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THE BALANCED SCORECARD APPROACH FOR SUSTAINABLE PERFORMANCE IN AN UNCERTAIN FUTURE: THE CASE OF CLIMATE CHANGE

DOCTORAL DISSERTATION

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AUTHORSHIP STATEMENT

The undersigned Andreja Kodrin a student at the University of Ljubljana, Faculty of Economics, (hereinafter: FELU), declare that I am the author of the doctoral dissertation entitled The Balanced Scorecard Approach for Sustainable Performance in an Uncertain Future: The Case of Climate Change), written under supervision of dr. Metka Tekavčič and co-supervision of Robert S. Kaplan.

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Andreja Kodrin

The Balanced Scorecard Approach for Sustainable Performance in the Uncertain Future: The Case of Climate Change

SUMMARY

The business world of the 21st century is facing complexity, intensifying competition and powerful mega trends. Companies' long-term performance now depends on anticipation and timely reaction to uncertainty. These aspects can be properly discussed when considering climate change, identified to be one of the most unpredictable threats for the business world after the industrial revolution, but as well as for the future of humanity.

This dissertation investigates if and how Balanced scorecard (BSC) can provide a timely strategic response to uncertain threats, such as the climate change, with dynamic, open, and focused strategic system that enables a continuous reformulation or adaptation of strategies and with ability to balance the short-, mid- and long-term strategic objectives.

The longitudinal study adopts an exploratory multiple-case study approach to explore the scope of the use of BSC in selected Palladium Hall of Fame for Executing Strategy® companies for the management of climate change, consequently also for sustainability. Afterthat, an explanatory case study was used to understand how BSC integrates uncertainty management to build resilience in the investigated company. The selected exploratory research companies belong to the energy and utility industry, among them the company PSE&G was selected for the explanatory case study.

The results demonstrate that BSC has the potential to provide timely responses to threats of an uncertain future, such as climate change, and that BSC enables the development of corporate resilience and thereby assures long-term performance. However, certain requirements have to be met for this to succeed, namely the high level of BSC implementation, and the scope of its overall integration. The dissertation upgrades the existing knowledge on BSC with identification of key success performance drivers, such as strong performance mindset, focus on multiple equilibriums, and people-focus. In addition, it identifies BSC intersection with resilience determinants and integrates them, in particular long-term mindset, an early warning system, capacity of adaptation, continuous learning and innovation, visionary leadership, multiscale collaboration, systems thinking and unity with the planet. Finally, this dissertation suggests the further development of such BSC system with resilience determinates, towards a performance vortex. The parameters of such a performance vortex are time-tuning, dynamic equilibriums, and long-term continuity.

The research extends the existing theory also with integration of climate change and resilience determinants into the overall performance and strategic management system, hence enabling company to survive and sustain performance in the age of uncertainty.

Key words: Balanced scorecard, performance management, strategic management, sustainability, uncertainty, climate change, resilience, performance vortex.

Uporaba uravnoteženega sistema kazalnikov za trajnostno uspešnost poslovanja v razmerah negotove prihodnosti: Primer podnebnih sprememb

POVZETEK

Poslovni svet 21. stoletja se sooča s povečano konkurenčnostjo, z vse težje obvladljivimi kompleksnimi sistemi in z izpostavljenostjo mega trendom. Dolgoročna in trajnostna uspešnost poslovanja podjetij je zato odvisna tudi od predvidevanj in pravočasnih odzivov na povečano negotovost. Pomemben vidik negotovosti so podnebne spremembe, ki predstavljajo eno izmed največjih groženj tako za poslovni svet kot za človeštvo.

Pričujoča disertacija raziskuje, ali in kako uravnotežen sistem kazalnikov poslovanja (USK) omogoča pravočasen strateški odziv na grožnje, povezane s podnebnimi spremembami, z dinamičnim, odprtim in osredotočenim strateškim sistemom, ki vzpodbuja nenehno nadgrajevanje in prilagajanje strategij ter sočasno uravnoteži kratkoročne, srednjeročne in dolgoročne strateške cilje. S poizvedovalno študijo primera proučujemo uporabo USK za obvladovanje različnih razsežnosti podnebnih sprememb in posledično trajnostnega razvoja v treh izbranih prodjetjih s področja energetike, ki so bila nagrajena s Palladium Hall of Fame for Executing Strategy®. Raziskavo nadgrajujemo s pojasnjevalno študijo primera podjetja PSE&G, s katero ponazorimo vključenost USK v procese obvladovanja negotovosti in izgradnje odpornosti podjetja na potencialne grožnje.

Rezultati raziskave potrjujejo zmožnosti USK kot managerskega orodja za pravočasen odziv na grožnje negotove prihodnosti, s sposobnostjo krepitve odpornosti podjetja na ogroženost in s tem zagotavljanja dolgoročne uspešnosti poslovanja. Uporaba USK v ta namen in njegova uspešnost sta pogojeni s stopnjo razvoja in globine vpeljave USK v podjetju. Disertacija nadgrajuje obstoječo teorijo USK z določitvijo temeljnih gradnikov USK za dolgoročno uspešnost: miselnost uspešnosti, osredotočenost na multipla ravnotežja in usmerjenost na ljudi. Na tej osnovi se z vključenostjo determinant odpornosti na ogroženost, kot so dolgoročna miselnost, sistem zgodnjih opozoril, sposobnost prilagajanja, stalnega učenja in inoviranja, vizionarsko voditeljstvo, odprto sodelovanje, sistemsko razmišljanje in edinost s planetom, lahko razvije managerski sistem za uspešnost poslovanja v razmerah povečane negotovosti (podnebne spremembe). Disertacijo zaključujemo s predlogom za nadaljnji razvoj modela odpornosti na ogroženost, izpeljanega iz USK, z vzpostavitvijo vrtinca obvladovanja uspešnosti, ki omogoča prilagodljivost dimenzije časa, dinamična ravnotežja in sistemsko trajnost.

Raziskava razširja obstoječo teorijo USK tudi s strateško integracijo podnebnih sprememb in determinant odpornosti v krovni sistem obvladovanja dolgoročne uspešnosti poslovanja.

Ključne besede: uravnotežen sistem kazalnikov poslovanja, dolgoročno obvladovanje uspešnosti, strateški management, trajnostni razvoj, negotovost, podnebne spremembe, odpornost na ogroženost, vrtinec obvladovanja uspešnosti.

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INTRODUCTION

This dissertation topic belongs to the field of business administration, and more specifically covers management accounting and strategic management. The topic explores the potentials of strategic and performance management tools and emphasizes the need for their evolvement in an age of uncertainty. Inside these tools, the research refers to the Balanced Scorecard (hereinafter: BSC) and its abilities to provide an integrated strategic framework for long-term sustainable performance in an uncertain future, examined through the prism of climate change.

Corporate (organizational) performance in the 20th century has been mostly driven by the short-term objective of achieving value generation for the shareholder as the ultimate stakeholder (Jensen & Meckling, 1976; Wheelwright, 1979; Winston, 2014; Zingales, 2000). Consequently, managers have often maximized short and medium-term profitability on the account of long-term viability (Kotler & Caslione, 2009; Porter & Kramer, 2006), while predominantly relying only on financial performance indicators (Kaplan, 2010). This excessive focus of the corporate world and capital markets on the short-term was termed as *short-termism* [1] (Laverty, 1996; Brochet et al., 2013), associated also with resource misallocation and with the recent financial crisis (Bair, 2011).

The contemporary business environment has been inexorably shaped by its complexity, growing uncertainty, intensifying competition and powerful mega trends[2]. Subsequently, uncertainty has narrowed the managers' comfort zone. These heightened levels of overall risk, speed of change and the magnitude of shocks, at both macroeconomic and microeconomic levels (Kotler & Caslione, 2009), are also referred as "the new normality" (Hamel & Valikangas, 2003) or "the age of the turbulences" (Kotler & Caslione, 2009).

As a result, the attention on long-term performance has gradually increased over the past years. At the same time, a growing number of companies has voluntarily integrated corporate, social and environmental consideration into their business models, operations and strategies (Eccles, Ioannou & Serafeim, 2013; Hoffman, 2004; Kiron, Kruschwitz, Rubel, Reeves & Fuisz-Kehrbach, 2013; Laszlo, 2008; Porter & Linde, 1995; Porter & Kramer, 2006; Zadek, 2004). Such approach is vital as the business world, natural world and society are interrelated, yet their interdependence and their strategic character are often forgotten (Anderson, 1999; Atkisson, 2008; Baumol, Litan & Schramm, 2007; Blackburn, 2007; Club of Rome, 1972; Cescau, 2007; Cohen, 1995; Epstein, 2008; Esty & Winston, 2006; Friedman, 1970; Greyson, 2004; Hoffman, 2000, 2001; Laszlo, 2005; Porter & Reinhardt, 2007; Rapetto & Austin, 2000). Therefore, any business that generates its profit

[1] I use in dissertation the term short-termism instead of another commonly used word "myopia".
[2] E.g. globalization, fast technological development, new industries, aging of the population in the developed countries, limited water and energy sources and frequent extreme weather conditions.

at the expense of the environment or society in which it operates "will find its success to be illusory and ultimately temporary" (Porter & Kramer, 2006, p. 83) as successful companies need a healthy society and a society cannot exist without successful companies (Meadows, Meadows, Randers & Behrens, 1972; Meadows, Meadows & Randers, 1993; OECD, 2008; Worldwatch Institute, 2007).

These two perspectives, long-term sustainability and long-term sustainable financial performance, are not stand-alone objectives but are rather closely correlated and complementary. For example, "The Best-Performing CEOs in the World" ranking by Harvard Business Review has recently been modified, using now a combination of environment, social and governance indicators (hereinafter: ESG) along with traditional long-term financial performance metrics[3] (Ignatius, 2015, pp. 50–51). Such shift is well represented in a statement by Lars Rebien Sorensen, the world's top performing CEO for 2015[4]: "Corporate social responsibility is nothing but maximizing the value of company over a long period" (Ignatius, 2015, p. 62). Likewise, the study by Eccles et al. (2013) acknowledges that high-sustainability companies notably outperform their counterparts over the long-term, both in terms of the stock market and accounting performance.

In addition, sustainability and long-term performance can be properly discussed when considering climate change, which has been identified as one of the most unpredictable threats following the industrial revolution. Many researchers warn that climate change will mark the economic and ecological environment (IPCC, 2007, 2007a, 2008; Lovelock, 2007; Stern, 2007) and may lead to sudden and catastrophic events (Kajfež Bogataj, 2008a). Companies are likely to be affected by climate change itself, through physical exposure, by policies to address it, and by regulatory, reputation and litigation exposures.

Unfortunately, the expectation of many companies is that climate change impacts will occur only in the extended long run and not within their current business horizon (Habbitts, 2007; Kolk & Pinkse, 2005; Pinkse & Kolk, 2009). Consequently, corporate responses are mostly reactive rather than strategic (Porter & Kramer, 2006; Porter & Reinhardt, 2007; Schwartz, 2007), and are avoidant and resistant rather than proactive (Kolk & Pinkse, 2004a). Therefore, this dissertation argues that long-term corporate performance[5] needs a strategic management system with the capability to anticipate and respond in a timely way to unexpected changes in the external environment, such as climate change. With increased anticipation and preparedness for future changes, companies also build corporate resilience (Hamel & Valikangas, 2003; Kotler & Caslione 2009; Moberg & Simonsen, 2014). Such

[3] Such financial metrics are country-adjusted total shareholders return, industry adjusted total shareholders return and changes in market capitalization.

[4] Mr. Sorensen is the CEO of Danish pharmaceutical Novo Nordisk, a company that is also one of the first successful users of the Sustainability Balanced Scorecard, explained in Chapter 4.8.2.

[5] In this dissertation "long-term time horizon" refers to a period over 5 years, a period that usually goes beyond the existing managers' focus, that is frequently connected to the duration of a CEO's terms of office.

an approach refers to the "ability to see the future", and "defining new needs" before competitors and customers (Dvir, Segev & Shenhar, 1993) what could lead to the formation of future industries (Hamel & Prahalad, 1996; Meyer & Davis, 2003). For example, companies that have actively and voluntarily addressed climate change mitigation and adaptation strategies, will benefit from reputation, stronger market position, and foremost from significantly lower costs invested into the transition towards climate change world compared to their avoidant and reactive competitors.

All of these requirements are beyond usual strategic or risk management and well exceeding also the time horizon of current corporate strategies (Apgar, 2006; Barker & Erickson, 2005; Gupta & Govindarajan, 1984; Maltz, Shenhar & Reilly, 2003; Miller & Friesen, 1983). Consequently, the ability to adapt to change has already been recognized as being the most significant competitive advantage by executives[6] (Rigby & Bilodeau, 2015), and the determinant of a company's resilience. Such resilience can be triggered by balancing short-term operational management with mid-term and long-term strategic management, and by continuous testing and refocusing of strategy when threats and opportunities are identified (Barney, 2006; Campbell, Datar, Kulp & Narayanan, 2006; Drucker, 1992, 2001; Fenton, 2007; Hamel, 1998; Hamel & Prahalad, 1996; Mintzberg Ahlstrand & Lampel, 2005; Mooraj, Oyon & Hostettler, 1999; Kaplan & Norton, 1996b, 2002, 2008b; Otley, 2005; Porter, 2004, 2008).

However, most companies operate on the assumption of a built-in self-restoring equilibrium, rather than using a triple view, dynamic performance, and integrated strategic system to make their business thrive in the extended long-term. To be able to apply such tools for continuous strategy renewal and adaptations, companies need to detect and respond to early warning signals, manage multiple time views, balance profit with people and society, and actively engage with all key stakeholders.

There are several performance management tools with explicit or inner potentials to address these requirements, such as the Baldrige Performance Excellence Program[7], Balanced Scorecard (Kaplan & Norton, 1992, 1996, 1996a), Total Quality Management (Dahlgaard, Kristensen & Kanji, 1998; Feigenbaum, 1991; Crosby, 1994; Juran, 2004), Tableaux de Board (Epstein & Mazoni, 1998), Performance Pyramid (McNair, Lynch & Cross, 1990; Nilsson & Olve, 2001) and Integrated Thinking (CGMA, 2014). For the purpose of this thesis, the Balanced Scorecard has been selected, in particular its application in the Palladium Hall of Fame for Executing Strategy® companies (hereinafter: HoF), due to the thesis author's longitudinal and extensive practical experience, enabling her insights and understanding of its key determinants.

[6] According to Bain & Company's 15th Management Tools & Trends survey (2015), 75% of executives selected the ability to adapt to change as being the most significant competitive advantage.
[7] The Baldrige Award was established by the US Congress in 1987.

The concept of BSC has been discussed by many academics and professionals (Epstein & Manzoni, 1998, Hope & Player, 2012; Hoque & James, 2000; Ittner et al., 2003; Maltz et al., 2003; Meyer, 2002; Niven, 2005; Olve, Roy & Wetter, 1999; Speckbacher, Bischof & Pfeiffer, 2003; Zingales, O'Rourke & Hockerts, 2002) and has been continually upgraded by its authors and other researchers (Bieker, 2003; Bieker et al., 2002; Epstein & Wisner, 2001; Figge et al., 2002; Kaplan & Norton, 1996b, 2001, 2004, 2006, 2008b; Kaplan & Mikes, 2012; Lawrie &, Cobbold, 2004; Lawrie et al., 2005; Orsato, Zingales & O'Rourke, 2001).

The initial model provides a balance between short and long-term objectives, between financial and non-financial measures, between lagging and leading indicators, and between external and internal performance perspectives (Kaplan & Norton, 1996). Furthermore, this concept has been undergoing continuous dynamic development, evolving from its early use as performance measurement framework towards a strategic planning and management system that is integrating various activities in a closed-loop and comprehensive system. According to Bain & Company's global research[8] (Rigby & Bilodeau, 2015, p. 10), BSC is among the most widely used management tools in last two decades.

The success of BSC is closely connected with its ability to balance, for example short and long-term objectives, financial and non-financial measures, leading and lagging indicators, and external and internal perspectives (Kaplan & Norton, 1992, 1993). Furthermore, it is a strong tool against short-termism, addressing the early call for the abandonment of short-term financial measures[9] in favor of indicators of long-term performance by BSC co-author Robert Kaplan (Kaplan, 1983; Neely, 1999).

Consequently, there is much evidence of the successful long-term performance of companies that use BSC, in particular of the HoF companies (Kaplan & Norton, 2002, 2006b, 2008, 2008a; Balanced Scorecard Collaborative 2005, 2006, 2007, 2008; Palladium Group 2009, 2010, 2011, 2013). Some of them are commitment to sustainable performance (Balanced Scorecard Collaborative, 2007, p. 2), applying the same key elements and practices as so called "high sustainability companies" (Eccles et al., 2013; Kiron, et al., 2013), such as strategic integration of sustainability, measurement of sustainability goals, performance reviews (Kiron et al., 2013, p. 12), linking compensation with performance metrics (Eccles et al., 2013; p. 8), and formal stakeholder engagement. However, despite these many references in the published literature, there is a lack of studies exploring the topic of how long-term strategic resilience can be accommodated within the framework of BSC.

[8] In the last published report "Management Tools and Trends 2015" BSC was placed 6th out of 25 global management tools.

[9] These financial measures have been based on manufacturing assumptions of standardization, such as an ability to specify non problematic input/output relationships, the mass production of mature products with known characteristics and a simple and stable environment.

Purpose and objectives

The purpose of this doctoral dissertation is to find out whether and how companies use the Balanced Scorecard as a tool for long-term sustainable performance, in particular in the environment of an uncertain future, examined through the prism of climate change. The BSC concept has been continually upgraded by its authors, academics and other researchers. This concept has clearly been undergoing continuous development, therefore, the ambition of this doctoral dissertation is not to test or upgrade BSC's basic premises, but rather to explore its abilities for long-term sustainability, uncertainty, and resilience management. The indication of BSC's resilience potential has its foundation in BSC unconditional requirement that "Strategy-focused organizations have to constantly evolve strategies to reflect shifts in opportunities and threats while the competitive landscape is constantly changing" (Kaplan & Norton, 2001, p. 17).

The main motivation for this study derives primarily from the fact that climate change is inevitable, thus exceeding the voluntary and responsible management as part of CSR or sustainability. Consequently, there is a growing demand for appropriate management systems that enable performance navigation and timely strategic responses in the fast-changing business environment. Therefore, the definition of the objectives of this doctoral dissertation, as well as definition of the thesis, is based upon the following statements:

1. Further development of BSC as an integrated strategic management system, enabling sustainability, uncertainty and climate change management, is reasonable considering the following facts:
    a) The existence of many BSC best practices in last twenty years, also with evidences of BSC use for strategic foresight and management of future performance.
    b) Unused potential and mostly partial usage of BSC in the business practice. Despite its popularity, companies mostly use BSC as a multidimensional matrix for performance measurement, rather than as a holistic strategic management system.
    c) The BSC potential for sustainability is intrinsic, as BSC demands multiple balances and offers many possibilities for sustainability management, embedding environmental and social perspectives into the managerial framework of the overall strategy (Bieker et al., 2001; Epstein, 2001; Orsato et al., 2001; Figge et al., 2002; Zingales et al., 2002; Zingales & Hockerts, 2003; Bieker & Waxenberger, 2002; Van der Woerd & Van den Brink, 2004; Elijido-Ten, 2011).
2. Business consideration of climate change and climate change corporate strategies is unavoidable and necessary due to the following:
    a) Inevitability of climate change (IPCC, 2008b, p. 72).
    b) Urgency to act, as non-response is intolerable (Hansen, Sato, Kharecha, Russell, Lea & Siddall, 2007; IPCC, 2008b). Moreover, the time for mitigation and adaptation is running out (Stern, 2007; IPCC, 2007b).

c) The strategic character of climate change, hence it will no longer be manageable as merely an environmental and sustainability issue (Hoffman, 2006; Kolk & Pinkse, 2004; Llewellyn, 2007; Porter & Reinhardt, 2007).
d) Reactions of companies are still directed mostly towards carbon strategies rather than towards timely adaptation and transition strategies (Kolk & Hoffmann, 2005; Lovelock, 2007; Reinhardt, 1999).

The objectives of the dissertation stem from its purpose. The **main objective** is to explore the potential of BSC as an integrated strategic management framework for long-term corporate sustainable performance and to examine it in the environment of an uncertain future, through the prism of climate change. Therefore, **further objectives** of this doctoral dissertation are as follows:

- To outline and emphasize the openness and many possibilities of BSC as a performance and strategic management system, with its limitations and advantages, and to define its key success factors for long-term performance.
- To test preparedness for climate change in selected companies, and consequently, to test whether these strategies are embedded into the overall corporate performance and strategic management system of today. To find out which BSC capabilities enable a timely response to an uncertain future, in this instance, to climate change.
- To explore elements of corporate resilience and to examine their interactions with BSC as a performance and strategic management system.
- To suggest further development of BSC as an integrated strategic management framework with embedded levers of resilience for sustaining long-term performance.

The overall objective of this study is to combine empirical findings with theoretical ones, in order to deepen and expand the current knowledge about the integrated strategic management framework based on BSC for managing those elements that are currently not at all, or not fully, embedded in the long-term strategic management of the company. With regards to the objectives of this dissertation, the exploratory case study of three companies and the explanatory single-case study research address the following research questions:

1. To what extent are sustainability, an uncertain future and climate change integrated into the vision, mission and strategy of the company, and in the process of company's management and governance? (Exploratory and explanatory case study)

2. How does BSC include the strategic consideration of sustainability and of uncertain future? How many perspectives does the company's BSC have? How are sustainability key performance indicators (KPI) presented? (Exploratory and explanatory case study)
3. How is the company responding to climate change; is the company responsive or proactive, what are its strategies? Does the company make long-term development

plans in consideration of expected climate change, and in what time frame? What are the initiatives for business opportunities? (Exploratory and explanatory case study)

4. How does the company achieve the balance between the pressure on short-term performance goals and those mid- and long-term goal of mitigating and adapting to climate change which require immediate consideration? (Explanatory case study)
5. Which principle of SFO and which stage of the BSC strategy execution closed-loop management system was the most important for preparedness to climate change, and way? How was an early warning system based on BSC work? (Explanatory case study)
6. How are climate change strategies integrated into the BSC performance and strategic management system? (Explanatory case study)
7. How is the company prepared for the following expected periods in climate change development? (Exploratory and explanatory case studies)
   a) regulatory period (2010–2020);
   b) the period of first expected devastating climate change shocks (2020–2040);
   c) rapid climate change.
8. What KPI does the company use regarding climate change, and what is their potential influence on BSC perspectives? (Exploratory and explanatory case studies)
9. How are climate change, sustainability and uncertain future management embedded into the strategic management system, and to what extent? (Explanatory case study)

Thesis

The turbulent nature of business in the past decade has narrowed the managers' comfort zone in the short-term, and increased the focus on corporate resilience and long-term sustainable performance. The main thesis of this dissertation is that the Balanced Scorecard can provide a framework for timely strategic responses to uncertain threats, such as climate change, with a dynamic, open and focused strategic system that enables continuous changes and timely reactions to future challenges. Therefore, BSC as an integrated strategic management system enables companies to attain long-term sustainable performance with the continuous reformulation and adaption of their strategies, based on the strategic consideration of sustainability and uncertain threats, such as climate change, while balancing short-term financial pressures alongside long-term strategic objectives.

BSC was selected as a potential tool on the basis of my direct longitudinal use of BSC and based on the findings of a preliminary archival-empirical study of HoF companies in the 2000–2008 period. In particular, positive experience of companies in dynamic environments (e.g. transition and emerging economies) and fast growing industries (e.g. digital, biotechnology, nanotechnology) raised my attention to BSC as being a potential holistic and systemic framework, suitable also for uncertain environments. Although the

uncertainty and high risks of climate change are not comparable to any present or past events, some scholars (Hoffman, 2004; 2006) acknowledge the 'transition' character of climate change, with great risks and great opportunities. In addition, this assumption of BSC's suitability for emerging cases was confirmed also by the results of Management Tools and Trends report in 2011 (Rigby & Bilodeau, 2011, p. 24), stating that BSC's usage varies per market type (from 38% in established markets to 53% in emerging ones).

The doctoral dissertation is based on the following assumptions:

- Beyond operational excellence, long-term successful performance requires strategic excellence with embedded sustainability and aligned corporate foresight.
- Climate change is an unequivocal and serious threat with potential devastating effects on mankind in the near future.
- Climate change necessitates companies to implement mitigation and adaptation strategies, as well as to identify development opportunities in the post-carbon world.
- Studying companies that have already achieved strategy excellence as defined by the Palladium Hall of Fame for Executing Strategy® enables reliable research of BSC as performance management and strategic management systems. While the research focuses only on selected companies in specific business sector, its results are expected to be generally transferable to companies in other business sectors with similar level of development of strategic systems. However, the industry and regional specifications have to be considered along with the level of development of BSC.

As the dissertation comprises multiple and vast research areas, the following limits were applied:

- BSC, the principles of Strategy-focused organization and the strategy execution closed-loop management system were selected as developed and originally proposed by the authors Drs. Kaplan and Norton. However, the selection of BSC does not discount the potentials of other management approaches, such as the Baldrige Quality System, Total Quality Management (Feigenbaum, 1991; Crosby, 1994; Juran, 2004), Tableaux de Board (Epstein & Mazoni, 1998) and Performance Pyramid (McNair et al., 1990).
- Sustainability is presented with the aim of highlighting the segments relating to environmental, social and long-term perspectives, and is addressed according to the guidelines of UN, OECD, and the UN Global Compact.
- The elements of uncertainty and the future dimension are explored through the case of climate change in order to observe its transition from being viewed as an uncertain and high-risk threat towards being a problem that requires an immediate corporate strategic response.
- This dissertation's approach with regards to the state of climate change is based on findings and scenarios from the latest reports by the Intergovernmental Panel on Climate Change (IPCC, 2014) and on scientists' agreement that the climate change poses a serious threat to our planet, largely resulting from human actions.

Research Methodology

The longitudinal review of the relevant literature and sources regarding BSC, sustainability, Sustainability BSC (Hereinafter: SBSC), climate change and the future dimension was conducted in order to formulate clearer and more insightful research questions about the thesis. While this was supported by knowledge accumulated from extensive personal experience with BSC in real companies and organizations during the 1999–2014 period, the emerging nature of climate change (with pressing and rapid developments in various areas as discussed in this doctoral dissertation) demanded continuous consideration of the latest findings and practice of leading world authors, institutions and companies throughout the whole period of research.

Thus, in the first, theoretical, part of the dissertation, I provide an extensive literature review based on different databases, including ABI inform, Proquest and Science Direct as well as the archives of Harvard Business Review, BSC Collaborative, IPCC, Stockholm resilience institute, Carbon disclosure project (CDP) and many other books and articles, which have been cited also in the list of references. I examined and systematized the findings, and compared different views, beliefs and approaches. This enabled me to establish the main pillars of a conceptual framework of the BSC strategic management system with embedded long-term sustainability, uncertainty and resilience management. Here, I used the methods of classification, analysis, and synthesis.

The literature review is followed by a combination of multiple research strategies focused on the actual usage of BSC with embedded sustainability and resilience management in the business practice. In order to give an internal view of BSC usage in supporting sustainable performance in an uncertain future, with its advantages and disadvantages, I used archival-empirical analysis and case study research design. A successful case study offers new and fresh insights, observations and thorough interpretations of a single or several research objects. The goal for selecting companies for the empirical research of the doctoral dissertation was not to document the average practice. Rather, it was to learn about innovative, cutting edge best practices. Therefore, the research focuses only on companies that were inducted into the prestigious Palladium Hall of Fame for Executing Strategy® award, by manifesting outstanding performance linked to BSC adoption.

Initially, an analysis of 131 Palladium Hall of Fame for Executing Strategy® companies was conducted, followed by the archival-empirical research of 19 utility and energy (see more on selection criteria in Chapters 4.2.1 and 4.2.2) HoF companies and selection of three companies for case study research. After this, I began an exploratory case study of Public Service Electric and Gas company (hereinafter: PSE&G), S-Oil and Statoil, following with an in-depth explanatory case study of PSE&G. The multiple-case study design for exploratory research enabled identification of direct replication. In addition, analytical conclusions independently arising from three case studies are more powerful.

The embedded design of the in-depth explanatory research concerning PSE&G presented additional significant opportunities for an extensive analysis, enhancing the understanding of sub-perspectives, for example how BSC contributes to the company's resilience and long-term sustainable performance.

A case study is an empirical inquiry that investigates a contemporary phenomenon within its real life context. In case studies, an attempt is usually made to counterbalance the impossibility of applying statistical inference with, for example, the large theoretical or practical relevance of a research subject, the thoroughness of analysis and interpretation, and the triangulation of research methods (Silverman, 1993; Yin, 2003). Triangulation refers to the comparison of different types of data (e.g. quantitative and qualitative) and different methods (e.g. observation and interviews) to see whether they sustain one another. The idea behind triangulation is that empirical evidence may be strengthened by the use of different approaches to the same problem (Bringall & Ballantine, 2004). In management accounting literature, three broad types of case studies have been published (Atkinson & Shaffir, 1998, p. 47):

- Case studies that provide a description of practice.
- Case studies that test theory development elsewhere. These case studies focus on developing evidence that either supports or contradicts an existing theory.
- Case studies that develop a theory.

The proposed research of the BSC approach for sustainable performance in the circumstances of an uncertain future regarding the three companies that achieved strategic excellence belongs to the first and second type of case studies. Furthermore, the in-depth research of the selected company PSE&G is a combination of the first and third type of case studies. Case studies typically rely on four methods of gathering information (Kaplan, 1986a, p. 442): participation in the setting (e.g. recording and transcribing), direct observation, in-depth interviewing, and analyzing texts and documents. These methods are often combined, which was mostly the case in this dissertation. The preparation phase of a case study included the development of a case study protocol, the screening of candidates for case studies and the conduct of a pilot case study.

The quality of the research was established using four tests common to all social science methods: construct validity, internal validity, external validity, and reliability (Yin, 2003, p. 19). Aside from survey analyses, the internal documents were reviewed and the accountability of managers and employees was recorded through their attachment to measure, objective, and initiative, and alignment with compensation systems. Based on an internal BSC report, cascaded scorecards were explained.

In addition, other management tools integrated into BSC were observed through communication documents, internal educational materials, and agendas of strategy review

meetings. Interviews with executives provided understanding and insight into the particular company's BSC approach, and also revealed obstacles to be overcome as well as areas of opportunity to be developed. In addition, through this process, important statements were made regarding drivers of BSC, complementing the survey results.

The final results were again critically discussed with PSE&G to confirm findings and the key drivers of strategic system for corporate resilience and sustainable performance. Built on these findings, the performance vortex based on BSC's integrated strategic framework for sustainable performance in the circumstances of uncertainty was proposed.

Contribution to science

The proposed dissertation makes the following **contributions to science:**

a. Deepening and extending current knowledge into the research area of BSC as a performance and strategic management system, and in particular into BSC abilities to integrate sustainability and uncertainty management, with the aim of developing corporate resilience and assuring long-term performance.

b. The discussion of uncertainty management, resilience and long-term viability in current literature has emerged recently. However, there is still a lack of integrated solutions with operational and strategic management. Therefore, this dissertation's contribution lies in the exploration of solutions which incorporate these emerging perspectives into the strategic management system.

c. While climate change has become one of the most widely researched subjects in science in the last decades, business and academic literature indicates that appropriate climate related business strategies are inadequately addressed or only partially elaborated among other environmental and sustainability issues. Furthermore, the discussion of climate change generally focuses on mitigation issues, especially the measures, processes and technologies directed at decreasing global warming. Therefore, an important scientific contribution of this doctoral dissertation is in its embedded strategic and holistic business discussion of climate change.

d. Another important contribution of this doctoral dissertation is its study of the business practice of best practice companies, as the research is based on extensive practical work in companies exhibiting strategic excellence. This dissertation is studying their preparation for climate change, their capability of balancing short-term and long-term objectives and their management of sustainability and an uncertain future. The majority of companies cannot address such challenges because of undeveloped performance and strategic management system due to scarce human resources, knowledge and experience. This is what makes the presentation of the best practices companies worldwide so important.

