment industries?

1.3 Research structure

This thesis includes five chapters. Chapter 1 introduces study background, motivation and research questions. Chapter 2 consists of theoretical framework. The theoretical framework explains the concepts of corporate social performance and corporate environmental performance. After that, earlier studies conducted on the link between CEP/CSP and CFP are listed and explained. Measurement challenges and studies that have resulted in different results (positive, no link, negative) are considered. Chapter 3 explains the methodology used in this thesis in detail. The chapter includes details regarding research design, target companies, data collection and data analysis. The environmental data evaluation criteria developed specifically for this study is presented in detail. Chapter 4 presents study results and analysis. Corporate environmental performance of the target companies is analysed first including specific figures on pollution prevention, clean energy, recycling, pioneering products, external recognition and awards as well as hazardous waste performance. After that, CFP figures are listed and then the link between CEP and CFP is analysed through statistical computing. In chapter 5, study results are discussed and compared with earlier studies. Study limitations and possible future research avenues are also discussed.

2 THEORETICAL FRAMEWORK

2.1 Corporate social performance

2.1.1 Carroll's CSP model

Archie Carroll (1979) is one of the early contributors to corporate social performance research. In his paper, he develops a conceptual model that describes significant aspects of corporate social performance. The model consists of three distinct aspects of CSP answering to:

1. What is included in corporate social responsibility?
2. What social issues the firm must address? and
3. What is the firm's philosophy of social responsiveness? (Carroll 1979.)

Carroll suggests that corporate social responsibility includes four categories: economic, legal, ethical and discretionary responsibilities. A business institution is the basic economic unit of our society and it has a responsibility to produce goods and services that society wants and to sell them at profit. Therefore, it has economic responsibilities. Legal responsibilities stem from laws and regulations that business must comply with. These ground rules are set by society that expects the economic responsibilities to be fulfilled within them. Although economic and legal responsibilities include ethical norms, there are also other actions, which are not necessarily stated in law but are still expected from the firm by society. These are ethical responsibilities and they can be very challenging for organizations to deal with. There is a lot of discussion about what is ethical and what is not. Discretionary responsibilities can also be challenging for business to deal with as society has certain expectations that are not clear-cut ones. Discretionary responsibilities are not required by law or generally expected of business in an ethical sense, which is why they are left to individual judgment and choice. Some examples of these kinds of responsibilities are philanthropic contributions, providing day-care centres for working mothers, or training the hard-core unemployed. (Carroll 1979.)

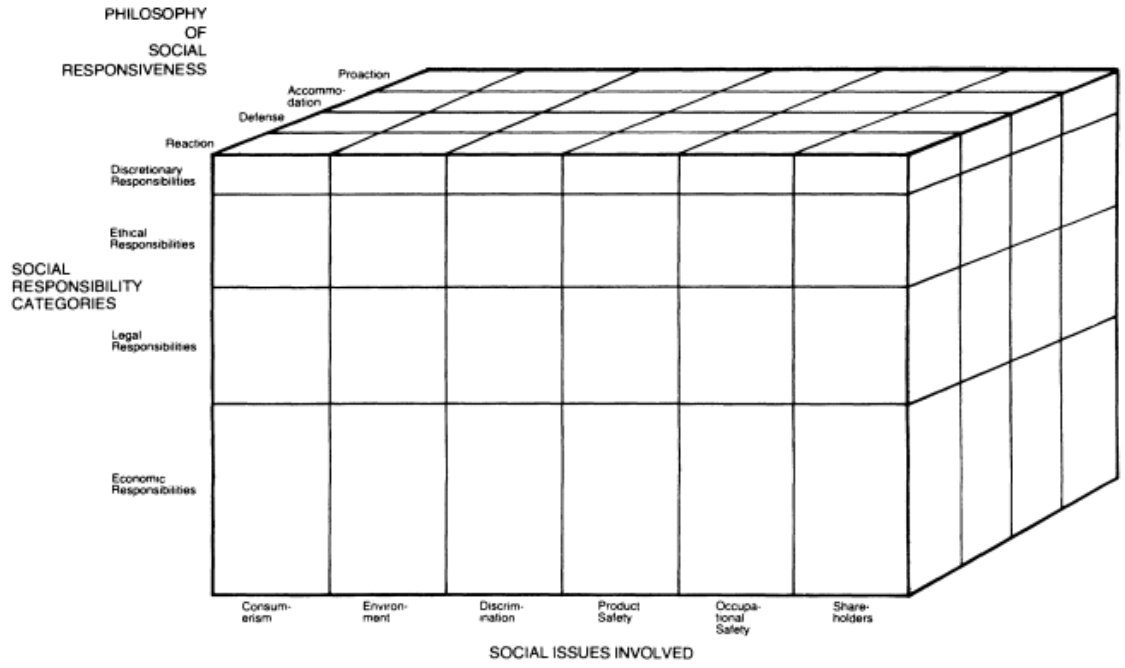
After answering the question of what is included in corporate social responsibility, the next aspect is to determine what social issues firms must address. There are major differences in the interests of different organizations, which is why also social responsibility varies from firm to firm. For example, a mining company and a bank have very different environmental impacts so naturally also their environmental responsibilities are different. While Carroll points out that issues change and they differ for different industries, he does not thoroughly determine what specific social issues firms need to address. He leaves question two to an argument that "… social issues must be identified as an important aspect of corporate social performance, but there is by no means agreement as to what these issues should be (Carroll 1979, 501)."

Thirdly, it is necessary to determine the philosophy, mode, or strategy of a firm for responding to social issues. This respond strategy is also called social responsiveness and it can range from no response, where a firm does nothing, to a proactive response, where firm does a lot. In his model, Carroll uses a responsiveness scheme developed by Ian Wilson (Wilson 1974 in Carroll 1979). In Wilson's responsiveness continuum, the business strategies identified are reaction, defence, accommodation, and

proaction. Social responsiveness presents the action phase of corporate social performance management in which managers respond to social expectations. (Carroll 1979.)

From the three aspects described above, Carroll develops a Corporate Social Performance Model that can be seen in Picture 1 below. The first aspect is formed according to the definition of corporate social responsibility and thus includes economic, legal, ethical, and discretionary components. The second aspect covers the range of social issues that management needs to address and it can vary greatly from organization to organization. Consumerism, environment, discrimination, product safety, occupational safety, and shareholders are few common issues mentioned as examples. Thirdly, there is a social responsiveness continuum ranging from reaction to proaction. Therefore, corporate social performance requires that:

1. organization's social responsibilities are assessed,
2. the social issues the organization must address are identified, and
3. a response philosophy is chosen. (Carroll 1979.)



Picture 1 Carroll's Corporate Social Performance Model (Carroll 1979, 503)

Carroll emphasizes himself that his CSP model is not the ultimate conceptualization but rather a modest step toward understanding the aspects of social performance. The model shows that economic performance and social responsibility are not distinct from each other but that economic responsibilities are only one part of the total corporate social responsibilities. (Carroll 1979.) His CSP model fails to identify what social issues organizations must address but instead points out the need to address social issues as important in organizations. The model has been analysed by several researchers who have developed it further. Maybe the most important revisit is that of Wood's (1991) which is explained next.

2.1.2 Wood's CSP model

In her paper, Wood (1991) combines different attempts to define corporate social performance and addresses the problems related to each definition. She specifically contin-

ues the work of Wartick and Cochran (1985) who developed their CSP model based on Carroll's (1979) work presented above. Wartick and Cochran (1985) address main challenges related to corporate social responsibility (economic responsibility, public responsibility, and social responsiveness), and discuss a new dimension of social issues management to corporate social performance model. As a result, CSP model's dimensions of corporate social responsibilities and corporate social responsiveness are similar to Carrol's model but the 'social issues involved' is replaced with 'social issues management' that includes issues identification, issues analysis, and response development. Therefore, Wartick and Cochran provide more insight into what issues a firm must address and they manage to address many important questions concerning Carroll's version. However, Wood (1991) argues that their model still includes some problems that she aims to solve.

As an outcome, Wood defines corporate social performance as 'a business organization's configuration of principles of social responsibility, processes of social responsiveness, and policies, programs, and observable outcomes as they relate to the firm's societal relationships.' (Wood 1991, 693). It has been argued that this definition is a classic one and "… one of the most influential, helpful, parsimonious, and yet comprehensive conceptualizations of CSP (Orlitzky et al. 2003)." According to the definition, the author also reformulates CSP model. The CSP model is formed of three facets: principles of corporate social responsibility, processes of corporate social responsiveness and outcomes of corporate behaviour. The corporate social performance model is presented in Table 1 below.

Table 1 The Corporate Social Performance Model (Wood 1991, 696)

The Corporate Social Performance Model
Principles of corporate social responsibility
Institutional principle: legitimacy
Organizational principle: public responsibility
Individual principle: managerial discretion
Processes of corporate social responsiveness
Environmental assessment
Stakeholder management
Issues management
Outcomes of corporate behaviour
Social impacts
Social programs
Social policies

Three principles of corporate social responsibility are specified as institutional, organizational and individual principle. Institutional principle refers to legitimacy by stating that business earns its legitimacy and power from society, which is why it should not abuse its power. If a business uses its power in a way that lacks society's approval, it will probably lose it. The institutional principle outlines firm's generic obligations and specifies what is expected from any business. The organizational principle refers to pub-

lic responsibility and defines the sphere of responsibility for business. Firms are not responsible for solving all society's problems but they are responsible for solving those problems that they have caused and for helping to solve issues that are related to their business operations. In other words, social responsibilities the firm addresses need to be relevant to the firm, which is why CSR will vary from company to company. After organizational principle, there is still a lot of room for managerial discretion leading us to the principle three. The individual principle emphasizes individuals in organizations and manager's role as a moral actor. Social responsibilities are not met by abstract organizational actors but by individual human beings who are not totally limited by formal corporate procedures or resource availabilities. Organizational environment is full of choices that are made by moral actors. (Wood 1991.)

Corporate social responsiveness refers to a firm's capacity to respond to social pressures providing an action counterpoint to the CSP model. Environmental assessment refers to responsiveness as an ecological concept as firms will survive if they adapt to environmental conditions. Business environment is changing all the time and in addition to economic and technological environments, social, political and legal environments are equally important. The better the firm is able to scan its environment, the better its social and financial performance will turn out. Different stakeholders set varying expectations and demands on companies and part of responsiveness is the need to manage these multiple and differing stakeholder relationships. Issues management aims at minimizing surprises by managing firm's responses to social issues through internal and external processes management. Therefore, environmental assessment provides the context, stakeholder management the actors and issues management the issues in the processes of corporate social responsiveness. All three are interlocked as information about the environment is a prerequisite for responding, issues involve stakeholders' interest and stakeholders are involved in issues. (Wood 1991.)

When assessing corporate social performance, the outcomes of corporate behaviour are under direct interest. They are divided into social impacts, social programs and social policies. Social impacts of corporate behaviour can be negative or positive. For example, factory disasters, oil spills and harmful products are negative social impacts of business behaviour while provision of jobs, payment of taxes and technological innovation are examples of positive social impacts of business behaviour. Some social impacts can be very challenging to measure economically, like air pollution or beauty of a wilderness area. A company can adopt a corporate social program to invest its resources in a specific course of action in order to meet specific needs that the company sees as socially desirable. Social policies again can guide decision making in problem solving or in other areas of great importance to the company. At the same time, this is risk management as social policies help to manage threats in the areas of interest and importance. Corporate social policies can be argued to have three objectives that are closely linked to the three principles of corporate social performance: 1. institutional – to maintain the legitimacy of business, 2. organizational – to improve firm's adaptability with its environment, and 3. moral/ethical – to guide a culture of ethical choice. (Wood 1991.)

The principles of corporate social responsibility at the institutional, organizational, and individual levels explain the motivations behind human and organizational behaviour. Responsive processes of environmental assessment, stakeholder management and issues management show how companies adapt to the external environment and as outcomes of corporate behaviour, social impacts, programs and policies represent the actually observable to outside part of corporate social performance. While principles

motivate companies and individuals to social responsibility, processes form the "how to" part and outcomes again are the visible part to outside based on which social responsibility is assessed.

2.1.3 Comparing the models

The CSP model of Wood differs from that of Carroll by moving further – especially to the outcomes of corporate behaviour. They both see that the first facet of CSP is definition of corporate social responsibility, although Carroll divided CSR into four categories (economic, legal, ethical, and discretionary), whereas Wood formed three principles of CSR (institutional, organizational, and individual principles). Wood's principles, however, seem to be based on Carroll's categories. Roughly speaking it can be argued that Carroll's economic, legal and ethical categories are similar to Wood's institutional principle, Carroll's model's third facet of social issues involved is similar to Wood's organizational principle, and Carroll's discretionary category is similar to Wood's individual principle.

While Wood includes the sphere of social issues a firm must address under the principle of public responsibility and defines rather clearly the limits for this, Carroll did not manage to give borders for what the firms are responsible for even though identifying them forms an own facet, 'social issues involved', in his model. According to Wood, organizations are responsible for fixing what they have broken and for helping to solve issues that are related to their business operations. However, both researchers' CSR facets are still rather similar as both are based on society's general expectations and approval as well as managers' role as moral decision makers. And although Wood manages to give limits for what to address, her conclusion is still rather wide and open to interpretations.

The second facet of Wood's CSP model, processes of corporate social responsiveness, is similar to the last aspect of Carroll's model, philosophy of social responsiveness. The basic idea is similar in both: what is the firm's response strategy and how well is it able to adapt to its environment. In both models, social responsiveness is the action part of corporate social performance. However, Carroll divides responsiveness philosophies into a spectrum consisting of reaction, defence, accommodation and proaction strategies, whereas Wood specifies corporate social responsiveness into processes of environmental assessment, stakeholder management, and issues management, not on a spectrum.

While Carroll leaves outcomes of corporate behaviour out of his CSP model, Wood emphasizes them as an own facet of CSP. This might be because measuring corporate social performance has increased its importance and popularity and as Wood notes, the outcomes are the part of CSR that is visible to outsiders. Therefore, in the end, assessment of corporate social performance is based on the outcomes of corporate behaviour. Wood suggests that economic, legal, ethical and discretionary categories can work as domains of CSR principles that can guide social policies. For example, an outcome of acting within discretionary domain of organizational principle could be to invest the firm's charitable resources in social problems related to the firm's primary and secondary involvements with society. Moving to outcomes and performance is probably the most important contribution of Wood's model. (Wood 1991.)

2.1.4 Corporate environmental performance

In this study, only environmental performance is investigated which is why it is also shortly defined in this chapter. Several studies investigating the link between corporate social performance and corporate financial performance use environmental performance as a proxy for social responsibility. Also in the business community, social responsibility usually includes both social and environmental performance. (Orlitzky 2003.) Many international corporate environmental management standards, such as ISO and GRI guidelines, use the construct of CEP in their standards. In addition, CEP concept has been used in several studies. (Poser, Guenther & Orlitzky 2012.) Few definitions are elaborated next.

Poser, Guenther and Orlitzky (2012) have conducted an overview of the different corporate environmental performance definitions. They have summarized various CEP definitions used in the conceptual and empirical papers so far and based on that, provide an overview on the different contexts used. The authors include the use of energy and water, greenhouse gas emissions and toxic releases and spills in CEP. They have listed some of the latest CEP definitions used in research, including for example the definitions of Clemens and Bakstran (2010, 395) "Environmental performance is a multidimensional construct with factors including environmental impact on the biosphere, customers, employees, the local community, and other stakeholders.", and Yang, Hong & Modi (2010, 252):" Environmental performance refers to the organization's performance with respect to their environmental responsibilities.". Key elements for corporate environmental performance are identified as the following: environmental impacts caused by company's operations covering operations management and inputs and outputs, as well as strategic dimensions for managing stakeholder expectations. (Poser, Guenther & Orlitzky 2012.)

Schultze and Trommer (2011) study the concept of corporate environmental performance and its measurement. They choose to refer to Wood's (1991) CSP framework because as stated also earlier, it is argued to be the most comprehensive, influential and helpful conceptualization of CSP. Following Wood's model, CEP is considered a multidimensional construct covering the principles of environmental responsibility and the processes of environmental responsiveness which predict future environmental impacts and outcomes. Based on earlier studies, the authors summarize environmental stakeholder demands being the following: reduce environmental externalities (environmental advocates), comply with regulations (government), avoid negative health and safety effects (neighbours, employees, consumers), reduce environment-related follow-up costs of products (consumers), reduce environmental risks (contracting partners, government), increase environmental reputation (contracting partners), and increase transparency and credibility (all stakeholders). After further operationalization of CEP, the authors argue that when measuring environmental performance, the following aspects should be considered: 1. Special interests of the stakeholder groups under investigation, 2. Special characteristics related to the company/products, and 3. External factors relevant to the expectations of stakeholders. (Schultze & Trommer 2011.)

2.2 CSP-CFP link

The relationship between corporate social performance (CSP) and corporate financial performance (CFP) has been studied for 45 years and it has aroused a lot of interest among both researchers and managers. Bragdon and Marlin (1972 in Margolis, Elfenbein & Walsh 2007) found a positive relationship already in 1972 but the research still continues. For example, 35 years later Margolis, Elfenbein and Walsh (2007) covered 167 studies made on the topic in their meta-analysis, concluding that all these studies later, managers might still be where they were in 1972. Results during the 45 years of research have been inconclusive and conflicting and at some point, even a moratorium of CSP-CFP research was called. Both positive and negative links have been found as well as mixed results or no link at all. In addition to the nature of the link, also temporal ordering of the relationship has remained unclear. (Orlitzky et al. 2003; Margolis, Elfenbein & Walsh 2007.)

There are two different ways of understanding the mechanism of CSP-CFP link. In the first approach, corporate social performance is seen as a distinctive resource that affects costs and thus financial performance. CSP can generate benefits such as attracting more skilled workforce, or employee efforts that stem from good human resource practices. Or CSP can reduce costs for example through avoiding penalties or through lowered material costs stemming from material efficiency improvements. For example, collaboration with a non-profit organization generates revenues through new innovative products or new markets. Thus, the efforts to do good have a value-creating impact that reduces costs or increases revenues. (Margolis et al. 2007.) Earlier research argues that for example the following benefits can be achieved through high environmental performance: new innovations, improved performance, lower regulatory-related expenses, new business opportunities created by growing demand for clean products, increased customer demand, lower waste costs, and competitive advantage (Montabon, Sroufe & Narasimhan 2006).

Other approach sees that it is the appeal of CSP that improves financial performance. The actual effects of CSP efforts do not matter but the appearance of doing good or the positive perception among key stakeholders that a company is doing good. This leads to increased demand for the company's stock, jobs, and products. In other words, in this model the appearance of CSP has the value-creating impact. For example, collaboration with a non-profit organization generates financial returns because the public gets an impression that the company is doing good and therefore they are more willing to purchase the company's products or services. (Margolis et al. 2007.)

2.2.1 Measurement challenges

Measuring CSP is a challenge of its own as corporate social performance is a multidimensional issue. It covers a wide variety of different kinds of inputs, such as investments in environmental strategies like pollution control equipment, and internal behaviours or processes, like treatment of minorities and relationship with customers. In addition, there are many possible outputs, like toxic wastes, technological innovations and philanthropic programs. Different industries have also very different characteristics, histories, and performance in varied CSP domains. (Waddock & Graves 1997.) Additionally, CSR decisions are affected by managerial discretion (Wood 1991). Even if leaving social issues out and measuring only environmental performance, there are argued to be

several difficult challenges, such as the complexity of environmental issues, difficulties in quantifying environmental issues and weighting environmental impacts against each other as well as challenges in comparing environmental impacts of firms in different industries and with different economic activities (Montabon et al. 2006). Taking into consideration all these issues, one might argue that measuring CSP is always unreliable.

CSP is usually measured through following strategies: CSP disclosures; CSP reputation ratings; Managerial CSP principles and values; and Social audits, CSP processes and observable outcomes. CSP disclosures cover content analysis of corporate annual reports, communication to shareholders, 10-K's, and other messages to the public. Several kinds of external CSP reputation ratings exist today, such as *Fortune* magazine ratings, Dow Jones Sustainability Index, and Global 1000 as well as researchers' own ratings such as Moskowitz's tripartite rating (1972, 1975 in Orlitzky et al. 2003). Managerial CSP principles and values cover evaluation of company's culture in terms of values and principles. For example, Aupperle (1984 in Orlitzky et al. 2003) has used forced-choice survey of corporate social orientation in order to measure CSP through managerial values and principles. Social audits, CSP processes and observable outcomes include third party social audits to assess company's CSP objectively. For example, community service, environmental programmes, corporate philanthropy and social audit rankings can be assessed. (Orlitzky et al. 2003.)

However, each of these measurement methods has limitations. A significant problem is that empirical studies of CSP often consider only one or two dimensions of social performance due to the complexity related to CSP measuring. For example, Waddock and Graves (1997) criticize CSP measurements especially for being unidimensional and for failing to identify the overall CSP. CSP disclosures are problematic because they depend on the comprehensiveness and purposes of the documents and they can be biased for intentionally leaving certain facts out and including others. Return rates and consistency of raters in different firms is problematic in survey methodologies and for example, the *Fortune* rating fails to be specific for CSP but is rather a measure of overall management. (Waddock & Graves 1997.)

It has been suggested that size, risk and industry affect both firm performance and social performance and thus are important variables in the studies. Larger firms have been noticed to show more open socially responsible behaviours than smaller ones. (Waddock & Graves 1997.) Large firms may have more resources in use for CSP, the average costs of implementing CSR initiatives may be smaller, and on the other hand, they may attract more pressure from the public to engage in CSP (Margolis et al. 2007). The literature review of Van Beurden and Gössling (2008) indicates that size is the most important variable in CSP measuring. Management's risk tolerance is other factor that needs to be considered as it influences management's attitude towards actions that may lead to costs or savings now or in the future or that may build or destroy markets (Waddock & Graves 1997). Margolis, Elfenbein and Walsh (2007) point out that stable firms with lower risk appear to engage in CSP more likely. Additionally, industry has a significant effect on results as specific industries are more vulnerable to their environment (Waddock & Graves 1997; Margolis et al. 2007; Michelon et al. 2013).

Thus, it is clear that there are several reasons that can explain the variation in study results. According to a meta-analysis of the CSP-CFP link conducted by Orlitzky and associates (2003) stakeholder mismatching, sampling error, and measurement error explain between 15 to 100 per cent of the result variation in the earlier studies.

Corporate financial performance is typically measured through either accounting based measures of financial returns (return on assets; return on equity; return on invest-

ment; return on sales) or through market-based measures of financial value (stock returns; market/book value ratio) (Orlitzky et al. 2003). Measuring corporate financial performance is relatively straightforward and the measurement challenges clearly concern corporate social performance and corporate environmental performance. However, there are several possible indicators for CFP and in some studies, it has been noticed that a right match between CSP/CEP indicators and CFP indicators results in positive link. On the other hand, Preston and O'Bannon (1997) noticed in their CEP-CFP study that the result was independent from the CFP measure used.

2.2.2 Mixed results

To clarify the confliction between CSP-CFP link, several reviews and meta-analyses have been conducted. Earliest was made in 1978 and the latest in 2015. These are all listed in Table 2 below. The table also clarifies number of articles each review covers and the overall result of the review if possible.

Table 2 CSP-CFP relationship reviews (partly from Margolis, Elfenbein & Walsh 2007, 35)

Authors (Year)	Number of articles reviewed	Result
Aldag and Bartol (1978)	10	Unclear
Arlow and Gannon (1982)	7	No significant relationship
Cochran and Wood (1984 in Margolis et al. 2007)	14	-
Aupperle, Carroll and Hatfield (1985)	10	No relationship
Wokutch and McKinney (1991 in Margolis et al. 2007)	20	-
Wood and Jones (1995)	34	Mixed
Pava and Krausz (1996)	21	Neutral or slightly positive
Griffin and Mahon (1997)	51	Mixed
Preston and O'Bannon (1997)	8	Positive
Richardon, Welker and Hutchinson (1999)	14	Positive
Roman, Hayibor and Agle (1999)	46	Positive
Margolis and Walsh (2001 in Margolis et al. 2007)	95	-
Margolis and Walsh (2003)	127	Unclear
Orlitzky, Schmidt and Rynes (2003)	52	Positive
Allouche and Laroche (2005)	82	Positive
Wu (2006 in Beurden et al. 2008)	39	Positive
Margolis, Elfenbein and Walsh (2007)	167	Positive
Van Beurden and Gössling (2008)	34	Positive
Goyal, Rahman & Kazmi (2013)	101	Unclear
Wang (2015)	42	Positive

Negative association between CSP and CFP has been justified by cost increases resulting from socially responsible behaviour. For example, investment in pollution control technology increases costs and therefore leads to a competitive disadvantage. These

costs could be avoided by socially irresponsible behaviour or they should be forced by others, like government, to all players in the competitive field. According to this view, social responsibility can bring only few measurable economic benefits for a firm while the measurable costs that reduce profits are numerous. (Waddock and Graves 1997.) Other critical approach is based on Friedman's (1970) arguments. According to it, a manager that allocates assets to socially responsible practices uses them to enhance his/her own personal benefits and steals from stockholders. The costs may be high and damage corporate value. (Wang et al. 2015.)

Many researches have also found no significant relationship between corporate social and financial performance (Arlow & Gannon 1982; Aupperle, Carroll & Harfield 1985). It is argued that there are too many intervening variables and if a relationship is found, it is only a halo effect. Waddock and Graves (1997) argue that the measurement problems that have stigmatized the CSP research might on the other hand mask any linkage that exists.

Wood and Jones (1995) ended up with mixed results in their review of CSP-CFP studies. They argue that the appropriate combination of variables within a justified theory produces consistent results. An example of a right match consists of revealed misdeeds and negative stock returns. Therefore, at least market measures used with a theory that is market-based is a match that shows a clear CSP-CFP relationship. Mixed results were also an outcome of the review of Griffin and Mahon (1997) as their paper indicates that Fortune and KLD indices track one another, whereas TRI and corporate philanthropy do not correlate with financial performance.

Orlitzky, Schmidt and Rynes (2003) conducted a meta-analysis that covered 52 quantitative studies of CSP-CFP relationship. The findings indicate that corporate social responsibility is likely to pay off across industries although the strength of the link varies from highly positive to modest positive because of contingencies like reputation effects, market measures of CFP, and CSP disclosures. Their results show that corporate social performance is more highly correlated with accounting-based measures of corporate financial performance than market-based indicators whereas CSP reputation indices are more highly correlated with CFP than other indicators of CSP. The results also indicate that relationship between corporate environmental performance and CFP is smaller than the relationship between other measures of CSP and CFP. These other measures cover for example managerial principles and corporate reputations for minority hiring. (Orlitzky et al. 2003.)

Positive association, although a small one, was also found in the meta-analysis of Margolis, Elfenbein and Walsh (2007). Their meta-analysis covers altogether 167 studies that showed 192 different effects. The authors divided the effects into nine categories: 1. Charitable contributions, 2. Corporate policies, 3. Environmental performance, 4. Revealed misdeeds, 5. Transparency, 6. Self-reported social performance, 7. Observer's perceptions, 8. Third-party audits, and 9. Screened mutual funds. Results indicate that the strength of the link varies according to different dimensions: it is the strongest for the analysis of the specific dimensions of charitable contributions, revealed misdeeds, and, contrary to the meta-analysis of Orlitzky, Schmidt and Rynes (2003), environmental performance as well as when CSP is evaluated broadly through observer's own perceptions. On the other hand, it is the weakest for the specific dimensions of corporate policies and transparency and if CSP is evaluated broadly through third-party audits and mutual fund screens. (Margolis et al. 2007.)

The results of the meta-analysis conducted by Margolis and associates (2007) may seem illogical at some level, as one might think that corporate policies and trans-

parency as well as third party audits are more reliable indicators of actual high corporate social performance than charitable contributions for example. They could more easily be perceived as cosmetic actions that tell nothing about the sustainability of the company's internal processes. An interesting finding is also the fact that observer's own perception has a more significant effect than third party audits although third party audits can be argued to be more objective and reliable sources of information. However, charitable contributions and revealed misdeeds are often the most visible part to outsiders, which is probably why people often base their perception of a firm's social performance on them.