Initially, the objectives of the dissertation also covered the presentation and discussion of the potentials of BSC to evolve into a management tool for climate change management. The reason behind that was that the existing literature on climate change management at the time of thesis proposal did not provide an adequate management tool for climate change management. Although such a tool might be still necessary for decreasing the magnitude of climate change and for proper adaptation to it, our research acknowledges a strong need for an embedded strategic management solution rather than a climate change management in parallel. In addition, due to extreme weather and additional evidence of accelerated climate change in the past years, the awareness of climate change threats has increased substantially in all spheres of social, business and political life.

Terminology

In this section, the main terminology is explained to avoid possible ambiguity.

The term **adaptation** refers to the process of adjustment to actual or expected climate conditions and its effects, in order to moderate harm or exploit beneficial opportunities. While in natural systems these processes are self-driven, in societies and companies human intervention is needed to facilitate adjustment. The IPCC (2014) evaluates adaptation as being an instrument to build resilience and to adjust to climate-change impacts, while considering limits to adaptation, climate-resilient pathways, and the role of transformation.

The **Balanced scorecard** is a well-known strategic system that links performance measurement to strategy by using a multidimensional set of financial and nonfinancial performance metrics. Its authors Kaplan and Norton presented three primary developments of BSC usage reflecting the successive phases in the evolution of the BSC concept and of its implementation in practice. Throughout the dissertation, all three BSC types are used when addressing BSC. Therefore, the research focuses only on companies that have successfully implemented all three below stated developments of BSC:

- BSC as a multidimensional framework for strategic performance measurement that combines financial and non-financial measures (Kaplan & Norton, 1992, 1996a).
- BSC as an advanced strategic and performance management tool that describes strategy through a cause-and-effect logic and is more strongly linked to an organization's strategy, including the reward system (Kaplan & Norton, 2001, 2004).
- BSC as an integrated strategic management system that includes execution premium's architecture for comprehensive and integrated management system which links strategy formulation and planning with operational execution (Kaplan & Norton, 2008).

Business turbulence is defined as the unpredictable and sometimes undetectable changes in an organization's external or internal environments that affect its performance (Kotler & Caslione, 2009; BNET dictionary, n.d.).

Climate change is a change in the state of the climate that can be identified by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes, external forcing, or to persistent anthropogenic changes in the composition of the atmosphere or in land use. For the purposes of this dissertation, climate change is inevitable, hence is demanding strategies for mitigation and adaptation (IPCC, 2007a).

Climate extreme means extreme weather or another extreme climate event that has the occurrence of a value of a weather or climate variable above (or below) a threshold value near the upper (or lower) ends of the range of observed values of the variable. For simplicity, both extreme weather events and extreme climate events are referred to collectively as "climate extremes" (IPCC, 2012, p. 5).

Corporate social responsibility, sustainability, shared values.
Many terms are used to describe the concept of sustainability in the academic and corporate world, differing between authors, countries and companies. The most common terms are corporate social responsibility, corporate citizenship, sustainability, sustainable development, corporate accountability and stakeholder's perspectives and management. Throughout the dissertation, many of these terms are used interchangeably to describe the social, environmental, and economic dimensions in general. However, there is a small distinction between them (Willard, 2002; Laszlo, 2006; Bansal & DesJardine, 2014).

Sustainability balances resource usage and supplies over time, and assures intergenerational equity with the resource use that match the earth's capacity to regenerate adequate future supply. Subsequently, if resources used exceed this earth capacity, then current demand is being met by borrowing from the future, which will eventually lead to an inability to meet society's needs. On the other hand, corporate social responsibility focuses on balancing current stakeholder interests. Its approach is grounded in ethics, morality and norms. In spite of moral and good intentions, the CSR measures can actually impose long-term liabilities on affected communities, making good-intentioned actions unsustainable (Bansal & DesJardine, 2014).

Resilience is the ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions (PIPCC, 2012, p. 34).

Contents outline

This dissertation is divided into five major chapters that follow the Introduction and precede the Conclusion. Its research area is defined at the beginning of **the Introduction.** Based on that, the research purpose and doctoral dissertation objectives are determined. This part is followed by the main thesis discussion, methodology explanation and by discussion of its contribution to science. To avoid any ambiguity, the main terminology in the dissertation is presented in short. At the end, chapter outlines are provided.

Chapter 1 includes a literature review regarding sustainable development and its implications for business. It begins with a definition of sustainable development, followed by the presentation of three different organizational responsibility trends and by a discussion of the importance of its strategic consideration. Finally, the review of business practice on the strategic dimension of sustainability is presented.

Chapter 2 comprehensively describes the context of an uncertain future with a brief outline of key challenges, such as the planet's limitations, climate change, demographic trends and technological trends. In the second section, the business aspects of an uncertain future are discussed, from risk management, adaptation, the challenges of competitiveness for the future, through to the necessity of creating new opportunities. The third section focuses on climate as a global threat and trend, based on climate change evidence, its mechanisms and its global and regional scenarios. The fourth section explores the effects on, as well as risks and opportunities for companies. Finally, corporate climate change strategies are discussed, emphasizing the need for adaptation and transformation strategies to operate in parallel with the well-known mitigation strategy.

Chapter 3 describes the evolution of BSC. The concept of the Balanced Scorecard is one of the most used management tools within the last two decades. This chapter outlines the framework and concept of BSC, tracing its progress from inception through its rapid development towards use as a strategic management system. It identifies its limits and criticisms, following this with insights and experience from practice based on the author's professional work and research over past sixteen years. The first section of the chapter provides a review of the literature regarding the inception, concept and rationales behind BSC. The second section describes the evolutionary phases in the development of BSC from a performance measurement system to a Strategy-focused organization and towards a comprehensive integrated strategic management system (Execution premium concept), primarily based on the work of Kaplan and Norton as well as other authors around the BSC Collaboration and Palladium initiatives. The third section explores how sustainability is addressed through the BSC model, the fourth section addresses the risk and uncertainty management, while the fifth section discusses insights of BSC business practice, also from the user's perspective. The final section reviews the criticism and limitations of BSC.

Chapter 4 consists of five sections. The first section gives an overview of the research design, followed by the presentation of the research process with all four research sequences. In addition, the process of selecting case study companies is presented as preliminary research sequence, followed by conduct of longitudinal empirical research of short-listed HoF companies, the exploratory case study of three selected companies and an in-depth explanatory case study of PSE&G. In the third section, the case study company PSE&G is presented together with a short overview of the other two researched companies. In the fourth section, key research areas of explanatory case study, such as BSC as a performance management and strategic management system, along with the company's long-term sustainability and resilience, examined through the prism of climate change, are discussed. Finally, the research questions results regarding the BSC approach for sustainable performance and resilience in the age of climate change uncertainty are presented in the fifth section.

In the Discussion **(Chapter 5),** I compare all research results and summarize the main findings around the thesis objectives. This part of the dissertation provides the findings on BSC's potential as a performance and comprehensive strategic management system based on the results of the explanatory case study of PSE&G, designed on the key findings of the exploratory case study of the three selected HoF companies. Finally, in this Chapter I suggest the further development of BSC with resilience determinates, towards a performance vortex. The parameters of such a performance vortex are time-tuning, dynamic equilibriums, and long-term continuity.

The Conclusion part draws the dissertation to a close, summarizes the findings and scientific contribution of the study, includes a discussion of the limitations of the study and introduces challenges for further research.

The main body of the text is followed by appendices which contain key information regarding the selected case companies, research questions, summary overview of the short-listed companies and an abstract of the dissertation in the Slovenian language.

1 SUSTAINABLE DEVELOPMENT AND BUSINESS ENVIRONMENT

The Brundtland Commission to the United Nations gave the most well-known definition of sustainable development: "Meeting the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland Commission, n.d.; World Commission on Environment and Development, 1987). This report promoted a three-dimensional model of social, environmental, and economic progress that are only attainable within the limits of the Earth's natural resources. Years later, some authors expanded the model with a fourth pillar of culture (Scerri & James, 2010), and/or institutions or governance (United Nations, 2014). This Chapter discusses sustainable development and its implications for business, followed by the presentation of three different organizational responsibility trends and by a presentation of the importance of its strategic consideration. Finally, the review of business practice on the strategic dimension of sustainability is presented.

1.1 Definition of sustainable development

The core issue of sustainable development is a change in the way we think as individuals, as organizations and as a society; yet, such changes are usually met with resistance (Hoffman & Bazerman, 2007; Kotler, 1996, 2005). The initial Brundtland Commission to the United Nations model triggered many positive developments, such as the introduction of new technologies, changes in customer behavior, creation of new institutions and NGOs, and the wider implementation of several multinational agreements. For example, the Millennium Development Goals (hereinafter: MGDs), was launched by the United Nations (hereinafter: the UN) in the year 2000 for combating main global challenges such as poverty, hunger, disease, inadequate schooling, gender inequality, and environmental degradation. As a result, population growth rates declined in response to education and increased incomes (United Nations, 2015), ecological standards were deployed worldwide, and the awareness of environmental issues began increasing. However, these are still relatively small achievements as the Millennium Development Goals has underperformed in almost all environmental objectives (Sachs, 2012). Hence, the human ecological footprint on a global scale is still increasing, with food, energy and industrial production still growing at rates far exceeding population growth.

Consequently, the authors of the "Limits to Growth" (see more in Chapter 2.1.1) argue that the concept of sustainability has remained ambiguous and somehow abused (Meadows Randers & Meadows, 2004, p. xiv). Therefore, a team of international scientists asserted that the classic model of sustainable development, of three integrated pillars, was flawed and did not reflect reality (Rockström, Sachs, Öhman & Schmidt-Traub, 2013). They proposed a new set of goals, such as thriving lives and livelihoods, food security, water security, clean energy, healthy and productive ecosystems, as well as a set of planetary

targets that among many other goals include climate stability, reducing biodiversity loss, protection of ecosystem services, a healthy water cycle and oceans, sustainable nitrogen and phosphorus use, clean air and sustainable material use.

In parallel, from an economic science perspective, several prominent environmental economists worked on putting a value on the environment, pioneered by S.V. Ciriacy-Wantrup in 1947 with a survey method known as "contingent valuation" (Ciriacy-Wantrup, 1963). Following this, scholars in the 1960s argued that economic values should be imparted to all natural resources, followed by James Tobin and William Nordhaus's work in the late 1960s on systematic accounting for natural resources (Ciriacy-Wantrup, Bishop & Andersen, 1985; Nordhaus, 2008). Influenced by the Club of Rome report, scholars began their comprehensive work on analytical and applied environmental economics (Dasgupta & Mäler, 2004; Mäler & Jeffrey, 2005). Finally, inspired by updated analyses of the book *Limits to Growth* (Meadows et al., 1993; Meadows et al., 2004), in particular by a novel concept called "planetary boundaries" launched by a group of scientists in 2009 (Rockström et al., 2009), researchers called for the redefinition of sustainable development to "development that meets the needs of the present while safeguarding the Earth's life-support system, on which the welfare of current and future generations depends" (Griggs et al., 2013).

1.2 New organizational and responsibility trend

Under pressure from the community at large, followed the Brundtland Commission to the United Nations report and the influential book *Strategic management: a stakeholder approach* (Freeman, 1984), corporate responsibility and sustainable development becoming a mainstream management issue and a priority for business leaders worldwide (Porter & Kramer, 2006). In past years, it has been labeled by many names, adjectives, and umbrella phrases, including corporate social responsibility, corporate citizenship, triple bottom line, sustainable growth, corporate philanthropy, corporate giving, corporate community involvement, community relations, community affairs, community development, corporate responsibility, global citizenship, corporate societal marketing, and sustainability (Kotler & Lee, 2005; Willard, 2005; Epstein, 2008). Each term has different origins and nuances but all are somehow interchangeable.

Critics argue that CSR distracts from the economic role of businesses, among them the Nobel prize winning economist, Milton Friedman, who claims that "the only social responsibility of business is to make profit" (Friedman, 1970, p. 126). Yet, a second stream of scholars maintain that corporations make more long-term profits by operating within the planet's limits and being of benefit to all stakeholders. Subsequently, companies can "do well by doing good", as the most important thing a company can do for society is to contribute to a prosperous economy (Porter & Kramer, 2006). This is also connected with the assumption that by not meeting the needs of other stakeholders, companies can destroy

shareholder value because of customer boycotts, inability to hire the most talented people, and by paying fines to governments (Eccles et al., 2013). A third stream of scholars argue that corporate sustainability refers to "business strategies that are intended to add social and/or environmental value to external stakeholders while increasing value to shareholders" (Reed, 2001). Despite different views of CSR, more and more voluntary standards, codes, and principles have been developed in past years. Such standards help companies to formulate sustainability issues and provide an opportunity to communicate commitment to sustainability to stakeholders. For example, the United Nations Global Compact was developed and launched in the year 2000 by the UN as an initiative to encourage and promote good corporate practices in the areas of human rights, labor, the environment, and anticorruption (Fussler, Cramer & Vegt, 2004). With more than 10,000 companies from 130 countries signing their commitment to the Ten Principles of the Global Compact, this platform has lately been criticized for its lack of monitoring, accountability, and enforcement (Oppenheim, Bonini, Bielak, Kehm & Lacy 2007).

While the progress in the field of corporate responsibility has been immense in recent years, there is still a disparity between shareholders' demand and environmental, social, and governance investments that are longer-term by nature. The absence of clear and consistent metrics that could relate and correlate such investments to investor returns aggravates this conflict. Consequently, according to a McKinsey study (Bielak et al., 2007, p. 10), fewer than one-fifth of the CEOs they surveyed believe that financial markets reward companies' approaches to environmental, social, and governance issues when they are valued. While some standards do exist, for example a socially responsible investment rating such as Sustainable Asset Management (SAM)[10], have yet to become benchmarks in the capital markets alongside stock prices and price-earning ratios.

1.2.1 Triple bottom line

Triple bottom line (hereinafter: TBL) is an accounting framework that expands the traditional reporting framework, focused solely on finances, with systems thinking underlying the company's social, economic and environmental impact (Elkington, 1997). The term was first articulated in 1981 by Freer Spreckley and defined in 1994 by Elkington who also coined the phrase "people, planet, profit". Interest in triple bottom line accounting grew across the for-profit, nonprofit and government sectors. Many organizations adopted this framework to evaluate their performance in a broader perspective in order to create greater business value (Slaper & Hall, 2011). By monitoring, measuring, and reporting this new management model, they were able to improve performance management in all three spheres and, as argued by Willard (2002), secure long-term economic performance by avoiding short-term behavior that is socially or environmentally less responsible.

[10] Initiatives such as Sustainable Asset Management (now Robeco SAM) and the Dow Jones Sustainability Index were among the first that brought sustainability issues into the mainstream of the capital markets.

TBL in the area of "people" measures social responsibility. Social indicators refer to the social dimensions of a community, region, and state and could include measurements of education, equity and access to social resources, health and well-being, quality of life, and social capital. Secondly, TBL in the area of "planet" measures a company's environmental responsibility. Environmental variables should represent measurements of natural resources and reflect potential influences affecting the company's viability. It could incorporate air and water quality, energy consumption, natural resources, solid and toxic waste, and land use/land cover. Thirdly, in the area of "profit", the economic variables deal with the bottom line and the flow of money, such as income or expenditures, taxes, business climate factors, employment, and business diversity factors (Slaper & Hall, 2011).

Although the move to triple bottom line was an important step towards business commitment to sustainable business development (Kolk et al., 2005; KPMG, 2001), it often represents the disparity between the three distinct sets of performance, and reflects the tension and contradictions between profitability and responsibility (Drucker, 1984; Laszlo & Zhexembayeva, 2011). However, TBL could serve as a valuable tool in more integrated approaches to measuring and managing business performance.

1.2.2 Corporate social responsibility and sustainability

The term corporate social responsibility evolved from a moral philosophy discipline (Willard, 2005) and came into common use in the late 1960s and early 1970s, after many multinational corporations introduced the term stakeholder. CSR integrates a self-regulation mechanism into a business model, whereby a business monitors and ensures its active compliance within the law, ethical standards, and international norms while encouraging a positive impact through its activities for the benefit of consumers, employees, communities, and any others who may be considered to be stakeholders.

There are several recent definitions of corporate social responsibility (CSR) and sustainability. Voluntary commitment is emphasized in several definitions, such as "corporate social responsibility is a commitment to improving community well-being through discretionary business practices and contribution of corporate resources" (Kotler, Lee, 2005, p. 3) or "business's commitment to contribute to sustainable economic development, working with employees, their families, the local community, and society at large to improve their quality of life" (World Business Council for Sustainable Development). Other definitions refer also to value creation and risk management, for example the Dow Jones Sustainability Group Index defines corporate sustainability as "a business approach that creates long-term shareholder value by embracing opportunities and managing risks deriving from economic, environmental and social developments", while referring to the integration of long-term economic, environmental and social aspects in business strategies for maintaining global competitiveness and brand reputation.

The economic prosperity element is usually easily understood and accepted by companies, as it refers to the long-term economic health of global, local, and corporate economies. The environmental dimension of sustainable development comprises the company's protection of environments through a "do not harm" attitude and by restoring the environment from harm already done. Very popular "eco-efficiency" is thus the intersection of economic and environmental elements of sustainability (Willard, 2002). Finally, the social responsibility calls for a global view of society and seeks to ensure human rights, equalities and more equitably distributed resources and wealth.

Prior to the 1990's, companies applied the traditional approach to CSR to fulfill obligations. Decisions to select social issues were not strategic decisions, rather reflecting emerging pressures for "doing good to look good" (Kotler & Lee, 2005, p. 8). Hence, sustainability was more an ethical constraint, a corporate public relation effort, a regulatory compliance initiative, philanthropy, rather than a real change in the way to conduct and manage business (Laszlo, 2005). Today, scholars use different arguments for CSR and sustainability: moral obligation, license to operate, reputation management (Porter & Kramer, 2006, p. 81), regulations, community relations, societal obligations, cost and revenue imperative (Epstein, 2008, pp. 21–22), brand positioning, motivation and retention of employees, risk management, and access to capital (Kotler & Lee, 2005).

The moral dimension of sustainability helped develop international reporting standards, such as the Global Reporting Initiative (GRI), the leading institution in developing guidelines on sustainability disclosures; the Organization for Economic Cooperation and Development (OECD) Guidelines for Corporate Responsibility; and the United Nations Global Compact. In 2013, the Global Reporting Initiative released its new G4 reporting standard, referring to the importance of identifying and disclosing material sustainability issues to meet stakeholders' expectations. The material sustainability issues are the sustainability issues most relevant to a company's continued ability to function, therefore "material" to their existence over the time (Kiron et al., 2013). Material sustainability may vary considerably, depending on industry and business model.

Despite all positive developments, there are still several doubts and open challenges. According to the survey of UN Global Compact & Accenture (2013)[11] a majority of CEOs see sustainability as crucial to their future success but do not believe that business is doing enough to address global sustainability challenges. Similarly, research from MIT Sloan and the Boston Consulting group highlighted a huge gap between business consideration of social and environmental issues and a company's respond, with less than half of surveyed companies fully or largely addressing these issues (Kiron et al., 2013). The study acknowledges two main challenges that companies are facing: inability to scale

[11] The largest study of UN Global Compact and Accenture to date covering 1,000 global CEOs, from 27 industries across 103 countries.

sustainability at the pace required to address global challenges, and failure to make business success. On the contrary, successes are attributed to the companies that are creating a sustainable strategy, making sustainability a top management agenda item, developing sustainability business cases, measuring sustainability performance and are changing business models as a result of significant sustainability (Kiron et al., 2013).

1.2.3 Shared value

Creating shared value originates from a Harvard Business Review article in 2006 by the Harvard professor Michael Porter and the Harvard Kennedy School of Government Senior Fellow Mark Kramer. The concept was further expanded in 2011 (Porter & Kramer, 2011), when authors built upon the mutual dependence of business and society, as successful corporations need healthy societies. A temporary gain to one will undermine the long-term perspective of both (Greyson, 2004; Porter & Kramer, 2006, p. 83). The same applies for society, which cannot exist without successful companies.

Since the term "shared value" was coined, it has run the risk of being confused with the phrase "corporate social responsibility" or even with the idea of "redistributing wealth". Rather, authors have stated that creating shared value is a way to grow economies, marketplaces, companies, and communities in the long-term interest of businesses and everyone else. They emphasized the importance of choosing which social issues to address. Therefore, a corporate social agenda looks beyond community expectations towards opportunities to achieve social and economic benefits simultaneously. It moves from mitigating harm to finding ways to reinforce corporate strategy by advancing social conditions. Finally, shared value emphasizes the strategic nature of CSR, while doing things differently from the competition in a way that costs less or better serves a particular set of customer needs.

1.3 Strategic dimension of sustainability

Initially, business approaches to CSR were fragmented and disconnected from business and strategy. Thus CSR was rather a cost or charitable deed than a source of opportunity, innovation, and competitive advantage (Porter & Kramer, 2006). "It is not anymore only a corporate social responsibility issue, but a business problem that is best addressed with the tools of the strategist, not the philanthropist" (Porter & Reinhardt, 2007).

While CSR can provide several business benefits, the long-term sustainable success will be determined by strategic responses that include innovation, management acumen and leadership (Eccles et al., 2013). Unfortunately, social and environmental goals are often developed separately from the business strategy, using different terminologies, engaging different departments and run by a variety of managers without the active engagement of a CEO (Rangan, Chase & Karim, 2015), and managed by different measures and reporting

tools (Laszlo, 2005). Subsequently, a better integrated approach for managing and measuring is much needed, as explained in the case of triple bottom line, which often stands for three distinct sets of performance. In addition, the role of sustainability is sometimes seen as adding complexity and costs (Laszlo, 2005, p. 29) due to the number and variety of approaches to corporate sustainability, with own accountability, business conduct, corporate governance, community involvement, human rights, and environmental responsibility, and due to voluntary approaches to corporate responsibility that have produced many types of social and environmental initiatives.

There are several impetuses for implementing such an integrated approach, for example management commitment to sustainability as a core value or as management recognition that sustainability can create financial value for a corporation through enhanced revenues and lower costs (Epstein, 2008). One of the leading impetuses for sustainability strategy is often a form of external pressure, for example through government regulations, marketplace demands, competitors, and NGO's. Similarly, adding environmental concerns to the core strategy is supported by three strong basic reasons: the potential for upside benefits, the management of downside risks, and a value-based concern for environmental stewardship (Esty & Winston, 2006). Business leaders are now more inclined to incorporate society's expectations into their core strategies, although they face many challenges when they do that (Bielak et al., 2007). Such integration has been recognized as a determinant of competitiveness, as acknowledged by Ceca (2008) "how well and how quickly business responds to this agenda will determine which companies succeed and which fail in the next few decades".

Epstein (2008) highlighted three stages in the company's development of its corporate sustainability strategy, from managing regulatory compliance, achieving competitive advantage and completing social, economic, and environmental integration. When strategic, CSR has a small number of initiatives whose social and business benefits are large and distinctive. For example, pioneering value chain innovations and addressing social constraints to competitiveness are each powerful tools for creating economic and social value, however the impact is even greater if they work together (Porter & Kramer, 2006). Therefore, Porter and Kramer (2011) believe that integration of CSR into the supply chain will be the next path to creating sustainable economic value in organizations.

1.4 The business case for sustainability

A growing concern of customers, investors, employees, communities and non-governmental organizations is how to define new sustainable business conduct. Consequently, companies are finding that sustainability performance is a source of differentiation that helps create or destroy shareholder value as well as manage risks (Laszlo, 2005).

While there are differences in the definitions of **sustainable performance** among scholars, relating to long-term stakeholder value (COSO, 2004) and long-term shareholder value creation (SAM, 2000), the majority of authors agree that the ability to provide long-term value demands effective management of the dual nature of uncertainty as an opportunity and as a risk, deriving from economic, environmental and social developments. Early research in this field has focused on the costs of pollution and payment of fines to governments, rather than on systematically addressing the link between sustainability and financial performance.

Subsequently, several studies have confirmed the positive effect of proactive management of environmental and/or social perspectives, for example in the Canadian oil industry as well as in chemical, pulp and paper, and food industries (Sharma & Aragon-Correa, 2005). A 2013 study examined the financial performance of the companies that voluntarily adopted corporate level sustainability practices in order to verify sustainability's profit potential. Scholars provided evidence of "high sustainability companies" – i.e. the companies with a substantial number of environmental and social policies adopted for a significant number of years, that significantly outperform their counterparts over the long-term, both in terms of stock market and accounting performance (Eccles et al., 2013).

The acknowledged potential of sustainable value creation goes beyond the issues of trade-off between social good and business results (Laszlo, 2008; Laszlo & Zhexembayeva, 2011). The concept evolved into embedded sustainability, the strategy framework and set of principles that integrate sustainability into the company and its whole system, defined by Epstein in 2008 and Laszlo and Zhexembayeva in 2011. The core of this approach is a set of new drivers, such as internalization of externalities, rising customer demand for environmental and social performance, and a market redefinition of competitive advantage. As a result, social and environmental values are integrated into the products and processes across the entire value chain without compromises in price or quality. Value is created by an incremental change, or radical innovation at all seven levels of value creation (Laszlo & Zhexembayeva, 2011, pp. 60–68). Hence, companies can use sustainability as a way to mitigate risks, achieve higher operational efficiency, differentiate products, create new markets, protect or enhance brand identity, reshape market rules and regulatory context.

Building a sustainability business case is not easy, as "the business case is not a generic argument that corporate sustainability strategies are the right choice for all companies and situations, but rather something that must be carefully honed to the specific circumstances of individual companies operating in unique positions within distinct industries" (Reed, 2001). This struggle of companies was confirmed by the results of a study by Kiron et al. (2013), with more than half of companies either failing or not even trying to address sustainability. However, a promising outlook arises from the same study's acknowledgment that the percentage of companies reporting additional profit generated by sustainability efforts is consistently increasing.

2 CLIMATE CHANGE IN THE CONTEXT OF AN UNCERTAIN FUTURE

Climate change and scarce natural resources represent one of the most unpredictable and threatening factors following the industrial revolution that will affect the economic and ecologic environment (IPCC, 2007; 2014; Lovelock, 2007; Llewellyn, 2007; Stern, 2007). **This Chapter** comprehensively describes the context of an uncertain future through key challenges, such as the planet's limitations, climate change, demographic trends and technological trends, followed by the discussion of business aspects of an uncertain future, such as risk management, adaptation, and the challenges of competitiveness for the future. Afterthat, the third section is dedicated to climate change as a global threat, presenting climate change evidence, its mechanisms, global and regional scenarios and the necessary measures. The fourth section explores climate change risks and opportunities for companies, while the fifth presents corporate climate change strategies and emphasizes the need for adaptation and transformation strategies in parallel with mitigation strategy.

2.1 Key challenges of an uncertain future

2.1.1 The planet's limitations

In 1972, the Club of Rome, an international think-tank, recognized that the depletion of the Earth's natural resources was leading to severe economic fallout. In the book *The limits to Growth,* they warned that humanity might have to divert much capital and manpower to addressing global ecological constraints such as resource scarcity and emissions (Meadows et al., 1972). While scientists emphasized the potential end of growth that may occur as a collapse, an uncontrolled decline in both population and human welfare, the real end of the world seemed a very distant prospect in 1972. Consequently, the book shared optimistic views by calling for early action to reduce the damage caused by the approaching or exceeding of global ecological limits. The same group of scientists updated their research and forecasts, and published them in the books *Beyond the Limits* (Meadows et al., 1993), and *Limits to Growth: the 30-Year Update* (Meadows et al., 2004).

In 2009, a novel concept of planetary boundaries was proposed by a group of Earth system and environmental scientists led by Johan Rockström from the Stockholm Resilience Centre and Will Steffen from the Australian National University. The concept was designed to define a "safe operating space for humanity", for the international community, including governments at all levels, international organizations, civil society, the scientific community and the private sector. The rationale behind it was scientific research that indicated that since the industrial revolution, human actions have gradually become the main driver of global environmental change. The scientists warned that once human activity passes certain thresholds or tipping points, defined as "planetary boundaries", there

is a risk of "irreversible and abrupt environmental change" (Rockström et al., 2009). Supported by decades of research, this analysis defined nine Earth systems: climate change; rate of biodiversity loss; interference with the nitrogen and phosphorus cycles; stratospheric ozone depletion; ocean acidification; global fresh water use; change in land use; chemical pollution; and atmospheric aerosol loading. However, because of human activities, the research estimates that three of the boundaries have already been transgressed: the climate change, the nitrogen cycle and biodiversity loss, while others are in imminent danger of being crossed (Rockström et al., 2013; Griggs et al., 2013).

Similarly, other recent studies predict and estimate that current demands on the Earth's resources already outstrip those which the planet can sustain (OECD, 2008; Worldwatch Institute, 2007; Gore 2006), such as energy, water shortages and increasing carbon dioxide emissions. In particular, the UN Millennium Ecosystems Assessment (2005) that report on the state of the world's ecosystems has diagnosed the degradation or unsustainable use of 60% of the ecosystem services that support human lives and well-being. The 2007 Energy Outlook report projected a 57% increase in global energy consumption from 2004 to 2030. Reducing current levels of global emissions of greenhouse gases will become increasingly difficult as demand for energy grows in developing countries. The outlook for fresh water supplies is even more pessimistic, with a decrease in fresh water availability per capita of more than 50% between 1950 and 2000 (OECD, 2008). Consequently, there may be a 40% gap between the required demand and the available supply of fresh water by 2030 under business as usual practices (Water Resource Group, 2008)[12].

2.1.2 Climate change

The Earth's climate has changed throughout history and there have been seven cycles of glacial advance and retreat in the last 650,000 years. While most of these climate changes have been attributed to very small variations in the Earth's orbit that changed the amount of solar energy our planet receives, the current warming trend is of particular significance because most of it is very likely human-induced, and is proceeding at a rate that is unprecedented in the past 1,300 years. Consequently, climate change and scarce natural resources will increasingly limit further human development (Flannery, 2005; Griggs et al., 2013) and could lead to sudden and catastrophic events (Alley et al., 2003; Kajfež Bogataj, 2008a).

However, there is great unpredictability and uncertainty regarding the overall impact of climate change, for example the scope, type, magnitude and time dimensions (Stern, 2007). Despite this huge uncertainty, climate change is challenging business leaders to rapidly address it. Moreover, the response and adaptation to climate change requires a dynamic

[12] Water Resources Group was formed in 2008 to contribute new insights to the increasingly critical issue of water resource scarcity. Members include McKinsey, the World Bank, and a consortium of business partners.

strategic discussion that goes beyond purely environmental or corporate responsibility orientation (Hoffman, 2006; Enkvist et al., 2008; Habbitts, 2007, p. 28; Pinkse & Kolk, 2009). Such transformative adaptation could also represent a new opportunity in the development of mankind. Climate change and its business dimensions are discussed further in Chapter 2.4.

2.1.3 Demographical trends

The human population on our planet has increased rapidly since 1800 from 1 billion to 7.3 billion, as at July 2015 (United Nations, 2015). The report estimates that the world's population could reach 8.5 billion by 2030, 9.7 billion by 2050 and could exceed 11 billion in 2100. Such exponential growth has been enabled by improved living standards for most people through economic development, technical and social innovation, international trade and collaboration, and improved health and wealth during last 200 years, in particular following World War II (Cohen, 1995; Meadows et al., 2004).

In contrast to the growth projections, a significant ageing of the world's population is the next demographic challenge. The average life expectancy increased from 46 in 1950 to today's 70 years of age, and is expected to be at around 77 in 2050. Consequently, today 0.9 billion of the global population is over 60 years old, with projections to 2050 of 2.1 billion worldwide (United Nations, 2015). Aging countries are likely to face a shrinking pool of labor, and the scarcity of working-age citizens will significantly decrease economic growth rates in Europe between 2025 and 2050 (Laudicina, 2005). Another cause of global aging is also declining birthrates. Birthrates around the world have declined steadily since the 1950's when each woman had an average of 5 children to the current 2.7 children (Laudicina, 2005). This problem is most acute in developed countries with only 1.7 child per woman, below the rate of 2.1 children per woman that maintains stable population size.