Given the history of CSP-CFP link debate, there are three important contributions of the paper of Margolis and associates (2007). First, companies clearly suffer from revealed misdeeds and they are costly to firms at the time they are exposed and afterward. Companies may lose their license to operate if they overlook social responsibilities. Second, although the positive relationship between CSP and CFP is only small, companies are not overtly penalized for investing in corporate social performance. Therefore, CSP does not destroy shareholder value misplacing Friedman's (1970) concerns about theft. The authors argue that "Companies can do good *and* do well, even if companies do not always do well *by* doing good (Margolis et al. 2007, 23)." Thus, CSP cannot at least be *de*legitimized on economic grounds. Thirdly, financial performance is suggested to be an unlikely rationale for pursuing CSP. When looking for investments with high financial returns, it is probably more lucrative to invest in something else, such as research and development. CSP again has other motivations, such as ethics (Margolis et al. 2007.) and improved employer attractiveness (Turban and Greening 1997). In spite of this, the results of Lozano's (2013) study on corporate sustainability drivers indicate that business case is a strong internal driver for striving sustainability.

2.2.3 Latest results

"Asking if Corporate Social Responsibility does pay is a too simplistic question because the answer will never be "yes" or "no" but always: "it depends". (David Vogel quoted in Gond, Akremi, Igalens and Swaen 2010, 14)"

Latest study results concerning the CSP-CFP link have been more unanimous and brought up important points that have to be acknowledged when measuring the relationship. Van Beurden and Gössling (2008) argue in their review of the CSP-CFP studies that many of the studies made on the topic are based on dated material. For example, Margolis and Walsh (2003) used studies published between 1972 and 2002, and Orlitzky and associates (2003) used studies published between 1970 and 1997. Van Beurden and Gössling (2008) again only included studies published after 1990 because they argue that the Brundtland Report "Our Common Future", published in 1987, had an important effect on the understanding of sustainable development and therefore, only studies conducted after 1990 are relevant. The results of their review clearly indicate a positive association between CSP and CFP.

Wang, Dou and Jia (2015) include in their meta-analysis only studies published after 2003. Their analysis shows a significant positive link from CSP to CFP. However, as in earlier studies, also they found out that the strength of the link varies according to different measurement strategies and environmental contexts. The link was the most positive for surveys compared with CSR reputation ratings, content analysis, social auditing database and proxy available such as corporate philanthropy. Content analysis

had an insignificant correlation with CFP. Accounting and perceptual based measures of CFP were more highly correlated with CSR than market-based measures. (Wang et al. 2015.)

Latest studies on the link have indicated that high financial performance is associated with high social performance and that the link is especially strong in case of superior social performance and high financial performance. For example, Ameer and Othman (2011) investigated top 100 global corporations in terms of sustainability performance and found out that superior sustainable practices and higher financial performance have a bidirectional relationship. Barnett and Salomon (2012) argue in their paper that stakeholder influence capacity is in a central role in the CSP-CFP link. Their results indicate a U-shaped relationship where firms with low CSP have higher CFP than firms with moderate CSP but the CFP is the highest with firms with high CSP. The authors emphasize that stakeholder influence capacity influences firm's ability to transform social responsibility actions into profit. Corporate responsibility is costly and firms with inadequate stakeholder influence capacity will not gain the possible benefits. The more they invest in social issues, the more they will lose financial assets. Then again, firms that are able to improve their stakeholder relations through CSP will also gain more profits. In the end, the greatest corporate social performance equals to superior capacity to transform social investment into high financial returns. (Barnett & Salomon 2012.)

Porter and Kramer (2006) argue that prevailing approaches to CSR are too disconnected from business and strategy to generate real outcomes pointing out a question of whether CSR is practiced in a strategic way that creates shared value. They guide managers to analyse social responsibility decisions in the same way as they assess other strategic choices related to their core business. This way, CSR can lead to new opportunities, innovations, and enhanced competitive advantage instead of being a cost or a constraint. In the end, the goal should be to create shared value. According to Porter and Kramer (2006, 10) "Typically the more closely tied a social issue is to a company's business, the greater the opportunity to leverage the firm's resources – and benefit society." Therefore, the correct question is not whether a cause is worthy but whether it presents an opportunity to create shared value. (Porter & Kramer 2006.)

Empirically testing Porter's and Kramer's (2006) arguments, Michelon, Boesso and Kumar (2013) take CSP-CFP research a step further by examining the relationship between *strategic* corporate social responsibility and company performance. By strategic corporate social responsibility, the authors refer to CSR issues that matter most to the company and its stakeholders and that are linked to the company strategy. The results show that when CSR initiatives are prioritized based on strategic concerns and stakeholder preferences, they correlate with superior financial performance. CSR was measured based on KLD rating and the relationship did not exist for all areas of CSR. Environment- and employee-related CSR initiatives lacked link with corporate financial performance, whereas the areas of community, governance, diversity, human rights and product/customer were linked with corporate performance. (Michelon et al. 2013.)

2.2.4 Temporal order

In addition to the nature of the link, there has been a lack of consensus on what is the direction of the relationship. In other words, if positive link is found, it has still been unclear whether CFP leads to CSP or vice versa. Good management theory and slack resources theory explain these different directions. They both see a positive association

between CSP and CFP but the temporal order is different. (Waddock & Graves 1997; Orlitzky et al. 2003.)

In good management theory (also called as 'instrumental stakeholder theory') good management leads to high CSP which again leads to high CFP. The theory emphasizes the importance of addressing stakeholder demands and practicing reciprocal stakeholder management as it is suggested that if managers address stakeholder demands, they are able to continuously divert attention on financial goals and maximize shareholder value. The satisfaction of different stakeholder groups is instrumental for financial performance. (Orlitzky et al. 2003.) Employees are one of the most important stakeholder groups and for example employee morale, productivity and satisfaction as well as higher employer attractiveness can be expected results from good employee relations, thus reducing costs. Then again, increased sales and reduced stakeholder management costs can result from positive customer perceptions about the company's product quality, environmental awareness, and community and government relations. (Waddock & Graves 1997.)

Slack resources theory differs from good management theory by emphasizing that prior high financial performance can result in subsequent CSP. This different temporal ordering derives from the idea that CFP may result in slack resources that can be used for corporate social responsibility actions. (Orlitzky et al. 2003; Waddock & Graves 1997; Margolis et al. 2007.) Slack resources are not, however, automatically used for socially responsible actions because strategic managers have to continuously decide how to allocate scarce corporate resources. For example, a firm in financial trouble may have a weak ability to use its resources on corporate social responsibility actions. (Waddock & Graves 1997.)

Waddock and Graves (1997) examined the direction of the link and their results support both slack resources theory and good management theory. In addition, they suggest that there is a virtuous cycle between the two. Also the meta-analysis of Orlitzky and associates (2003) supports both theories and additionally, confirms that the link is both bidirectional and simultaneous. Margolis and associates (2007) conclude in their meta-analysis that the strength of the link seems to be equally strong from prior CFP to subsequent CSP as from prior CSP to subsequent CFP. However, Wang and fellow researchers (2015) found support only for the good management theory. They believe that the lack of support for slack resources theory stems from the fact that the antecedents of CSR vary so greatly.

3 METHODOLOGY

3.1 Research design

This research was conducted as a qualitative research although it includes also some quantitative elements. In qualitative research, data is analysed as thoroughly and deeply as possible. The objective of this study was to examine the link between corporate environmental performance and corporate financial performance. Qualitative analysis method was chosen to gain a comprehensive and thorough understanding of CEP in the target companies. Only after understanding and evaluating CEP, it was possible to study the link itself.

In this study, content analysis method was used to analyse corporate environmental performance of the target companies. Content analysis is a basic analysis method that can be viewed as a single method or as a loose theoretical framework that can be attached to different analysis methods. If content analysis is viewed as a loose theoretical framework, which means the content analysis of different written, heard or seen contents, most qualitative data analysis methods are in some ways based on content analysis. Essential part of content analysis is that a researcher must decide the subject to be examined and the limitations of the study carefully. It is important to decide what is interesting in the data and leave the rest out. Tomi and Sarajärvi (2002) emphasize that there can be several highly interesting issues in the data but in a single study, the boundaries must be strict. (Tomi & Sarajarvi 2002.)

In this study, the phenomenon I am interested in is the link between corporate environmental performance and corporate financial performance. To limit the topic more, I have chosen two industries. A research question describes the phenomenon that is under investigation in the specific study. In content analysis, the phenomena that is studied is described verbally. (Tomi & Sarajärvi 2002.) The research question in this study is: "How are corporate environmental performance and corporate financial performance linked in forest, paper and packaging and manufacturing of machinery and equipment industries?" Quantitative methods are utilized in analysing the link.

When forming an analysis framework for a study, there are three options: data-based analysis method (inductive), theory-based analysis framework (deductive), or a combination of the two. In a data-based analysis the aim is to create a theoretical whole based on the research data. Prior observations, information or theories should not affect in analysing the research data or in the end result. Theory-based analysis is a traditional analysis model, especially in natural sciences. It relies on a specific theory or a model that guides data analysis. Usually this theory or model is tested in the new research. The third option is the combination of data-based analysis method and theory-based analysis method, also called theory-bound method. In this model, theory can help in analysis but existing knowledge is not experimental in nature but rather creates way for new thoughts.

It was clear that in this research, data-based analysis framework is used. Based on a volume of earlier research on CSP-CFP link, it was clear that the research in the field is mainly based on specific key concepts and prior research rather than theory. Poser, Guenther and Orlitzky wonder in their CEP study how there is no common theoretical basis for CEP even though it has been studied empirically quite extensively.

Usually when a new research field grows, first follows theory development and theory testing. Due to lack of theoretical basis, this study leans on the key concepts of corporate social performance (Carroll's and Wood's models), corporate environmental performance (Schultze & Trommer, Poser, Guenther & Orlitzky) and corporate financial performance.

Return on equity figure was used to measure corporate financial performance. It is the second most common financial variable used in CSP-CFP studies. (Boaventura, Santos da Silva & Bandeira-de-Mello 2012.) CEP and CFP data are compared with a one year lapse so that financial performance of a subsequent year is used.

3.2 Target industries and companies

Target industries were chosen to be forest, paper and packaging industry and manufacturing of machinery and equipment industry. They are both significant industries in Finland. Three biggest companies were chosen from the first industry: Stora Enso Oyj, UPM-Kymmene Corporation and Metsä Group, and two biggest companies from the second industry: KONE Oyj and Wärtsilä Oyj Abp. One criteria for selecting the industries was that both industries cause significant environmental impacts. Other criteria were also a sufficient amount of CSR reports available. It was not easy to find companies that have published enough environmental data from 2010 onwards. The initial plan was to select companies from energy, chemistry and metal industries but in energy sector there was only one company that had published enough environmental data from 2010 onwards and in chemistry and metal industries none had enough public data on their environmental performance. So, this was also a major reason for selecting forest, paper and packaging and manufacturing of machinery and equipment industries.

The "Largest Companies" websites were used to identify the target companies. Largest Companies website includes a large number of top lists of Nordic companies compiling and comparing data altogether from 500,000 largest companies in the Nordics (Largest Companies, n.d.). They have top lists of the largest companies per country in a specific industry so it was easy to find the largest companies in the chosen industries. Target companies are described next.

3.2.1 Forest, paper and packaging industry

Stora Enso Oyj

Stora Enso is a paper and packaging industry company providing renewable solutions in packaging, biomaterials, wooden constructions and paper. Stora Enso was founded in 1998 as a merger of Swedish mining and forestry products company Stora AB and Finnish forestry products company Enso Oyj. The company employs approximately 26 000 people in more than 35 countries. Sales were EUR 10.0 billion in 2015.

UPM-Kymmene Corporation

UPM is a Finnish forest industry company combining bio and forest industries. It has six business areas: UPM Biorefining, UPM Energy, UPM Raflatac, UPM Specialty Papers, UPM Paper Europe and North America and UPM Plywood. The company was formed in 1996 through a merger of Kymmene Corporation and Repola Ltd and its sub-

sidiary United Paper Mills Lth. It employs approximately 19 600 people in 13 countries. Sales were EUR 10.1 billion in 2015.

Metsä Group
Metsä Group is a Finnish forest industry group producing renewable products from northern forests. The company has five business areas: Metsä Forest, Metsä Wood, Metsä Fibre, Metsä Board and Metsä Tissue, through which it focuses on wood supply and forest services, wood products, pulp, fresh fibre paperboards and tissue and cooking papers. It employs approximately 9 300 people and operates in about 30 countries. Metsä Group was founded in 1947. Metsä Group's parent company is Metsäliitto Cooperative that is owned by 104 000 Finnish forest owners. Sales were EUR 5 016.0 million in 2015.

3.2.2 Manufacturing of machinery and equipment

KONE Oyj
KONE is a Finnish elevator and escalator company. In addition to manufacturing elevators, escalators and automatic building doors, they provide solutions for maintenance and modernization. The company employs approximately 52 100 people in over 50 countries. Sales were EUR 8.8 billion in 2015.

Wärtsilä Oyj Abp
Wärtsilä manufactures and services power sources and other equipment in the marine and energy markets. Its three largest businesses are: Energy Solutions, Marine Solutions and Services. Wärtsilä employs approximately 18 300 people in more than 70 countries. Sales were EUR 4.8 billion in 2016.

3.3 Data collection

In a qualitative study, the most common data collection methods are interviews, questionnaires, observing and information on different documents, such as reports, diaries or journals. These are not mutually exclusive but can be used side by side and they can be combined in different ways. (Tomi & Sarajärvi 2002.) Data source in this study was secondary data consisting mainly of CSP disclosures. More precisely, CSP disclosures in this study covered corporate social responsibility reports, annual reports and company websites as well as progress books and other similar publications when needed. In addition, some other relevant websites were used. Google search engine and company websites were used to find CSR reports and annual reports. Google search engine was also used if information on some environmental variable was missing from CSR report. The Largest Companies website was used to find the largest companies in the chosen industries.

Data collection was challenging at first and the target industries changed during the process. This was due to insufficient amount of publicly available environmental performance data. Only after finding enough environmental performance data, the selection of target companies was confirmed. If a company had enough publically available environmental data, it was easy to find. From the paper, packaging and forest industry, Metsä Group and Stora Enso Oyj had a sufficient number of CSR reports available and

UPM Kymmene Corporation again had integrated its CSR information in annual reports. Environmental data was mainly easy to find from these data sources. Metsä Group started publishing separate CSR report in 2011 which is why also its annual report 2010 was utilized to retrieve part of the comparison figures. From the manufacturing of machinery and equipment industry, both KONE and Wärtsilä have published CSR reports during the chosen review years, 2011-2015. Wärtsilä started publishing a separate report in 2011 but it included in the 2011 report sustainability data from five previous years. Therefore, the 2011 report provided the necessary information also from year 2010 to get comparison figures.

The final data used for analysis is listed in the table 3 below, excluding possible company websites used. Usually, one corporate social responsibility report or annual report was used per company per year. Altogether, 29 extensive reports were used and in addition, some extra publications or company websites when necessary. For Stora Enso, for example, Rethink Stora Enso 2014 publication was used to retrieve more extensive information on their new product innovations. For Wärtsilä, the company's press releases were browsed to find information on the same topic. For Metsä Group, KONE and Wärtsilä Google search engine was used to find information on external recognitions gained for CEP. All the data used can be found online from target companies' websites.

Table 3 Main data sources used for environmental data

The company	Data used	Pages
Metsä Group	Annual report 2010	142
	Sustainability report 2011	36
	Sustainability report 2012	56
	Sustainability report 2013	60
	Sustainability report 2014	64
	Sustainability report 2015	73
UPM Kymmene Corporation	Annual Report 2010	166
	Annual Report 2011	180
	Annual Report 2012	150
	Annual Report 2013	147
	Annual Report 2014	147
	Annual Report 2015	155
Stora Enso Oyj	Sustainability Report 2010	50
	Global Responsibility Report 2011	64
	Global Responsibility Report 2012	72
	Global Responsibility Report 2013	80
	Rethink Stora Enso 2013	39
	Global Responsibility Performance 2014	102
	Sustainability Report 2015	83
KONE Oyj	Corporate Responsibility Report 2010	76
	Corporate Responsibility Report 2011	50
	Corporate Responsibility Report 2012	48
	Corporate Responsibility Report 2013	50
	Sustainability Report 2014	50
	Sustainability Report 2015	50

Wärtsilä Oyj Abp	Annual Report, Sustainability 2011	134
	Annual Report, Sustainability 2012	104
	Annual Report, Sustainability 2013	89
	Annual Report, Sustainability 2014	56
	Annual Report, Sustainability 2015	60
Altogether 5 companies and 2 633 pages + financial data.		

3.4 Data analysis

The first phase of the data analysis included investigating possible data evaluation methods for environmental performance and skimming of CSR and/or annual reports of the target companies. Ready-made data evaluation methods for assessing corporate environmental performance, that would have been suitable for this study, were not found. Therefore, a data evaluation method for environmental performance was specifically developed for this study by using different frameworks and earlier studies as an inspiration. This is explained thoroughly in the next subchapter 3.4.1.

3.4.1 Environmental data evaluation

Available metrics for evaluating and scoring corporate environmental performance that would have suited this study do not exist, or at least they were not found when conducting this study. In several earlier papers that study the link between CSP and CFP or CEP and CFP, social and environmental performance data was derived from some of the social and environmental indices made by third parties. In other words, rare researchers have evaluated corporate social and environmental performance by themselves but instead, rely on third party evaluations. In some of the early studies, the length of a CSR report or the amount of social and environmental information included in the annual report has been used as an evaluation criteria. Some have used information concerning substances released to the environment, penalties assessed for violations of environmental regulations, environmental liabilities or environmental announcements on corporate environmental initiatives. (Poser et al. 2012.)

Many CSP and CEP measures have been criticized for measuring only past performance and failing to measure the future performance. Schultze and Trommer (2011) have studied the concept of environmental performance and its measurement. The authors have identified five measurement categories that predict also future impacts and directly correspond to the CEP construct: operational input indicators, output indicators, process indicators, indicators of strategic environmental management and indicators of environmental attitudes and objectives. They argue that if a measure belongs to these categories, it probably provides construct validity. After further operationalization, the authors argue that when measuring CEP, the next aspects should be considered: 1. Special interests of the stakeholder groups under investigation, 2. Special characteristics related to the company/products, and 3. External factors relevant to the expectations of stakeholders. External factors could be for example technological possibilities or legal pollution limits.

For this study, the environmental performance evaluation criteria were developed by utilizing several sources. These include Kinder, Lydenberg, Domini Research

& Analytics rating's environmental variables, GRI reporting framework, Jacobs' CEP framework, stakeholder materiality analysis of target companies and the sustainability topics covered in their reports.

Kinder, Lydenberg, Domini Research & Analytics (KLD) rating is the most widely used social rating providing information on seven areas of CSR: environment, community, corporate governance, diversity, employee relations, human rights, and product quality and safety. It is also the largest multidimensional CSP database available to the public. KLD ratings' environmental variables have been utilized in earlier CEP-CFP studies. Of the seven CSR areas included in the original rating, only environmental variables are utilized in this study as well. The environmental dimension alone covers 14 variables: seven environmental strengths and seven concern variables. The strength variables include: beneficial products and services, pollution prevention, recycling, clean energy, communications, property, plant and equipment, and other strength. The concern variables include: hazardous waste, regulatory problems, ozone-depleting chemicals, substantial emissions, agricultural chemicals, climate change, and other concern. For example, for the pollution prevention strength variable, a company receives points if it has strong pollution prevention programs in place. For the clean energy strength variable, a company is given points if it has done significant actions to reduce its climate change impact. For the regulatory problems concern variable, a company is given minus points if it has recently paid major fines or penalties for violating environmental regulations. (Chatterji, Levine & Toffel 2009; Michelon et al. 2013)

KLD's environmental variables provided a platform for forming the evaluation criteria for environmental performance in this paper. The initial plan was to use KLD's environmental variables as they are as an evaluation criteria. However, closer investigation revealed that none of the variables was usable as they are stated in the original KLD rating and approximately half of them were completely irrelevant for the target industries. Some variables, such as agricultural chemicals, have nothing to do with the target companies of this study. Therefore, KLD ratings was, in the end, used more as an inspiration and the final evaluation criteria was specifically developed for this study. KLD gives companies 0, +1 or +2 points for strength variables and 0, -1 or -2 points for concern variables (Chatterji et al. 2009). Similar scoring method was used in this study expect that the evaluation method of this study does not include concern variables and thus minus points are not given.

All of the target companies of this study follow the guidelines of Global Reporting Initiative (GRI). GRI produces widely used standards for corporate responsibility reporting. According to GRI websites, 82% of the largest 250 corporations in the world use GRI's Standards for reporting on their sustainability performance. GRI Standards enables companies to measure the critical impacts they have on the environment, society and economy. (GRI At a Glance, n.d.) GRI has environment-specific Standards for measuring and understanding the material impacts related to environmental issues. These include materials, energy, water, biodiversity, emissions, effluents and waste, environmental compliance, and supplier environmental assessment. These topics were taken into consideration when developing the evaluation framework for this study because as stated, these cover the material environmental issues. (GRI Standards Download Center 2016.) Energy, emissions, effluents, waste and environmental compliance were directly included in the analysis framework and materials to some extent.

Jacobs, Singhai and Subramanian (2010) have studied environmental performance through announcements related to CEP. CEP announcements are divided into two categories. The first one covers announcements concerning self-reported efforts to

minimize negative impacts. The second category covers announcements concerning external recognition and awards granted for high CEP. They divide the first category further into seven subcategories: environmental business strategies, environmental philanthropy, voluntary emission reductions, eco-friendly products, renewable energy, recycling, and miscellaneous. (Jacobs et al. 2010.) Klassen and McLaughlin (2001) speak for behalf of the second category, third-party recognition. They argue that an environmental award from a third party improves objectivity of social performance measurement because self-reported information is not necessarily objective. Awards are usually granted after an extensive examination of management system, process operation and product design and can be viewed as a public signal of a company's cumulative performance as well as positioning for performance in the future (Klassen & MacLaughlin 2001). Third-party awards, emission reductions, eco-friendly products, renewable energy and recycling as well as, to some extent, environmental business strategies are included in the analysis framework of this study.

By taking into consideration the sustainability topics that target companies covered in their CSR or annual reports, it was ensured that the evaluation criteria of this study cover industry specific issues. CSR and/or annual reports of the target companies were first analysed lightly to gain on overview of the data and environmental performance of the companies. The initial scan helped in forming the analysis framework as all of the companies reported more or less about the same areas. Analysis focused mostly on the environmental parts of the CSR reports and/or annual reports. However, some information was also derived from other sections of the reports, such as product-related details. Target companies' possible stakeholder materiality analysis were also assessed. For Metsä Group's stakeholders for example, the top 12 material topics include: safety at work, sustainable forest management, product safety, product and process innovation, material and energy efficiency, bioenergy, sustainable supply chain, emissions to water and air, circular economy, new bioproducts, supporting local livelihoods and society, and water use.

In this study, corporate environmental performance is evaluated over a five-year period (2011-2015) to gain a more reliable picture of CEP and the possible link than if only assessing CEP and the possible link during one year. This differs from earlier studies as usually CSP or CEP was evaluated based on one or two years. Depending on the improvement achieved during the period, the company is given either 0, +1 or +2 points for each variable. Initial idea was to include both strength and concern variables in similar way than as in KLD rating. However, in the end there would have been only one accurate concern variable, hazardous waste, which was easier to switch to so called strength as well. If hazardous waste would have been a concern variable, the companies would have been assessed based on how much the amount of hazardous waste has worsened and given 0, -1 or -2 points. Because also other figures are assessed based on how much they have improved, it was logical to assess also hazardous waste in that way. Corporate financial performance figures are derived from the previous or from the consecutive year, depending on the direction of possible link.

The first environmental variable is pollution prevention. This variable evaluates company's pollution prevention programs including emission reductions. Industry relevant pollutants such as carbon dioxide (CO2), chemical oxygen demand (COD), and sulphur dioxide (SO2) are investigated. The second environmental variable is clean and efficient energy use. Through this variable, company's renewable energy use and energy efficiency improvement programs are assessed. The first two variables focus on climate change mitigation. Third variable is recycling. Recycling variable evaluates recy-

cling rate and efforts to decrease the amount of waste to landfill. The fourth variable is pioneering products in the industry. This means that the company is given points if it has introduced new products that are more environmentally friendly than other competing products, such as products where part or all fossil based materials are replaced with renewable materials or that are significantly more energy efficient. The company is also given points if it has clearly improved environmental performance of its existing products. The fifth environmental variable is external recognition and awards. The company receives points for this variable if its environmental performance has been recognized by third-parties, such as Carbon Disclosure Project or Dow Jones Sustainability Indices. The sixth and last environmental variable is hazardous waste and measures the amount of hazardous waste the company produces and more specifically, the success in decreasing that waste.

Initially environmental incidents were also one variable. The aim of this variable was to measure how many environmental incidents have happened in company's operations and how successfully the company has been able to reduce them. However, it turned out that the target companies report rather differently about their environmental incidents and the figures were thus not comparable. For example, UPM started reporting on its environmental incidents in detail only in 2013. Stora Enso has reported in detail how many incidents have occurred, what the incidents were and which corrective actions were taken. KONE again has simply stated in its reports that no significant fines or sanctions regarding society occurred during reporting period.

Environmental data evaluation criteria are elaborated in table 4 below.

Table 4 Environmental data evaluation criteria

Environmental data evaluation criteria
Pollution prevention How significantly has the company decreased its pollution levels, such as CO2, SO2 and COD?
Clean and efficient energy use What is the share of renewable energy of company's energy use? How much has it increased? How much has the company improved its energy efficiency?
Recycling What is the recycling rate? How much has is improved? How much has the amount of waste to landfill decreased?
Pioneering products in the industry Has the company introduced products that are more environmentally friendly than competing products in the industry? Has the company improved environmental performance of its products?
External recognition Has the company received external recognition and awards for its environmental performance?
Hazardous waste Has the company decreased the amount of hazardous waste generating from its operations?

Each environmental performance variable was analysed for each target company

by utilizing content analysis method. Information on key topics such as pollutants, waste and product innovations was mainly searched from CSR and/or annual reports. Information was often searched by utilizing key word search function. Key words used were for example 'chemical oxygen load', 'COD', 'sulphur', 'hazardous waste', 'landfill', 'award' and 'recognition'. The most challenging data to find was information on environmental variable "pioneering products in the industry". Often search words 'introduced' and 'launched' resulted in relevant information but in some cases the CSR report lacked product related information so also company websites and press releases were utilized.

Scoring criteria

Most of the environmental variables provide numerical figures so giving points is based on possible numerical improvement achieved during the review years. If a company has managed to reduce the amount of waste sent to landfills, for example, it is given points. As many of the numerical variables include more than one figure (pollution prevention, clean and efficient energy use and recycling), the whole picture is assessed. For example, pollution prevention variable covers several different pollutants: carbon dioxide, sulphur dioxide, chemical oxygen load, nitrogen oxides and sulphur oxides. In case of this variable, for example, if a company has succeeded in reducing its sulphur dioxide emissions clearly but at the same, the amount of carbon dioxide emissions has remained stable, the company is given one point.

Points were given based on following criteria:

1. Pollution prevention:
    a. 0 points: Emission levels have worsened, or remained the same during as in previous year.
    b. +1 points: All emission levels have at least remained at the same level when at the same time the amount of at least one emission has decreased significantly, or the amount of all emission levels has decreased to some extent from previous year.
    c. +2 points: All emissions levels have decreased when at the same time at least one has decreased significantly. Or many pollutants have decreased significantly.
2. Clean and efficient energy:
    a. 0 points: The figures have worsened or remained the same as in previous year.
    b. +1 point: All figures have at least remained at the same level when at the same time at least one figure has improved significantly. Or all figures have improved to some extent from previous year.
    c. +2 points: All figures have improved and at least one has improved significantly.
3. Recycling:
    a. 0 points: The figures have worsened or remained the same as in previous year.
    b. +1 point: Waste to landfill figure has improved significantly or waste to landfill figure has at least remained at the same level when at the same recycling rate is at least 90%.
    c. +2 points: Waste to landfill figure has improved more than 20% and recycling rate has remained the same or improved at the same time.
4. Pioneering products:

   a. 0 points: The company has not invented innovative products that address environmental aspects better than other similar products.
   b. +1 point: The company has invented at least one innovative product that clearly addresses some environmental challenge or that has significantly smaller negative environmental impact than competing products.
   c. +2 points: The company has introduced at least two products that clearly address some environmental challenge or that have significantly smaller negative environmental impact than competing products.
5. External recognition:
   a. 0 points: The company has not gained external recognition for its environmental performance.
   b. +1 points: The company has been recognized by at least one external party for its environmental performance
   c. +2 points: The company has gained extensive external recognition, including recognition for being an industry leader.
6. Hazardous waste:
   a. 0 points: The figure has worsened or remained the same as in previous year.
   b. +1 point: The figure has improved 5-20% from previous year.
   c. +2 points: The figure has improved significantly, more than 20%, from previous year.