Such demographic trends, with pronounced population aging along with a decline in the proportion of people who are economically active in developed countries on the one hand, and increasing numbers of young unemployed people in the developing world on the other, will also have geopolitical consequences. In such a world, the economic potential of migration flows may become increasingly important, as could be seen by the migration and refugee crisis in Europe in recent years. Even more so, because new migration waves are expected due to the water and climate crisis. The decades to come will necessitate a transformation which human civilization has neither experienced nor has been historically prepared for (Pearce, 2010). Although humans have been somehow successful in modifying the planet to meet the current demand of such rapid population growth, there is a question as to where and when the overpopulated planet will reach its limits (Meadows et al., 2004; Jackson, 2011) and how far we will be able to transform societies to accommodate the aging population and develop more equal societies (Pearce, 2010).

2.1.4 Technological trends

Critical technological breakthroughs are an important factor in considering economic performance and improving the quality of human life. Several predictions of the future have failed, since they did not take into account the power of technology to transform. For example, the 1970's prediction of the Club of Rome that overpopulation would lead to a global energy crisis and mass starvation failed, thanks to "green revolution" and the emergence of biotechnology with more productive agricultural techniques and genetic engineering (Laudicina, 2005).

Since popularization of the term "high tech" by John Naisbitt in 1978, several technological labels emerged, such as nanotech, biotech, and infotech. While some scholars and practitioners argue the applicability of "tech" for some other areas, we could expect the emergence of natural (such as bio-mimicry) and human ecosystems of technology (Barker & Erickson, 2005). Gartner's recent research (Walker & Cearley, 2015) identified the technology trends which stem from merging virtual and physical worlds, the growth of artificial intelligence, and the emerging new realities of IT, along with 3D printing, internet of things, smart machines, cloud/client computing and digital risk-based security that already have a significant impact on modern business and society.

However, technological innovation additionally increased the pace and impact of change for the business world. To illustrate that, patent applications in the U.S. has increased 6 times from 100,000 to 600,000 annually (Dyer, Furr & Lefrandt, 2014). In addition, the diffusion rate of products from invention to saturation also rose dramatically. While it took 39 years for the telephone to go from 10 to 40% penetration in the U.S. market, mobile phones achieved that degree of penetration in 6 years and smartphones in 3 years. That means products and business models become obsolete more quickly and companies must adapt and innovate more rapidly (Zhexembayeva, 2014). Businesses that fail to keep pace may lose their competitive viability, as was the fate of Kodak, Borders Group, Polaroid, and many others (Reeves, Levin & Daichi, 2016).

2.2 Business consideration of an uncertain future

Business turbulence is now the normal condition of industries, markets, and companies. It is manifested through heightened levels of overall risk and uncertainty at both macroeconomic and microeconomic levels. Throughout the history of business, there was always some degree of turbulence both at the macro and micro level. To demonstrate this, we can even cite Aristotle: "It is probable that the improbable will happen". This means that managers have always lived with some degree of risk and uncertainty. The anticipation of constant threats that could have a major impact on companies was well articulated is a famous statement by Andrew Grove, a former president and CEO of Intel Corporation: "sooner or later, something fundamental in your business world will change"

(Grove, 1996). Similarly, the same view was argued by several scholars and practitioners, first by Peter Drucker in his book *The Age of Discontinuity* (Drucker, 1992), Alen Greenspan in *The Age of Turbulence* (Greenspan, 2007), Clayton Christensen in *Business Innovation and Disruptive Technology* (Christensen, 2003), and Kotler and Caslione (2009), who coined a management system to deal with chaos.

However, there is much more risk and uncertainty in business affairs today than ever before, mostly as result of disruptive innovations and big unexpected shocks as revealed by the study of more than 30,000 public firms in the United States over a 50-year span (Reeves et al., 2016) which investigated companies' longevity. The research confirmed that businesses are disappearing faster than ever before as public companies have a one in three chance of being delisted in the next five years, which is six times the delisting rate of companies 40 years ago. Consequently, on average, firms move through business life cycles twice as quickly as they did 30 years ago, while the number of start-ups increased over past fifty years from 10 million to almost 100 million per year (Dyer et al., 2014).

Although the predictions of the future are uncertain, business should consider drivers and developments that are likely to occur. According to the National Intelligence Council's Global Trends 2025 (2008) we can anticipate increasing turbulences around the world, such as rapid political leadership changes in emerging markets, major policy shifts, the rise of new powers, migrations, urbanization, demographics of disorder[13], increasing armed conflicts, local and national government budget cuts, food, water and climate change crises, if we name just some (National Intelligence Council, 2008).

As a result, business should address this ever increasing uncertainty, especially due to the following business implications:

1) *Acceleration of technological uncertainty*. Technological innovation has increased the pace and impact of change that has resulted in uncertainty regarding technologies that might emerge or be combined to create new solutions (see more in Chapter 2.1.4).
2) *High interconnectedness of global business and the complexity and diversity of business environments* that are often harsher, less predictable, and more malleable than classical business environments (Reeves et al., 2016). Consequently, companies are also driving increased correlation across stock markets.
3) *Ecosystem degradation and climate change.* The evidence that the Earth is warming is unequivocal (see more in 2.3). In addition, there is a growing understanding that in spite of immense technological development, our economies and societies still fundamentally depend on ecosystems to provide us with a hospitable climate, clean water, food, fibers and numerous other goods and services (Rockström et al., 2009).

[13] For example, aging of the population and overpopulation, as explained in 2.1.3.

2.2.1 Risk and uncertainty management

Businesses of all sizes everywhere in the world need new strategies to protect themselves and to capitalize on the opportunities that will undoubtedly arise. Thus, companies must be prepared for "strategic inflection points" (Grove, 1996) that occur in all industries as a direct result of specific forces affecting particular businesses, and mean that old strategies do not work anymore and need to be replaced by new ones. As argued by Simons (1995, pp. 166–169), this could be manisfested either as risks to be avoided either as strategic uncertainties, both identified as key strategic variables for business strategy togheter with core values and critical performance variables.

While enterprise risk management offers efficient risk management practices to avoid corporate disorders and failures, there is an expanded list of companies that have been identified with failure to anticipate and manage risks within their organizations[14] (Mikes & Kaplan, 2014). Risk management is not a new management tool and there are several sophisticated models and international regulators that have institutionalized risk management, such as Basel I and Basel II, for banks. In addition, the Committee of Sponsoring Organizations of the Treadway Commission (hereinafter: COSO) has defined enterprise risk management as "a process, affected by an entity's board of directors, management and other personnel, applied in strategy setting and across the enterprise, designed to identify potential events that may affect the entity, and manage risks to be within its risk appetite, to provide reasonable assurance regarding the achievement of entity objectives" (COSO, 2004, p. 6).

However, the financial crisis of 2008 revealed a major gap in the management system of companies with excessive exposure to risk, and therefore some scholars believe that risk management approaches are largely unproven and still emerging (Mikes & Kaplan, 2014, p. 3). There are many different types of risks that companies face. Based on their degree of predictability, controllability and management, as well as on the magnitude of their business consequences, Kaplan (2009) classified three risk categories: category level 1, which encompasses routine operational and compliance risks; level 2, which represents strategy risks; and level 3 which captures global enterprise risks.

The events with a large impact on business but associated with great uncertainty are candidates for early warning. An **early warning system** is a set of capabilities needed to assist individuals, companies, and communities in dealing with discontinuations or strategic surprises. The underlying assumption is that discontinuations do not emerge without warning. Such warning signs are described as "weak signals" (Ansoff, 1975), usually detected by environmental scanning (Aguilar, 1967). They enable companies to

[14] Such companies are BP, Tokyo Electric, Lehman Brothers, Bear Sterns, Marril Lunch, Enron, Tyco, Kodak, Polaroid, the Mirror Group, among many others.

respond appropriately and in sufficient time to reduce the possible of harm or loss (IPCC, 2012). The second system is a strategic early warning system that focuses on the issues management ignores, or whose implications management has not yet fully recognized. Such a system detects weak, ambiguous, early signals, sometimes years before management is due to register them on its radar (Gilad, 2006). By detecting the weak signals (Aguilar, 1967), both systems allow companies to react ahead of time. Early warning drivers are building blocks for the company's **scenario planning**. Scenarios fisrt emerged as military planning after World War II but reached a new dimension with pioneering work of Pierre Wack at Royal Dutch/Shell in enrly 1970's (Schwartz, 1998, pp. 7–9). They are not predictions, rather they define the rules of that world and how companies, societies, and people behave. Once the company decides what the drivers are, it can develop scenarios that become targets of its early warning system (Fuld, 2004). Scenarios enable managers to anticipate and take better decisions about the future with a knowledgeable sense of risk and reward (Schwartz, 1998).

Climate change poses risks for human and natural systems with implications for future generations, economies, and environments (Oppenheimer et al., 2014). Therefore, it demands that companies not only apply risk management processes but also reduce and manage risks through **adaptation** and mitigation (IPCC, 2014).

Risk can be considered in relation to **resilience management** (Böggemann & Both, 2014). The modern awareness of risk is not about our own experience or about current statistical risk, but rather about an uncertain future (Hovden, 2004). Consequently, resilience-based management (see more in 2.3.3) is characterized by an emphasis on transdisciplinarity, redundancy, and diversity (Hovden, 2004) rather than to risk management, characterized by an emphasis on scientific assessments, reduction of exposure and/or probabilities.

Although uncertainty is accelerating, it does not affect all industries in the same way. Some scholars differentiate between the two primary types of uncertainty: demand uncertainty, which refers to whether customers will buy your product, and technological uncertainty, which refers to the question whether we can devise a desirable solution (Dyer et al., 2014). Companies from the industries that are in the upper right quadrant of the matrix for both uncertainties, such as pharmaceutical, medical, computer and software, are facing high uncertainty and require greater innovation management skills than industries in any other quadrant. Hence it is not a surprise that more than 80% of the most innovative companies compete in the industries in the upper right quadrant (Dyer et al., 2014).

2.2.2 Competitiveness for the future

While uncertainty could be observed as being a risk, it also presents an opportunity. In 1994 Hamel and Prahalad (1994) articulated the business term "Competing for the Future" as a response to an increasingly uncertain environment, institutional entropy and

management's short-sighted view of downsizing, delayering, divesting, and refocusing. They claimed that companies must invest in creating the future as seen by the potential needs of their customers and must have the foresight to create and dominate emerging opportunities, if they wish to survive in the long-term. This approach of companies in shaping the structure of future industries was further developed by several academics (Kim & Mauborgne, 2005; Hamel, 2007; Zhexembayeva, 2014). However, the goal was not to predict the future, but to imagine the future based on changes in technology, life style, work style, regulation, global geopolitics, and similar. The long-term is thus not something that happens someday, but it is what every company is building on a daily basis.

Such forward thinking is not an easy task in the corporate world. As stated by Hamel and Prahalad (1994), senior management devotes on average less than 3% of its energy to building corporate perspectives for the future. Here again, companies should use weak signals and trend lines (Canton, 2006) that suggest how the future might be different, in order to build their scenarios and forecasts (Hamel & Prahalad, 1994, p. 88). However, the most surprises do not occur due to lack of early signs, but for the lack of a culture and mindset open to seeing them (Kotler & Caslione, 2009). Competing for the future is about attaining long-term competitiveness, because, as quoted by Hamel and Valikangas (2003), "any company that can make sense of its environment, generate strategic options, and realign its resources faster than its rivals will enjoy a decisive advantage".

2.2.3 Resilience

Resilience is the capacity of a business, economic, social or natural system to deal with change, to adapt, survive, and continue to develop. It requires knowledge regarding how to strengthen the capacity to deal with shocks and disturbances with a high impact and a low probability of occurrence, such as a financial crises or climate change (Bresch et al., 2014; Böggemann & Both, 2014; Moberg & Simonsen, 2014; Hamel & Valikangas, 2003).

Initially, resilience emerged as a unifying concept in a number of disciplines linked to sustainability sciences (Curtin & Parker, 2014; Li & Guo, 2015). However, interest in resilience extended from ecology and natural resource management (Quinlan, Berbés-Blázquez, Haider & Peterson, 2015) to fields such as international development, health, food security, community planning and disaster management (Xu et al., 2015), and recently in particular to business management (Hamel, Valikangas, 2003; Hamel & Prahalad, 1994; Kotler& Caslione, 2009). Companies can foster their resilience by developing their long-term adaptive capacity (Bresch et al., 2014), which is built on the capacity for learning, foresight, and self-organization (Albani & Kupers, 2014). While Hamel and Valikangas (2003) argue that resilience spurs innovation and long-term survival, the author of *Antifragile* (Taleb, 2012) differentiates the resilience that resists shocks but stays the same from the antifragility that improves after the shocks.

Strategic resilience differs from **operational resilience** (Hamel & Valikangas, 2003; Birkinshaw, 2012) with adaptive capability to broader threats in the business environment and with an ability to dynamically reinvent business models and strategies before the change becomes obvious. This is possible by continuously anticipating and adjusting to changes and deep secular trends that can severely impact core business, and by developing the strategy that is forever transforming and constantly meeting the requirements of emerging opportunities and incipient trends. Therefore, the company must master the following challenges to achieve strategic resilience (Hamel & Valikangas, 2003):

- Cognitive challenge, which denotes a conscious approach of companies to what is changing and their perpetual willingness to consider how those changes are likely to affect their current core business.
- Strategic challenge, which requests the exploration of a range of strategic alternatives to accommodate changes in the environment.
- Political challenge, which demands the liberation of resources (capital and talent).
- Ideological challenge, which refers to companies' accelerated pace of strategic evolution aimed at mimicking nature's reactions: automatic, spontaneous, reflexive.

Contrary to that, operational resilience means recovering from threats to day-to-day operations by having the ability to respond quickly and by rebalancing the product mix (Birkinshaw, 2012; Hamel & Valikangas, 2003). For example, Winston (2014) classifies cost and risk resilience, in reference to resources, energy efficiency and renewable sources, and revenue resilience, which provides protection against volatility in demand. In addition, the following elements have been identified in recent academic research:

- **Structural resilience** focuses on the structural elements that build resilience of the system itself, with a view to improving system performance continuity. The main pillars are redundancy, modularity (Albani & Kupers, 2014; Bresch et al., 2014), and requisite diversity (Winston, 2014; Hamel & Valikangas, 2003).).
- **Integrative resilience** emphasizes the complex interconnections of the company with its environment, for example business stakeholder's integration (Kotler & Caslione, 2009), new partnership forms (Winston, 2014), and co-creation models (Bulc, 2012). Consequently, systems thinking acknowledges that a natural-social-economic system consists of many different scales, emphasizing the unity with ecosystems and that human and nature are strongly coupled (Moberg & Simonsen, 2014). In addition, thresholds and social capital are also eminent concerns of integrative resilience. They describe the accumulated capacity for the bottom up self-organization of a society's response to stress (Albani & Kupers, 2014). Integrative resilience also refers to a dynamic strategic system with quick responses and with a shorter planning cycle.
- **Transformative resilience** adds a longer time scale to ensure and enhance a company's transformability. It is supported by the evaluation of governance models, foresight capacity, innovation (Hamel & Valikangas, 2003) and experimentation (Albani & Kupers, 2014; Bresch et al., 2014).

Increased interest in managing resilience has led to efforts to develop standardized tools for assessments and quantitative measures. However, there are no simple solutions due to the complex adaptive systems and system dynamics of resilience. However, unlike sustainability, resilience has no normative connotation (Böggemann & Both, 2014). However, there are several intersections with sustainability, especially as businesses can build long-term relationships, innovate enduring designs and invest in long-lasting infrastructure to survive and thrive over the long-term (Bansal & DesJardine, 2014).

2.3 Climate change as a global threat

Climate change is an alteration in the state of the climate that can be identified by changes in the mean and/or the variability of its properties. It persists for an extended period, typically decades or longer (IPCC, 2007). As such, it is a fundamental reference point for framing the different management themes and strategic challenges dealt with in this thesis.

Climate change may occur due to natural internal processes, natural external forcing, or due to persistent anthropogenic changes in the composition of the atmosphere or in land use (IPCC, 2014). Current anthropogenic climate change is projected to continue during this century and beyond. This conclusion is robust under a wide range of scenarios for future greenhouse gas emissions, including some that anticipate a reduction in emissions (IPCC, 2007a). While specific, local outcomes of climate change are still uncertain, recent assessments (IPCC, 2014) project alteration in the frequency, intensity, spatial extent, or duration of weather and climate extremes, including climate and hydro meteorological events such as heat waves, heavy precipitation events, drought, and tropical cyclones. Such change, in the context of increasing vulnerability, will lead to increased stress on human and natural systems, and subsequently also on the business world.

2.3.1 Science: Climate change evidence, mechanisms and scenarios

For more than half a century, natural scientists have been studying greenhouse gases and other mechanisms that lead to global warming (Hansen et al., 2007; Jones, New, Parker, Martin & Rigor, 1999; IPCC, 2001, 2007; Mann et al., 2003, Nordhaus, 2007). There is a consensus among the majority of researchers regarding the changing composition of the Earth's atmosphere (Kajfež Bogataj, 2009; Hansen et al., 2007; IPCC, 2001, 2007, 2008, 2008a, 2014; Jones et al., 1999; Lovelock, 2007; Mann et al., 2003; Stern, 2007; Wigley, 2005), although there are still some skeptics, mainly because past and potential changes in solar output are still to a certain extent unknown (Warsh, 2007) or because global climate has always changed and always will (Robinson, Robinson & Soon, 2007).

Since 1990, the Intergovernmental Panel on Climate Change (IPCC) has produced a series of Assessment Reports, Special Reports, Technical Papers and Methodology Reports. Its most recent publications of 2014 (IPCC, 2014) acknowledge that each of the last three

decades has been successively warmer at the Earth's surface than any preceding decade since 1850. The period from 1983 to 2012 was likely the warmest 30-year period in the last 1.400 years in the Northern Hemisphere, where such assessment is possible (medium confidence). The globally-averaged combined land and ocean surface temperature data, as calculated by a linear trend, shows a warming of 0.85 [0.65 to 1.06] °C over the period from 1880 to 2012 (IPCC, 2014, p. 2). On a global scale, the ocean warming is largest near the surface, and the upper 75 m warmed by 0.11 [0.09 to 0.13] °C per decade over the period from 1971 to 2010.

Total anthropogenic GHG emissions continued to increase from 1970 to 2010 with larger absolute increases between 2000 and 2010, despite a growing number of climate change mitigation policies. Anthropogenic GHG emissions in 2010 reached 49 ± 4.5 gigatons CO_2-eq/yr 3 (IPCC, 2014, p. 5). Emissions of CO_2 from fossil fuel combustion and industrial processes contributed about 78% of the total GHG emissions increase from 1970 to 2010, with a similar increase during the period 2000 to 2010 (high confidence).

Observations from satellites in the period from 1992 to 2011 show that the Arctic ice has been shrinking by 2.7% per decade, in summer by even 7.4% per decade. Apart from this, permafrost in the Arctic warmed by up to 3°C and in the northern hemisphere there is 7% less seasonally frozen soil. Consequently, the melting of ice and expansion of the sea has already caused rising sea levels (Kajfež Bogataj, 2008b), with global mean sea level rose by 0.19 [0.17 to 0.21] m over the period from 1901 to 2010 (IPCC, 2014, p. 4), what is faster than the mean rate during the previous two millennia (high confidence).

A rise in air and ocean temperatures causes increasing humidity. This is related to a higher frequency of heavy precipitation also in the areas that have experienced a declining trend of annual precipitation. In the 1901–2004 period, there was 11–21 mm growth of annual precipitation in relation to the millennium average, however with great regional variations. Drought resulting from the changes in the air circulation regime is affecting the world with increasing frequency, and has devastated many geographic areas in spite of the global increase in precipitation. After 1970, more droughts were observed in the Sahel, the Mediterranean, South Africa and South Asia. On the other hand, there was more precipitation in the East of Americas, the North of Europe, and North and Central Asia. Impacts of recent climate-related extremes, such as heat waves, droughts, floods, cyclones and wildfires, reveal significant vulnerability of some ecosystems and many human systems to current climate variability (IPCC – very high confidence) (IPCC, 2014, p. 8).

In such circumstances the prospects for climate-resilient pathways for sustainable development are related fundamentally to whatever the world accomplishes through climate-change mitigation phase (IPCC, 2014). Since mitigation reduces both the rate and the magnitude of warming, it also increases the time available for adaptation to a particular level of climate change, potentially by several decades.

2.3.2 Climatology: global and regional scenarios

Climate change should be considered as a real, long-term global problem that encompasses air and ocean warming, ice and snow melting, and sea level rising (Kajfež Bogataj, 2009). These developments have already shown the vulnerability of countries' economies and people. The forecasts of the climate system and its changes in the future depend heavily on the scenarios of greenhouse gas emissions.

IPCC refers to four groups of scenarios. Their latest report from 2014 states that a continuing rise in global temperature by at least 0.2°C per decade can be expected. Under the best case scenario, temperature is anticipated to rise by +1.8°C (compared to the 1961–1990 period), or alternatively by +4°C alongside increasing greenhouse gas emissions and by a maximum of 6.4°C (IPPC, 2007) by the end of the century (with variability by region and country). The future climate will depend on committed warming caused by past anthropogenic emissions, as well as by future anthropogenic emissions and natural climate variability. If there are no major volcanic eruptions, IPCC (2014) estimates with medium confidence that the global mean surface temperature change for the 2016–2035 period is likely be in the range of 0.3°C to 0.7°C.

It is virtually certain that there will be more frequent hot and fewer cold temperature extremes over most land areas on daily and seasonal timescales, as the global mean surface temperature increases. It is very likely that heat waves will occur with a higher frequency and longer duration. Changes in precipitation will not be uniform. The global ocean will continue to warm during the 21st century, with the strongest warming projected for the surface in tropical and Northern Hemisphere subtropical regions.

Risk of climate-related impacts results from the interaction of climate-related hazards (including hazardous events and trends) with the vulnerability and exposure of human and natural systems, including their ability to adapt (IPCC, 2014a). Rising rates and magnitudes of warming and other changes in the climate system, accompanied by ocean acidification, increase the risk of severe, pervasive and in some cases irreversible detrimental impacts. Some risks are particularly relevant for individual regions and some regions are likely to be especially affected by climate change. Therefore, the impacts of climate change vary significantly among regions (IPCC, 2007, 2014):

- the Arctic, because of the impacts of high rates of projected warming on natural systems and human communities;
- Africa, because of low adaptive capacity and projected climate change impacts;
- small islands, where there is high exposure of population and infrastructure to projected climate change impacts and sea level rise;
- Asian and African mega deltas, due to large populations and high exposure to sea level rise, storm surges, and river flooding.

In addition, on a global and regional level, there will be climate change related risks from extreme events, such as heat waves, heavy precipitation and coastal flooding (high confidence) that will increase progressively with further warming (IPCC, 2014).

2.3.3 Rapid climate change scenario

Anthropogenic warming could lead to some impacts that are abrupt or irreversible, depending upon the rate and magnitude of the climate change (IPCC, 2007). Rapid or abrupt climate change occurs when the climate system is forced to transition to a new climate state at a rate determined by the climate system energy-balance, which is more rapid than the rate of change of the external forcing (Committee on Abrupt Climate Change, 2002).

The term is also used within the context of global warming to describe sudden climate change that is detectable over the time-scale of a human lifetime (Kajfež Bogataj, 2008), with large and potentially serious economic and ecological impacts (Alley et al., 2003). For example, Earth systems models project that, under ongoing greenhouse gas emissions, as early as in 2047 the Earth's near surface temperature could depart from the range of variability in the last 150 years, affecting over 3 billion people and most places of great species diversity on the Earth (Mora, 2013).

There are three potential occurrences of rapid climate change (Kajfež Bogataj, 2008), with arguments that climate change is likely to lead to some irreversible impacts (IPCC, 2007a) due to the potential danger of "fast-feedback" effects causing ice sheet disintegration, based on paleoclimate data, although it is difficult to predict the time of a collapse in such a nonlinear problem (Hansen et al., 2007). The first is accelerated climate change, caused by the additional release of greenhouse gases from permafrost and the oceans as the climate warms. The second occurrence carries the potential climatic implications of a collapse of the thermohaline circulation in the North Atlantic, resulting in cooling across Europe. The third occurrence is related to a rapid sea level rise that would result from the disintegration of the West Antarctic Ice Sheet. These rapid climate change scenarios served as foundation for development of two research scenarios in Chapter 4.1.4 with the aim to test the anticipation of such sudden changes and emerging impacts in selected explanatory case study company PSE&G as presented under research results in Chapter 4.4.

2.3.4 Economic effects of climate changes

Many scientists warn that climate change will strike even harder and faster than expected (IPCC, 2008b, 2014; Stern, 2007; Lovelock, 2007; Llewellyn, 2007), as human activities are constantly accelerating its development (Schwartz, 2007). The extent and characteristics of climate change impacts are still quite unpredictable and will depend on the speed of the mitigation measures and adaptation of countries, economies and people.

The cost of economic damage caused by climate change and the mitigation price are also unpredictable, although many analyses predict reductions by several percent of world gross domestic product due to climate related costs caused by increased extreme weather events or by sea level rises in low-lying areas. The conservative estimate of this cost is between 0 and 3% of gross world product (GWP) per year when the average global Earth temperature increases by 2 to 3°C (Mendelsohn et al., 2000; Tol, 2008; Nordhaus, 2007) and a 5 to 11% loss in GWP at the warming of 5–6°C (Stern, 2007).

In all scenarios, the cost varies a great deal by region because of the different climate change exposure. In addition, Wilbanks et al. (2007, p. 377) argue with high confidence, that the economic costs of extreme weather events in large countries or on large regional scales would unlikely exceed more than a few percent of the total economy in the year of the event, except for possible abrupt changes, while in smaller countries, particularly developing countries, the short-run damage could amount to more than 25% of GDP in the year of the extreme event.

The unpredictability of estimates and the fact that climate change is not only a scientific and economic category but also an ethical and philosophical one, led to many academic debates concerning the cost estimation and the cost-benefit analysis (Stern, 2007; Nordhaus, 2007, 2008; Dasgupta, 2007; Weitzman, 2008; Deaton, 2008).

2.3.5 Necessary measures

Delaying mitigation may reduce options for climate-resilient pathways in the future. Therefore, the international political response to climate change began at the Rio Earth Summit in 1992, where the 'Rio Convention' included the adoption of the UN Framework Convention on Climate Change (UNFCCC). This convention set out a framework for action, aimed at stabilizing atmospheric concentrations of greenhouse gases (GHGs) and is reviewed by annual Conference of Parties (COP). The first COP took place in Berlin in 1995. Significant meetings since then have included COP3, where the Kyoto Protocol was adopted, COP11 where the Montreal Action Plan was produced, COP15 in Copenhagen where an agreement to succeed the Kyoto Protocol was unfortunately not realized, and COP17 in Durban where the Green Climate Fund was created.

For the first time in over 20 years of UN negotiations, COP21, also known as the 2015 Paris Climate Conference, aimed to achieve a legally binding and universal agreement on climate to keep the global warming below 2°C. COP 21 was held in Paris from November 30 to December 12, 2015 and negotiations resulted in the adoption of the Paris Agreement to curb emissions in order to limit the increase in the global average temperature to "well below" 2°C "above pre-industrial levels" (UNFCCC, 2015).

Anything above this threshold of 2°C could have serious consequences, meaning more extreme weather and climate-related events. However, to achieve this target the reduction of global greenhouse gas emissions by up to 70% by 2050 is needed, with the aim of becoming fully carbon neutral by 2100. While 180 countries submitted plans to limit their greenhouse gas emissions, the Paris Agreement will enter into force only if 55 countries which produce at least 55% of the world's greenhouse gas emissions ratify it (UNFCCC, 2015)[15].

The Paris Agreement and the outcomes of the UN climate conference COP21 cover all the crucial areas identified as essential for a landmark conclusion:

- Mitigation – reducing emissions fast enough to achieve the temperature goal.
- A transparency system and global stock-take – accounting for climate action.
- Adaptation – strengthening ability of countries to deal with climate impacts.
- Loss and damage – strengthening ability to recover from climate impacts.
- Support – including finance, for nations to build clean, resilient futures.

COP21 is one of the most important milestones in regards to necessary measures taken on global scale but it has also some weaknesses, such as that there are no sanctions, taxes, or other means of punishing those who break the agreements or who fall short of the targets set by COP21. In addition, critics of the agreement, such as professor James Hansen, have been very vocal in pointing out that there are rather promises than actions and that the pledges do not quite match the goal of greenhouses reduction (Milman, 2015).

2.4 Climate change's effect on the business world

2.4.1 Business responses to climate change

Climate change is recognized as the most pressing long-term issue that affects social, environmental and economic concerns of companies. Businesses are likely to be affected both by climate change itself, such as physical exposures through shifting temperature, weather patterns, and geostrategic changes due to sea level rises, and by policies to address it, for example through regulations that increase the cost of emissions, and through behavior changes in customers (Kolk & Pinkse, 2005). These new major forces could dramatically reshape the business world (Porter & Reinhardt, 2007) and affect the availability of business inputs, such as the size, growth, and nature of demand, and the access to related and supporting industries.

Although managers believe that climate change is a real risk to companies, they are not prepared yet to respond strategically (Kiron et al., 2013). Rather, they treat climate change

[15] By the time of the last edit of this disertation in March 2016, this was not achieved yet.

as an environmental or corporate social responsibility issue (Porter & Reinhardt, 2007). Consequently, as argued by Stern, such typical approach of executives to managing climate change risks as a problem of regulatory compliance, potential liability from industrial accidents, and pollutant release mitigation, will not be sufficient for addressing climate change because (Stern, 2007):

- **Causes and consequences of climate change are global**, although climate change is likely to have a substantially different impact across countries.
- **The impact is long-term and will persist,** as once greenhouse gases have entered the atmosphere, some remain there for hundreds of years.
- **Uncertainties and risks are huge.** Consequently, this raises the general issue of decision making against the uncertainty of a potentially catastrophic event.

While emissions measurement, target setting and reporting are generally considered to be the initial activities in a company's response to climate change (Pinkse & Kolk, 2007), companies should systematically assess their vulnerability to floods, droughts, storms, and sea level rises, aside from water, resources and food supply, and then make proactive investments and support policy initiatives. After that, companies should develop and implement strategies for the reduction of greenhouse gas emissions and for climate change adaptation. Such corporate responds to climate change are beyond usual operational improvements, rather have a more strategic role (Porter & Reinhardt, 2007).

Therefore, business leaders need to address climate change as any other strategic threat or opportunity, with anticipation of climate change impacts on the value preposition of a company (Porter & Kramer, 2006), including supply-chain breakdowns, employee migrations, increases in disease, and for the enhancement of their competitive position (Kolk & Pinkse, 2008; Lash & Wellington, 2007). Beyond only defensive and/or compliance approaches (Zedek, 2003) companies can avoid costs, manage liabilities and build resilience to climate change impacts, while at the same time increasing community resilience (UN Global Compact et al., 2011).

There are already first evidences that top climate companies report stronger financial performance and a better ability to manage the shifting dynamics of natural resource supplies, customer demand and regulatory controls (CDP, 2015a). In 2014, over 1,000 businesses and investors showed their support for carbon pricing by signing the World Bank Group's carbon pricing statement. Similarly, 150 companies reported to the Carbon Disclosure Project (hereinafter: CDP) that set an internal price on carbon in 2014, while in 2015 the number of these companies nearly tripled to 437 (CDP, 2015).

In addition, as climate change adaptation and disaster risk management are critical elements of long-term sustainability (Wilbanks et al., 2007) and resilience (IPCC, 2014), these concerns have already affected the capital market's behavior, as there is a growing

recognition of real costs and risk implications. Especially, as future expectations are already reflected in today's stock price calculations, while the companies might be badly handicapped, might need to invest significant costs for adaptation or may even cease to exist at the time of payback. Therefore, investors are adopting guidelines for asset management and lending, aimed at encouraging companies to implement mitigation plans and manage fiduciary responsibilities today.

Consequently, leading financial institutions have joined several initiatives: the Portfolio Decarbonization Coalition, committed to cutting the carbon intensity of investments and re-investing capital in carbon-efficient companies, projects, and technologies; the Montreal Carbon Pledge whose aim is to measure and publicly disclose the carbon footprint of investment portfolios on an annual basis; and the Low Carbon Investments (LCI), committed to investing in renewable energy, green bonds, energy efficiency, and low carbon funds (CDP, 2015a).