After environmental variables were assessed through content analysis method and each variable scored based on the scoring criteria, the points were calculated per company per year. Maximum points per each variable were 2 and because there are six environmental performance variables, total maximum was 12 points. Environmental performance of each company per year is the sum of points given on each environmental variable.

3.4.2 Financial data evaluation

Corporate financial performance is typically measured through either accounting based measures of financial returns (return on assets; return on equity; return on investment; return on sales) or through market-based measures of financial value (stock returns; market/book value ratio). Accounting based measures are a way to capture a firm's internal efficiency. They have been criticized for being possibly biased as they are subject to managerial manipulation and differences in accounting procedures. Market based measures lack these weaknesses but they do, however, have their own weak spots: it is argued that they are only related to financial stakeholders although CSR activities affect also non-financial stakeholders. (Scholtens 2008; Margolis et al. 2007.)

Return on equity (ROE) was chosen as CFP variable for this study. Return on equity is one figure for measuring company profitability as it shows how much profit a company generates with the money that shareholders have invested. Return on equity was chosen because it has been used in earlier studies as well and it was available from all of the companies over 2010-2016 period. Information on ROE was found from annual reports. Annual reports were found by using Google search engine and they are available in digital form.

3.4.3 Evaluating the link between CEP and CFP

The link between CEP and CFP was investigated bidirectionally: does high corporate environmental performance lead to high corporate financial performance and/or does high corporate financial performance lead to high corporate environmental performance. The link was evaluated with a one-year lag between CEP and CFP. When evaluating the link from CEP to CFP, CFP figure was from the sequent year. When again evaluating the link from CFP to CEP, CFP figure was from the previous year.

After calculating the total score for corporate environmental performance per company per year and retrieving information on ROE figures, the link between those two was evaluated using statistical methods. Pearson's correlation coefficiency was calculated for each company from the five-year period. Correlation coefficiency was computed in Microsoft Excel using PEARSON function. After that, coefficient of determination was computed for each result to understand how big proportion of the variance is predictable from the independent variable.

4 RESULTS

Study results are presented in this chapter. An analysis of corporate environmental performance of the target companies is presented first. Each environmental variable is analysed and scored separately including tables that show key figures related to each variable. After environmental performance of the target companies is analysed, corporate financial performance of the companies is listed. Last part is the analysis of how CEP and CFP are linked in the selected industries.

4.1 Corporate environmental performance

4.1.1 Pollution prevention

Stora Enso has set targets for carbon dioxide (CO2), chemical oxygen demand (COD) and sulphur dioxide (SO2) reductions. The goal is to lower carbon dioxide intensity of pulp, paper and board mills by 35% from 2005 level by the end of 2025. The company includes scope 1 and 2 emissions in the target and reports publically also scope 3 emissions. CO2 emissions have lowered slowly during the review years although Stora Enso in on track in reaching its target. In 2015, the company had reduced CO2 emissions by 32% from 2006 level. During the review years, the figure has usually improved by few percent. For example, in 2015 emissions were reduced by 3% from previous year. Stora Enso's target concerning COD is to reduce it per saleable tonne of pulp, paper and board by 7% from 2007 level by the end of 2015. Expect for 2015, the company's COD figure has slightly improved during each review year. Stora Enso has set a goal also for sulphur dioxide emission reductions: to reduce SO2 emissions by 30% from 2007 levels by 2013. However, the target was not met. The company's sulphur dioxide level has improved in some years and worsened in others. For example, in 2011 it improved by 16% and in the following year, worsened by 19%.

UPM has set targets for fossil CO2 emissions, acidifying flue gases and effluent load. The goal is to reduce scope 1 and 2 fossil CO2 emissions by 30%, acidifying flue gases (SO2/NOx) 20% and effluent load (COD) 40% from 2008 levels by 2030. UPM has had challenges in reducing CO2 levels due to the acquisition of Myllykoski mill in 2011 and increased carbon dioxide factors for purchased power. During the year, CO2 emissions increased significantly, by 46%. After that, UPM managed to cut them a little but positive development stopped in 2014. Overall during the review years, the company has reduced fossil CO2 levels by 11%. SO2 and COD levels are in line with the targets and clear continuous improvement has occurred. Sulphur dioxide emissions have been reduced each year expect for 2011 when the figure worsened significantly. COD levels were not found for 2010 which is why comparison figure could not be calculated for 2011. During other years, COD figure has slightly improved.

Metsä Group has set a target for fossil carbon dioxide emissions: to reduce fossil CO2 emissions 30% from 2009 level by 2020. The company has not set targets for other emissions. The target concerning CO2 emissions was met already in 2013 when carbon dioxide emissions were 32% lower than in 2009. Expect for 2015, Metsä Group has cut CO2 emissions continuously. The company has also reduced SO2 and COD emission

levels during each review year with the exception of worsened SO2 level in 2013. Metsä Group managed to first cut sulphur dioxide emissions significantly by 29% in 2012 but in the following year emissions rose by 28%.

KONE has set a target for its relative carbon footprint but it does not report on any other emissions. The target is to reduce carbon footprint relative to net sales by 3% annually between 2014-2016. Before this, KONE's target was to reduce carbon footprint relative to net sales 3% from 2010 level by 2013. Its relative carbon footprint has decreased during each review year. The company's absolute carbon footprint has increased together with the business; e.g. in 2015 KONE received 17% more orders than in 2014 and its absolute carbon footprint increased 4% from 2014 level. By 2015 KONE had decreased its operational carbon footprint relative to orders received by over 60% from 2008.

Wärtsilä has set target for reducing greenhouse gas emissions: the target is to reduce GHG emissions 3% by 2015 through engine efficiency improvements. The company does not clarify what is the baseline year but the goal was set in 2011. Wärtsilä measures carbon dioxide emissions for scope 1, 2 and 3 separately and GHG emission intensity for all together. Scope 2 emissions stem from purchased electricity and heat and scope 3 emissions from flights. Wärtsilä has been very successful in reducing all of its emissions. Only in 2015 GHG intensity as well as CO2 and NOx emission levels worsened. When 2015 levels are compared with 2010 levels, the company has reduced all emissions, including e.g. sulphur oxide emissions by 77%.

Table 5 Pollution prevention

Pollution prevention	**2011**	**2012**	**2013**	**2014**	**2015**
Stora Enso[1]	CO2 -13% SO2 -16% COD -4%	CO2 -3% SO2 +19% COD -1%	CO2 +3% SO2 -9% COD -8%	CO2 -3% SO2 +5% COD -1%	CO2 -3% SO2 -14% COD +3%
UPM[1]	CO2 +46% SO2 +69% COD -	CO2 -13% SO2 -31% COD -5%	CO2 -1% SO2 -9% COD -2%	CO2 +/-0% SO2 -6% COD -2%	CO2 +2% SO2 -35% COD -3%
Metsä Group[1]	CO2 -8% SO2 -5% COD -6%	CO2 -20% SO2 -29% COD -5%	CO2 -11% SO2 +28% COD -2%	CO2 -6% SO2 -5% COD -8%	CO2 +/-0% SO2 -1% COD -2%
KONE[2]	RCF +5% ACF +11%	RCF -3% ACF +14%	RCF -9% ACF +7%	RCF -4% ACF +1%	RCF -12% ACF +4%
Wärtsilä[1]	GHG intensity +2% CO2 -14% NOx -7% SOx -4%	GHG -4% CO2 -7% NOx -9% SOx -45%	GHG -8% CO2 -6% NOx -21% SOx -37%	GHG -4% CO2 -4% NOx -5% SOx -16%	GHG +7% CO2 +10% NOx +7% SOx -17%

1 All figures are compared with previous year.

2 RCF=Relative carbon footprint and ACF=Absolute carbon footprint. All figures are compared with previous year.

Points given for companies during each review year are seen in table 7 below. Stora Enso receives 2 points for 2011 as all emission levels have improved and more specifically, CO2 and SO2 levels have improved significantly. For performance in 2012 the company receives 0 points because sulphur dioxide level has clearly worsened and CO2 and COD have improved only slightly. For 2013 Stora Enso gets 1 point as SO2 and COD levels have improved. For 2014 performance, the company receives 0 points due to minor improvements in CO2 and COD and worsened SO2. For 2015, the company is given 1 point as SO2 has clearly improved.

UPM receives 0 points for 2011 performance as CO2 and SO2 levels have worsened significantly. For the next year, the company receives 2 points as it has managed cut emission levels, of which SO2 level significantly. For 2013 UPM receives 1 point as it has managed to reduce all emissions levels. For 2014, the company is given 0 point as although some figures have improved, the improvements have been small. For 2015, UPM receives 2 points as SO2 has improved significantly.

Metsä Group is given 1 point for 2011 performance because all figures have improved. For 2012 the company receives 2 points as CO2 and SO2 levels have improved significantly. For 2013 performance, Metsä Group gets 0 points due to significantly weaker SO2 level. For 2014 the company, the company receives 1 point as all figures have improved. In 2015, the figures have remained the same or improved little which is why Metsä Group gets 0 points. When reviewing the period as a whole, CO2 and COD level reductions have been successful whilst SO2 emissions have not reduced.

KONE receives 0 points during each year expect for 2015. Its relative carbon footprint has improved only slightly each year while absolute carbon footprint has worsened. In 2015, ACF has worsened slightly but RCF has improved by 12% which is why the company is given 1 point.

Wärtsilä receives 1 point for 2011 as all figures have improved expect for slightly worsened GHG intensity number. For next year, the company receives 2 points because all figures have improved and SOx level significantly. Wärtsilä is given 2 points also for 2013 performance as all figures have improved and NOx and SOx significantly. Wärtsilä receives 2 points as it has succeeded in improving all figures, including GHG emissions, CO2 emissions, nitrogen oxides and sulphur oxides. Wärtsilä receives 2 points also for 2014 performance, as all figures have again improved and SOx significantly. For 2015, the company is given 0 points as most of the figures have worsened.

Table 6 Points for pollution prevention

Points for pollution prevention (0, +1 or +2)	**2011**	**2012**	**2013**	**2014**	**2015**
Stora Enso	2	0	1	0	1
UPM	0	2	1	0	2
Metsä Group	1	2	0	1	0
KONE	0	0	0	0	1
Wärtsilä	1	2	2	2	0

4.1.2 Clean energy

Concerning energy efficiency, renewable energy and biofuels, Stora Enso has set a target only for the first one. Stora Enso's target is to reduce electricity and heat consumption per saleable tonne of pulp, paper, and board by 15% from 2010 level by 2020. Its

energy efficiency figure has improved steadily during the review years, apart from 2011 when the figure worsened slightly. The company started adopting a "Lean" approach in 2015 which generated significant energy savings during the year. Stora Enso is also certifying its mills to ISO 50001 energy management system. In 2015, 36 mills in Europe were certified to the standard. The share of renewable energy shown in table 8 includes also internally generated energy. This portion has remained the stable during the review years. The share of biomass fuels used in the company's internal production has increased from 76% in 2011 to 81% in 2015.

UPM has not set targets for energy efficiency improvements, the share of renewable energy or biomass fuels. The company's energy efficiency figure has first worsened in 2011 but then improved until 2015, when it remained the same. UPM does not specify the share of renewable energy used. The share of biobased fuels is the same through the review years: 67%.

Metsä Group has set a target to improve energy efficiency 10% by 2020 from 2009 level. Unlike the energy efficiency figures of Stora Enso and UPM which are always compared with previous year, Metsä Group's figures are compared 2009 level due to insufficient data. The company's energy efficiency figure has remained rather stable during the review year: 5% better in 2011 and 7% better in 2015 when compared to 2009 level. During the review years 2011 and 2012, Metsä Group included renewable electricity and heat and internally generated energy and heat in the same figure. During both years, renewable or internally generated electricity and heat accounted for 61% of the total use. After that, purchased electricity and heat is a separate figure. The share of renewable energy was 18% in 2013 and 25% in 2015. In 2015, all of Metsä Group's mills produced bio-based electricity and heat to communities in addition to their own energy need. The company has increased the share of biomass fuels used in production from 80% in 2011 to 86% in 2015.

KONE has not set targets for increasing the share of renewable energy or improving the energy efficiency of its own operations. KONE has, however, increased the share of renewable energy used in its operations 4% in 2013 to 22% in 2015. The company's targets are related to improving the energy efficiency of its product offerings and it has also succeeded in this. However, in this section the efficiency of company's own operations, not its products', is measured. KONE reports the efficiency and energy consumption of its products in detail but it lacks specific data on the energy consumption of its own operations. Environmentally friendly products are considered in chapter 5.1.4, pioneering products.

Wärtsilä's target is to reduce absolute energy consumption by at least 10% by 2016 from 2005 level. In 2015 the company had saved altogether 42 GWh of energy which represents 90% of the target. Wärtsilä has been successful in its energy efficiency improvements as apart from 2015, it has improved its relative energy consumption. For example, in 2013, the figure improved by 13% from previous year. Wärtsilä's corporate social responsibility report 2015 has no information or mention about the use of renewable energy so the company either only uses non-renewable energy or it does not include the shares in its reporting. The company reports about the share of light fuel oil, heavy fuel oil and natural gas. Wärtsilä's factories generate some internal energy.