Furthermore, all investors will expect that companies will see and understand the trends, threats and opportunities and will prepare and execute the appropriate mitigation, adaptation and post-carbon strategies. These requirements together with the short-term pressure on performance by the capital markets are foreseen as the most complex, demanding and challenging management issues for executives and companies at the beginning of the 21st century.

2.4.2 Climate change risks

Before 2007, climate change was mostly perceived as an external, uncontrollable risk with very low probability of occurrence[16]. Following that, several academics and practitioners simultaneously emphasized the need to consider climate change as a strategic risk (Schwartz, 2007; Porter & Reinhardt, 2007; Stern, 2007), as businesses are exposed to six aspects of climate change (Lash & Wellington, 2007):

- **Regulatory risk** is the most recognized area of impact that occurs either as the regulation of the emissions from products or from the manufacturing process.
- **Supply chain risk** could lead to higher component or energy costs, while the company should take into account also the geographical distribution of it suppliers' network.
- **Product and technology risks** could be perceived more as an opportunity, depending on a company's ability to identify ways to exploit new market opportunities for low carbon or carbon-neutral products and services.
- **Litigation risk** is connected to companies that generate significant carbon emissions and thus face the threat of lawsuits similar to those experienced in the past by the tobacco, pharmaceutical, and asbestos industries.

[16] Could be classified under category Level 3 risks classification (Kaplan & Mikes, 2012).

- **Reputation risk** can in some sectors affect the value of company brands because of negative perceptions related to climate change (Carbon Trust).
- **Physical risk** is a direct risk posed by the physical effects of climate change such as droughts, floods, storms, and rising sea levels.

Aside from usual business climate change responses with strategies related to mitigation, there are multiple approaches to managing these risks, from vulnerability and exposure reduction through decisions, planning and adjustments, near-term disaster risk management, adaptation to longer-term climate change and transformation. There are many potential synergies between disaster risk management and climate change adaptation which can contribute to social, economic and environmental sustainability and a resilient future (IPCC, 2014, p. 469).

In addition, companies should build their coping and adaptive capacities[17] for climate change (IPCC, 2014):

- Capacity to anticipate and reduce risk.
- Capacity to respond.
- Capacity to change, as a requirement of adapting to climate change.

Although the systems' vulnerabilities created by climate change could turn into opportunities for businesses to develop new technologies and new partnerships with governments, other players in the supply chain, and even with traditional competitors, the recovery from severe weather events might be impossible (Schwartz, 2007a).

2.4.3 Climate change effects on particular industries

It should be noted that climate change will not affect all companies with the same intensity and scope. Hence, climate change may not be a strategic issue for some companies, also multinational, given the nature of their industry, the nature of their activities, and the inconclusiveness of policy-making (Pinkse & Kolk, 2009).

On the other side, rising temperatures and extreme weather events already have visible consequences for several industries that are/will be more and more affected by water resources unavailability, agriculture and food security issues, changes in coastal zones and in marine ecosystems, and by consequences on human health (Kajfež Bogataj, 2009). All these developments increasingly create pressure for corporate actions on climate change.

[17] Here, capacity refers to the combination of all the strengths, attributes, and resources available to the company to use to achieve its established goals.

A number of industrial sectors that will be affected by climate change include forestry, fisheries, energy (see more about climate change effects on energy and utility industry in Chapter 4.2.1), insurance, tourism and recreation industries, with highly uncertain aggregate impact of climate change on most of these sectors (Schneider et al., 2007, p. 790). In addition, according to Tol (2008), all main infrastructure, such as roads, airport runways, railway lines and pipelines (including oil pipelines) may require increased maintenance and renewal as they become subject to greater temperature variations and are exposed to weather that they were not designed for.

2.4.4 Business initiatives

Beyond the stages of carbon measurement and management and after companies had taken steps to reduce emissions and calculate costs per ton of greenhouse gases, some companies understood the significance of participation in policy making as climate-related standards were being set at the state and international levels (Hoffman, 2007). Among the first such initiatives of companies were Chicago Climate Exchange, the Pew Center's Business Environmental Leadership Council, and the Global Roundtable on Climate Change.

On an international level, companies are engaged in the United Nations Framework Convention on Climate Change with its annual conferences, such as recent COP 21 in Paris. There are also other business initiatives within the framework of the United Nations. Caring for Climate was launched by UN Secretary-General Ban Ki-moon in July 2007 as a sub-group of the United Nations Global Compact, together with the secretariat of the United Nations Framework Convention on Climate Change (UNFCCC) and the United Nations Environment Programme (UNEP). The initiative defines climate change adaptation as "initiatives and measures to reduce the vulnerability of natural and human systems against actual or expected climate change effects and helps companies to advance practical solutions, share experience, inform public policy as well as shape public attitudes, (United Nations Framework Convention on Climate Change, 2015).

Similarly, the Adaptation Program was launched by the United Nations Framework Convention on Climate Change (UNFCCC), based on the unique expertise of the private sector, its capacity to innovate and produce new technologies for adaptation, and its financial leverage (Adaptation Private Sector Initiative, n.d.). This initiative aims to catalyze the involvement of the private sector in the wider climate adaptation community and was launched to form an important part of the multisector partnership that is needed between governmental, private and non-governmental actors (UNCFCCC, 2015; UNGC, UN Environment Programme, Oxfam & the World Resources Institute, 2011).

Among climate change initiatives beyond international institutions is the most well-known CDP, initially named the Carbon Disclosure Project. CDP works with institutional investors and motivates companies to disclose their impacts on the environment and

natural resources and take action to reduce them (CDP, 2015). CDP holds the largest collection globally of self reported climate change, water and forest-risk data, requesting information on greenhouse gas emissions, energy use and the risks and opportunities from climate change (CDP, 2015).

One among CDP's recent initiatives is a joint platform with a coalition of organizations working with global businesses and investors that recognize the necessity of transition to low-carbon as the only way to secure sustainable economic growth and prosperity for all. The other initiative, the Low Carbon Technology Partnerships Initiative (LCTPi) supports businesses who want to be in pole position for success in a low-carbon future. It provides a collaborative platform for private and public stakeholders to discuss solutions to accelerate low-carbon technology development, and scale up the deployment of business solutions to a level and speed that are consistent with limiting global warming to below 2°C.

2.5 Business strategies for climate change

2.5.1 Demands for strategic approach

The strategic nature of climate change has been emphasized by several academics (Porter & Kramer, 2006; Porter & Reinhardt, 2007; Kolk & Pinkse, 2005), as climate change consideration should be part of both a strategy formulation process as well as embedded in the strategy implementation tools (Zingales et al., 2002). Sustainable climate related strategies cannot be an add-on to existing business models, independent of the company's overall strategies. Rather, the overall company's strategy should integrate mitigation and adaptation measures as well as transformational strategies.

The **mitigation or abatement strategies** concern actions for decreasing CO_2 emissions, such as improving energy efficiency, cutting non-fossil-fuel-related emissions, diverting demand from emissions-intensive goods and services and switching to low-carbon technologies. However, even if quite substantial abatement policies are put in place, and fairly immediately, significant climate change will occur nevertheles[18] (IPCC, 2007).

Consequently, climate change mitigation strategies unavoidably need to be supplemented by policies and **strategies of adaptation** in order to limit the damage, and hence the costs, resulting from climate change. In addition, there is a need to formulate more **transformational strategies** to develop new business opportunities in post-carbon world (Hoffman, 2006; Pinkse & Kolk, 2009; Habbitts, 2007, p. 28; Enkvist et al., 2008).

[18] Scientific evidence suggests that, even if all greenhouse gas emissions were to cease forthwith, Earth's mean temperature would continue to rise, because of lagged and feedback effects, by a further 1°C or so over the coming 50–-100 years.

Unfortunately, many companies are neglecting these facts and are not reacting because they expect that climate change impacts will occur only in the long run, not within their current strategy horizon (Pinkse & Kolk, 2009, p. 85; Habbitts, 2007). Hence, companies' approaches are mostly reactive and not strategic (Porter & Reinhardt, 2007, Schwartz, 2007), avoidant and resistant rather than proactive (Kolk & Pinkse, 2004).

On the contrary, the businesses that will survive and prosper in the post-carbon world will tend to be those that will have at an early stage recognized the inexorability of climate change, foreseen the implications for their industry, adapted to the new circumstances, and redefined strategy to the new strategic momentum[19].

Such a strategy with an eye on climate change impacts and regulatory constraints is fast becoming a corporate imperative (Esty & Winston, 2006). For example, the pharmaceutical company Baxter was one among first presented cases that already aligned its strategies for a GHG emissions program and reduction strategies with overall strategies while using the BSC (Meissen, 2007).

2.5.2 Strategies for mitigating climate change

In the existing climate change literature and practice, business strategies for climate change mitigation refer to a series of objectives and action plans aimed at reducing the rate of climate change via the management of its causal factors, such as the emission of greenhouse gases from fossil fuel combustion, agriculture, land use changes, cement production, etc. (IPCC, 2007c).

Consequently, mitigation or abatement methods are directed towards actions for reducing carbon emissions, improving energy efficiency, cutting non-fossil-fuel-related emissions, diverting demand from emissions-intensive goods and services and switching to low-carbon technologies. Mitigation climate change strategies usually entail the following processes (Grobbel, Maly & Molitor, 2004; Pinkse & Kolk, 2009; Hoffman, 2007a; Enkvis & Vanthournout, 2008):

- **Indirect and direct emissions reductions from:**
  - energy and fuels efficiency initiatives;
  - redesigning the distribution system, decreasing supply chain emissions;
  - materials usage strategies;
  - optimizing current assets and products, and repositioning the asset portfolio;
  - reducing costs through carbon efficient operations;
  - capturing profit in carbon-trading markets.

[19] Some authors also refer to new moral and ethic principles (Laszlo, 2005).

- **Research, development and investment into new low carbon solutions, production and process connected technology:**
  - building new low-carbon business;
  - shaping the regulatory landscape;
  - assessing the value at stake and developing a stance on regulation; and
  - leveraging the advantages of incumbent or attacker positions;
- **Public policy engagement:**
  - engaging regulators at many levels.

2.5.3 Strategies for adapting to climate change

Significant climate change will occur even if quite substantial abatement policies are put in place, and fairly immediately (IPCC, 2007). Therefore, climate change mitigation should unavoidably be supplemented by policies and strategies of adaptation to limit the damage, and hence the cost, resulting from climate change.

Adaptation can be defined as the process of adjustment to actual or expected climate change and its effects in order to moderate harm or exploit beneficial opportunities (IPCC, 2014). It could consist from the following corporate actions (UNGC et al., 2015):

- Connect climate "adaptation" and "resilience" to the company and corporate culture, building on existing mitigation initiatives.
- Integrate climate adaptation into core strategic business planning processes.
- Align business objectives with adaptation priorities.
- Build a portfolio of climate-resilient goods and services.
- Build mutually beneficial strategies with stakeholders; build communication channels.
- Partner with internal and external decision-makers.

Adaptation strategy could be anticipatory or reactive, as well as incremental or transformative (Neil et al., 2008). In any case, climate change adaptation is an ongoing process that encompasses responses to many emerging factors, including those evolving from the experience with vulnerability reduction planning and risk perception (IPCC 2014, p. 443). While such early respond on adaptation might be foreseen as additional non-business related costs, conversely, costs of adaptation will rise exponentially if efforts to mitigate emissions are unsuccessful (Stern, 2007; Oppenheimer et al., 2014).

2.5.4 Climate change as a transformative opportunity

Climate change presents an unusual situation, being referred as a cost but also as an opportunity for companies who react in the very early stage. While there are sound short-term upsides due to eco-efficiency and green innovation, the downside associated to climate change is long-term, although it may be far more expensive in the future if we do not act now (Schwartz et al., 2007).

Even though there is evidence of a gap between the awareness of climate change and business action (Kiron et al., 2013), some climate change business initiatives, such as CDP and UNGC, are reporting on progress in the recognition of the strategic opportunity presented by the transition to a low-carbon global economy by leading companies and investors (CDP, 2015). This can be perceived as an opportunity, since significant corporate strategy occurs in revolutionary ways, with sudden major shifts in the whole strategy and organizational structure of the company before they reach a new steady state (Miller & Friesen, 1982).

Therefore, climate change strategies could be perceived as a competitive advantage for companies that goes beyond public relations, education, green technologies, products and services (Schwartz, 2007a). They could find new opportunities while investing in changes in technology and business models, using innovation as a key part of their business strategy (Davila, 2006; Laszlo & Zhexembayeva, 2011). For example, CDP claims that we are on the threshold of an economic revolution that will transform how we think about productive activity and growth, decoupling energy use and greenhouse gas emissions from GDP, through a process of 'dematerialization', where consumption migrates from physical goods to electronic products and services (CDP, 2015).

The capital markets predict that only the pricing of gas emissions will create an enormous economic transformation, with a potential larger than that of globalization. The most successful in attracting green capital will be those companies that share investors' view of the importance of this change.

However, as climate change risk and uncertainty increases, transformation may no longer be sufficient to achieve resilience. Such an approach may be facilitated by adaptive management, learning, innovation and leadership capacity to manage risks and uncertainty (IPCC, 2014). These capabilities have been explored in the examined BSC companies with to the aim of identifying the scope and ability of BSC to manage such threats and to explain how companies address such uncertainty to assure long-term survival and long-term performance (see more in Chapter 4.4 and 5).

3 EVOLUTION OF THE BALANCED SCORECARD

Performance measurement and management [20] has attracted the attention of many academics and practitioners, especially since the beginning of the information age, when performance management tools had evolved from those focused on better costing or better process management to more comprehensive performance management systems (e.g. BSC). **This Chapter** describes the evolution of BSC, outlines the framework and concept of BSC, and identifies its limits and criticisms. In addition, it explores how sustainability, the risk and uncertainty management are addressed by BSC and discusses insights of BSC business best practice, also from the user's perspective.

3.1 BSC framework for performance measurement

3.1.1 Innovations in performance measurement and management

During the industrial age, from 1850 to about 1975, the success of companies was determined based on how well they captured the benefits from economies of scale and scope (Chandler, 1990). Consequently, they used the management of financial and physical assets and liabilities (Chandler, 1977; Johnson & Kaplan, 1987) and performance systems relying on financial measures for decision-making and performance evaluation purposes (Anthony & Govindarajan, 2001). In addition, some scholars argue that business in the 20th century used basic methods that were already in place by 1910 (Chandler, 1977, p. 417), based on the formal positioning of Scientific Management in 1911 that reflected ideas and concepts of Frederic Taylor on optimal performance in work processes.

Hence, in the 1980s and 1990s, leading theorists in this field (e.g. Ashton, 1997; Chandler, 1990& Kaplan, 1984a; Neely, 1999) reached a conclusion that financial measures represent past events and are inadequate for measuring drivers of current and future performance. In 1992, Robert S. Kaplan and David P. Norton published their analysis of a two-year project that led to the introduction of the BSC concept (Kaplan & Norton, 1992). BSC was launched as the first performance tool that crystallized company's entire strategy into one holistic model, derived in a logical cascade from company's vision and mission.

BSC, as well as other frameworks that encompass both financial and nonfinancial measurement, have their roots in the management planning and control systems of General Electric (hereinafter: GE) in the 1950's. A corporate staff group in GE conducted a project for developing performance measures for GE's decentralized business units (Lewis, 1955), and recommended the measurement of divisional performance by one financial and seven nonfinancial metrics, such as: profitability; market share; productivity; product leadership;

[20] Some authors state that the performance management started with the formal positioning of Scientific Management in 1911, which reflects the ideas and concepts put forth by Frederick Taylor (1856 - 1915).

public responsibility (legal and ethical responsibility to all stakeholders); personnel development; and balance between short-term and long-term objectives.

Unfortunately, this project was never integrated into the management system and incentive structures of GE (Lewis, 1955). However, at about the same time, the term "*scorecard"* was coined in performance management by Herb Simon and his colleagues at the Graduate School of Industrial Administration, Carnegie Institute of Technology. In addition, in 1954, Peter Drucker introduced 'management by objectives' in his book *The Practice of Management*, arguing that all employees should have personal performance objectives aligned strongly with the company's strategy (Drucker, 1954, pp. 126–129).

In the 1960's and 70's, a Japanese management tool, Hoshin Kanri was developed to ensure that the mission, vision, goals, and annual objectives are communicated and implemented throughout the company, by aligning the goals of the company with the plans of middle management and the work performed by all employees (Kesterson, 2014). Similarly, in the mid-1960s, Robert Anthony proposed a comprehensive framework for planning and control systems with strategic planning, management and operational control (1965).

Despite the innovative work of these scholars, most companies before the 1990s relied exclusively on financial measures for decision-making and performance evaluation purposes (Anthony & Govindarajan, 2001). The importance of non-financial indicators was stressed by several authors, while traditional financial measures were criticized for lack of strategic focus (Skinner, 1974), being historically focused (Dixon, Nanni & Vollman, 1990) and failing to provide information on customers and competitors (Camp, 1989; Kaplan & Norton, 1992). In addition, the emerging Information Age requested the alignment of technical and human domains with strategic directions and the activation of organizational communication and collaboration across performance management cycles.

One of the first such systems was created as a "corporate scorecard" by Schneiderman in 1987 at Analog Devices, a mid-sized semi-conductor company. In parallel, the US government introduced in 1987 the Malcolm Baldrige National Quality Award, drawing the initial set of criteria from financial metrics, customer-perceived quality metrics, internal process metrics and employee metrics.

Afterthat, several new performance measurement frameworks or systems addressed the use of financial and non-financial measures for strategy implementation, for example the Integrated Performance Measurement Model (Dixon et al., 1990), Performance Pyramid (McNair et al., 1990; Nilsson & Olve, 2001), BSC (Kaplan & Norton, 1992, 1993, 1996, 1999, 1999a), Effective Process/Performance Measurement (EP2M) model (Adams & Roberts, 1993), stakeholder model (Atkinson, Waterhouse & Wells, 1997), Tableau de Bord (Epstein & Manzoni, 1998), Total Quality Management (Feigenbaum, 1991; Crosby, 1994; Juran, 2004), European Quality Foundation Excellence Model (European Foundation for Quality, 1999), and performance management framework (Otley, 1999).

For example, **the Tableau de Bord** is a concept popularized in France that appeared before BSC (Epstein & Manzoni, 1998; Bourguignon, Malleret& Nørreklit, 2004), cascading down the organization's ability to support the development and implementation of strategy. **The Performance Pyramid** approaches an organization from four interdependent levels: corporate management, business unit, processes and operational goals. At the operational goal-level, values such as time and quality are determined at different frequencies and are used to meet management requirements at higher levels (McNair et al., 1990). **The Effective Process/Performance Measurement (EP2M)** model provides four measurement taxonomies: top-down measures for managing strategy, bottom-up measures for considering human action and the outcomes of ownership, internal measures for improving and sustaining process efficiency and effectiveness, and external measures for addressing markets, customers and suppliers (Adams & Roberts, 1993).

In general, the common elements of new performance frameworks are the linkage to corporate strategy, the inclusion of external and internal measures, the inclusion of non-financial and financial measures, the inclusion of difficult-to-measure factors aside easily measurable ones and the special attention on measures that will motivate managers and employees (Otley, 2005). Some recent studies demonstrate a significant link between non-financial measures and future performance, improved even more when incentives were tied to non-financial measures (Banker et al., 2000). In addition, modern performance management tools generate continuous signals for improved decision-making (Hoque & James, 2000; Kaplan & Norton, 2008), hence companies are continually adapting their performance frameworks to survive in the dynamic business environments (Otley, 1999).

Recently, performance measurement and management development indicates a tendency towards integrated reporting, strategic insight, strategic foresight and risk management (Kaplan & Mikes, 2012; Mikes & Kaplan, 2014). For example, **Integrated Reporting** is founded on integrated thinking, which helps demonstrate interconnectivity of strategy, strategic objectives, performance, risk and incentives and helps to identify sources of value creation based on a broader, more interconnected and more forward-looking information set, than traditional financial analysis (CGMA, 2014; International Integrated Reporting Council, 2013).

According to the study of Marr (2012), financial performance is still the most measured aspect of any business, however, more than half of the researched companies also measure customers, employees, sales and marketing perspectives. The research also concludes that the most sophisticated approach to business performance management uses performance data to improve operational and strategic decisions, enables companies to develop strategic foresight and makes predictions of the future. Among 3,083 surveyed companies, around 14% of respondents believe that their companies have reached such performance management (Marr, 2012).

3.1.2 The Balanced Scorecard

The Balanced Scorecard was launched by Drs. Robert S. Kaplan and David Norton in an influential article *The Balanced Scorecard-Measures that Drive Performance* in 1992 in Harvard Business Review (HBR). At the time, this was a new approach to performance measurement that integrates measures derived from strategy by using a multidimensional set of financial and non-financial performance metrics. BSC was developed as an answer based on numerous discussions about the limits and inefficiency of traditional performance measurement systems with past orientation, short-term orientation, data overload, and non-correlation with strategy (Johnson & Kaplan, 1987; Chandler, 1990; Kaplan, 1984a; Neely, 1999; Ittner & Larcker, 1998).

The authors introduced this concept in recognition of the challenges of the information age, in particular the need to integrate the measurement of intangible assets into the management systems (Kaplan, 2010). Moreover, this was a response to various studies indicating that 60 to 80% of companies when implementing new strategies encountered major difficulties and often failed (Charan & Colvin, 1999; Kaplan & Norton, 2001, 2008a). Consequently, BSC offered a solution to translate an organization's mission and strategy into a comprehensive set of performance measures that provide a framework for a strategic measurement and management system with four interrelated perspectives: Financial, Customer, Internal Processes, and Employee Learning and Growth.

The initial model provided a balance between short- and long-term objectives, between financial and non-financial measures, between leading and lagging indicators, and between external and internal performance perspectives (Kaplan & Norton, 1992). As BSC supplemented traditional financial measures with intangible aspects, such as customer satisfaction, quality of processes and organizational development, it enabled companies to both track financial results and simultaneously monitor progress in building their capabilities and acquiring the intangible assets needed for future growth. The concept also described how a concise combination of key success factors can be used by management for aligning business operations with strategy and converting the employee's efforts into actions in line with corporate strategy. The importance of choosing measures linked to the strategy execution was explained in the second HBR article, "Putting the Balanced Scorecard to Work," published by BSC authors in 1993.

The approach quickly evolved from strictly a performance measurement tool to a performance management framework (Kaplan & Norton, 1996) and to a strategic management system (Kaplan & Norton, 2002) that places the strategy at the heart of the performance management process and describes strategy by a cause-and-effect logic with a link to the reward system. As the senior executives of the observed companies involved in the implementation and use of the initial BSC also applied BSC as the central framework for important managerial processes, such as clarifying and communicating strategy, and

managing strategy by setting individual and team goals, compensation, resource allocation, budgeting and planning, and strategic feedback and learning, Kaplan and Norton summarized these learning achievements in a third article, "Using the Balanced Scorecard as a Strategic Management System" (1996) and in their first book on the subject in "*The Balanced Scorecard: Translating Strategy into Action*" (Kaplan & Norton, 1996a). This book popularized the management rhetoric of the jet cockpit gauge metaphor, describing executives as pilots with a range of controls and indicators in front of them, while comparing the management of the company with only financial metrics as flying the plane with only one instrument.

Since its inception, BSC has been recognized as one of the most widely used management tools, implemented by government agencies, military units, business units and corporations as a whole, hospitals, non-profit organizations, schools and universities. It was awarded by the American Accounting Association as being the "best theoretical contribution in 1997" (Kaplan, 2010). Moreover, since 1996, BSC has ranked among the top 25 management tools in Bain & Company's Management Tools & Trends survey (see Table 1). According to this global survey, BSC gained the rank among the top ten global management tools after the 2008 financial crisis, whereby BSC was ranked 6th in 2008/09, 2010/11, 2011/12, 2014/15 and 5th in 2012/13, compared to its initial rankings in 2005/2006, that was 12th per usage and 21st per satisfaction (Rigby & Bilodeau, 2007, 2009, 2011, 2013, 2015). The share of the global companies working with BSC according to the same Bain & Company's research (Rigby & Bilodeau, 2007, 2015) varies from 39% in 1996 to a pick usage of 66% in 2006 and back to 38% in 2012 and 2014. According to the same research, BSC is ranked constantly very high in terms of user satisfaction.

Table 1: BSC rankings in Bain & Company's Management Tools & Trends in the 1996–2014 period

	Global Top 10 Ranking	Usage	Satisfaction
1996	-	39% (15th)	3.81 (7th)
1997	-	46% (14th)	3.94 (5th)
1998	-	38% (19th)	3.89 (13th)
1999	-	40% (14th)	3.84 (13th)
2000	-	36% (14th)	3.94 (5th)
2002	-	62% (16th)	3.88 (8th)
2004	-	57% (13th)	3.86 (18th)
2006	-	66% (12th)	3.60 (21st)
2008	6th	53% (6th)	3.83 (8th)
2010	6th	47% (6th)	3.90 (8th)
2012	5th	38% (5th)	3.90 (6th)
2014	6th	38% (6th)	3.90 (9th)

Source: D. Rigby and B. Bilodeau, *Bilodeau, Management Tools and Trends*, 2007, 2009, 2011, 2013, 2015.

A key determinant of BSC's long-term success has been its steady evolution, based mainly upon practical experience (Lawrie & Cobbold, 2004), as well as to some extent also upon theoretical development by other scholars (Neely, 1999, 2002; Olve et al., 1999; Paladino, 2001). Moreover, numerous studies have found a positive correlation between BSC use and improvements in organizational performance. BSC's authors suggest that "BSC clearly reveals the value drivers for superior long-term financial and competitive performance" (Kaplan & Norton, 1996b, p. 8). Likewise, Epstein and Manzoni (1998, p. 196) argued that BSC "allows managers to keep an eye on the way performance is achieved and offers the organization a clear way to communicate and reinforce the strategy". Malmi (2001) reports that the introduction of BSC improved such areas as logistics, delivery reliability, warehouse turnover, planning and control systems, as well as company growth.

Concerning financial performance, Davis (2000) tested the financial performance of a banking institution's branches prior to and after the implementation of BSC and found significant improvements after its implementation, however the association between the implementation of BSC and the increase of financial performance was not fully confirmed (Davis, 2000, p. xii). Likewise, a study from 2003 investigated the link between BSC adoption and performance, especially stock market returns within one industry through the 1997–1999 period. They identified no conclusive association between BSC and shareholder return, but found that the combined use of financial and nonfinancial measures had a positive effect on a company's stock market performance (Ittner, Larcker & Meyer, 2003; Ittner, Larcker & Randall, 2003a). Another study by Crabtree and DeBusk (2008) investigated the financial performance in the three-year period following BSC adoption, and covered a range of industries. Their study was the first to demonstrate that BSC users earn better stock market returns compared to non-users, with the evidence of 27.12 basis points difference in the market value of the equity sample, of 30.17% difference in the book-to-market sample, and of 27.58% higher points in the net asset sample over the three-year post adaptation period (Crabtree & DeBusk, 2008, p. 12).

3.1.3 Conceptual framework of the Balanced Scorecard

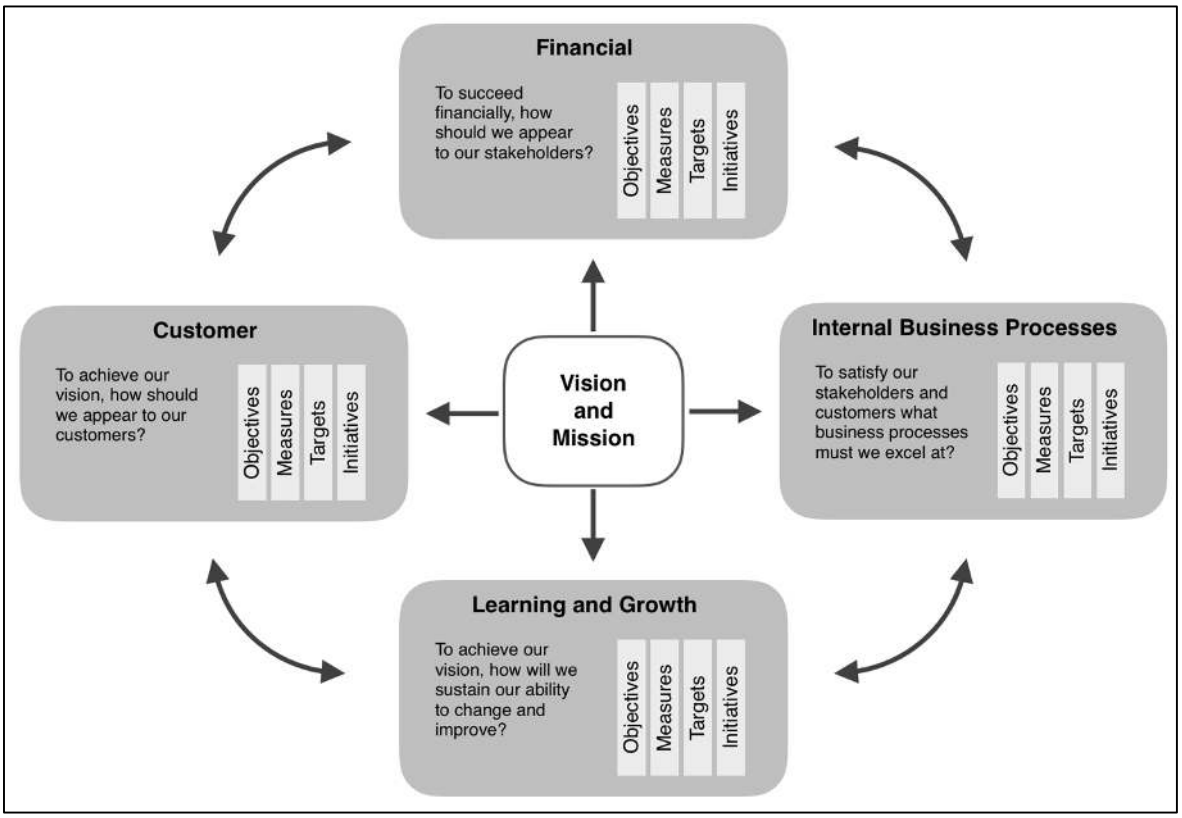
BSC's origins are connected to the multi-company research project of Nolan Norton Institute that studied performance measurement in companies whose intangible assets played a central role for value creation (Kaplan & Norton, 1992). Based on those findings, BSC's framework seeks various *equilibrium* between short-term and long-term related goals, between internal and external aspects, between outcome measures and the measures that drive future performance, lagging and leading[21] indicators. Finally, Kaplan and Norton suggest a balance of quantitative, financial and qualitative, non-financial measures provide to the management a comprehensive view of business performance.

[21] Figge et al. (2002) define lagging indicators as the outcome measures indicating whether the strategic objectives are achieved, while leading indicators reflect how lagging indicators come about.

The measures are clustered into four groups called **perspectives** (Kaplan & Norton, 1992, 1993, 1996a, 1996b), originally called 'Financial', 'Customer', 'Internal Process' and 'Innovation and Learning', however the last two have been lately renamed 'Internal Business Process' and "Learning and Growth' (see more in Figure 1):

- The *Financial* perspective refers to improved economic success (how should we look to our shareholders?).
- The *Customers* perspective focuses on how to create, satisfy and keep customers (how should we appear to our customers?).
- The *Internal-Business Process* perspective monitors the internal processes that are critical for delivering products and services to customers, such as product quality and innovation (what business processes must we excel at?).
- The *Learning and growth perspective* covers the infrastructure needed to achieve the objectives set by the other three perspectives, such as employees and information system capabilities (how will we sustain our ability to change and improve?).

Figure 1: BSC's initial framework to translate strategy into operational terms



Source: R. S. Kaplan and D. P Norton, *Using the Balanced Scorecard as a Strategic Management System*, 1996, p. 76.

Each BSC perspective clearly aligns a defined corporate strategy to relevant strategic goals, performance indicators, measures and initiatives (see Figure 1). Measures relate to

specific strategic goals, with one or more measures associated with each goal (Kaplan & Norton, 1992, 1993, 1996a, 1996b). In addition, BSC provides KPIs that are linked in the chain of cause-and-effect and emerge from the company's strategic orientation, not only within one perspective but within all (Bieker & Gminder, 2001, p. 4). In theory, improvements in "Learning and growth" measures should cause improvements in "Internal business processes" which should cause improvements in "Customer" measures, until finally, "Financial" performance is improved.

Subsequently, in a well-constructed strategy scorecard, the value proposition in the Customer perspective, all processes in the Internal perspective, and the Learning and growth perspective components of the scorecard define also how they are fundamental to the strategy as the expected strategy outcomes (Kaplan & Norton, 2001, pp. 102–103). This **cause-and-effect relationship** and communication through key **strategic themes** and **strategy maps** addresses a deficiency in traditional management systems, primarily "their inability to link a company's long-term strategy with its short-term actions" (Kaplan & Norton, 1996a, p. 75).

Such BSC design process is build upon a set of premises (Norton, 1999, p. 1):

- Strategy is a hypothesis (it makes certain assumptions about outcomes that can be achieved);
- Strategy can be described as a set of cause-and-effect relationships (the causal chain can be made explicit and testable);
- Strategy requires the definition of activities that are the drivers (lead indicators) of desired outcomes.

BSC refers to these strategic hypotheses as **strategy maps**. Strategy maps describe strategy in a logical and consistent way; they define the set of near-term objectives and activities that will differentiate a company from its competitors and create long-term shareholder value (Kaplan & Norton 2004). In addition, the strategy maps provide a framework that shows how various resources are converted into desired outcomes, reflecting also the time delay between resource consumption and results (Kaplan & Norton, 1996, 2004).

The BSC authors Kaplan and Norton stated that BSC could function as a missing link that provides integration among apparently conflicting management theories from the 1970s and 1980s, such as quality and lean management, shareholders theory and stakeholders theory. Continuous process improvement of operations, customer management, and innovation is critical for current and future success, hence they argue that it is crucial for the BSC framework to include both operational metrics as leading indicators and financial metrics as lagging outcomes, along with other metrics to measure a company's progress in driving future performance (Frigo, 2012).

With regards to the differentiation of BSC from other performance measurement systems there are four aspects Davis (2000): performance at the SBU level, cause-and-effect relationship, and both non-financial and financial measures. Similarly, also Lawrie and Cobbold (2002, pp. 3–4) identified BSC attributes related to the mixture of financial and non-financial measures and a limited number of measures, ranging between 15 and 25 (Kaplan & Norton, 1993; Kaplan & Norton 1996b). Another widely discussed characteristic of BSC is the dissemination of corporate strategies among employees. For example, Bierker and Gminder (2001) identified the link with effective and efficient human resources management through incentives. Moreover, Queazada (2005) has identified additional critical factors for successful implementation of BSC, such as leadership support, integration with TQM and Six Sigma, and alignment of evaluation indicators at all organizational levels.

3.1.4 Other developments of the Balanced Scorecard

Since 1992, in parallel with and/or following the development of BSC by its authors, several scholars, practitioners, and consultants have invested efforts to further, adapt and refine the design of BSC. While some have continued refining the concept itself (Lawrie & Cobbold, 2002; Meyer, 2002; Albernethy et al., 2005), or developing design methods (Malina & Selto, 2001), others authors have focused on adaptation of the BSC to better suit a particular agenda or to suit a larger range of companies, such as agenda of green/sustainability[22] (Epstein & Wisner, 2001; Bieker, 2002; Zingales & Hockerts, 2003), public sector management (Northcott & Taulapapa, 2012), and the future dimension (Maltz et al., 2003). In addition, there are regional adjustments to business practice and culture of the use of BSC (Malmi, 2001; Speckbacher et al., 2003; Wickramasinghe, Gooneratne & Jayakody, 2007; Tekavčič, Peljhan & Ševič, 2007) and the BSC use in unconventional areas such as the Berlin Balanced Scorecard approach (Schmeisser, Clausen, Popp, Ennemann & Drewiscke, 2011).

Many of these variations are broadly similar, and with various patterns as identified by Lawrie & Cobbold (2004), who refer to these distinct types as the BSC's generations. Subsequently, Kaplan and Norton's original BSC design, which appears in their 1992 article, was termed the 1st generation BSC design. A "strategy map" diagram, with major causal relationships between strategic objectives, was termed the 2nd generation BSC. The 3rd generation BSC made several additional steps, for example translated the long-term success into short-term objectives and applied strategy maps and destination statements. It consists of four main components: a destination statement, a strategic linkage model, a set of definitions for each of the strategic objectives, and a set of definitions for each of the measures selected to monitor each of the strategic objectives, including targets.

[22] Explained in detail in chapter 3.3.

3.2 BSC evolvement into strategic management system

3.2.1 The Strategy-focused organization

BSC started out as a better measurement system, but several executives began using it in the 1990s as a framework for formulating and executing strategy management (Kaplan & Norton, 1996). After the adoption of BSC by thousands of private, public, and nonprofit organizations, authors extended and broadened the concept into a management tool for describing, communicating and implementing strategy. In effect, BSC offered a framework for important managerial processes, such as individual and team goal setting, adjusting incentives to each employee, integrating long-term related strategies into resource allocation, an annual process of budgeting and planning, and obtaining strategic feedback and learning (Kaplan & Norton, 1996; Bieker & Gminder, 2001, pp. 4–5).

After that, Kaplan and Norton (2001) identified five critical principles with an underlying set of best practices for companies and organizations in order to achieve breakthrough results. Their second book, *The Strategy-focused organization* (Kaplan & Norton, 2001), explains this BSC evolvement from a management reporting and performance measuring system to a new strategy management system that provides a comprehensive taxonomy of **the Strategy-focused organization model** (hereinafter: SFO), with five management principles (see Figure 2): Mobilize change through executive leadership; Translate the strategy into operational terms; Align the organization to its strategy; Motivate employees to make strategy their everyday job; and Govern to make strategy a continual process.

Figure 2: The Balanced Scorecard initial strategic framework

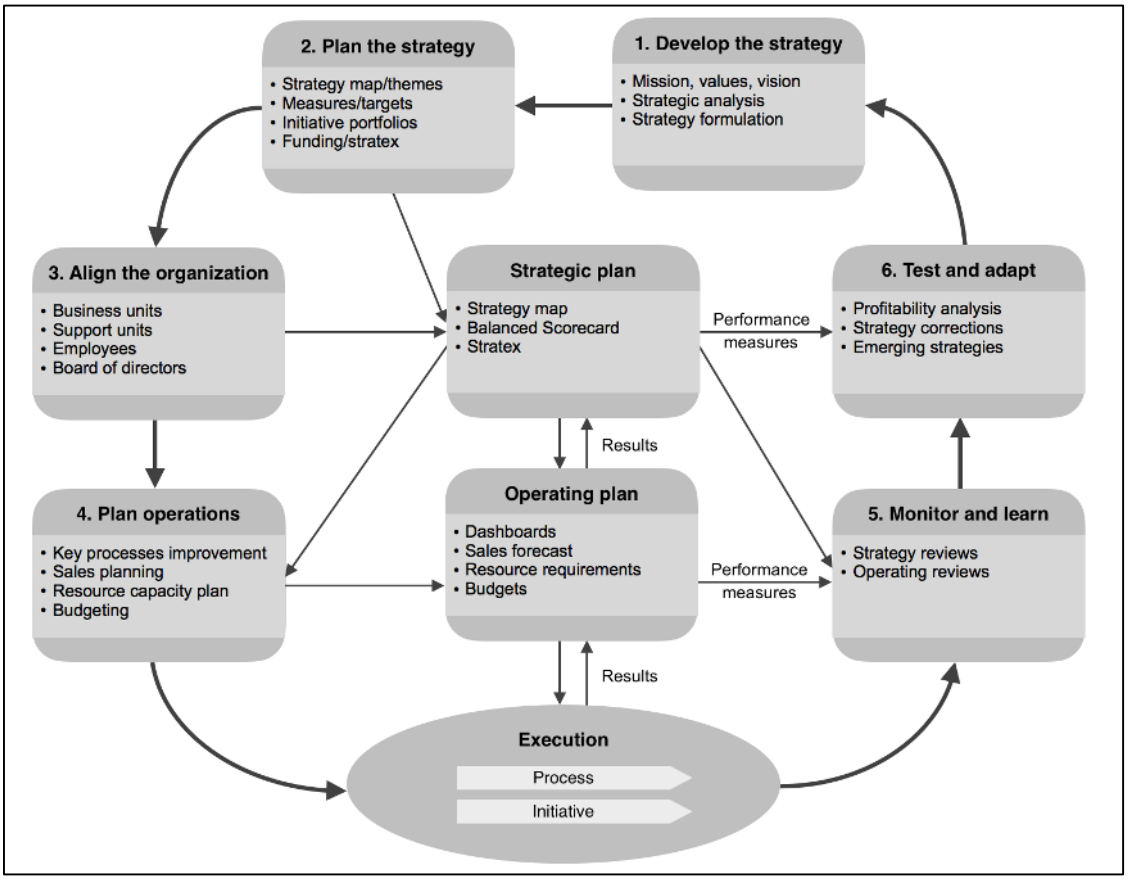
Source: R. S. Kaplan and D. P. Norton, *The Balanced Scorecard: Translating Strategy into Action, 1996a.*

This framework was further expanded by authors in the book *Strategy Maps* that explained Principle 2 "translate the strategy" (Kaplan & Norton, 2004). Principle 3 was expanded by the fourth book *Alignment,* in which the authors showed how scorecards could aggregate the corporate strategy into a collection of business units, creating more value than if each unit operated autonomously (Kaplan & Norton, 2006a). According to some surveys (Kaplan & Norton, 1996b, 2002, 2008; BSC Collaborative, 2005, 2006, 2007, 2008) the principles of SFO contributed to the financial performance of companies. Companies that use a formal Strategy-focused process achieved breakthrough results, with a 75% among them outperformed their peer group (Kaplan & Norton, 2008a, p. 1), and have been also more committed to sustainable performance (BSC Collaborative, 2007, p. 2).

3.2.2 A comprehensive and integrated management system

In spite of the wider application of BSC as a strategy execution system, BSC authors Kaplan and Norton identified a gap, since the link between strategy and operations remained ad hoc, varied, and fragmented. This gap stems also from the large number of diverse tools for strategy formulation, and operational improvements used by companies (Kaplan & Norton, 2008b, p. 6).

Figure 3: Strategy execution closed-loop management system – The Execution Premium



Source: P. S. Kaplan and D. P. Norton, *The Execution Premium*, 2008.

As a solution, a systems approach was applied in order to develop BSC into a **comprehensive and integrated management system (see** Figure 3) that links strategy formulation and planning with operational execution, named as Execution Premium Process (hereinafter: XPP). XPP creates and reinforces the linkages between strategy, people, processes, and data while repairing the fragmentation and performance gap. This six-stage integrated management system, as illustrated in Figure 3, is an upgrade of the initial Strategy-focused approach, that assures the application of Principle 5 "Govern to make strategy a continual process" through a comprehensive set of integrated management processes to develop, describe, align, and adopt the strategy (Kaplan & Norton, 2008; 2008a, pp. 2–6; 2008b, pp. 8–9):

1. **Develop the Strategy** is an initial stage that integrates processes related to three main questions regarding the purpose, values and vision of the company, strategic analysis of key issues the company is facing, and the formulation of a new strategy with solutions of how to best compete.
2. **Plan the Strategy** provides processes to address typically five questions, such as how to describe the strategy, how to convert the objectives into BSC and how to measure them, how to select strategic initiatives, how to coordinate resources allocation and how to coordinate human resources and leadership.
3. **Align the Organization with the Strategy** ensures the alignment between business units and the alignment of support units with business units and the strategy, as well as motivates employees to contribute to strategy execution.
4. **Plan Operations** links long-term strategy with day-to-day operations through an operational plan that addresses critical processes for executing strategy and links the strategy with operational plans and budgets.
5. **Monitor and Learn** comprises an operational review meeting and a strategy review meeting as well as actions to improve operations and strategy based on new information and learning.
6. **Test and Adapt the Strategy** is a separate meeting that addresses the validation of the current strategy by assessing the multiple inputs and changes in the external environment.

This approach overcame the dilemma of the strategy expert Porter (2006) that "the strategy cannot be implemented without an excellent operational and governance process" while "operational excellence is not sufficient to achieve and sustain success without strategic vision and guidance".

BSC as an integrated strategy execution management system explicitly links strategy formulation and planning with operational execution, hence enabling the continuous process (Kaplan & Norton, 1996b, 2002, 2008, 2008a, 2008b; Balanced Scorecard

Collaborative, 2005). Furthermore, a closed-loop system, with a time-tested approach, helps companies to balance demand for near-term operations with long-term strategic goals, while enabling them to review and validate their strategic hypotheses and, if necessary, to update or even change in a proactive way (Kaplan & Norton, 2008a, p. 6).

Following the aims of this dissertation, I will in detail explore stages (5) Monitor and Learn and (6) Test and Adapt the Strategy (see more under research results in Chapter 4.4. and in Chapter 5). However, the contributions of all stages are significant, as after the strategy is updated, the strategy maps and BSC are modified and another cycle with strategy planning and operational executions starts. This includes new targets, new initiatives, forecasts and operational plans, process improvement priorities, resources requirements and an updated financial plan, as well as information requirements for the next operational review, strategy review and strategy testing and adopting meeting.

3.2.3 Other integrated frameworks and models

In addition to a comprehensive and integrated management system that links strategy formulation and planning with operational execution, BSC can be effectively combined with one or more management tools and approaches. Their integration could bring advantages beyond those any one of them could deliver on its own (Kaplan & Norton 2006, p. 282). In particular, BSC helps them to integrate into the overall management system and to find a strategic context. For example, some companies integrate into Stage 4: Plan of Execution Premium their *total quality management – TQM*, *Six Sigma,* and the *reengineering* programs. Consequently, integrated solutions with Six Sigma were proposed by several other authors, emphasizing BSC's ability to identify performance gaps and Six Sigma's ability to address specific performance issues for closing specific strategic performance shortfalls (Nagel, 2005; Queazada, 2005).

There are several best cases of such integration, in particular in the USA, among them also PSE&G, HoF 2007, the selected company for our exploratory and explanatory case study. Besides, several authors acknowledge complementarity between BSC and the *EFQM Excellence model* (European Foundation for Quality Management, 1999; Gardiner & Simmons, 2003; Tekavčič & Peljhan, 2004) and with the *Total Quality Management* (Hoque, 2003).

The integration of BSC and Activity-based costing (hereinafter: ABC) is used by some companies to assess product and customer profitability related to strategic KPIs as well as for forecasting costs and expenses (Kaplan & Norton, 2008, 195). Such a case is Aktiva, a HoF 2004 company explained in Chapter 4.11.2. which integrated BSC with ABC, Value based management (hereinafter: VBM) (Young & O'Byrne, 2001) and Economic value added (hereinafter: EVA). Likewise, the integration of activity based management, risk management, and information technology with BSC have been also argued by

Papalexandris, Ioannou, Prastacos and Soderquist (2005). A well-known case is also the company Statoil, HoF 2007, one of the selected case companies in this study, which has been recognized as a global best case for aligning BSC with the *Beyond Budgeting* approach (Bogsnes, 2010, 2011).

The origin of BSC, as cited in Witcher and Chau (2007), is also interconnected with Japanese *Hoshin Kanri*. One of the first Corporate scoreboards developed by Schneiderman (2001) has integrated the Hoshin planning principles with the BSC strategic objectives and measures. The integration of both approaches has been noted also by BSC's authors, who acknowledge that some companies use Hoshin Kanri to cascade high-level strategic objectives to specific goals and targets for operating departments (Kaplan & Norton, 2008b, pp. 6). In addition, several authors (Witcher & Chau, 2007; DeBusk, DeBusk, 2011) argue that combining BSC with Hoshin Kanri makes it possible to develop effective strategic management systems that provide long-term stability while managing and controlling change in the short-term. In addition, such a combination of BSC and Hoshin Kanri forms dynamic capabilities for the organization wide strategic management. Integrated framework is also an Execution Premium, developed by Drs. Robert S. Kaplan and David P. Norton together with a consulting company (see more in Chapter 3.2.2).

3.3 Integrating BSC and sustainability

In regards to sustainability, BSC integrated frameworks have been proposed and developed as explained in Chapter 3.3.1. Several academics and practitioners (Orsato et al., 2001; Figge et al., 2002) have emphasized "the ability of BSC for integrated and value-based sustainability management that helps significantly to overcome the shortcomings of the often parallel approaches of environment, social and economic management systems implemented in the past" (Figge et al., 2002b, p. 27). In addition, NGOs and governmental departments have found very useful the embedded version of the 3rd generation BSC integrated into the UN's Result based Management system (Lawrie et al., 2005).

3.3.1 Balanced Scorecard authors' discussion of environmental and social dimensions

The authors of BSC have referred to health, society and environmental issues in almost every among their BSC books, especially in detail in the *Strategy Maps* (Kaplan & Norton, 2004) and in *Alignment* (Kaplan & Norton 2006b). Subsequently, companies' responsibilities to employees, citizens, and their communities have been recognized as being crucial in order to perform adequately on regulatory and social processes without putting at risk the company's ability to operate, grow, and deliver future value to shareholders. In addition, they have acknowledged that many companies have achieved excellence in these processes, which enhance their long-term shareholder value. For example, they have stated that an excellent reputation for environmental and social performance assists companies in attracting and retaining high-quality employees (Kaplan

& Norton, 2004, pp. 190). Furthermore, as presented in the case study of Amanco, the reduction of environmental incidents and improvement of employee safety and health improve productivity, lead to lower operating costs and enhance the company's brands (Kaplan & Norton, 2004, pp. 192–195).

Kaplan and Norton suggest that the stakeholder objective should be included, when they are vital to the success of the strategy (Kaplan & Norton, 1996a, pp. 34). For example, when describing strategic themes, authors mention "good corporate citizenship" (Kaplan & Norton, 2001, pp. 78). In addition, authors locate environmental and social indicators as a part of companies BSC related to the internal process perspective (Kaplan & Norton, 2001, p. 38). Such indicators include energy and resource consumption, water emissions, air emissions, solid waste production and disposal, product performance, and aggregated environmental measures (Kaplan & Norton, 2004, pp. 168–177). Authors also noted that many companies had already provided extensive quantitative information on their environmental performances, mostly to satisfy regulatory reporting requirements, in the form of Sustainability or Citizenship Reporting. However, they emphasized that these measures, if being used for BSC, should be relevant and aligned to the company's strategy for long-term value creation. Moreover, when explaining the issues related to building a Shared Service Unit Scorecard, Kaplan and Norton (2001, p. 191) provide guidance that could be highly applicable for environment/sustainability departments in companies.

With further BSC evolvement, Kaplan and Norton stated cases of companies that include in their internal business process the perspective of new constituents, suppliers and the public, aside from innovation, customer management and operations excellence (Kaplan & Norton 2001, p. 92). This approach has been further developed by some companies through a new 'Regulatory and Social' perspective, conforming to regulations and societal expectations, and building stronger communities (Kaplan & Norton, 2004, p. 12). Initially, BSC creators Kaplan and Norton caution companies about adding a fifth perspective, noting that it is crucial that the linkages pervade the organization as extensively as those of the four core perspectives (Kaplan & Norton, 1996, pp. 35). Subsequently, stakeholder objectives should not be appended to the scorecard via an isolated set of measurements (Kaplan & Norton, 2002, p. 6) and rather should be embedded in the strategy if other measurement and control systems cannot establish diagnostic and compliance requirements far more effectively than BSC (Simons, 1995).

However, the authors identified some circumstances when the creation of a **fifth BSC perspective** for social and environmental issues might be reasonable (Kaplan & Norton, 2004; Kaplan & De Pinho, 2007), such as:

- When sustainability and corporate responsibility is seen as a strategic imperative that creates competitive advantage and not merely as a means to improve operational efficiency.

- When a fifth perspective serves as a tool to focus managerial and employee attention on social and environmental responsibility as a core corporate value.
- For companies with a high profile, or high-impact sustainability issues, such as chemical, oil and utility, in order to highlight the importance of these issues for the company.
- Where resource allocation to social and environmental responsibilities is relatively high.

Interestingly, the sustainability literature refers to the current state of sustainability measurement and management in a similar way to customer relationship management: "another critical process, customer relationship management, was once at a similar stage to that of corporate sustainability today, before Kaplan and Norton launched BSC in 1992" (Laszlo, 2005, p. 31).

3.3.2 Discussion of the BSC in the sustainable development literature

Besides the authors' evolution of BSC towards a strategy management system, BSC became a subject of academic research and publications as an appropriate conceptual framework for sustainability and environmental and social strategies (Radcliffe, 1999; Bieker et al., 2001; Orsato et al., 2001; Bieker, 2002; Figge et al., 2002, 2002a; Willard, 2002; Zingales et al., 2002; Bieker & Waxenberger, 2003; Zingales & Hockerts, 2003; Van der Woerd & Van den Brink, 2004; Ockabol, 2007; Epstein, 2008; Greyson et al., 2008). The special interconnection between BSC and sustainability has been also acknowledged by the study that confirmed that BSC disclosers among the Top 100 listed companies in Australia are those companies that are most likely incorporating sustainability measures and targets in their performance measurement system (Elijido-Ten, 2011).

Johnson (1998) was one of the first authors to address BSC and environmental performance, contributing substantially to the alignment of environmental issues to a top management agenda, and acknowledging the integration ability of BSC for environmental performance within the context of corporate strategic objectives. Afterthat, Radcliffe (1999) and Figge, Hahn, Schaltegger & Wagner (2002a) argue that BSC offers a promising starting point for the incorporation of environmental and social aspects into the main management system of a company. Similarly, Bieker and Waxenberger (2002) acknowledged the integrative capability of BSC but expressed concerns about linking any activity of a company to its predominant financial objective and about the exclusion of other groups concerned by business activities, for example residents (Bieker, Waxenberger, 2002, p. 5).

An interesting point has been presented by Nilsson (2001), who explored the integration of environmental factors and measures to the existing BSC of Telia, hence describing how to update BSC with new measures. Okcabol (2007) proposed the utilization of BSC to cope

with rapid changes in globalization and environments, as they have begun to affect the economy, society, competition, and technology. In addition, he saw the opportunity for governments that could make use of BSC in order to achieve a sustainable environment for all living and future creatures of the world, determining what kind of incentives should be given and what kind of penalties should be enforced on corporations.

The *Lubin-Esty Model of Sustainability* builds on the basic platform of the general Kaplan-Norton model for strategy execution – the Execution Premium Process (XPP) and identifies an expanded set of requirements that should be considered when executing a sustainability-focused strategy (Lubin, Longsworth & Russell, 2011).

Although there have been many successful cases implementing social and environmental strategies through BSC, the authors Epstein and Wisner (2001) warned that a scorecard perspective containing the measures could vary from company to company, depending on the drivers of success and how critical social and environmental performance is to a particular company's overall strategy and performance.

Therefore, some companies include social and environmental key success factors and key performance indicators in each of the four perspectives of the BSC (see Figure 5), while the other define sustainability as simply an internal business process. Companies that have identified sustainability as a key corporate value or strategy may choose to expand BSC by creating a fifth perspective (see Figure 4). The fifth dimension includes social and environmental performance indicators that link with the other four perspectives. In regards to the discussion about adding additional BSC perspectives to the initial four, Olve, Roy, and Wetter (1999, p. 120) claimed that it is more useful to give a broader interpretation of the original four perspectives than to create new ones. Reinhardt (1999a) advises that the environmental objectives and measures chosen for a company's BSC should represent those areas in which environmental excellence can provide synergy by simultaneously increasing shareholder value and reducing the company's environmental footprint. Johnson (1998) recommends creation of incentives for future improvement in long-term measures while selecting environmental performance indicators which are most clearly associated with the company's strategic goals.

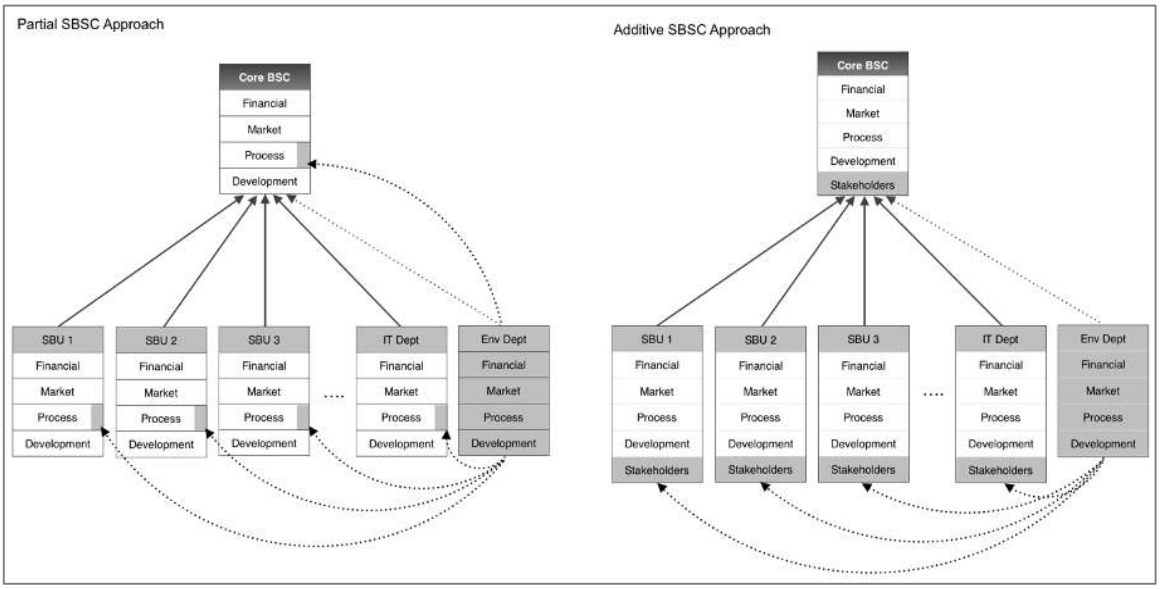
After early attempts to build the *Environment-related Scorecard (e-BSC)* and *the Socio-related Scorecard (s-BSC*) (Zingales et al., 2002) more attention has been received by the **Sustainability Balanced Scorecard** (hereinafter: SBSC), for **value-oriented sustainability management through the Balanced scorecard** (Figge et al., 2002; Figge et al., 2002a; Figge et al., 2002b). SBSC helps companies to integrate the three pillars of sustainability into a single and overreaching management tool. Likewise, the **Integrity Scorecard (ISC)** (Bieker & Waxenberger, 2002) integrates stakeholders' demands into the core management system of companies, with the aim of rolling-out the ethical issue to the operational level.

In addition, the **Business Sustainability Balanced Scorecard** (hereinafter: BBSC) was developed as part of the European Corporate Sustainability Framework (Van der Woerd & Van den Brink, 2003) as a flexible framework for long-term success. Their pilot cases in the Dutch tourist sector included social and environmental topics in all four perspectives of traditional BSC. After BBSC, the same authors proposed the **Responsive Business Scorecard** (Van der Woerd & Van den Brink, 2003) that offers equilibrium between external and internal stakeholders through five perspectives: Customer and Suppliers, Financial and Owners, Society and Planet, Internal processes and Employees & learning.

In general, Bieker & Gminder (2001) identify five possibilities of social and environmental integration into the SBSC methodology:

- *Partial approach* with integration of one or two sustainability indicators into the traditional perspectives of BSC, and with limited effects in practice (see Figure 4).

Figure 4. Partial and Additive SBSC Approach

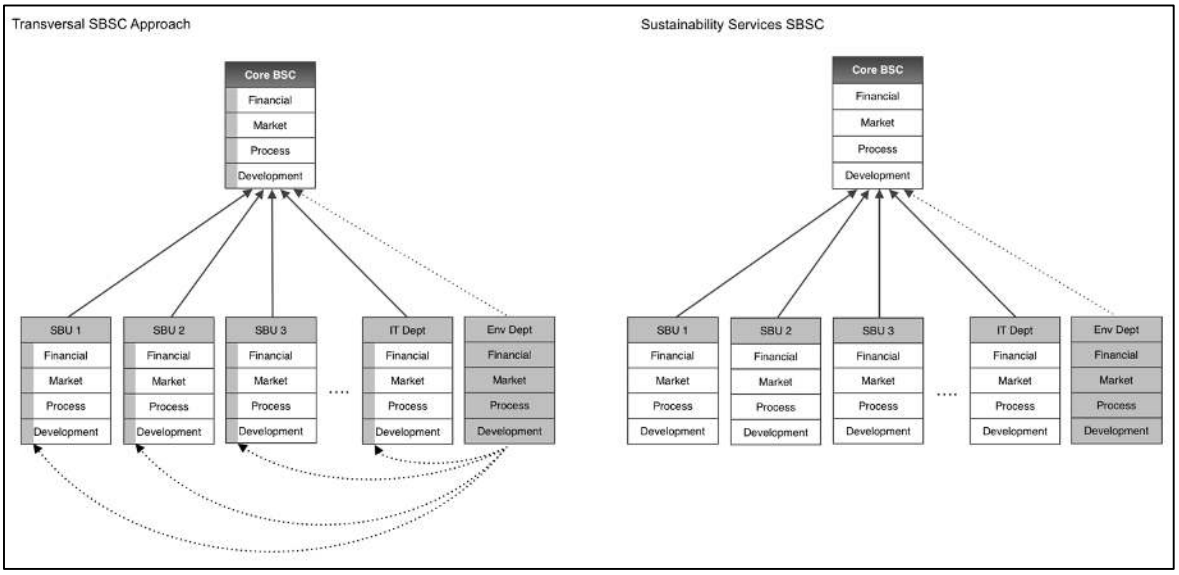


Source: T. Bieker and C. U. Gminder, *Towards A Sustainability Balanced Scorecard*, 2001.

- *Additive SBSC* which adds a fifth perspective for environment and social sustainability to BSC, is found mostly in companies with high exposure to sustainability issues (see Figure 4).

- *Transversal approach*, where social and environmental aspects are integrated into leading indicators in all four perspectives, as enablers of future success (see Figure 5).

Figure 5. Transversal and Shared service unit SBSC



Source: T. Bieker and C. U. Gminder, *Towards A Sustainability Balanced Scorecard*, 2001.

- *Total SBSC* with the integration of environmental and social aspects in all BSC perspectives, which could result in strong sustainability awareness in companies.

- *Shared services unit SBSC* which has a limited impact on the integration of objective, but is complementary to all four above-described alternatives (see Figure 5).

Adaptation of SBSCs has been proposed also in regards to different types of corporate sustainability strategies. For example, Bieker, Idyllic, Gminder and Hockerts (2001) suggest SBSC for the clean type strategy (sustainable market buffering strategy), for the efficient type strategy (sustainable cost strategy), for the innovation type strategy (sustainable differentiation strategy) and for the progressive type strategy (sustainable market development), with the main differentiation between the types being in indicators and in engaged BSC perspectives.

To conclude the discussion on integration between BSC and sustainability, the aim of many authors has been to develop the Sustainable Balanced scorecard model that could be used for sustainability management, performance measurement and even for planning (Bieker& Waxenberger, 2002, p. 6). However, Zingales et al. (2002, p. 32) have identified four main challenges in this regard, first related to the question whether BSC is a tool for strategy implementation or strategy formulation, and the connected issue of "double loop learning" which is of extreme importance for the integration of environmental issues into the long-term vision[23]. The second challenge addressed the integration of other existing

[23] This issue has been addressed by a six-stage strategy management system by the authors in 2008.

tools into the BSC. While the need for a systems approach has been already suggested by Becker et al. (2001), studies later acknowledge this BSC capability (Bieker & Grinder, 2001; Figge et al., 2002b, p. 27), although the question of full embedment of different environmental reporting, assessments and social audits are still open regardless of recognized benefits (Zingales et al., 2002, pp. 33).

The third challenge – the question associated with capabilities for managing environmental and social scorecards – triggers the fourth challenge, which addressed the extent of environmental and social agenda management by specialized organization areas. Zingales et al. (2002) emphasized that rather than establishing a specialized department, the focus should shift to the type of corporate culture that would inspire environmental and social responsibility at all levels of the company. This conclusion intersects with the later developments and suggestion of embedment by Laszlo & Zhexembayeva (2011) and Epstein & Buhovac Rejc, 2014, p. 21).