Table 7 Clean energy

Clean energy	**2011**	**2012**	**2013**	**2014**	**2015**

Stora Enso[1]	EE -1% Renewables/ Internal 47% Biofuels 76%	EE +1% Renewables/ Internal 43% Biofuels 78%	EE +3% Renewables/ Internal 47% Biofuels 77%	EE +2% Renewables/ Internal 49% Biofuels 79%	EE +3% Renewables/ Internal 46% Biofuels 81%
UPM[2]	EE -3% Biofuels 67%	EE +4% Biofuels 65%	EE +2% Biofuels 67%	EE +1% Biofuels 67%	EE +/-0% Biofuels 67%
Metsä Group[3]	EE +5% Renewables/ Internal 61% Biofuels 80%	EE +4% Renewables/ Internal 61% Biofuels 83%	EE +5% Renewables 18% Biofuels 85%	EE +6% Renewables 25% Biofuels 86%	EE +7% Renewables 25% Biofuels 86%
KONE[4]	Renewables 7%	Renewables 4%	Renewables 4%	Renewables 20%	Renewables 22%
Wärtsilä[5]	Relative energy consumption -1%	Relative energy consumption -3%	Relative energy consumption -13%.	Relative energy consumption -10%.	Relative energy consumption +1%.

1 Stora Enso: Renewables/Internal figure presents the share of internal and renewable energy. Biofuels figure presents the share of biofuels of all fuels used by Stora Enso. Energy efficiency is always compared with previous year.
2 UPM: Biofuels figure presents the share of biofuels of all fuels used by UPM. Energy efficiency is always compared with previous year.
3 Metsä Group's energy efficiency is compared with 2009 level. Biofuels figure presents the share of biofuels of all fuels used by Metsä Group. The logic is the same with renewable energy.
4 KONE: Renewables figure presents the share of renewables of all energy used by KONE.
5 Wärtsilä's relative energy consumption figures are always compared with previous year.

Stora Enso is given 0 points for its performance in 2011, 2012, 2014 and 2015 as the figures have improved only little or not at all or even worsened. For 2013 the company receives 1 point because the share of renewables has improved as well as energy efficiency. UPM is given 0 points throughout the years as the figures have improved only little or not at all or even worsened.

Metsä Group is given 1 point for 2011 performance as energy efficiency has improved and the share of biofuels increased. For 2012 the company receives 0 points as the share of renewables has remained the same, the share of biofuels has increased only little and energy efficiency has worsened. The figures have improved only slightly in the next year when the company also receives 0 points. For 2014, Metsä Group receives 1 point as the share of renewables has increased by 7%. For 2015 performance, the company gets 0 points as the figures have remained the same or improved only slightly. When reviewing the period as a whole, Metsä Group has improved all figures.

KONE receives 0 points for every other review year expect for 2014. In other years, the share of renewables has increased only little or worsened. For 2014 performance, the company is given 2 points as the share of renewables has increased by 16%.

Wärtsilä receives 0 points for 2011, 2012 and 2015 performance due to minor improvements in relative energy consumption figure. For 2013 and 2014 the company is given 1 point as relative energy consumption figure has improved clearly. Wärtsilä does not report the share of renewable energy.

Table 8 Points for clean energy

Points for clean energy (0, +1 or +2)	2011	2012	2013	2014	2015
Stora Enso	0	0	1	0	0
UPM	0	0	0	0	0
Metsä Group	1	0	0	1	0
KONE	0	0	0	2	0
Wärtsilä	0	0	1	1	0

4.1.3 Recycling

Stora Enso had a target to reduce waste to landfill by 5% from 2007 level by 2013. After that the company discontinued the target but focused instead on improving material efficiency more broadly. Material efficiency covers waste reduction but also the efficient use of raw materials, and the creation of business opportunities from waste and residuals. The company has been successful in reducing the amount of waste to landfill as already in 2011 it had reduced it by 26% and in 2015 by 65% from 2010 level or28% from previous year. Only exception is year 2013 when landfilled waste amount increased by 29% from previous year. Stora Enso specifies the utilisation purposes of process waste and residual markets and the content of process waste to landfill. More than half of the waste to landfill consists of fly ash. The recycling rate has remained high, between 96%-98%, during the review years.

UPM's target is to reduce the amount of waste to landfill by 40% from 2008 level by 2020. In 2015 a new target was set to "no process solid waste to landfill by 2030". Most Central European paper mills sent 0% to landfills already in 2015. Like Stora Enso, also UPM has developed new ways to reduce its waste and reuse waste in new products. Over 2005-2015, UPM has been able to reduce its amount of solid waste to landfills by 65%. As can be seen from the table 20, the company has managed to decrease the amount of waste to landfill each year apart from 2013. The amount of waste to landfill increased significantly in 2013 due to changes in reuse possibilities at one mill. In the following year, a new method of recycling was established and the figure improved accordingly. The company specifies waste numbers for waste to landfills, to temporary storage, to incineration, and hazardous waste. Recycling rate has been approximately 90% thorough the review years.

Metsä Group has not set a target for reducing its waste to landfills but the company has included circular economy in its sustainability themes. One of the themes is resource efficiency and emissions covering efficient use of raw materials, energy and water as well as increasing the value of side streams. Like Stora Enso and UPM, also Metsä Group is seeking for ways to utilize production side streams and thus decreasing the amount of waste to landfill. The company explains the significant reduction in the amount of waste between 2014 and 2015 with productization of almost 100 000 tonnes of side stream materials that were earlier treated as waste. Metsä Group states that the EU Waste Framework Directive and the Finnish Waste Act have supported waste management development within the company. Metsä Group has managed to decrease landfilled waste each year apart from 2012 The company's residues end up for energy recovery, material recovery, landfill or hazardous waste treatment. Metsä Group also

specifies its waste sources. Recycling rate has remained around 90% throughout the review years.

KONE has not set a target regarding waste reduction. However, reducing material use, including waste and packaging, and maximizing recycled content and recyclability are focus areas in the company's design process in R&D. KONE's waste numbers are significantly smaller than other companies' in this study. The company has reduced the amount of total waste by 61% between 2010 and 2015 but the amount of landfilled waste has increased considerably: from 1500 tonnes in 2010 to 3000 tonnes in 2015. While other companies have managed to decrease landfilled waste amount, KONE has managed in this only in 2012. The company does not report the reason for continuously increasing waste to landfill. KONE specifies waste amounts for recycled waste, incinerated waste, landfill waste and hazardous waste separately. Recycling rate has been around steady 90% during the review years.

Wärtsilä has not set a target regarding waste reduction. The company reports its waste numbers and types in detail specifying for example the amounts of waste for incineration and recycling. The amount of waste to landfill was significantly worse in 2011 (65 900t) than in 2010 (22 800t) due to approximately 36 300 tonnes of contaminated soil which was treated as hazardous waste to landfills. The company does not provide more details about the contamination expect that appropriate corrective actions were taken. However, during the review period, the company has decreased its waste to landfills by 51% when compared to 2010 level. Wärtsilä's main sorting categories are waste to incineration, crude waste to landfills, clean cardboard and waste paper. Additionally, waste wood, scrap metal and metal swarf are collected. Landfill waste includes coarse waste and to some extent waste wood. Wärtsilä follows waste management hierarchy with the following aims in the following priority order: 1. Reduce the amount of waste generated in processes, 2. Use waste as a material, 3. Use waste as energy, 4. Dispose of waste in an environmentally sound way. Recycling rate has increased significantly from 23% in 2010 to 78% in 2015.

Table 9 Recycling

Recycling	**2011**	**2012**	**2013**	**2014**	**2015**
Stora Enso[1]	Landfilled -26% Recycled 97%	Landfilled -12% Recycled 97%	Landfilled +29% Recycled 96%	Landfilled -40% Recycled 98%	Landfilled -28% Recycled 98%
UPM[1]	Landfilled -2%	Landfilled -13% Recycled ~90%	Landfilled +25% Recycled ~90%	Landfilled -19%	Landfilled -8% Recycled ~90%
Metsä Group[1]	Landfilled -12% Recycled 91%	Landfilled +12% Recycled 88%	Landfilled -6% Recycled 91%	Landfilled -7% Recycled 92%	Landfilled -37% Recycled 93%
KONE[1]	Landfilled +80% Recycled 89%	Landfilled -11% Recycled 91%	Landfilled +13% Recycled 89%	Landfilled +/-0% Recycled 88%	Landfilled +11% Recycled 86%
Wärtsilä[1]	Landfilled	Landfilled	Landfilled	Landfilled	Landfilled

	+189% Recycled 23%	-40% Recycled 37%	-41% Recycled 48%	-48% Recycled 74%	-7% Recycling rate 78%

1 Landfilled waste figure is always compared with the previous year. Recycling figure shows the share of recycled waste of all waste.

For 2011, Stora Enso is given 2 points for its improvements in recycling strength as it has managed to decrease the amount of waste to landfills significantly, by 26%. For 2012, the company receives 1 point as waste to landfill has decreased by 12%. In 2013, landfilled waste amount has increased significantly which is why it gets 0 points for its performance then. For both 2014 and 2015, Stora Enso is given 2 points as the amount of waste to landfills has decreased significantly. Recycling rate remained very high, around 97% thorough the years, which has strengthened good points.

UPM receives 0 points for 2011 as its performance has improved only slightly. For 2012, it is given 1 point as recycling rate is around 90% and the amount of landfilled waste has decreased. Next year, the company receives 0 points as landfilled waste amount has increased significantly. For 2014 and 2015 performance, UPM receives 1 point as it has managed to decrease the amount of waste to landfill and in 2015, also the share of recycled waste was high.

Metsä Group is given 1 point for 2011 performance as it has managed to decrease the amount of waste to landfill. For next year, the company gets 0 points as the figures have worsened. For 2013 and 204, the company gets 1 point as waste to landfills has decreased when at the same time, recycling rate has been over 90%. For 2015, Metsä Group is given 2 points as landfilled waste amount has decreased significantly.

KONE's waste to landfills has worsened every year apart from 2012. For this reason, it receives 0 point for evert other year than 2012. For 2012, KONE gets 1 point as then it managed to decrease the amount of waste to landfill and also the share of recycled waste was over 90%.

Wärtsilä's waste to landfill has radically increased in 2011 which is why it is given 0 points for that year's performance. For the following three years, the company gets 2 points as it has managed to mutually decrease landfilled waste and increase the amount of recycled waste. For 2015, the company gets 0 points as the figures have only improved slightly.

Table 10 Points for recycling

Points for recycling (0, +1 or +2)	**2011**	**2012**	**2013**	**2014**	**2015**
Stora Enso	2	1	0	2	2
UPM	0	1	0	1	1
Metsä Group	1	0	1	1	2
KONE	0	1	0	0	0
Wärtsilä	0	2	2	2	0

4.1.4 Pioneering products

Stora Enso invests in R&D and develops products, services and production processes in cooperation with its stakeholders. In 2011, the company reinvested 0.7% (EUR 80.1million) of its revenue into R&D activities. Stora Enso initiated a pilot-scale pro-

duction of Micro Fibrillated Cellulose in 2011. In the product, aluminium in paperboard packaging is replaced with biodegradable film. In the same year, Stora Enso introduced Vivid, a lighter paper grade alternative for paper publications, and Urban MultiStorey, a wooden construction solution that utilizes cross-laminated timber. Next year, the company started manufacturing microcellulose that can help in developing lighter and stronger renewable packaging materials. In 2013, Stora Enso introduced FLYO+ paper which is produced from 100% recycled fibres and is suitable for commercial flyers and other print advertising. In 2014 the company started trial runs in its biorefinery. Its Consumer Board division offers renewable options, bio-polyethylene and biopolymer, for oil-based plastics in food packaging. To further support biorefining, the company acquired Virdia, a US-based biotech company, in 2014. In 2015, a New Natura Concept was introduced in partnership with Elopak. It aims to make packaging as light as possible.

UPM's R&D aims are to create new technologies and products for UPM's future businesses and support current businesses. For example, in 2013, the company invested approx. 20.6% (EUR 155 million) in R&D. In 2011, UPM launched a new biocomposite, UPM ForMi that has 30-60% smaller lower carbon footprint than traditional products. In UPM ForMi wood fibres replace non-renewable materials. In 2012 UPM developed new more sustainable solutions for several end-use areas. New solutions require less film and paper materials. In 2014, the company launched new printing paper grade, UPM Valor, that is up to 15% lighter in basis weight and thus, has a smaller environmental footprint throughout the value chain. In the same year, UPM Grada 2000, with significantly more efficient production process, was introduced.

Metsä Group's R&D has three focus areas: process efficiency and resource value, renewable raw material as a competitive advantage, and value-added products and services. Some R&D project are carried out in collaboration with partners like universities. Metsä Group invested 0.4% (EUR 19 million) of its sales in R&D in 2011. In 2013 Metsä Group introduced new folding boxboards, Avanta Prima, Simcote and Carta Elega, that are lighter than earlier ones and 30% lighter than some of the competing products. The company does not report about other product innovations during the review years but emphasizes that it will introduce several new bioproduct innovations in the future as a new bioproduct mill will be established in Äänekoski in August 2017. It is expected that the new mill will produce various new bioproducts in addition to conventional ones, like biocomposites and textile fibres. The new mill project will be largest investment made in the forest industry of Finland.

One of the drivers in KONE's R&D is sustainability. It aims to for example reduce energy, water and material consumption and maximize material durability and recyclability. In 2011, KONE managed to extent A-class energy rating to a new elevator, KONE MonoSpace Special. In 2012 KONE launched new volume elevators that are 70% more energy efficient than in 2008. In the sequent year, the company launched KONE UltraRope, a new high-rise elevator that has an exceptionally long lifetime. KONE was the first company to achieve the best A-class energy efficiency classification for eight volume elevator installations in 2014. It launched KONE NanoSpace elevator that wins other hydraulic elevators in energy efficiency by 70%.

Wärtsilä states in its 2015 CSR report that it "- has focused its R&D activities for development of new environmental sound products and solutions that meet the future demands of the changing operating environment" (Wärtsilä Corporation Annual Report 2015 Sustainability, 2016). Its R&D costs have varied between 132 and 188 million euros during the review years. In 2011, Wärtsilä introduced the new Wärtsilä Gas

Platform Supply Vessel that features excellent energy efficiency and fuel economy, and the Wärtsilä RT-flex48T engine that has significant emission reductions. In 2013, the company launched 2-stroke dual-duel engine technology that has significantly fewer negative environmental impacts. For example, CO2, NOx, SOx and particulate emissions are significantly smaller and the fuel efficiency is greater. In the sequent year, Wärtsilä launched new Low Loss Hybrid that provides 15% fuel savings and substantial reductions in exhaust gas emissions. In 2015 Wärtsilä launched a new Wärtsilä 31 engine which was awarded a Guinness World Records for being the world's most efficient 4-stroke diesel engine.