In parallel to emergence of academic models there are several business cases of sustainability BSC, presented in business literature, such as Bristol Myer Squibb (Epstein & Wisner, 2001), Telia (Nilsson, 2001), and Statoil, (again) Telia, Skanska and Unilever (Zingales et al., 2002, pp. 36–60). In addition, well explored cases of Lunds Energi, Novartis, Novo Nordisk and Shell followed by Zingales and Hockarts (2003), whereby the research findings confirmed that only Shell and Novo Nordisk's BSC integrate environmental and social issues with objectives, targets, actions and processes. The most extensively cited case for a sustainability BSC, also by its authors, is the company Amanco (Kaplan & Norton, 2006b; 2008), part of Grupo Nuevo and Mexichem, as presented in Chapter 3.5.3.

3.4 BSC and risk and uncertainty management

Since the economic crises, the discussion about performance and strategic management has involved more and more risk management, in particular identification and management of strategic risks. As written by the authors of BSC, "the competitive landscape is constantly changing, so strategies must constantly evolve to reflect shifts in opportunities and threats" (Kaplan & Norton 2001, p. 17). Hence, the authors acknowledge not only that strategy must be a continual process, but that management should balance the tension between stability and change. In addition, Kaplan introduced a three-level hierarchy of risk, based on their degree of predictability, controllability, management and their impact on companies, whereby Level 3 represented operational and compliance risk, Level 2 strategy risks, and Level 1 global enterprise risk (Kaplan, 2009).

Kaplan (2009) argues that while companies are managing compliance and control risks, they often neglect the inherent and unavoidable risks that arise from their strategies. For example, in BSC "Financial perspective" there are usually two financial drivers of

sustainable shareholders' value, revenue growth and productivity. Hence, he suggests that risk management should be introduced either as a third pillar within financial perspective or as an entirely new set of risk management processes included within the BSC "Internal process" perspective (Kaplan, 2010).

As a potential solution for risk management, Kaplan and Mikes (2012) proposed a risk management approach for so-called foreseeable risks, firstly quantifying the likelihood and consequences of each identified risk event, followed by the development of key risk indicators and risk mitigation initiatives. Some BSC companies (VW Brazil, Infosys) already use strategy maps for their risk dialogues (Frigo, 2012). After they set priorities using a risk map, they develop early-warning indicators in a separate risk scoreboard. A special manager is assigned to develop a risk mitigation plan, to monitor the risk event, and to allocate resources to reduce the likelihood and impact of the risk (Frigo, 2012, p. 53).

However, the measurement and management of risk differs substantially from the measurement and management strategy, and hence it may be preferable to develop a completely separate risk scorecard (Kaplan, 2009). Kaplan expects some important advances to embed risk management objectives more centrally into the strategy execution framework as consequence of the intense focus of companies around the world to improve their measurement and management of risk (Kaplan, 2010, p. 31). The integration of risk management into the strategy management system will help avoid a fragmented approach that could result in the dislocation of risk management into functional units (Frigo, 2012).

In regards to uncertainty management, Kaplan refers also to unforeseeable risks, or "Black Swan Events" (Taleb, 2010), the threats that cannot be successfully addressed by a risk management system. The term used for this category has emerged as uncertainty management (Kotler & Casoline, 2009), defined as the management of unpredictable and swift changes in an organization's external or internal environments that affect its performance. As already discussed in relation to risk management, BSC is not offering any tailor-made solution for uncertainty management.

However, since evolvement of BSC into strategic management system, BSC authors advise that managers who are stretching for high performance, should use such management processes and systems to verify that their trajectory remains on course to a profitable future, to be able to stay alert and vigilant to new threats and opportunities (Kaplan & Norton, 2001, pp. 303–314). In addition, with increased anticipation and preparedness for highly uncertain threats with very significant impacts, companies also build corporate resilience that is the most effective tool also in uncertainty (Hamel & Valikangas, 2003; Kotler & Caslione 2009; Moberg & Simonsen, 2014).

3.5 Business practice overview

3.5.1 Palladium Hall of Fame for Executing Strategy®

The Balanced Scorecard Hall of Fame for Executing Strategy®, now the Palladium Hall of Fame for Executing Strategy®, was founded in 2000 by BSC authors and Balanced Scorecard Collaborative. The name was changed in 2005 to Balanced Scorecard Hall of Fame for Executing Strategy® as a tribute to strategy execution excellence (Balanced Scorecard Collaborative, 2008).

From the beginning, the aim of the award was twofold: to recognize the companies that use their BSC in an exemplary manner, successfully executing their strategy and achieving outstanding performance results, and to identify and learn the best practices from the companies that perform very successfully. The HoF award selection criteria is related to the use of BSC and strategy maps within a formal strategy execution system and to the convincing evidence of significant quantified and validated results for successfully executed strategies (Kaplan & Norton, 2008b, p. 22).

Since its founding, new companies and organizations have been inducted each year from around the world. In 2015, more than 200 Balanced Scorecard Hall of Fame for Executing Strategy® (hereinafter: HoF) winners represented a diverse mix of industries, geographies, and organizational sizes and structures, from both the public and private sectors, including corporations, government entities, and non-profits.

Through the HoF program, the reported feedback and results of selected high-performing organizations help the award's founders to understand how companies match management process with increasingly sophisticated technologies. In addition, the evidence enables them to further develop management theory frameworks (Balanced Scorecard Collaborative, 2008, p. 2). For example, such learning experience relates to the combined use of BSC and Six Sigma, the Baldrige Award, and the EFQM Business Excellence Model, and the integration of strategy development with planning and budgeting.

Moreover, the practical applicability contributed also to continual improvements and the never-ending pursuit of alignment (Balanced Scorecard Collaborative, 2006, p. 2), to dashboards, risk management scorecards, the Beyond budgeting concept, knowledge sharing systems and decision analytics (Balanced Scorecard Collaborative, 2008, p. 2).

For the purpose of this study, only HoF companies have been selected and studied. More information can be found in Chapter 4.1, together with the list of BSC HoF companies from industry group "Utility and Oil" that has been selected due to high-levels of exposure to climate change regulatory and physical risks, price volatility and reputation issues (see more in Chapter 4.2.2).

3.5.2 Best cases and Strategy Execution Benchmark

The Balanced Scorecard Collaborative, lately Palladium, has performed three Strategy Execution Benchmark surveys (hereinafter: SEB) in 2003, 2004 and in 2007 with the goal of accessing usage of the strategy execution principles and to identify best practices employed by the most successful organizations. The term "best practice" was being used to describe a specific business process, management process or strategy management that is performed particularly well (Russell, 2005). While observing the level of benefit and success, they created a four-level scale of success (Norton, 2005; Palladium 2007):

- **BSC Hall of Fame organizations** with significant success that have been clearly documented, validated, and publicized.
- "**Breakthrough result" organizations** that claim to have results of the HoF magnitude, while not validated.
- **"Operational results" organizations** that have not seen significant changes in results and in industry position, but do claim quantifiable benefits in such lead indicators as quality, cycle time, and on-time performance
- **"Organizational results" organizations** that are not yet producing any quantifiable result but claim qualitative benefits in such areas as teamwork, communications, consensus building, and focus.

Based on the results of this extensive research, a consistent set of 27 best practices, or sub-principles of SFO, has been identified. In 2007, the SEB survey enhanced the understanding of the specific practices and behaviors that distinguish high-performing companies from others, supported by the information collected on their financial performance. The study acknowledged the critical importance of the "Motivate stage" and the "Governing and Mobilizing" stage (Palladium, 2007) in relation to outstanding financial results of Strategy-focused organizations (SFO).

3.5.3 Case studies of Aktiva and Amanco

Several business case studies of outstanding use of BSC, as explained under Chapters 3.5.1 and 3.5.2, have been presented in Kaplan & Norton's books, in Balanced Scorecard Collaborative publications, other BSC literature or have been published as an independent case study. In the present dissertation the case studies of PSE&G (Balanced Scorecard Collaborative 2008; Field, 2008) and Statoil (Bogsnes, 2010; Balanced Scorecard Collaborative, 2008; Keller, 2008) are discussed and integrated into the research of three selected BSC companies. In addition, two case studies have been selected to shed light on the thesis' hypothesis, in particular to explore the integrative capability of BSC's strategic management system and BSC's ability to integrate the environmental dimension. The selected companies are Aktiva (Kaplan & Norton, 2006) and Amanco (Kaplan & Norton, 2004; Kaplan & De Pinho, 2007).

Aktiva Group, founded in 1989 in Slovenia, was inducted into the Palladium Hall of Fame for Executing Strategy® in 2004 (Balanced Scorecard Collaborative, 2005). At that time Aktiva was an international diversified investment group with a portfolio consisting of approximately thirty companies from a vast range of industries, including pharmaceuticals, chemicals, paper, cement, financial services, telecoms and cables, technology, tourism, and aviation, private equity, and venture capital, located in fourteen different countries in Europe, Asia, and the United States (Kaplan & Norton, 2006).

While Aktiva has always been a committed user of leading financial performance indicators, the executive team acknowledged that these tools were insufficient to provide the complex overview of business opportunities, external threats, people and innovations. As testified by Aktiva CEO Darko Horvat in 2004: "By implementing BSC, our focus moved from EVA to the other three perspectives, which, in the end, are those that contribute the most to the future as well as to the financial success of the company" (Kaplan & Norton, 2006, p. 49). Hence, Aktiva developed its own active governance approach, dedicated to continuous value creation. The management system of the group has integrated Activity-based budgeting (Cooper & Kaplan, 1988; Kaplan & Cooper, 1998; Kaplan & Anderson, 2007), Economic Value Added (Lehn & Makhija, 1996; Stewart, 1992; Young & O'Byrne, 2001; Tekavčič & Kosi, 2004) and BSC (Kaplan & Norton, 1996, 2001, 2004), as the major pillars of strategic and performance management. Such integration has moved the focus beyond financial indicators to the future perspective and performance (Aktiva Group d.o.o., 1999). Hence, the integrated strategic management system has enabled early warning signals collection and continuous feedback, both contributing to an evolving strategy (Balanced Scorecard Collaborative, 2005, p. 5).

In addition, Aktiva formed an Active governance team at headquarters to help the companies refocus their strategies and to develop their own BSC and strategy maps. Subsequently, members of the active governance group have participated in the incentive scheme of the portfolio company, which empowered them to help the company succeed. By the beginning of 2002, every member company had a scorecard, the group's monthly reporting was designed in BSC format, and all internal reporting among managers, such as their weekly reports, and all incentives were directly linked to the BSC program (Aktiva Group, d.o.o. 2000, 2001, 2002; Aktiva Group, 2003, 2004, 2005). Aktiva executives met quarterly and often monthly with the executive team of each portfolio company to review and discuss performance, future foresight and potential threats (Aktiva Group, 2003a). These meetings, attended by the members of Active governance group members, also provided an opportunity for knowledge sharing. Furthermore, the board meetings on group level were aligned with the BSC management cycle. In 2006 Aktiva Group went through a major transformation and was sold in 2010, without evidence of BSC usage after the year 2006[24].

[24] From 1998 until 2005 I acted as the Chief Financial Officer of Aktiva, responsible for Aktiva's BSC.

Latin American-based company **Amanco**, part of Grupo Nuevo, was one of the first companies to successfully execute a sustainability strategy using BSC (Kaplan & De Pinho, 2007). This producer and marketer of plastic pipes and fittings has developed a sustainability scorecard based on three bottom-line performance measures (economic, environmental, and social) to communicate strategy, measures performance and to position itself as a leading progressive corporation in all regions it operates in (Kaplan & Norton 2008, p. 55). The Amanco sustainability scorecard was first introduced in 2000, and has initially focused on the social impact of its business on employees and the community at large (Lubin, Longsworth & Russell, 2011). In 2002, Amanco revitalized its sustainability scorecard to better align and to expand it with additional economic, social, and environmental measures. Hence, the top of Amanco's strategy maps showed their commitment to triple bottom line performance (Kaplan & De Pinho, 2007): to create economic value sustainability in long run, to generate value through a system of corporate social responsibility, and to generate value through environmental management.

Amanco has integrated CSR throughout its organization (Velarde, 2007, p. 195). Therefore, the company also revised the sustainability scorecards of its regional operational units, across geographical locations. To track performance over time, Amanco has used quarterly meetings with country and business unit managers to evaluate performance and to rethink strategy. Amanco was also working on aligning the scorecard to its compensation system (Epstein, 2008). Due to the Amanco's special emphasis on social responsibility and eco-efficiency, they have developed a fifth BSC perspective (see also Figures 5 and 12), dedicated to environmental and social elements. In this dimension, Amanco has measured health and safety performance by lost-time injury frequency and environmental performance objectives based on eco-efficiency concepts with reductions in per-unit inputs and wastes from its products and processes. Furthermore, it has measured per unit energy and water consumption and raw materials waste and scrap. Although the company has used a fifth dimension, the reflection of social and environmental perspectives was reflected also in other four perspectives (Kaplan & Norton, 2006, p. 194).

To improve Amanco's relationship with its stakeholders, the company had a formal process in order to identify potentially negative impacts through the creation of a risk matrix to measure the risk level and the probability of occurrence, followed by an action matrix, communication plan and indicators to measure progress. In parallel, a number of programs have been developed in alignment with the results of periodic consultation sessions with Amanco's stakeholders, such as collaborators (employees), community, environment, clients and suppliers. The most well-known initiative in this regard is "Amanco for a better Peru" (Velarde, 2007, p. 203). Amanco management acknowledged that with the help of the new BSC, the triple bottom-line has been better understood and managed through the company and across the community. The company was in 2007 acquired by Mexichem, a worldwide leader in plastic pipes, and one of the largest chemical and petrochemical companies, with 18,000 employees in 30 countries.

3.6 Balanced scorecard limits and criticism

The business practice, rankings and many international research projects have shown that the Balanced Scorecard concept is a very popular management tool around the world. At the same time, its apparent success has attracted many analyses of its limits and criticism from a variety of sources. While it is normal that, together with success stories, there have also been several cases where the implementation project is not finalized or has not led to the expected success (Rillo, 2004), critics mostly refer to initial versions of BSC, such as technical aspects of the concept and design of BSC (Malina & Selto, 2001; Schneiderman, 1999), and cause-and-effect relations (Olve et al., 1998; Nørreklit, 2000).

Olve et al. (1998) have demonstrated examples of several Swedish companies in which cause-and-effect relations are not proven, while Nørreklit (2000) claims that cause-and-effect relations are not connected time-wise or related in reality (Rillo, 2004). Moreover, some research findings (Malmi, 2001) suggest that the idea of linking measures together based on assumed cause-and-effect relationships was not well understood by the early adopters of BSCs.

On the other side, Neely (2002) argues that the most difficult problem of BSC is that it lacks several important interest groups in its structure, such as suppliers, co-operation partners and close neighbors. Instead, he recommended, that it would be feasible to use a performance prism methodology as a possible source for adding new interest groups to the framework of BSC.

Similarly, BSC has also not received a particularly warm welcome in France, where the Tableau de bord has been used for at least 50 years (Bourguignon et al., 2004). However, Mooraj et al., (1999) demonstrate that BSC is a “necessary good” for today's organizations, which adds value by providing both relevant and balanced information in a concise way for managers. In addition, Wickramasinghe et al., (2007) found that the failure in sustaining BSC can be due to an upsurge of professional rivalry and the owner-manager's inclination to look at financial indicators.

Lawrie and Cobbold (2002) noted that the challenge with BSC is not the concept but the content. They claim that BSC is useful only when the measures and targets chosen are appropriate, and that therefore the method of choosing which measures and targets to use is critically important. In addition, some scholars refer to the applicability of BSC for small and medium size companies (Malmi, 2001; Rillo, 2004). Similarly, Maltz et al., (2003) commented that in spite of its wide usage, BSC has shown to be inadequate in various circumstances and across differing firm types.

4 EMPIRICAL RESEARCH

There is a variety of evidence for the successful long-term performance of companies that use BSC. In particular, the HoF companies have been recognized for their outstanding financial performance (Kaplan & Norton, 2002, 2006b, 2008, 2008a; Balanced Scorecard Collaborative 2005, 2006, 2007, 2008; Palladium Group 2009, 2010, 2011, 2013). In addition, some BSC companies have been recognized for their commitment to sustainability (Balanced Scorecard Collaborative, 2007, p. 2), while developing the same key elements and practices as so called "high sustainability companies" (Eccles et al., 2013), such as: sustainability strategic integration; measurement and management of sustainability goals; performance reviews (Kiron et al., 2013, p. 12); linking compensation of top management with performance metrics (Eccles et al., 2013; p. 8); and formal stakeholder engagement.

However, despite some references in the published literature, for example Kaplan (2009) addressing the unpredictable, unprecedented occurrences that create existential risk through the BSC and Meissen (2007) presenting BSC use for the purposes of climate change mitigation in Baxter International, less study has been done on how uncertain threats, such as climate change, and resilience can be addressed with BSC. Therefore, the overall objective of this research is to combine empirical findings with theoretical ones in order to expand knowledge about BSC for managing those dimensions that are currently not integrated, such as uncertainty management, explored climate change, and resilience.

At the beginning of this Chapter, I provide an overview of the research process, from selecting case study companies, conducting longitudinal empirical research of short-listed HoF companies, through to the exploratory research of the three selected companies and an in-depth explanatory case study of PSE&G. In the second section, the case study company PSE&G is presented, along with a short overview of two other companies. In the third section, key research areas are explored, such as the use of BSC as a performance management and strategic management system, along with the long-term sustainability and resilience management, examined through the prism of climate change. Finally, the results on all research questions regarding the BSC approach for sustainable performance and resilience in the circumstances of climate change uncertainty are presented.

4.1 Research design

This dissertation firstly adopts an exploratory case study method in order to investigate research topics, followed by the explanatory case study of a selected company to explain research questions. The primary research was conducted from January 2007 to March 2016. It consisted of two case studies designs, the first being a multiple-case study design of exploratory case study research of three selected companies PSE&G, S-Oil, and Statoil, and the second an in-depth explanatory case study of PSE&G.

The case study methodology has been one of the significant trends in management accounting research during recent years (Peljhan, 2005, p 101), as they can be very powerful for identifying research problems and for developing and generalizing theory. A case study, like other research strategies, is a way of investigating an empirical topic by following a set of pre-specified procedures. The selection of a research strategy in doing social science research, such as experimentation, surveys, histories, and the analyses of archival information, takes into account three elements (a) the type of research questions posed, (b) extent of control an investigator has over actual behavioral events, and (c) the degree of focus on contemporary (as opposed to historical) events.

According to Yin (2003) and Peljhan (2005, pp. 96–117) there are some prejudices with regards to using the case study method. For example, Yin (2003, p. 10) pointed to:

- The lack of rigor of case studies is the greatest concern regarding case study research. This could be minimized by a case study protocol and fairly-reported evidence.
- Case studies also offer little basis for scientific generalization. However, the goal of a case study is not statistical generalization, but to expand or generalize theories (analytical generalization).
- A case study takes too long and results in massive and unreadable documents. According to Yin, this complaint may be appropriate for case studies such as were conducted in the past, based on ethnographic or participatory-observed data. In contrast, contemporary case studies could even be performed solely via telephone or internet, depending on the topic being studied.
- Finally, not all investigators have the ability to carry out good quality case studies.

For the purpose of this dissertation, the multiple exploratory case-study design was selected, as it offers the potential of identification of direct replications, not a samplic logic (Yin, 2003, p. 53). In addition, analytic conclusions independently arising from three cases are more powerful. The multiple-case study consists of multiple (in this case, three) embedded cases. As argued by Yin (2003), when an embedded design is used, each individual case study may in fact include collection and analysis of highly quantitative and qualitative data, including the use of surveys within each case. In the case of our research, surveys were used, but the results of each survey were not pooled across cases. Rather, the survey data was expressed as part of the findings for each individual case.

In addition, the initial case study research was followed by an in-depth explanatory study of the company PSE&G. The holistic design was selected, as the underlying theory is itself of a holistic nature. Such research could additionally offer significant opportunities for extensive analysis, enhancing the insights of sub-perspectives, for example how BSC contributes to the company's resilience and long-term sustainable performance.

The case companies PSE&G, Statoil and S-oil were selected for exploratory case study very carefully, based on their theoretical significance (Yin, 2003), on three main grounds:

First, this dissertation includes the theory and empirical research of selected companies that have been inducted into the prestigious BSC Hall of Fame for Executing Strategy™. Such companies have implemented the BSC in accordance with Kaplan and Norton's methodology, have achieved strategic excellence based on five perspectives of Strategy-focused organization (SFO), and have demonstrated outstanding financial performance. Applying these criteria has minimized the potential risks of selecting a company with recent or limited implementation of BSC, and enables the focus to be on companies that are long-horizon adopters of BSC. The arguments behind this are Kaplan and Norton's (2001) examples of improved performance that occurred only two to three years after BSC implementation. Similarly, Crabtree and DeBusk (2008) also acknowledge the existence of a time lag between BSC adoption and improved performance.

Secondly, the companies fulfilled the criteria for the selection of case study research companies as follows:

- The company has been continuously using BSC's key elements of strategic management system until at least 2015.
- The company has well-defined sustainability strategy objectives and measures, and has an appropriate strategy statement.
- The company has well-developed strategies in the area of climate change, as well as the measurable KPIs and targets of mitigation and adaptation strategies.

Finally, as climate change does not affect differing geographical areas and industries in the same way, the consideration of geographical areas and industry sector criteria was applied to ensure a varied database.

The results of the research process and of the archival empirical research of the three selected companies are presented in detail in Chapters 4.2 and 4.3. All research questions were initially tested through the pilot case study, which was conducted on the company Korea East West Power, a South Korean utility company awarded with HoF in 2006. After this, the company PSE&G was selected for the explanatory case study (see Chapters 4.4 and 4.5) that was conducted in the periods November 2014 and December 2015, and updated in January March 2016. Once the data had been collected from different sources, it was collated and transcribed. The interview responses were coded using the key theoretical concepts. For this first analytical step of naming segments of the data with labels or open codes, I used the segment-by-segment coding approach. During the coding, I used patterns and comparative data identification (Ahrens & Dent, 1998). The patterns that emerged from the data were then compared to prior research on BSC and management of climate change, uncertainty and resilience theory (Fowler, 2001). I compared the data within each

research sequence and subsequently among all four sequences. The results were documented in memo-writing once this process was complete. Charmaz, 2006 states that memos should be written from the beginning of the study throughout the research process; at the beginning they are about codes and data, while later they progress towards theoretical concepts. A similar process of pattern identification and comparison was undertaken regarding observational data and document review. This process is consistent with pattern matching, described by Ahrens and Dent (1998), and was also used for the explanatory case study with elements of explanation building analytical technique (Yin, 2003, p. 120). In addition, I followed the advice of Charmaz to recognize the perspective as being one view among many, rather than the truth itself (Charmaz, 2006, p. 54).

4.1.1 Data Collection sources and techniques

This research combines different research strategies and research techniques in order to best fulfill the aims of the dissertation. After the conclusion of the archival empirical research, the exploratory case study primarily utilized two types of data collection: interviews/ surveys, and archival documentation review. The data was collected using online surveys, followed by semi-structured interviews and a review of BSC documentation. To ensure construct validity, questions were designed to reflect the key theoretical assumptions and research questions (Yin, 2003) such as the integration of sustainability, climate change preparedness and responses, and uncertainty management into BSC as a performance and strategic system (see Appendices B, C, D, E, and F).

Interviews are one of the most important data gathering techniques for qualitative research in management if they are guided conversations rather than structured queries (Yin, 2003). During the research, I used three types of interviews: structured, semi-structured and informal. At the beginning of the exploratory research, I conducted extensive structured interviews with on-line survey support (Appendix B, C, and D) with teams from selected companies, consisting of members of performance management, BSC, strategy and sustainability departments or units. The time required for conducting the on-line survey at the level of any particular company varied between 18 to 24 days, with some additional weeks and months for the post-survey semi-structured or informal interviews for explanation and clarification of answers and of supporting documentation. This part of the research was followed by comparison analyses of the findings in all three companies.

In the explanatory case study, the data was collected through semi-structured and informal interviews, and by documentation review and analyses. In accordance with standard practices of qualitative research, the interview questions were refined during the research period based on responses of informants (Yin, 2003). A total of 5 interviews (one being supported by an on-line questionnaire) were conducted with PSE&G (Appendix E and F). The majority of interviews were conducted at the executive and senior management level. Aside from traditional field-based methodologies as outlined by Yin (2003), such as documentation, archival records and interviews, additional research questions were

obtained directly from the company chosen for the explanatory case-study, particularly exploring how PSE&G addresses sub-perspectives of the key research questions. A separate report was written and presented to PSE&G representatives to allow comments regarding the reliability, validity and overall credibility of the observations and conclusions (Yin, 2003). The feedback was very positive in this regard.

Second, the primary source of archival data was obtained from PSE&G's BSC performance and strategic management system. A selection of monthly and annual BSC reports was reviewed, aside from documentation collected around the PSE&G HoF BSC award in BSC reports. Other documentation reviewed included board reports, Annual reports, Sustainability reports, climate change reports (CDP), incentives organizational charts, training presentations, and policy and procedure documents. Publicly available information on PSE&G was also obtained.

The potential weakness of this case study research is that direct observation, such as the direct attendance of various meetings, was not possible. I compensated for the absence of this source of information via extensive and in-depth personal practical experiences regarding the BSC performance and strategic management system, which enabled the construction of the questions in a way which highlighted all potential aspects. Although this could be perceived as being a weakness, it also acts as an example of Yin's arguments that contemporary case-studies could even be performed solely on telephone or internet, depending on the topic being studied (Yin, 2003, p. 11). The second limitation during the multiple-case study research was some documentation only being available in the Korean language, which resulted in the depth of S-oil analyses not equaling those of Statoil and PSE&G. The scope of the research was limited to the initial structured survey questions.

Finally, although I followed the rules and guidelines carefully, I also "fostered my own critical and creative inspiration" (Myers, 2010, p. 111), applying the insights from my own extensive experience and allowing myself to be guided by intuition.

4.1.2 Criteria for judging the quality of research design

To establish the quality of any empirical social research, four tests have been commonly used (Yin, 2003, pp. 33–38) and summarized in numerous articles and books (Kidder & Judd, 1986, pp. 26–29). As case studies are one form of such empirical social research, these four tests are relevant also to case studies:

- *Construct validity:* establishing correct operational measures for the concept being studied. To increase construct validity, the present study employs tactics, such as the use of multiple sources of evidence in the phase of data collection. Data was collected from multiple sources, explored afterwards by a questionnaire conducted via semi-structured in-depth interviews.

- *Internal validity:* establishing a causal relationship, whereby certain conditions are shown to lead to other conditions, as distinguished from forged relationships. Internal validity is only a concern for explanatory case studies, and it is applicable to our study of PSE&G. In order to avoid the possibility that the investigator incorrectly concluded that event x led to event y without knowing that some third factor (z) may actually have caused y, we decided to combine testing of theories developed elsewhere as well as further developing a new theory or at least establishing foundations for such further development.
- *External validity:* establishing the domain to which a study's findings can be generalized. The issue of external validity is the extent to which the findings of a particular study can be generalized across population, contexts and time. In our exploratory case study, the theory was tested by replicating the findings in the second and third research company. In the case of explanatory study, we wanted to support the theoretical replication by emphasizing the vital building components of strategy and performance systems for sustainable performance and for managing in the circumstances of uncertainty. Therefore, our case-based study would foster "practice from theory" learning from other companies, built or re-built on our case-based findings. As argued by Peljhan (2005) various rhetoric of generalization exists in accounting research, whereby the Contextual generalization rhetoric, claiming that a successful case study may provide the possibility to widen the validity of the research results beyond the primary observation by effective triangulation of the data elements, is present in our case-based research of BSC.
- *Reliability:* demonstrating that the operations of the study (such as the data collection procedures) can be repeated, with the same results. The goal of reliability is to minimize the errors and biases in a study. I attempted to document research procedures, and to carry out as many steps as operationally as possible, alongside the use of case-study protocol and the development of a case study database. I also attempted to note accurately what interviewees said, and collected supporting documentation for the main findings, before all findings were again subsequently reviewed by the company.

4.1.3 Ethical issues

Research ethics are determined by the moral and responsible way in which we formulate and clarify our research topic, design research, gain access to and collect data, process and store data, analyze data and write up research findings (Saunders, Lewis & Thornhill, 2009, p. 184). To ensure high ethical standards, I have respected confidentiality and privacy; at the beginning of the research, the non-disclosure agreement was offered to all invited research companies, although after the initial presentation of research and questionnaire, none among the companies decided to actually sign this agreement.

However, due to the sensitivity of the internal information, and due to the fact that PSE&G and Statoil are publicly listed companies, we agreed that some sensitive data would not be published, and that the parts of the dissertation or subsequent articles would be checked and approved by the companies prior to any public announcement. Such an agreement has contributed also to the validity of the research, as all findings have been checked, confirmed and commented on by the research companies.

In addition, the research was conducted through voluntary participation, with prior presentation of the research objectives, the scope of the company's engagement and the timeframe of the research. For the interviews, I also obtained oral permission for taking notes, and have sent for validation all statements from participants that are quoted. Finally, to ensure free access to all data collected, I created a case study protocol to deal with documentation problems in detail, and a case-study data-base which is stored in a way so as to ensure privacy.

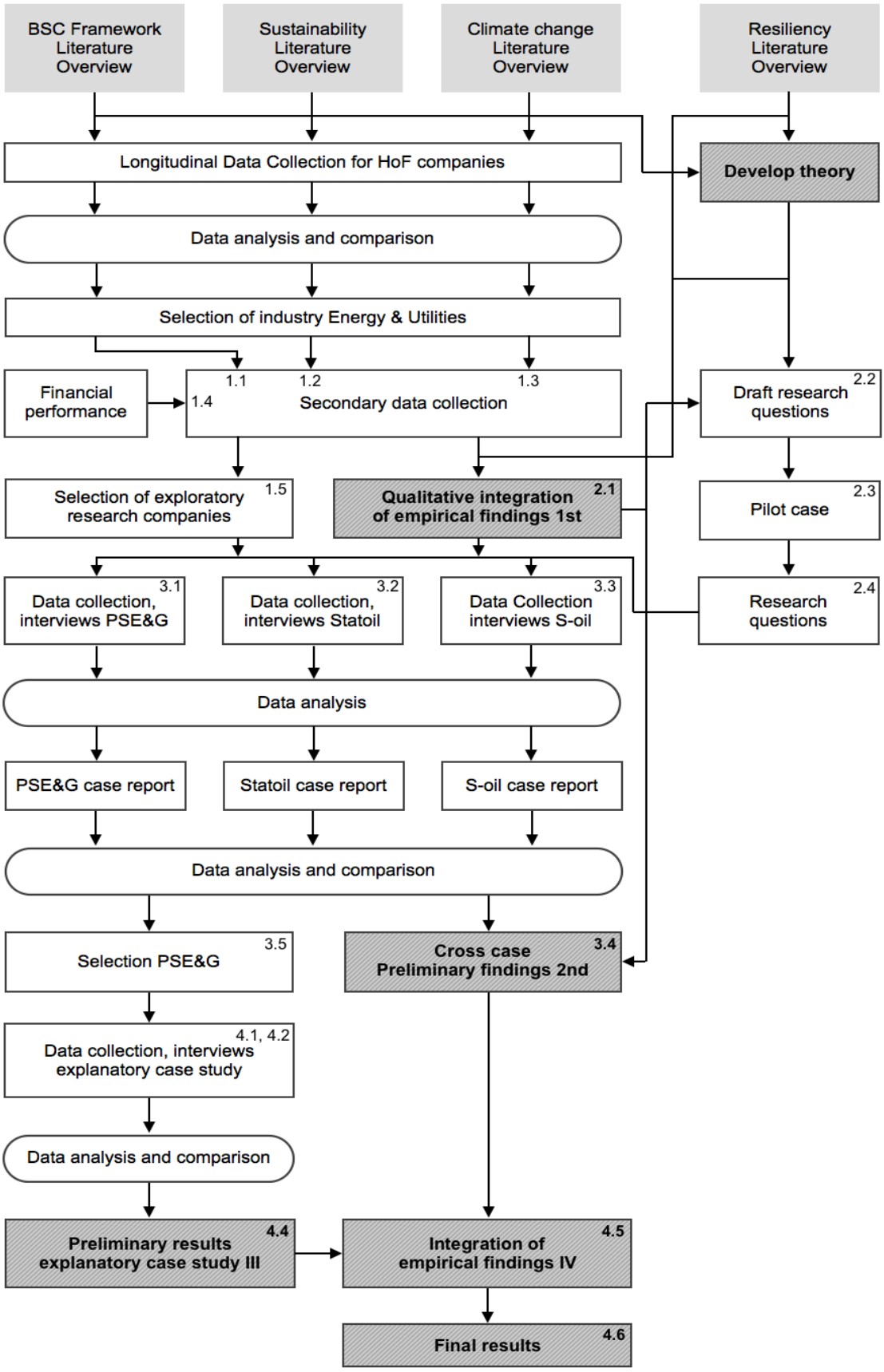
4.2 Research process overview

The fundaments of the process of designing this research started in 1999, with the very first implementations of the Balanced Scorecard in the Aktiva Group of companies. As explained in Chapter 3.5.3, Aktiva Group has integrated the BSC strategic management system with its active governance approach into the management of a very diversified group of companies in several countries. My practical experiences with BSC derived from my CFO position, covering also development and management of the Active governance system in the period 1999–2004. These insights enabled the understanding of the true value of BSC from an inside perspective, while being responsible for delivering real results. Such mutual dependence sped up the identification and utilization of elements and key drivers of BSC that contributed significantly to the ultimate objective of outstanding performance and sustainable long-term performance, while avoiding the possibility of knowledge-generation that would be externally selective or based on isolated experiments.

The whole research process is presented in Figure 6, and consists of the following sequences (see more in Chapters 4.2.1, 4.2.2., 4.2.3, 4.2.4, 4.2.5):

- The preliminary research sequence began in January 2007 and continued to September 2008, followed by a research update in the period August 2013 – November 2013.
- The first research sequence was carried out between December 2013 and May 2014.
- The second research sequence was carried out between June 2014 and October 2014.
- The third research sequence was carried out between November 2014 and March 2015.
- The fourth research sequence was carried out between April 2015 and March 2016.

Figure 6. Research process overview



4.2.1 Preliminary research sequence

The preliminary research sequence commenced in January 2007 and continued until September 2008, followed by research update in the period August 2013 – November 2013. The aim of this sequence was to explore HoF companies and to learn about practices related to the dissertation objectives. In addition, the information collected during preceding sub-sequences represented the foundation for the selection of the industry. Initially, the analysis of 131 Palladium Hall of Fame for Executing Strategy® companies was conducted. The companies were examined through their enduring use of BSC in the period from their induction into the Palladium BSC HoF to the present[25].

The main research questions during that period were around evidence of sustainability integration into BSC and strategic management. Data from BSC Hall of Fame Reports was explored (Balanced Scorecard Collaborative, 2004, 2005, 2006, 2007, 2008; Palladium, 2009, 2010, 2011, 2013), as well as publicly available corporate information. The companies were also analyzed through different sustainability and climate change associations and organizations, such as Carbon Disclosure Project (CDP), United Nation Global Compact, Carbon Trust, and by rankings, such as the Dow Jones Sustainability Index and The Global 100. As a result, the research identified a group of eligible HoF companies, some among them also being recognized as global climate change leaders, listed on the A List of the CDP Climate Performance Leadership Index (CDP, 2015).

However, identified companies were very diversified, represented in six among nine different industry groups[26], hence exposed to different risks, with different probability, and with an extensive range of possible impacts and their magnitudes. To enable the data and results comparison, the selection of a single industry was required. Examination of a single industry has advantages when considering internal validity, although a potentially limited ability to generalize results should be considered (Crabtree & DeBusk, 2008).

For the purpose of this research, the **energy and utility industry** was selected. The criteria for the selection consisted of strategic integration of sustainability, uncertainty, and climate change risks and impacts for the industry. While this industry has been ranked as less uncertain[27] (Dyer et al., 2014), there are several strong arguments for its selection:

1. The energy industry has historically been exposed to uncertainties of resource reserves and the high volatility of resource prices, while their flexibility for fast adaptation is very limited. In addition, it will be affected by global commitment to limit the global

[25] Aside from the evidence that several companies from the HoF list have been acquired or merged, it was also noted that there were no public evidences to prove the ongoing use of BSC in several companies.
[26] Palladium Group classifies the awarded HoF companies into nine industry groups (Palladium, 2014),
[27] That research bases on interaction of two primary types of uncertainty, defined by authors as "demand uncertainty" and "technological uncertainty".

average atmospheric temperature to sustainable levels, hence 84% of currently known reserves of coal, gas and oil will need to stay unexploited (Kiron et al., 2015).

2. The generation and distribution of energy is exposed to the uncertainty manifested in sudden policy shifts, in strong demand for renewable energy, and in regulatory changes for carbon prices (Heiligtag, Luczak & Windhagen, 2015; Lash & Wellington, 2007).
3. Energy and utilities will also be significantly affected by climate change as indicated by the MIT study (Kiron et al., 2013), in particular their physical infrastructure (Kolk & Levy, 2004). In the oil industry, pipelines may require increased maintenance as they become subject to greater temperature variation and extreme weather (Tol, 2008).

In addition, new technology is steadily reshaping the energy sector, bringing unexpected digital competition to this historically pioneering sector. For example, the scientists of the Exxon (now ExxonMobil) were among the first to indicate in 1978 the threat of climate change and confirming fossil fuels' role in global warming (Inside Climate News, 2015). Furthermore, the Anglo-Dutch oil company Shell was one of the first companies that used the triple bottom line "people, planet, profit" in their first sustainability report in 1997. Shell is also well-known for its development of scenario planning tools. Finally, the Canadian oil industry was among first to prove positive effects of proactive environmental management on corporate financial performance (Sharma & Aragon-Correa, 2005).

4.2.2 First research sequence

The first research sequence, which started in December 2013, was conducted until the end of May 2014. It has been divided into five sub-sequences, as presented in Table 2. Sub-sequences followed one another, each representing the foundation for execution of the next sub-sequence. The overall aim of the first research sequence was to identify the most representative three companies for the exploratory case study.

Table 2. Course of the First research sequence

Sequence	Period	Subsequence activities	Informants	Outputs
1.1	12/2013 01/2014	• BSC secondary data gathering, external • Quick analysis	Palladium, R.S. Kaplan	Selection of the best case companies
1.2	02/2014	• Sustainability secondary data gathering, external • Quick analysis	/	Selection of the best case companies
1.3.	03/2014	Climate change secondary data gathering, external • Quick analysis	/	Selection of the best case companies
1.4	04/2014	• Financial data gathering • Quick analysis	/	Selection of the best case companies
1.5	05/2014	• Comparison analysis	/	Research candidates selection

To assure the selection of best cases for the research I started with the examination of of nineteen shortlisted companies, recognized for their BSC and Strategy excellence by the prestigious Hall of Fame for Executing Strategy Award. The companies are presented in Table 3, while the full set of information regarding the main research pillars are presented in Appendix G.

Table 3. The list of all BSC Hall of Fame companies from industry group "Utility and Oil"

No	Company	HoF year
1	Aquafin, Belgium, (Utility – water)	2004
2	Blue Ridge Electric Membership Corporation, USA, (Energy)	2012
3	Bord Gais Eireann, Ireland, (Utility – water; Energy, gas)	2008
4	Chilectra S.A., Chile, (Energy – Electric Utilities)	2006
5	Endesa, Spain, (Energy – Electricity, Gas, Industry Group: Electric Utilities)	2005
6	Hindustan Petroleum Corporation Limited, India, (Energy, Industry Group: Oil, Gas Consumable Fuels)	2010
7	Korea East-West Power, South Korea, (Energy, Utilities, Industry Group: Power Producers – Traders)	2006
8	Korea South-East Power Co, South Korea, (Energy)	2013
9	Mobil North America Marketing & Refining, USA, now Exxon Mobil Corporation (Energy, Ind. G.: Oil, Gas)	2000
10	New Brunswick Power Group, Canada, (Utility – Electricity, electricity generation and utility)	2008
11	North Delhi Power Ltd., India, now Part of Tata power CO, (Utility, electricity distribution)	2008
12	Nova Scotia Power, Canada, now owned by Emera, (Utility, integrated electric utilities)	2000
13	Power River Energy Corporation, USA, (Energy),	2013
14	Public Service Electric & Gas Company, USA, (Energy – electricity, Utility –Multi-Utilities)	2007
15	Reliance Industries, India, (Energy – exploration and production of oil and gas, petroleum, petrochemicals)	2011
16	S-OIL, South Korea, (Energy, Ind. G.: Oil, Gas Cons. Fuels, Sub Industry: Oil & Gas Refining & Marketing)	2012
17	Statoil ASA, Norway, (Energy – Industry Group: Oil, Gas, Cons. Fuels, Sub Industry: Integrated Oil & Gas)	2007
18	Tennessee Valley Authority, USA, (Utility, Electric Ut.)	2003
19	Western Water, Australia, (Utility – water)	2004

Source: R. S. Kaplan and D. P. Norton (2006b); Balanced Scorecard Collaborative (2007, 2008); Palladium group (2009, 2010, 2011, 2013).

The research questions from the sub-sequence 1.1. were structured with the aim to check if the companies could prove their enduring use of BSC and SFO principles, based on strong and recent evidences, including in their Sustainability reports, corporate communications, annual reports and on their web pages. There were "weak evidences" for only three

companies from the short-list of HoF companies, while six companies proved to have "strong evidences" and the remaining ten have "fair", "some evidence" or "evidence".

A strong link between leadership and the enduring use of BSC was identified; for example, I noted that when a CEO or BSC project leader left the company, the company often lost their BSC "best case" character (Korea East West Power, Western Water in Energy and Utility industry group, otherwise Gerdeau)[28]. On the contrary, there are cases in which companies have continued with BSC use even after a merger or acquisition, for example the Statoil merger with Norsk Hydro in 2007.

Furthermore, to understand the full potential of BSC in the age of climate change, it was essential to identify HoF companies that had voluntarily addressed **sustainability and climate change.** The findings of sub-sequence 1.2 confirmed high expectations as only three companies among the 19 short-listed do not publish their Sustainability reports. Likewise, sub-sequence 1.3 I found strong evidence of a proactive approach on climate change, along with particularly well-developed mitigation and adaptation strategies. Among them, the biggest climate change risks have been identified around regulation, such as cap and trade schemes, air pollution limits and carbon taxes. All of these risks are expected to have an impact in the short-term. Moreover, tropical cyclones are noted as being the short-term physical risk due to the costly damage that can be inflicted on fixed assets, which are often locate in exposed areas (CDP, 2015; PSEG, 2013).

In addition, the measurement and disclosure of climate change information to investors and the public by the companies was further explored through the Carbon Disclosure Project – CDP disclosures and rankings. Eight companies from the short-list had never submitted a CDP report, and thus have not been rated by CDP. On the other hand, eleven companies had disclosed the information, and among them, eight companies had been rated. Regardless that this industry has very few companies that are able to meet the leadership criteria under CDP's current scoring methodology, two companies from the short-list (Endesa and S-OIL) had already achieved an A band (CDP, 2015) and are represented in the CPLI (hereinafter: Climate Performance Leadership Index). Afterthat the resilience of companies was further cross-checked in sub-sequence 1.4 through financial performance analysis of short-listed companies, including the analysis of performance in different periods related to the financial crisis and other turbulences.

Finally, in subsequence 1.5 a results comparison was conducted to select three of the most suitable companies for further research. Moreover, as climate change does not affect geographical areas and industries in the same way, geographical area and industry sector risk consideration has been applied to ensure a varied database. Taking into the

[28] The same was partially noted also for mergers and acquisitions in the Preliminary research sequence for companies from other industry groups such as Amanco, Tata Motors, Aktiva, Pliva, etc.

consideration all researched factors, I selected three HoF companies, one coming from ”utility” and two from “oil, gas consumable fuels” sub-industry groups. The companies are located in three geographical regions, Europe, Asia – South Korea and America – United States of America, representing different climate-related risks, regulatory schemes and political environments. The selected companies are as follows[29] (see Company profile information in Table 4):

1. **Public Service Electric & Gas Company** (hereinafter: PSE&G) is part of PSEG, USA. The company was inducted into HoF in 2007, with strong evidence of longitudinal use of BSC, in particular of using it to address climate change and sustainability. Its financial performance is stable and profitable; for example, the mother company PSEG is well known for having paid dividends for 113 years (PSEG, 2015). PSE&G has received public recognition in the field of sustainability and climate change, while being among the first companies that have responded to climate change, and has successfully implemented mitigation strategies with reduction targets much before the planned deadlines. The company is directly exposed to extreme weather, in particular tornados. It is pioneering in reliability and in resilience to climate change.

2. **Statoil ASA** is an oil and gas company from Norway. The company was inducted into HoF in 2007, and has been recognized as a global best case for aligning BSC with the Beyond Budgeting approach. Based on own knowledge and experiences, the company has developed the strategic and performance management concept Ambition to Action. Sustainability leadership has been recognized on an annual basis through several awards and indexes; the company has also been named in The Global 100 and regularly discloses information to CDP. The company has strong financial performance and is actively addressing resilience. The portfolio of company assets is located all around the world, facing different climate change and extreme weather risks.

3. **S-OIL Corporation** is an oil refining company from South Korea. The company was inducted into HoF 2012 and has been recognized as a global climate change leader through the achievement of an A band from CDP in 2014, and is hence listed in the CPLI (CDP, 2015). Therefore, it represents an exceptional case of a recently inducted BSC HoF company that is at the same time also recognized as being a global climate leader by CDP. The company has been very profitable over the long-term, with evidence of a slightly negative trend in the last two years. S-OIL has a well-developed and embedded sustainability strategy around BSC and SFO concepts. Located in South Korea, the company is also exposed to political and military threats from North Korea.

[29] Initially, Korea East West Power, a South Korean company from utility industry and HoF 2006, was selected for the research, and was replaced by S-oil company in December 2014. Although the company fully completed all research questions, I have used this part of the research as the pilot case for questions and research concept validation, due to the limited supporting documentation available in English language.

Table 4. Company profile of PSE&G (PSEG), S-OIL Corporation and Statoil

Company profile	PSE&G (PSEG)	S-OIL Corporation	Statoil ASA
Sector	Utilities	Energy	Energy
Industry	Utilities	Oil, Gas & Coal	Oil, Gas & Coal
Sub-Industry	Integrated Utilities	Refining & Marketing	Integrated Oils
Founded	1903 (1985)	1976	1972
Country	USA	South Korea	Norway
Employees (2015)	6787 (12689)	3512	22516
Sales (2014/Forbes)	$6,63 B ($10,41 B)	$27,13 B	$95,14 B
Headquarters	Newark	Seoul Gongdeok-dong	Stavenger

Source: Internal documentation PSE&G, PSEG, S-OIL and Statoil, Forbes.

4.2.3 Second research sequence

The second research sequence was undertaken between June and October 2014, and was divided into four sub-sequences (see Table 5). In the first part I investigated the literature based on resiliencd to update the research findings to that time.

Table 5. Course of Second research sequence

Sequence	Period	Subsequence activities	Informants	Outputs
2.1	06/2014 07/2014	• Literature overview, update with resilience developments • Comparison key findings from 1.1, 1.2, 1.3 with theory updates	/	Developing 1st integration of empirical findings
2.2	07/2014 09/2014	• Secondary data collection for case companies • Quick analysis	/	Memos Building first draft of questions
2.3	10/2014	• Pilot case survey • Data analyses • Questionnaire modification	/	Questionnaire A Questionnaire B Questionnaire C
2.4	10/2014	• Invitation preparation • Contacting companies • Presentation to companies	/	Companies confirmed participation

In sub-sequence 2.2, I collected additional data on selected companies with the aim of exploring the draft questions of the research through screening published corporate reports, CDP reports, DSJI assessments, by visiting corporate websites, and by analyzing BSC Hall of fame reports and cases. The companies were examined by public recognitions and awards, especially for sustainability and climate change leadership. In regards to sustainability, I again examined DJSI Global and DJSI North America among several other global and national awards and recognitions, such as The Global 100, MSCI Global sustainability index, Reliability One Award, and Top 50 Employers.

When exploring the company's climate change responses, the rankings and awards for climate change, such as Carbon Trust Standard, Emergency Response Award, and awards for renewable energy or energy efficiency leadership were explored. Moreover, evidence for the company's climate change adaptation strategies and the timeframe of the company's climate change responses were considered, to reduce the possibility of "greenwashing" and "followers reacting" positions.

To gain comparison data for assessment of corporate responses to climate change, the public available information was explored through Annual reports, in Sustainability reports and in CDP reports, in particular the information on the first emission reduction programs, the reduction performance of GHG emissions, and CDP disclosures and ratings (see Table 6). Likewise, I tracked over time the references and citations of climate change and resilience in available strategic documents, reporting. and communications to identify the extent to/of BSC's use for company's sustainability, climate change and resilience management.

Table 6. Comparison of three selected research companies by main sustainability and climate change rankings

Company profile	**PSE&G (PSEG)**	**S-OIL Corporation**	**Statoil ASA**
Sustainability Report	(since 2010)	since 2001	since 2001
Dow Jones Sustainability Index	(North America 2014, 2013, 2012, 2011, 2010, 2009, 2008)	(Global) 2014, 2013, 2012, 2011, 2010	(Global) 2014, 2012,2010, 2009, 2008, 2007
Climate change recognized as threat	(1994 – voluntary targets)	2005 (voluntary targets)	1997 (voluntary targets)
Baseline year for GHG emissions reduction program	(1994 signed Global Climate Change program)	2005 Korean Energy Management Corporations' GHG Reduction Registry	1997
Carbone Disclosure Programme (CDP)	(2003, 2004, 2006, 2007, 2008, 2009, 2010, 2011)	2012, 2013, 2014	2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014
CDP ratings (latest rank)	C, 79 (2011)	A, 96 (2014)	C, 82 (2014)

Source: Internal documentation PSE&G, PSEG, S-OIL and Statoil, Forbes.

Finally, **financial performance** has been examined. This part of 2.2 sub-sequence has been updated twice, first during July–August 2015 for financials related to 2014 and secondly in March 2016 for financials related to 2015. Current financial performance and

stability has been evaluated by analyzing companies' performance in the year 2014 (see Table 7), what was followed by cross-checking of long-term financial performance in period 2004–2014 (see more data in Table 15). The financial performance was examined through **growth rates** with selected indicators, such as revenue and net income, **profitability rates**, with profit margin, return on assets and return on equity, **financial strengths,** observed through indicators sales per employee and leverage ratio, and **stock performance** indicator YTD (year to date). I have used public data from Annual reports and from the rankings, such as Global Forbes 2000, Fortune Global 500, Fortune 500, and similar rankings.

Table 7. Comparison of financial performance in 2014 among PSEG (PSE&G), S-OIL Corporation and Statoil

Financial Performance 2014	PSEG (PSE&G)	S-OIL Corporation	Statoil ASA
Growth rates			
Revenue Growth 2014/13	9%	-8%	-2%
Net Income Growth 2014/13	22%	-199%	-44%
Profitability 2014			
Profit Margin	14%	-1%	4%
ROA	4%	-3%	2%
ROE	12%	-6%	2%
Financial Strength			
Sales/Employee in US$ (Forbes 2014)	919,694.2	7,724,943.1	4,225,439.7
Leverage Ratio	1.9	1.09	1.59
Stock Performance			
YTD (31.2.2014)	29%	-12%	-11%

Source: Annual reports 2014 from PSEG, S-OIL and Statoil.

In sub-sequence 2.3, the draft questionnaire was finalized and a pilot case survey was conducted in the company Korea East West Power, that had confirmed its participation in the study in 2009 but had, due to the lack of supporting documentation, been excluded from the final research. Based on the answers received from this company, final modification of the questionnaires was completed. Afterthat a detailed instructions and explanations were prepared in sub-sequence 2.4 for the on-line presentation of the research question to the companies. Invitations for research were sent to companies during the period between October and December 2014, all responding positively and in a very short time.

4.2.4 Third research sequence

The third research sequence, which was conducted between November 2014 and the March 2015, was divided into five sub-sequences (see Table 8). This sequence was dedicated to the exploratory study to support the assumptions and objectives of dissertation and to explore BSC abilities for long-term sustainable performance in an uncertain future.

Table 8. Course of Third research sequence

Sequence	Period	Subsequence activities	Informants	Outputs
3.1	11/2015 01/2016	• Structured interviews and on-line exploratory survey (3x) • 1st tentative validation of further development	KRI (all three companies	• Survey responses • E-mails • Notes
3.2	12/2014 02/2015	• Validation of answers • Informal conversations • Internal data gathering	KRI (all three companies)	• Memos • E-mails
3.3	01/2015 02/2015	• Initial analysis • Secondary data gathering	/	• Construct model BSC pillars for L-T performance • Constructs BSC climate change integration
3.4	01/2015 03/2015	• Comparison analysis	/	• Memos • selection of PSE&G

Legend: KRI = key research informants in selected companies, executives on Director, Vice president, project team leader positions

The 3.1 sub-sequence started with PSE&G, collaborating with informants on management level, directly responsible for BSC, for sustainability and climate change. The time required to obtain answers on research question from PSE&G was 18 days.

The aim of the exploratory case study survey was not only to validate the research pillars, but especially to gain insights in the construction of the pillars of the thesis. To better understand the company's BSC and its overall strategic and performance management, sixteen (16) questions were designed, including on respected time horizons of company's strategic documents, on drivers of strategic and performance management, and on BSC structure as an integrated strategic management system (see Appendix B and C). The company's sustainability management was examined through 6 questions, including three related to the integration of the BSC strategic management system (more in Appendix D).

In the following 3.2 and 3.3 sub-sequences, a similar process was conducted for Statoil and S-oil. In all three of the first sub-sequences, validation was assured by checking received

answers, comparing with publicly obtained data and through asking for clarifications from the company where needed. The level of quality of the obtained answers was very high. The logic of answers was checked through logic-related questions and cross-questions. If any information was missed out, or if the answer was not clear enough, the company was contacted again. In this period, I obtained BSC reports to check if the answers supported the actual dimensions and KPIs in the companies' BSC. These post-survey explanations and clarifications lasted from a few weeks to a few months per particular company. Hence, these sub-sequences have been conducted in parallel.

In sub-sequence 3.4, the comparison analysis of the findings between all three companies followed. Moreover, th**e company PSE&G was selected for the in-depth explanatory case study** based on the comparison of the findings from the archival-empirical research and from the exploratory research:

- Strong evidence for the company's further development and integration of BSC, also during the time following their induction into HoF. PSE&G was recognized as the best case for benchmarking efforts, for its well-rounded program of incentives and for excellence in its strategic management system relating to processes of strategy review and initiative management (Balanced Scorecard Collaborative, 2008; Field, 2008), all acknowledged within the survey responses and by supporting documents.
- Strong evidence of using BSC for sustainability and climate change management, where the company's information was acknowledged using publicly obtained information and with obvious references in Sustainability reports as well in CDP reporting (PSEG, 2010, 2011, 2012, 2013, 2014, 2015; CDP, 2006, 2007, 2008, 2009, 2010, 2011).
- Strong evidence of ambitious climate change results, including climate change disaster preparedness and evidences of transition to a low carbon economy, with alignment of investment plans (PSEG, 2010, 2011, 2012, 2013, 2014, 2015).
- Noted strong commitment to resilience management, evident through sustainability, climate change and financial resilience.

4.2.5 Fourth research sequence

The fourth research sequence, which lasted between April 2015 and December 2016 was prolongued until March 2016 per recommendation of mentor to add some additional apects and final validation. Including this additional sub-sequence it was divided in total in six sub-sequences (see Table 9). The questions for interviews and surveys were prepared in subsequence 4.1 based on findings in previous, exploratory study. Afterthat, the survey and interviews were conducted in sub-sequence 4.2, data was analyzed in sub-sequence 4.3, and findings were evaluated in 4.4, all with the aim of obtaining insights and to learn best practices on how PSE&G deals with:

- Openness of BSC, in particular the scope of actual integration of BSC with other management tools.
- Integration of sustainability issues into strategy renewal and implementation.
- Preparedness and response to the dimensions of an uncertain future.
- Development of the strategies and measures concerning expected climate change effects addressed by the BSC strategic management system.
- Test of readiness for rapid climate change management.
- Use of BSC as a performance measurement tool for managing the perspectives of future performance and uncertainty.
- Use of BSC as a strategic management system with long-term sustainability and company resilience management for sustaining long-term performance.

Table 9. Course of Fourth research sequence

Sequence	Period	Subsequence activities	Informants	Outputs
4.1	04/2015	• Preparation of interviews and on-line explanatory study	KRI PSE&G	• Questionnaire D • Questionnaire E
4.2	05/2015 08/2015	• Structured and semi-structured interviews • Internal data gathering • Informal conversations	KRI PSE&G	• Memos • E-mails • A brief summary of conversation
4.3	08/2015 10/2015	• Data analysis	/	• notes
4.4	11/2015	• Informal conversations	KRI PSE&G	• notes • developing 3rd empirical findings – explanatory
4.5.	11/2015 01/2016	• Data analysis • Results comparison	KRI PSE&G Statoil	• Developing 4th integrated empirical findings
4.6.	01/2016 03/2016	• Informal conversations • Final validation of findings	KRI PSE&G	• Final results

Legend: KRI = key research informants in selected companies, executives on Director, Vice president, project team leader positions.

Several internal reports and documentation supporting the findings from surveys and interviews were obtained and analyzed. In particular, when explaining the scope of integrations of multiple BSC elements, the BSC reporting of the mother company PSEG and its other daughter companies were analyzed. In addition, eight semi-formal research questions for the identification of the company's exposures to uncertainties and turbulences and for identification of PSE&G's approach were explored (see Appendix E).

The structure of the questions enables understanding regarding how the company builds their resilience, and how is it interconnected with BSC. Finally, I examined the company's

climate change preparedness regarding the impacts of climate change, together with its mitigation and adaptation strategies. To support this aim, twenty-two questions were framed. In addition, two climate change scenarios were developed to test PSE&G's resilience to abrupt climate change scenarios, based on the findings and recommendations of IPPC 2013 and 2014 reports (see Table 10). With 11 questions, I tested multiple climate change responses, the company's preparedness for the impacts of abrupt climate change and PSE&G's performance resilience in the circumstances of abrupt climate change (see all questions in Appendix F).

Although these scenarios have been developed for the explanatory case study, they have enabled also the results comparison with the two other companies, as done in sub-sequence 4.5, as the both climate change scenarios supported the major geographical regions of the selected three companies, while differing regarding probability and the magnitude of impact. The probability of the first scenario is very high and possible timeframe immediate. There were five questions related to this scenario. The time horizon of the second scenario is 2025–2065, with the probability located in the far end of the risk quadrant (with "very high uncertainty" but with "the most devastating" impact). Six additional questions were related to this scenario.

Table 10. Key dimensions of constructed research's climate change scenarios

Climate change	**Scenario 1**	**Scenario 2**
Certainty	Very high certainty	Very high uncertainty
Likehood	Very likely probability	Unlikely probability
Confidence	High confidence and very likely in North East America, North Europe, and South Australia High confidence and likely in North Asia.	Low confidence.
Time horizon	Until 2018	Until 2065
Impact	Extreme climate event with extreme impact (damaging cyclones, increased number of tornados, intense and very long droughts and extreme precipitation)	Rapid climate change with severe increases of mean temperatures until 2025 that could lead to abrupt changes in climate and with abrupt cooling around 2065
Geographical scope	All world	Devastating effects on North and Central Europe.

Source: IPCC, 2008, 2012, 2014 and 2014a.

At the end, final conclusions were validated by the case-study company, and built into a final proposal of the further development of BSC to accommodate the needs for uncertainty management, developed further as a model with integrated resilience determinants towards a performance vortex for long-term management of corporate resilience through BSC strategic and performance management.

4.3 Basic introduction of research companies

4.3.1 Basic facts about PSE&G

Public Service Electric and Gas (hereinafter: PSE&G) is one of the largest combined electric and gas companies in the United States. It was founded in 1903 and is now part of the Public Sector Enterprise Group (hereinafter: PSEG). The company provides electric and gas distribution and transmission services to over 300 New Jersey communities over an area of 2600 square miles. In 2014, the company provided to around 2.2 million electric and 1.8 million gas customers (approximately 70% of the state's population). PSE&G is highly regarded for its reliable service.

In 2014, PSE&G was named America's most reliable electric utility for the fifth time as it got the prestigious National Reliability Excellence Award from PA Consulting, an industry benchmarking group. Moreover, it was recognized as the most reliable utility in 2015 in the Mid-Atlantic region for the fourteenth year straight. PSE&G was also named 2015 Utility of the Year by Electric Light & Power magazine, elected for its infrastructure investments, reliability and customer satisfaction rankings, sustainability initiatives and financial strength, among other factors.

PSE&G received a 2008 BSC Hall of Fame award for its customer service and continuous improvements culture. The company convinced the jury with its well-defined performance drivers and measures, deep benchmarking efforts and its closed-loop program of incentives, initiatives, and reviews. The finances of the company are closely interconnected with those of the mother company PSEG. While the employees of PSE&G totaled 6,780 at the 2015 year-end, which represented around 50% of all employees in PSEG, PSE&G's share in operating revenue was close to 65% for 2015, with more than $ 6,636 billion in operating revenue and a net income of $ 787 million.

In 2015, the company ranked the highest in customer satisfaction with business natural gas service and large business electric service in the East, according to J.D. Power. It was the first time in PSE&G's history to rank the highest in business customer satisfaction for both electric and gas service.

4.3.1.1 A short history and basic facts of PSE&G (PSEG)

The Public Service Corporation was founded in 1903, through the consolidation of more than 400 gas, electric and transportation companies in New Jersey. While the main vehicle of the company was related to transportation, the company joined a national trend of consolidating and merging smaller utilities into large utility-holding companies. By the 1930s it had become part of a huge corporation named Public Service Electric and Gas that also owned more than 100 utility subsidiaries throughout the Eastern, Central and Southern

United States. Concerns about this concentration of economic power resulted in federal and state actions necessitating the breakup of utilities.

In 1943, Public Service once again became a stand-alone company and was renamed the Public Service Electric and Gas Company (PSE&G) in 1948. In 1985, the Board of Directors created the Public Service Enterprise Group (PSEG) as a holding company and PSE&G became the largest subsidiary. During the restructuring in 2000, the generation assets of PSE&G were transferred to PSEG Power, an electric generation and wholesale energy trading company. Today, the company shares the vision, values, performance, sustainability, and resilience approaches with the mother company, Public Service Enterprise Group (PSEG).

PSEG is a publicly traded diversified energy company, listed on NYSE (PEG) and headquartered in New Jersey. The company employs approximately 12,700 employees and generated annual revenue of close to $ 10.4 billion in 2015, with a net income of $ 1.7 billion. PSEG is ranked number 464 in Forbes magazine's "Global 2000" list for 2015, number 274 on the Fortune 500 list for 2015 and number 326 on Forbes's America's Best Employers for 2015. PSEG was named one of the Fortune "World's Most Admired companies", ranking the fourth among Electric and Gas Utilities.

Alongside PSE&G there are three additional subsidiaries of PSEG: PSEG Power LLC, PSEG Energy Holdings, and PSEG Long Island. PSEG Power owns diverse and geographically well-positioned generating assets and is a major supplier of electrical energy to the Northeast and Mid-Atlantic markets. PSEG Energy Holdings manages a portfolio of lease investments and generation projects as well as develops, owns and operates a growing portfolio of renewable energy resources. Another member of the PSEG family of companies, PSEG Long Island, operates the electric transmission and distribution system of the Long Island Power Authority, with 1.1 million customers. In addition, PSEG Services Corporation was formed in 1999 to provide quality, value-added services to internal clients within the Enterprise family of companies.

4.3.1.2 PSE&G (PSEG) operational excellence

Operational excellence with continuous improvements is the foundation of the PSE&G Operational Excellence model, developed by PSEG in order to define how the company conducts business, establishes priorities, and develops and executes business plans. The model uses BSC as a strategic management tool to monitor and assess performance (PSEG, 2014, p. 11) and to translate priorities into tactical measures of success (PSEG, 2013, p. 9). The company establishes stretch goals on metrics related to operations, people, green energy, and safe and reliable services, using benchmarking to measure up against top quartile performers in each category.