Table 11 Pioneering products

Pioneering products	**2011**	**2012**	**2013**	**2014**	**2015**
Stora Enso	Micro Fibrillated Cellulose, Urban Multistorey, Vivid	Microcellulose	FLYO+	Bio-plastics	New Natura Concept
UPM	UPM ForMi	New label solutions	-	UPM Valor	UPM Grada products
Metsä Group	-	-	Avanta Prima, Simcote and Carta Elega	-	-
KONE	A-class energy ratings	New volume elevators 70% more energy efficient.	KONE UltraRope	KONE NanoSpace	-
Wärtsilä	Wärtsilä Gas Platform Supply Vessel, Wärtsilä RT-flex48T	-	2 stroke dual-fuel engine technology	Low Loss Hybrid	Wärtsilä 31 engine

Stora Enso receives 2 points for performance in 2011 as it has several new environmentally friendly product innovations. Foe years 2012-2015, the company is given 1 point as each year, as it has introduced at least one new sustainable product.

UPM receives 1 point for all years expect for 2013 when it did not launch new environmentally pioneering products. In other years, the company has introduced new product innovations.

Metsä Group is given 1 point for 2013 performance but 0 points for every other review year. 2013 is the only year Metsä Group has introduced new more sustainable product innovations.

KONE has successfully improved the energy efficiency of its products which is why it is given 1 point between 2011-2014. In 2015 the company did not introduce new environmentally pioneering products and is thus given 0 points.

For 2011, Wärtsilä receives 2 points for its two environmentally pioneering product launches. The following year the company receives 0 points because it did not introduce any new sustainable innovations. For 2013-2015, Wärtsilä is given 1 point as it has each introduced some new sustainable product development.

Table 12 Points for pioneering products

Points for pioneering products (0, +1 or +2)	2011	2012	2013	2014	2015
Stora Enso	2	1	1	1	1
UPM	1	1	0	1	1
Metsä Group	0	0	1	0	0
KONE	1	1	1	1	0
Wärtsilä	2	0	1	1	1

4.1.5 External recognition and awards

Stora Enso has gained extensive external recognition for its work with corporate sustainability. Few of these are mentioned here and in the table 14 below. It has been included in the FTSE4Good Series since 2001 and is included in the series throughout the review years. FTSE4Good Index Series includes companies that meet globally recognized responsibility standards and measures their performance. The company has been included also in the Carbon Disclosure Project's Nordic Carbon Disclosure Leadership Index throughout the review years. In 2015, the company received 99 points of 100 in CDP. In 2015 Stora Enso was included in RobecoSAM's 2016 Sustainability Yearbook with a Silver Class distinction. Throughout the review years, Stora Enso has also been included in the MSCI Global Sustainability and SRI Indices. During the years, the company has been recognized by World's Most Ethical Companies, UN Global Compact Stock Index, Forest Footprint Disclosure and STOXX Global ESG Leaders Indices.

UPM has gained extensive external recognition for its sustainability efforts. It has been recognized by CDP thorough the review years. In 2012, the company was listed in the Dow Jones Sustainability Indices as the only forestry and paper company worldwide. It continued in the Indices during 2013, 2014 and 2015. In 2012, UPM received the highest score regarding its climate change disclosure in the Nordic Carbon Disclosure Leadership Index, compiled annually by CDP. In 2012 Ethical Corporation Award named the company as the Most Innovative Company for its eco-design concept and sustainability thinking. In 2014, UPM was recognized by Dow Jones European and World Sustainability Indices, RobecoSAM's Sustainability Yearbook with a Gold Class distinction and CDP. In 2015, the company received an invitation to the UN Global Compact Lead as the first Finnish company and the first forest industry company. UPM was also listed in Dow Jones European and World Sustainability Indices, RobecoSAM's Sustainability Yearbook and CDP like in the previous year.

In 2013, Metsä Board was recognized by CDP's Nordic Climate Disclosure Leadership Index, receiving 98/100 points for the quality and depth of data it discloses related to climate change. The business was recognized by CDP also in 2014 and 2015, receiving 100 points in the sequent year. In 2015, Metsä Group was also recognized by WWF's Environmental Paper Company Index. This recognition was due to transparen-

cy and overall high-level environmental performance, covering clean manufacturing, improved reporting, environmental management systems and responsible sourcing.

KONE has been included in the Carbon Disclosure Project's Nordic Carbon Disclosure Leadership Index throughout the review years. The company has also improved its points received in the Index: from 83/100 in 2011 to 100/100 in 2014. CDP has recognized KONE as one of the world leaders in providing data related to climate change. BGreen Awards awarded KONE Middle East as Sustainable Supplier of the Year in 2013. The award takes into account R&D efforts used in developing eco-friendly products, the range of eco-friendly products and sustainable alternatives offered to the buyer. In 2015, KONE was ranked 28th and the only elevator and escalator company in Global 100 Index fund by Corporate Knights investment advisory company.

Wärtsilä has received a Lean & Green Star Award in 2013. The Lean & Green Star Award aims at encouraging players to take more ambitious actions towards environmental sustainability. In addition to that, Wärtsilä has not been awarded or does not report on its award expect for 2015. In 2015 the company has been included in several sustainability indices, including for example FTSE4Good and MSCI Global Sustainability Index Series.

Table 13 External recognition

External recognition	**2011**	**2012**	**2013**	**2014**	**2015**
Stora Enso Oyj	DJSI, FTSE4Good Index, CDP	CDP, FTSE4Good Index, World's Most Ethical Companies	FTSE4Good Index, CDP, RobecoSAM Sustainability Award	FTSE4Good Index, CDP, RobecoSAM Sustainability Award	CDP, FTSE4Good Index, RobecoSAM Sustainability award
UPM Kymmene Corporation	CDP	DJSI, CDP, Ethical Corporation Award	DJSI, CDP	DJSI, CDP, RobecoSAM	DJSI, UN Global Compact LEAD, CDP, RobecoSAM
Metsä Group	-	-	CDP	CDP	CDP, WWF's Environmental Paper Company Index
KONE Oyj	CDP	CDP	BGreen Sustainable Supplier, CDP	CDP	CDP, Global 100 Index fund
Wärtsilä	-	-	Lean & Green Star Award	-	FTSE4Good Index, MSCI Global Sustainability Indices

Stora Enso receives 2 points for external recognition strength on each of the review year as it has gained extensive recognition through 2011-2015. UPM receives 1 point for external recognition for 2011 and 2013 for being recognized by one or two parties. For other years, the company receives 2 points each year as it has gained extensive external recognition including several industry leader awards. For 2011 and 2012, Metsä Group is given 0 points due to lack of external recognition. From 2013 onwards the company has been recognized mainly by CDP and is thus given 1 point for 2013, 2014 and 2015 performance. KONE is given 1 point for external recognition each as it has been mainly recognized by CDP. In 2013 and 2015 the company has been recognized by second party in addition to CDP. Wärtsilä receives 0 points for 2011, 2012 and 2014 performance due to not receiving any external recognition. For 2013 it gets 1 point for Lean & Green Star Award. For 2015, it gets 2 points for being recognized in several indices.

Table 14 Points for external recognition

Points for external recognition (0, +1 or +2)	2011	2012	2013	2014	2015
Stora Enso	2	2	2	2	2
UPM	1	2	1	2	2
Metsä Group	0	0	1	1	1
KONE	1	1	1	1	1
Wärtsilä	0	0	1	0	2

4.1.6 Hazardous waste

Hazardous waste from Stora Enso's production incudes used oils, solvents, paints, laboratory chemicals, and batteries. The amount of hazardous waste increased significantly at Stora Enso in 2011 due to the dismantling of paper machines. After that the amount decreased during next two years but then increased again in 2014. In 2015 the level stayed stable and was also more or less the same as in 2010.

UPM does not report specifics about its hazardous waste. It is mentioned that oil and oil waste are the main sources of hazardous waste. Hazard risks are also included in the company's risk management. UPM has listed environmental risks, including leaks, spills and explosions, and physical damage to the employees or property as hazard risks. UPM started externally reporting on hazardous waste in 2011 which is why result figure is not available yet for that year. From 2011 onwards the amount of hazardous waste has decreased until 2015 when it rose significantly.

Metsä Group's reporting on hazardous waste varies to some extent between different CSR reports. It provides the amount of hazardous waste in all reports and in some CSR reports also the main sources. The main sources include oils and chemicals, paints, laboratory waste, fluorescent lamps and batteries. In 2012, 2013 and 2014 CSR reports Metsä Group mentions environmental damages as hazard risks that are part of the company's risk management. Metsä Group also ensures that its fresh forest fibre products contain no hazardous mineral oils. The company has reduced the amount of hazardous waste every other year during the review period. In 2011 and 2014 Metsä Group managed to cut the amount significantly. In 2014, on the other hand, the figure worsened radically.

KONE reports specific numbers for the amount of hazardous waste each year but lacks more details. Its R&D process aims at minimizing the use of hazardous substances. The company also emphasizes that it provides eco-efficiency in every phase of a building's life cycle, including environmentally efficient waste handling on site and separate containers for hazardous waste. KONE's has only managed to decrease the amount of hazardous waste in 2011 and after that, the figure has either remained the same as in previous year or worsened.

Wärtsilä reports specific numbers on its hazardous waste including the shares for landfilled, incinerated and recycled hazardous waste. Hazardous waste at Wärtsilä includes mainly cutting fluids, various types of waste oil, paints and solvents, oily wastes and solid wastes. Wärtsilä's amount of hazardous waste went significantly up in 2011 from 2010 level, increasing from 5 200 tonnes to 42 300 tonnes due to 36 300 tonnes of contaminated soil. The company does not provide more details about the contaminated soil case expect for the fact that appropriate corrective actions were taken. After 2011 the amount of hazardous waste has decreased continuously and significantly. However, 2010 level was not reached yet in 2015.

Table 15 Hazardous waste

Hazardous waste	**2011**	**2012**	**2013**	**2014**	**2015**
Stora Enso[1]	+123%	-44%	-18%	+24%	+/-0%
UPM[1]	-	-2%	-5%	-7%	+26%
Metsä Group[1]	-26%	+/-0%	-35%	+69%	-9%
KONE[1]	-14%	+12%	+/- 0	+14%	+/-0%
Wärtsilä[1]	+713%	-46%	-52%	-33%	-3%

1 Figures are always compared with previous year.

Stora Enso receives 0 points for its hazardous waste concern although the amount increased significantly in 2011. However, after that they have been able to reduce it to a similar level than in baseline year, 2010. UPM has first been able to reduce the amount of hazardous waste by 13% from 2011 figure but in 2015, the amount is 9% bigger. Therefore, UPM receives -1 points. Metsä Group is the only company from the five target companies whose amount of hazardous waste is smaller from 2010 level every year during the review period. However, the figure is the same in 2011 and 2015. They will thus receive 0 points. The amount of hazardous waste at KONE has increased by 14% from 2010. Therefore, they will get -1 points. Wärtsilä's figures are bigger than in baseline year during all the review years and especially during the first review years, they are significantly bigger. Thus, the company gets -2points.

Table 16 Points for hazardous waste

Points for hazardous waste (0, +1 or +2)	**2011**	**2012**	**2013**	**2014**	**2015**
Stora Enso	0	2	1	0	0
UPM	0	0	1	1	0
Metsä Group	2	0	2	0	1
KONE	1	0	0	0	0
Wärtsilä	0	2	2	2	0

4.2 Corporate financial performance

Return on equity (ROE) was used as a measure of corporate financial performance. ROE of each company on each year is listed in table 17 below. The figure is included from years 2010-2016 because the link between CFP and CEP is evaluated bidirectionally with a one year lag: does high corporate financial performance lead to high corporate environmental performance, or does high corporate environmental performance lead to high corporate financial performance.

ROE in the forest, paper and packaging industry companies varies between the same range of negative to approximately 15.0%. Each of them has a negative return on equity figure once during the review period. ROE in the manufacturing of machinery and equipment companies is higher, between approximately 15.0% and 45.0%. Especially KONE has high ROE figures through the review years: 32.1%-45.4%.

Table 17 Return on equity

	Return on Equity (ROE)						
Company	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Stora Enso	13.5%	5.6%	8.3%	-1.3%	1.7%	14.6%	7.2%
UPM	8.2%	6.3%	Neg.	4.5%	6.9%	11.9	10.9%
Metsä Group	13.9%	-9.9%	6.1%	9.9%	13.0%	15.9%	11.2%
KONE	36.5%	35.5%	32.1%	40.1%	40.9%	45.4%	38.1%
Wärtsilä	25.0%	17.5%	20.1%	21.4%	18.0%	20.2%*	15.6%*

*continuous operations

4.3 The link between CEP and CFP

The link between CEP and CFP was evaluated bidirectionally: from CEP to CFP and from CFP to CEP. One year lag was used between CEP and CFP. For example, when the link was evaluated from CEP to CFP, corporate environmental performance figure was from year 2011 and financial performance figure from 2012. When the link was evaluated from CFP to CEP, financial performance figure was for example from year 2010 and environmental performance figure consequently from 2011. Figure pairs are listed in Table 18 below. Summary table of corporate environmental performance is in appendices. Maximum points for CEP for one year is 12 points and minimum 0 points. Wärtsilä has had the highest score of all: 9 points in 2013. Several companies have had the lowest score of 2 in some year: UPM in 2011, Metsä Group in 2012 and KONE in 2013 and 2015.

Table 18 CEP and CFP figure pairs

	Stora Enso		UPM		Metsä Group		KONE		Wärtsilä	
Time	CEP→CFP%		CEP→CFP%		CEP→CFP%		CEP→CFP%		CEP→CFP%	
11/12	8	8.3	2	Neg.	5	6.1	3	32.1	3	20.1
12/13	6	-1.3	6	4.5	2	9.9	3	40.1	6	21.4
13/14	6	1.7	3	6.9	5	13.0	2	40.9	9	18.0
14/15	5	14.6	5	11.9	4	15.9	4	45.4	8	20.2
15/16	6	7.2	6	10.9	4	11.2	2	38.1	3	15.6
Time	CFP%→CEP		CFP%→CEP		CFP%→CEP		CFP%→CEP		CFP%→CEP	
10/11	13.5	8	8.2	2	13.9	5	36.5	3	3	25.0
11/12	5.6	6	6.3	6	-9.9	2	35.5	3	6	17.5
12/13	8.3	6	Neg.	3	6.1	5	32.1	2	9	20.1
13/14	-1.3	5	4.5	5	9.9	4	40.1	4	8	21.4
14/15	1.7	6	6.9	6	13.0	4	40.9	2	3	18.0

Pearson's correlation coefficient was calculated with Microsoft Excel's PEARSON function for CEP→CFP and CFP→CEP figure pairs listed in the table 18. Correlation coefficient was calculated for each company over the five-year period. Results are shown in table 19. As can be seen from the table, results vary greatly. For CEP→CFP correlation coefficiencies vary between -0,152 and 0,627 and for CFP→CEP correlation coefficiencies vary between -0,164 and 0,897. When reviewing correlation figures from CEP to CFP, there is a lot of variation. The figure is almost zero for Stora Enso and Metsä Group meaning that there is no correlation from environmental performance to financial performance. At the same time, the correlation coefficiency is significant for UPM: 0,627. When reviewing whether certain level financial performance leads to the same level of environmental performance, the pattern varies similarly. For Stora Enso and Metsä Group, correlation is very significant: 0.90 and 0.84. The result is insignificant in other companies.

As correlation coefficiencies vary so significantly, it can be argued that there is no link between CEP and CFP. Although there is significant correlation in some cases, like from high CEP to high CFP in UPM (0.63) or from high CFP to high CEP in Stora Enso (0.90) and Metsä Group (0.84), these can stem from coincidence. There are no similarities within industries either. Overall, forest, paper and packaging industry companies receive the strongest correlation but in different direction. While at UPM, environmental performance leads to financial performance, at Stora Enso and Metsä Group it is the other way around. At KONE, the figures are the same to both directions.

Table 19 Correlation between CEP and CFP

Company	$r_{CEP \rightarrow CFP}$	r^2	$r_{CFP \rightarrow CEP}$	r^2
Stora Enso	-0.15	0.02	0.90	0.81
UPM	0.63	0.39	0.18	0.03
Metsä Group	-0.04	0.00	0.84	0.70
KONE	0.35	0.12	0.34	0.12
Wärtsilä	0.25	0.06	-0.16	0.03

In this study, the sample is very small to derive statistically significant conclusions. Coefficient of determination varies similarly to correlation coefficiency. As is shown in table 19, coefficient determination (r^2) varies anywhere between 0.02 to 0.81. According to the coefficient of determination, financial performance explains 81% of environmental performance at Stora Enso. However, in fact, CFP is probably influenced by many other variables as well.

5 CONCLUSIONS

The aim of this study was to evaluate the link between corporate environmental performance and corporate financial performance in the forest, paper and packaging industry and in manufacturing of machinery and equipment industry. The link was evaluated bi-directionally: does high corporate environmental performance lead to high corporate financial performance and does high corporate financial performance lead to high corporate environmental performance. The study was conducted using both qualitative and quantitative methods. Corporate environmental performance of the target companies was analysed with content analysis method. Data source consisted mainly of corporate social responsibility reports and annual reports. CEP evaluation criteria was specifically developed for this study by utilizing several sources such as earlier studies, KLD rating framework and GRI framework. Return on equity figures were used as indicators of financial performance. The link was analysed with statistical computing method. Correlation coefficiencies were computed for each company from the five-year review period with a one year difference between CEP and CFP.

5.1 Main results, discussions and comparison with earlier research

Study results indicate that corporate environmental performance and corporate financial performance are not linked. Correlation figures varied greatly between different companies from no correlation to very significant correlation. When evaluating the link from CEP to CFP, correlation varied anywhere between -0.15 and 0.63. From CFP to CEP, correlation varied anywhere between -0.16 and 0.90. The few strong correlation rates can be due to a coincidence. Therefore, this study is not in line with most of the earlier research as majority of earlier studies have found a positive link. Due to small sample size, strong statistical conclusions cannot be made based on this study and its results. Measurement challenges related to measuring CEP must be considered as well.

Although a positive link was not found in this study and therefore the results are not in line with majority or earlier studies, some parts do support earlier research. Almost all of the earlier studies agree that firms are not punished for high environmental performance. Also the results of this study suggest the same. Although there were three negative correlation coefficiency figures, they were very close to zero: -0.16, -0.15 and -0.04. All other figures were between 0.18 and 0.90. Therefore, the argument of Margolis and associates (2007) that even though companies might not always do well by doing good, they can do good and do well, is supported.

Earlier studies have shown that a certain match between the type of CSP/CEP measure used and the type of CFP measure used results in a more positive link between the two. For example, the analysis of Allouche and Laroche (2005) indicates that CSP reputation ratings has a more significant effect on financial performance and on the other hand, the link is not strong from social disclosure to CFP. Earlier studies also indicated that the relationship between CEP and CFP is smaller than the relationship between other measures of CSP and CFP (Michelon et al. 2013, Orlitzky et al. 2003). In this study, the factors resulting in smaller link in the past studies have been used: environmental performance and CSP disclosures. On the other hand, Preston and O'Bannon

(1997) notice in their study between corporate social performance and financial performance that the study result is independent of the financial figure used. One reason for not finding a positive link in this study could be due to the CEP and/or CFP measure used.

One reason why CEP is argued to affect financial performance stems from the possible cost savings earned through e.g. low regulatory related expenses (Margolish et al. 2007). The reason why earned cost savings do not translate into positive link between CEP and CFP in this study might result from the old age of the target companies and industries. Because both industries have existed in Finland for a long time, also major environmental improvements resulting in cost savings could have been made already earlier.

Even though the results of this study do not indicate that CEP and CFP are linked, climate change, recource scarcity and energy questions will likely influence the costs of these companies in the future. Forest and paper industries are undergoing major changes that stem for example from energy questions, climate change, international requirements related to climate change, and globalization. Paper and sawmill have formed a significant part of forest use in the past but now traditional wood processing is decreasing and demand is growing for new wood-based products and services. Bioenergy is one important future business area for forest companies which can be seen from the target companies of this study aswell: UPM has developed wood-based UPM BioVerno diesel and Stora Enso has studied similar possibilities with Neste. (Hetemäki, Niinistö, Seppälä & Uusivuori 2011.)

At the same time as this study indicates that CEP and CFP are not linked, the CSR study conducted by FIBS (2017) on companies operating in Finland shows that financial aspects are not even among the most important drivers for CSR. In fact, increasing sales or the value of shares, or saving costs are among to least important drivers for CSR. The most important drivers for investing in responsibility are: 1. Ensuring future operating conditions, 2. Responsibility being the prerequisite of all business and, 3. Intensifying risk management. The most important drivers seem to be significant for companies as all of the target companies emphasize that CSR is highly important issue for them. Additionally, as stated in the beginning of this study, 100% of big companies operating in Finland perceive CSR as highly significant or somewhat significant and 90% of the companies evaluate that the significance of CSR will increase within the next five years, 90%. (FIBS 2017.) It can be argued that even though investments in CSR might not result in clear positive financial outcomes, CSR is highly important for companies and stakeholders as it is a prerequisite of all business and ensures future operations. In addition, earlier research has found out that revealed misdeeds result in negative stock returns (Wood & Jones 1995) so companies might be punished for irresponsible social and environmental behaviour. There were not any revealed misdeeds concerning the target companies of this study during the review period.

5.2 Evaluating the research

There are some issues that should be considered when evaluating the reliability of this study. Regarding the statistical analysis conducted to analyse the link between CEP and CFP, the sample is small: review period of five years per company and five companies in total. Therefore, strong statistical conclusions cannot be made based on this study and

its results. The fact that no link was found in this study might be due to the fact that CEP and CFP are not linked, or that they are not linked in the target companies of the study, or due to measurement errors in CEP evaluation or CFP indicator chosen.

Earlier studies have argued that one problem in many CSP-CFP studies is that they consider only one dimension of CSP (Waddock & Graves 1997). Also in this study, only one dimension, the environment, is included but on the other hand, it is studied in depth. Many earlier studies focusing on corporate environmental performance include only one dimension of it, such as pollution or external recognition. In this study, environmental performance is analysed thoroughly as six variables are included in the analysis: pollution, clean energy, recycling, pioneering products, external recognition and hazardous waste. However, corporate environmental performance evaluation criteria used lacks strong theoretical background due to the fact that CEP and CSP concepts lack solid theoretical base.

One weakness of this study stems from the data source used. As data consists of secondary data and mainly of CSR and annual reports, the analysis relies on the comprehensiveness of these reports. The length of CSR reports varied between 36 and 83 pages so it can be argued that they were comprehensive. Almost all required information was found from CSR or annual reports. If necessary information regarding some environmental variable was missing, Google search engine and company websites were utilized. Mainly information on new product innovations had to be searched from other sources than company reports and all other information was available in the reports. However, it is possible that some relevant information was not publically available or found during this study. Some companies might have been for example recognized by more parties or some companies might have introduced also other new sustainable product innovations but because they were not listed in company reports or found from other data sources, they are not included in the analysis. It is also possible that companies leave certain facts intentionally out of their reports and other disclosures to the public.

5.3 Future research

There are several interesting future research topics related to CEP and CFP. It would be interesting to for example study the possible effect of successful and unsuccessful greenwashing in financial performance. Related to that, Chatterji (2009) argues that customers and other stakeholders can be misled by erroneous CSR metrics like successful greenwashing campaigns. One interesting research path would be to study CEP-CFP link among companies who have had environmental misdeeds. In the future, the environmental performance evaluation criteria developed in this study could be combined with some social performance evaluation criteria and the combined performance of these two be compared with corporate financial performance. It would be important to also create solid theoretical base for CEP and CSP.

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APPENDICES

Appendix 1: List of all data used in empirical part

The company	Data used
Metsä Group	Annual report 2010 Annual report 2011 Annual report 2012 Annual report 2013 Annual review 2014 Financial Statements 2015 Financial Statements 2016 Sustainability report 2011 Sustainability report 2012 Sustainability report 2013 Sustainability report 2014 Sustainability report 2015 "Metsä Group recognized for transparency and high-level performance in the WWF's Environmental Paper Company Index", 11/2015, http://bit.ly/1PDM88J
UPM Kymmene Corporation	Annual Report 2010 Annual Report 2011 Annual Report 2012 Annual Report 2013 Annual Report 2014 Annual Report 2015 Annual Report 2016
Stora Enso Oyj	Tilinpäätös 2010 Tilinpäätös 2011 Tasekirja 31.12.2012 Tasekirja 31.12.2013 Tasekirja 1.1.-31.12.2014 Tasekirja 1.1.-31.12.2015 Tilinpäätös 1.1.-31.12.2016 Sustainability Report 2010 Global Responsibility Report 2011 Global Responsibility Report 2012 Global Responsibility Report 2013 Rethink Stora Enso 2013 Global Responsibility Performance 2014 Sustainability Report 2015
KONE Oyj	Financial Statements 2010 Financial Statements 2011 Financial Statements 2012 Financial Statements 2013 Financial Statements 2014 Financial Statements 2015

	Annual Review 2016 Corporate Responsibility Report 2010 Corporate Responsibility Report 2011 Corporate Responsibility Report 2012 Corporate Responsibility Report 2013 Sustainability Report 2014 Sustainability Report 2015
Wärtsilä Oyj Abp	Annual Report 2010 Annual Report 2011 Annual Report 2012 Annual Report 2013 Annual Report 2014 Annual Report 2015 Annual Report 2016 Annual Report, Sustainability 2011 Annual Report, Sustainability 2012 Annual Report, Sustainability 2013 Annual Report, Sustainability 2014 Annual Report, Sustainability 2015 The new Wärtsilä 31 engine, 10/2015, http://bit.ly/2hnK2PU Wärtsilä's 2-stroke dual-fuel engine introduced, 11/2013, http://bit.ly/2gVJUtF Wärtsilä launched Low Loss Hybrid energy system offering fuel savings and reduced emissions, 4/2014, http://bit.ly/2z4vDll Wärtsilä and CEVA Logistics receive Lean & Green Star Award for significant reductions in emissions, 7/2013, http://bit.ly/2xBnwc7

Appendix 2: Corporate environmental performance of the target companies.

Stora Enso	**PoP**	**CE**	**Re**	**PiP**	**ER**	**HW**	**Total**
2011	2	0	2	2	2	0	**8**
2012	0	0	1	1	2	2	**6**
2013	1	1	0	1	2	1	**6**
2014	0	0	2	1	2	0	**5**
2015	1	0	2	1	2	0	**6**
UPM	**PoP**	**CE**	**Re**	**PiP**	**ER**	**HW**	**Total**
2011	0	0	0	1	1	0	**2**
2012	2	0	1	1	2	0	**6**
2013	1	0	0	0	1	1	**3**
2014	0	0	1	1	2	1	**5**
2015	2	0	1	1	2	0	**6**
Metsä Group	**PoP**	**CE**	**Re**	**PiP**	**ER**	**HW**	**Total**
2011	1	1	1	0	0	2	**5**
2012	2	0	0	0	0	0	**2**
2013	0	0	1	1	1	2	**5**
2014	1	1	1	0	1	0	**4**
2015	0	0	2	0	1	1	**4**
KONE	**PoP**	**CE**	**Re**	**PiP**	**ER**	**HW**	**Total**
2011	0	0	0	1	1	1	**3**
2012	0	0	1	1	1	0	**3**
2013	0	0	0	1	1	0	**2**
2014	0	2	0	1	1	0	**4**
2015	1	0	0	0	1	0	**2**
Wärtsilä	**PoP**	**CE**	**Re**	**PiP**	**ER**	**HW**	**Total**
2011	1	0	0	2	0	0	**3**
2012	2	0	2	0	0	2	**6**
2013	2	1	2	1	1	2	**9**
2014	2	1	2	1	0	2	**8**
2015	0	0	0	1	2	0	**3**

PoP = Pollution prevention, CE = Clean energy, Re = Recycling, PiP = Pioneering products, ER = External recognition, HW = Hazardous waste