PSEG acknowledges the need for continuous management of improvements and top performance. The company accomplishes this by (PSEG, 2013, p. 9):

- Defining management accountability for governance, goal setting, and performance;
- Fostering a workplace environment that enables it to attract, develop, and retain a highly skilled, diverse, and engaged workforce;
- Providing disciplined implementation of the shared management model framework which drives each line of business, supporting organizational units in their efforts to achieve top performance levels and promoting continuous improvement;
- Utilizing the BSC template through which, and against which, the organization's performance can be assessed vis-a-vis internal measures and external benchmarks;
- Realizing synergies, identifying and implementing best practices in order to optimize organizational scale, resources, and improvement efforts;
- Focusing on identifying and satisfying customer needs and objectives;
- Providing a platform for efficient knowledge transfer;
- Maintaining predictable, consistent guidelines and expectations for behavior based on the company's values of Accountability, Continuous Improvement, Customer Focus, Diversity, Ethics and Integrity, Respect, and Safety.

4.3.1.3 PSE&G (PSEG) financial performance

As PSE&G financials are an essential part of the PSEG company, the overall performance was analyzed to gain an authentic understanding of performance. PSE&G and its mother company PSEG are well known for having one of the longest recorded periods of paying dividends in corporate America – 112 years. PSEG is achieving sustainable performance, as reflected in its net income and profit margin performance (see Table 11 and Figure 7).

Table 11. PSEG performance in years 2012–2014 (in USD)

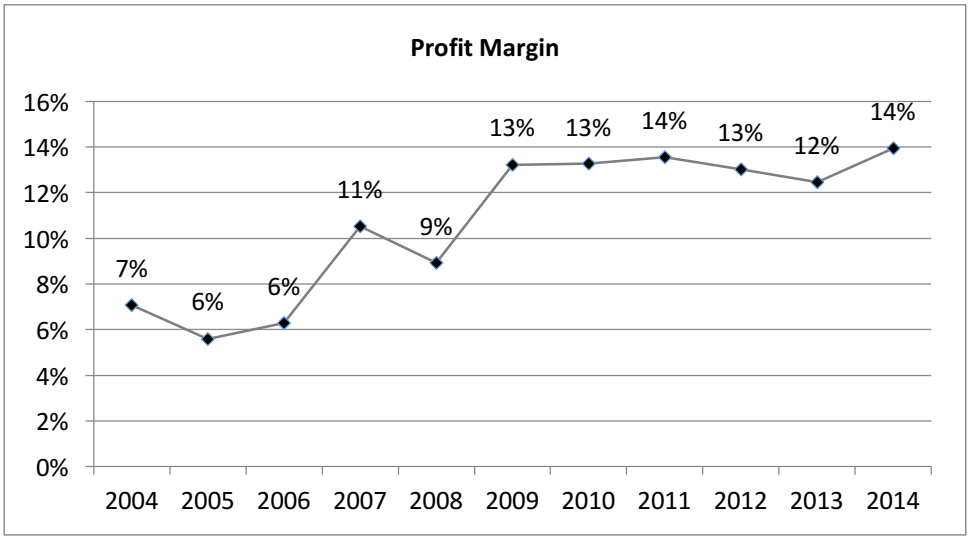
Element	2012 (M$)	Index 2011/12	2013 (M$)	Index 2013/12	2014 (M$)	Index 2014/13
Total revenues	9.781	83	9.968	102	10.886	109
Net Income	1.275	82	1.243	97	1.518	122
Total equity (31 December)	10.780	112	11.609	108	12.186	105
Total assets (31 December)	31.725	106	32.522	103	35.333	109

Source: PSEG, 2011, 2012, 2013, 2014.

The growth rates analysis shows that PSEG reached a revenue growth of 9% in 2014 and 22% growth in net income in comparison to 2013. Moreover, PSEG was very profitable in 2014, as evidenced by profitability indicators such as a profitability margin of 14% in 2014 (see Figure 7), return on assets (ROA) of 4% and a return on equity (ROE) of 12%. PSEG reached $ 919,694.2 of sales per employee in 2014 and had the leverage ratio of 1.9 as per

December 31, 2014. The results for 2015 revealed a slight decline in annual revenue of 4.5% in 2015 but an increase in net income of around 13%. Although the year was one of the toughest for the energy sector, the profitability margin ended on a record high, being slightly over 16%. The assessment of stock performance showed a 33.86% growth in 2014 and a drop of 2.80% in 2015, while the overall performance of stocks of the industry utilities has been 11.81% (PSE&G, 2016).

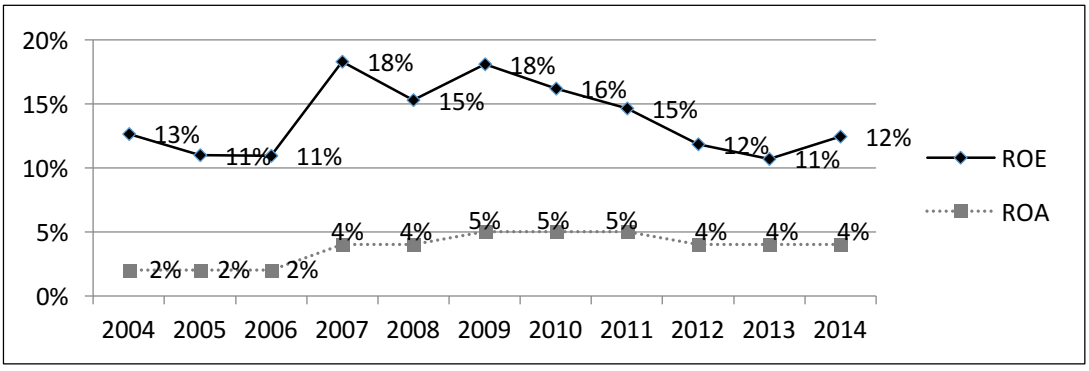
Figure 7. PSEG's profit margin performance in the 2004–-2014 period



Source: PSEG Annual reports 2004, 2005, 2006, 2007, 2008, 2009, 2010a, 2011a, 2012a, 2013a, 2014a.

Likewise, the analysis of the long-term financial performance of PSEG over that period of ten years – one of the most turbulent decades – showed impressive growth rates and profitability indicators, aside from the fact that PSEG never failed to pay dividends. For example, net income growth in 2014 compared to 2004 was higher by 209%, with an average annual profit margin of 10.7%, average ROA of 4.0% and an average ROE of 13.8% for the whole decade (see more in Figure 8). In this observed period, the financial strength of PSEG improved as the laverage ratio decreased from 4.1 in 2004 to 1.9 in 2014.

Figure 8. Return on equity and return on assets in PSEG in the 2004–2014 period



Source: PSEG Annual reports 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014.

4.3.1.4 PSE&G's response to climate change

PSEG as well as PSE&G acknowledge that climate change is a serious threat. At an early stage they recognized the need to address it. Since 1994, PSEG pursued a low-carbon strategy that aligns its business interests with regulatory action on climate change. Evidence from research indicates that the company is expecting (at a likelihood of 66% and above) to be affected by climate change impacts as early as 2018. Two climate change indicators – damaging cyclones and sea level rise – were acknowledged to represent a source of very high risks, followed by extreme temperature and extreme precipitation.

Consequently, the need for a resilient infrastructure to improve society's ability to withstand and recover from extreme and changing weather patterns (PSEG, 2013, p. 11) was identified as being the biggest climate change challenge. Hence, an essential part of the Group's sustainability strategy is dedicated to climate change, and consequently considerable parts of its Sustainability reports 2013, 2014, and 2015 address climate change, not only as a risk but also as an opportunity.

Initially, PSEG publicly acknowledged that central to its green energy strategy was the intention to effectively address climate change through reducing own greenhouse gas emissions and through working to advance public policies that will effectively mitigate climate change. After 2011, PSEG's climate change strategy evolved into a climate resilient strategy based on three pillars: **clean energy displacement strategies and targeted long-term reductions from smaller sources**; being prepared for extreme weather and reducing vulnerability to extreme weather events; **and climate change adaptation strategies and building resilience** (PSEG, 2013, 2014).

Early mitigation strategies

PSEG established its initial carbon emissions goals in the early 1990s and was one of the first companies in the industry that recognized the need to address climate change. As a participant in both the Department of Energy's Global Climate Challenge and the Environmental Protection Agency's Climate Leaders programs, PSEG set a record for setting voluntary carbon reduction targets and meeting or exceeding them (CDP, 2011). In 1994, PSEG was the first electric company to sign up for the Department of Energy's Global Climate Challenge program, committing to stabilize carbon emissions from its power plants to 1990 levels by 2000. This goal was met in 2000 through the reduction of CO_2 emissions by over 500,000 tons between 1990–2000 and at the same time maintained the MWh production.

Following that, PSEG voluntarily pledged in 2004 to intensively reduce the GHG emissions of its fossil fuel-fired power plants by 18% from 2000 levels as early as 2008, through the Environmental Protection Agency's Climate Leaders program. PSEG again

met this voluntary goal by reducing its GHG emissions intensity by 31% from 2000–2008, while increasing MWh production by over 50%. To achieve this goal, PSEG invested 3 billion USD in the construction of technologically advanced gas combined cycle power plants and realized operational efficiency in several of its fossil fuel power plants.

Subsequently, building upon this success, in 2009 PSEG set a new goal: to reduce its GHG emissions to 25% below 2005 levels by 2025 by implementing a new climate strategy with three principal areas of energy efficiency, deployment of renewable energy, and clean central station power that includes emissions-free nuclear power. These goals included the reduction of energy consumption in offices, lowering the carbon emission intensity of the power generation fleet, delivering energy efficiency to customers, and generating renewable energy from utility and non-utility investments (CDP, 2011). Combined investment in these areas exceeded $ 3 billion.

PSE&G contributed significantly to PSEG's successes. It put into service eleven utility-scale solar installations and installed 72,000 solar units on utility poles across PSE&G New Jersey service territory. PSE&G also facilitated additional 19 megawatts of solar capacity in its service territory through an innovative solar loan program. With regulatory approval, PSE&G in 2009 commenced two energy efficiency initiatives: the first was a four-year Carbon Abatement Program and the second an eighteen-month Energy Efficiency Economic Stimulus Program (CDP, 2011). The approach proved to be very successful, as in 2011 PSEG met its climate mitigation goals fourteen years ahead of schedule. PSEG's **current climate change strategy** shifted from an overall reduction strategy and evolved into a climate resilient strategy based on the following three climate change strategies:

Clean energy displacement strategies and targeted long-term reductions from smaller sources (PSEG, 2013, 2014)

- Half of the company's power is today free of greenhouse gas emissions.
- PSE&G's Solar Loan Program helped to finance and develop more than 80 megawatts of solar capacity, while the plans anticipate a further 98 megawatts.
- Initiatives to reduce GHG emissions from mobile resources, in particular through encouraging own employees to commute in electric cars.

Preparedness for extreme weather

- Improving many levels of addressing severe weather events is part of PSEG's regular practice, hence th company has a well communicated and up-to-date storm manual.
- An effective and timely response to winter storms (PSEG, 2014).
- A robust structure and processes in place to support storm response and restoration.

Climate change adaptation and resilience strategies

- PSEG is addressing Climate change adaptation strategies and is a founding member of the New Jersey Climate Adaptation Alliance, founded on November 29 2011 (PSEG, 2012). The Alliance is dedicated to climate change preparedness and adaptation in key impacted sectors, including energy infrastructure. It led efforts to identify critical issue gaps and to recommend actions to improve New Jersey's resilience.
- With regards to its climate change adaptation strategy, PSEG's approach is to learn as much as possible from experience with recent severe storms. Such best practices learned from superstorm Sandy and from the severe polar vortex in the 2014 winter are also part of the adaptation strategies that are building resilience.
- To make key systems more resilient in order to better withstand severe weather and other impacts, PSEG developed the Energy Strong Proposal, related to the reallocation, protection, modernization, and deployment of smart grid technologies as well as to the creation of redundancy. Investments were approved in May 2014 to the total amount of $ 1.22 billion for the period of three years (PSEG, 2014, pp. 35–36). While some of the infrastructure improvements will also lower GHG emissions, others are building resilience. For example, PSE&G will replace and modernize 250 miles of low-pressure cast iron gas mains and upgrade other gas distribution facilities; will deploy $ 100 million to deploy smart grid technologies to better monitor system operations; and dedicate $ 100 million to create redundancy in the electrical distribution system, reducing outages when damage occurs.

In addition to these three strategies, PSEG also runs the energy efficiency and renewable energy program, including a solar development approach based on direct ownership of large-scale grid connected projects and pole-attached systems (PSEG, 2010, 2014).

4.3.2 Short description of S-OIL Corporation

4.3.2.1 Basic facts about S-OIL Corporation

S-OIL Corporation is a South Korean oil-refining company operating in the Asia-Pacific region which was established in 1976. The company operates an oil refinery facility with a capacity of 669,000 barrels per day, and owns facilities for the production of petrochemicals and lube base oil in the Onsan Refinery in Ulsan. The company vision of being "the most profitable and integrated energy company" is developed from S-OIL's mission of "sustainable, profitable growth".

Based on both the mission and the vision, S-OIL prioritized three clear strategic directions: (1) further investment in the refining business, (2) integration with the petrochemical business and (3) seeking out renewable energy business (S-OIL, 2013a, 2014a). These

strategic directions build the S-OIL Action Plan, together with performance measurement and strategic imperatives (S-oil 2015).

In alignment with its mission, S-OIL has been included in the DJSI World for six consecutive years. The company was also evaluated as Korea's No.1 company in the oil refining sector and acquired the Carbon Trust Standard (CTS) in 2012 (the global certification on carbon management from Carbon Trust). S-OIL was also rated among "The A List" companies by CDP that comprises 187 businesses, identified from a pool of nearly 2,000 listed companies (CDP, 2015). This is a significant achievement, as very few companies from the energy sector are able to meet the leadership criteria, hence only five energy companies achieved an A band and a position on the CPLI.

To perform its mission of sustainable profitable growth, in 2008 S-OIL adopted a BSC based performance management system and was inducted into the Palladium BSC Hall of Fame for Executing Strategy® in 2012. In this period, the company significantly enhanced its competitiveness and profitability.

4.3.2.2 S-OIL financial performance

S-OIL showed strong long-term financial performance, generating the highest operating profit ever in 2011. Recently, however, S-OIL has faced some challenges and recorded a decline in revenue and net income since 2013. This resulted in an announced loss of 288 billion KRW for 2014 (see Table 12) and lower return on equity and return on assets (see Figure 9).

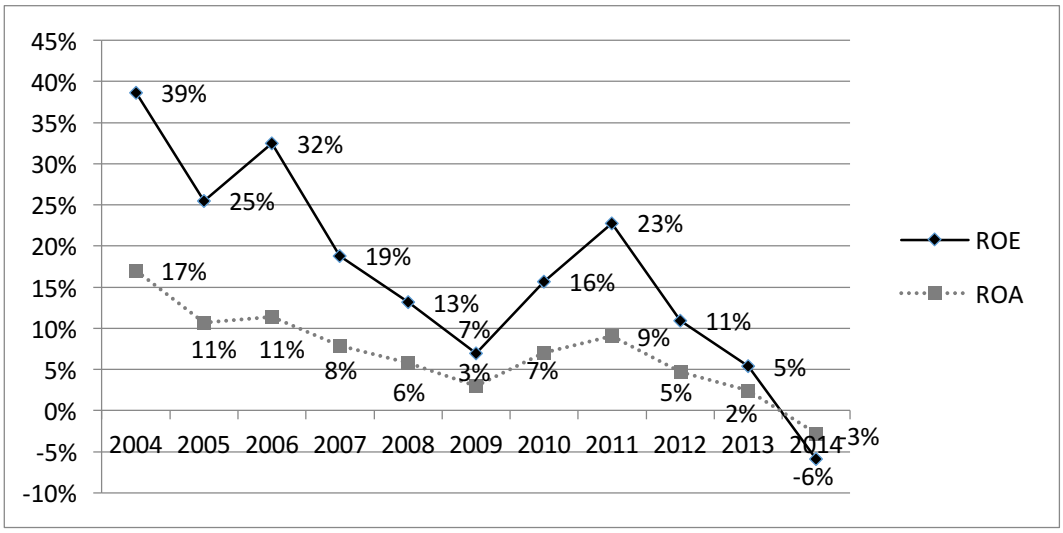
Table 12. S-OIL's performance in years 2012, 2013 and 2014 (in billions KRW)

Element	**2012**	**Index 2011/2012**	**2013**	**Index 2013/2012**	**2014**	**Index 2014/2013**
Total revenues	34,723	109	31,159	90	28,558	92
Net Income	585	49	290	49	-288	-99
Total equity (31 December)	5,340	102	5,376	101	4,909	91
Total assets (31 December)	12,497	95	11,921	95	10,256	86

Source: S-OIL Annual reports, 2011, 2012, 2013, 2014.

S-OIL's strategic performance management system uses KPIs and engages its employees to set strategic targets for major market changes. After that, the targets are shared with all employees in order to take appropriate action. A similar system is used for the Compliance Monitoring System, implemented in 2011, which monitors the compliance Key Performance Indicators (KPI's) of each team and department on a quarterly basis.

Figure 9. Return on equity and return on assets in S-OIL in the 2004–-2014 period



Source: S-OIL Annual reports 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014.

S-OIL regularly assesses risk factors that can affect its management goals, using company-wide risk assessments and risk-based audits (since 2005) in addition to using outcomes of its Enterprise Risk Management activities and benchmarking analyses of global practices.

4.3.2.3 S-OIL's response to climate change

S-OIL responded to threats of climate change through participating in public policy processes and through designing mitigation and adaptation strategies. To implement mitigation strategies, S-OIL developed specific plans for setting mid-to-long-term GHG reduction targets and systematically monitors GHG emissions, forecasts future emissions and required amounts of abatement, pursues GHG mitigation activities, and shares GHG information. In aid of this, in 2013 S-OIL launched internal protocols to take into account carbon costs for all new investment decisions. In its production lines, GHG emissions were reduced through increased energy efficiency and decreased waste heat (S-OIL, 2015a).

For example, S-OIL made improvements among 18 waste heat recovering facilities and processes in 2013 (S-OIL, 2014) and will install an additional mechanical vapor recompressor that recovers waste heat in each production process, which will save approximately KRW 30 billion in annual fuel costs. S-OIL plans to reuse the waste heat from its petrochemical refinery process to produce steam energy, which will fuel steam turbine power generators and will produce and distribute enough electricity to supply 5,400 households. This plan is expected to lower GHG emissions by approximately 60,000 tons annually and is under development in partnership with Ulsan's municipal government.

S-OIL adaptation strategies are focused on the numerous effects of climate change on the earth such as torrential rains and typhoons. With its Intelligent Diagnostic Alert System (IDAS), S-OIL aims to maintain stable operations in case of such an emergency by

diagnosing the situation accurately and taking prompt measures. It also carries out periodic drills based on pre-defined emergency response plans for various scenarios (S-OIL, 2015a). In order to be responsive to opportunities arising from climate change, S-OIL is contemplating facility investment to ensure a flexible response to potential changes in product demand caused by climate change.

4.3.3 General description of Statoil

4.3.3.1 Basic facts about Statoil

Statoil is among the world's largest net sellers of crude oil and condensate and is the second largest supplier of natural gas to the European market. Statoil ASA is a Norwegian government-controlled energy company, with oil and gas exploration and production operations in 35 countries. Founded as The Norwegian State Oil Company (Statoil) in 1972, the corporation is headquartered in Norway and has approximately 23,000 employees worldwide. Statoil went public and was listed on the Oslo and New York stock exchange in 2001, though the Norwegian government still holds a substantial ownership share. The company was recognized as one of the best performing National Oil Companies (NOCs). In October 2007, Statoil merged with Norway's second largest oil producer Hydro, and implemented an IPO of Statoil Fuel and Retail ASA (SFR) on the Norwegian stock exchange in 2010.

Statoil's vision is to provide the energy to meet the growing demand caused by economic and social development, while at the same time caring for the environment and actively taking part in international efforts to mitigate climate change. Statoil was inducted into HoF in 2007 for its excellence in strategy implementation and for achieving key performance results, such as a revenue increase from $ 38.7 billion to $ 68.5 billion, stock price increase from $ 6.76 to $ 27.28 (Balanced Scorecard Collaborative, 2008), and being voted four times number one in its industry on the Dow Jones Sustainability Index, the leading corporate environmental indicator – all in the 2001–2006 period.

As evidenced by an annual survey, there was a significant increase in employee engagement and understanding of Statoil's performance management process. Statoil is also a widely recognized case among HoF companies due to the development of the Beyond Budgeting movement and its active role in the Balanced Scorecard Community of Bjarte Bogsnes,VP (Performance Management Development at Statoil).

The company's main activities are represented in seven business areas: Development & Production Norway (DPN); Development & Production International (DPI); Development & Production North America (DPNA); Marketing, Processing and Renewable Energy (MPR) Technology; Projects and Drilling (TPD); Exploration (EXP); and Global Strategy & Business Development (GSB).

According to the documentation examined, sustainability is at the core of Statoil's business. The company's concept of sustainability is to help meet the world's growing energy needs in an economically, environmentally, and socially responsible manner. As stated in Statoil's Sustainability report 2013 *"Our economic, environmental and social performance is driven by effective long-term relationships, technology and efficient use of resources and capital"*. Statoil has an embedded sustainability approach, with a fundamental belief in the business case for sustainability that is focused on efficiency in resources (and therefore costs), a long-term social license to operate, and technology that will secure future business opportunities.

4.3.3.2 Statoil Financial Performance

After a period of growth up to 2012, Statoil faced some serious challenges in 2013 and 2014 because oil and gas production were not growing and international performance lagged behind Norwegian results (see Table 13). Likewise, the financial results for 2015 showed 22.4% decrease in annual revenue and the company ended 2015 with a net loss of NOK 37.3 billion. In 2015, Statoil announced its intention to abandon its 2020 production targets and decrease its capital expenditure (Statoil, 2015).

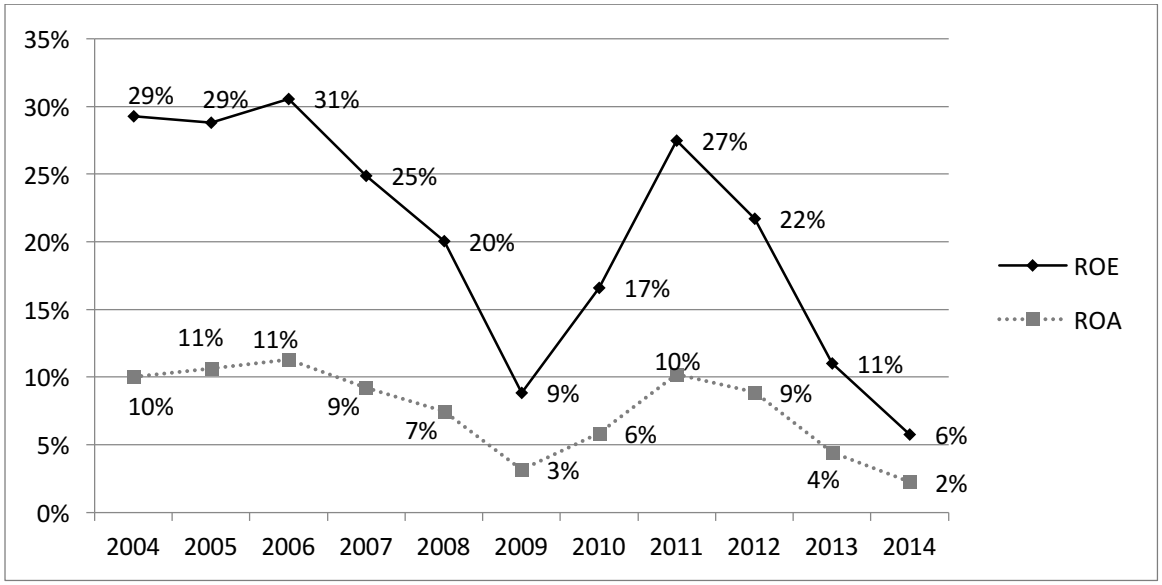
Table 13. Statoil's performance in years 2012, 2013 and 2014 (in millions NOK)

Element	**2012**	**Index 2011/2012**	**2013**	**Index 2013/2012**	**2014**	**Index 2014/2013**
Total revenues	718.2	108	637.4	89	622.7	98
Net Income	69.5	89	39.2	56	22.0	56
Total equity	319.9	112	356.0	111	381.2	107
Total assets	784.4	102	885.6	113	986.4	111

Source: Statoil Annual reports 2011, 2012, 2013, 2014.

Compared with its nine competitors (including Chevron, BP, ExxonMobil, ConocoPhillips, and Shell), Statoil was always very profitable, reporting high average return on assets (ROA) and return on equity (ROE) rates in multiple years since 2012 (see Figure 10).

Figure 10. Return on equity and return on assets of Statoil in the 2004–2014 period



Source: Statoil Annual Report 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014.

4.3.3.3 Statoil's corporate strategy

Statoil aims to grow and enhance value through its technology-focused upstream strategy, supplemented by selective positions in the midstream and in low carbon technologies. Its top priorities are safe, reliable operations with zero harm to people and the environment, and to deliver profitable production growth through disciplined investments and prudent financial management with competitive redistribution of capital to shareholders (Statoil, 2013).

Statoil uses a management system based on a set of principles, policies, processes and requirements, documented in governing documentation, the most important of which is the Statoil Book. Statoil Management System's three main objectives are: (1) to contribute to safe, reliable, and efficient operations and to enable the group to comply with external and internal requirements; (2) to help them incorporate their values, people and leadership principles in everything they do; and (3) to support their business performance through high quality decision making, fast and precise execution, and continuous learning. Therefore, the policies on **Safety, Security, Sustainability, People, Communication, Risk Management, Finance and Control, Procurement, Ethics, Managing Information** are common to the group, all divisions, and all employees (Statoil book, 2013, pp. 55–74).

Statoil's integrated performance management is termed "Ambition to Action", with the main purpose of translating ambitions and strategies into strategic objectives, key performance indicators, actions, and team or individual goals. It has its roots in 1990, a time when Statoil realized that the regional area's reserves peaked and that it could no

longer rely solely on the region's resources to power growth, regardless of the fact that the Norwegian continental shelf had long fueled Statoil's success.

In 1997, the finance group encouraged adoption of BSC, intrigued by its mix of financial and nonfinancial perspectives and by scorecard implementations in other European companies (HoF, 2008, p. 31). The first implementation generated limited success, as the company failed to link BSC sufficiently to other business processes, the traditional budget remained dominant over the scorecard, and the program had no IT support (Statoil, 2014b).

However, in 2000, frontline managers within the Exploration and Production Norway business unit revived Statoil's BSC program by developing a management information system (MIS), i.e. a web interface built on top of an SAP business data warehouse. The aim of the MIS project was to streamline the most important key performance indicators (KPIs) that form the Statoil BSC program alongside standardization of automatic data capture and delivery of reliable performance data through a user-friendly system. Following the success of this bottom-up effort, one entire business unit adopted MIS in 2003, followed by the remainder of Statoil's units during 2004 and 2005.

Statoil is also well known as having the best practice in following the SFO principle "make strategy a continual process" by ensuring that budgeting is driven by strategy and in principle "making strategy everyone's everyday job" through linking bonuses of all employees to how well the company performed on two core KPIs: relative return on capital employed and relative shareholder return (both performances measured against industry peers' performance). All employees ensure that Ambition to Action is established at all relevant business levels (Statoil & Bogsnes, 2012).

To sustain long-term performance, Statoil placed risk management as one among ten corporate policies to enable identification, evaluation, and management of risks related to all organizational levels, to its major commitments, and to its corporate objectives. In addition, Statoil manages risks in order to make sure that its operations are safe and in compliance (Statoil book, 2013, p. 66), to avoid undesirable incidents and to strengthen operational performance.

Risk overviews and reputational consequences are also part of the decision-making process for investment projects at pre-defined milestones. The company uses Value at Risk measures for all their trading. They also assign and review internal credit ratings and global credit limits at the corporate level, insure against physical damage, business interruption and third-party liability at the corporate level, and optimize their self-insurance. To act on risk and to ensure business continuity, the corporate risk committee uses business impact analyses as well as assesses and discusses measures to manage the overall risk for the company.

4.3.3.4 Statoil's response to climate change

Statoil acknowledges that there is a broad scientific and political consensus that **climate changes** are influenced by human factors and that there are sufficient arguments for company actions (CDP, 2013a). Influenced by regulatory, reputational and business risks and opportunities, climate change is now a vital part of Statoil's revised business strategy for 2020, with the strategic objective of being an industry leader in carbon efficiency. In August 2011, the company set carbon efficiency targets to be attained by 2020 for six production segments (conventional oil and gas, extra heavy oil, heavy oil, shale gas, LNG, refining and processing) and reports on GHG emissions (CDP 2014, 2015a)[30].

In addition, Statoil launched a strategy for the development of renewable and clean energy technologies that comprises plans for offshore wind, with several billions of investment, and with floating wind demo projects that could revolutionize the field, along with carbon capture and storage (CCS). Statoil also has many years of experience regarding underground CO_2 storage at several of its oil and gas production facilities, including the Sleipner Field off the Norwegian coast. The group and has a key technology for reducing carbon emissions (regarding which the final investment decision is planned for 2016). Recently, Statoil increased its focus on methane emissions, in order to better understand and manage potential leakage points and help implement meaningful policy solutions.

Statoil is ranked number one on the 2014 Global 100 index of the world's most sustainable energy companies, and number four of all corporations (Corporate Knights, 2014), which is in accordance with Statoil's aim to be recognized as the most carbon-efficient oil and gas producer, committed to creating lasting value for communities.

4.4 Key research dimensions overview

The explanatory case study was selected to explore the BSC approach to sustainability and uncertainty management through the company's preparedness and the management of climate change in the selected company PSE&G. The aim of this part of the research was to explore the question "How" and to obtain PSE&G's insights into BSC as an approach to performance and strategic management which integrates benchmarking, sustainability management and climate change management. The management in the circumstances of uncertainty was explored through climate change and financial resilience of PSE&G what enabled the identification of those resilience capabilities that are contributing to the overall resilience of PSE&G performance. This part of the research served as the basis for presenting results of research questions (see Chapter 4.5).

[30] For example, emissions of CO_2 were 15.1 million tons in 2013 and 15.3 million tons in 2014, methane emissions were 37,000 thousand tons in 2013 and 40.6 thousand tons in 2014 and total GHG emissions remain stable at 16.0 million tons of CO_2 equivalents in 2013 and 16.6 million tons of CO_2 in 2014.

4.4.1 Balanced Scorecard as the performance and strategic management system

4.4.1.1 PSE&G's Balanced Scorecard Approach 2002–2015

The Balanced Scorecard was introduced in PSE&G in 2002 when Ralph Izzo became the president of PSE&G[31]. The initial BSC was launched by a team of vice-presidents and directors, under the leadership of Mr. Izzo. The company's income statement and strategy were reviewed and analyzed with an aim to identify drivers of success. The team came up with more than 500 KPIs, from headcount and productivity to revenue and asset utilization, with the final selection of 30 priorities. After that, measures based on these key drivers and a standard set of metrics for the entire organization were developed by a working group of managers from each business area.

This working group also defined a strategy and developed a pictorial business model (BSC Collaborative, 2007, p. 27) – an illustrated strategy map enabling employees and stakeholders to understand the cause-and-effect relationship between people, processes, customers, and financial performance. By the end of 2002, the company's first strategy map was presented, followed by the completion of the company's first corporate-level BSC in January 2003. Subsequently BSC was cascaded to business and supporting units that together with department BSCs strengthen the linkage of day-to-day results to strategy.

In parallel, a BSC team was established for in-depth quarterly scorecard reviews with leadership, monthly reporting and dissemination of best practice. This enabled PSE&G to realign the organization of the company in order to better support strategic objectives and the scoreboard process as well as to increase accountability for results, in particular by assigning to specific business areas direct responsibility for the implementation of specific parts of the strategy (BSC Collaborative, 2007; Field, 2008).

The education of employees, managers, and unions was identified as the next critical step for assuring the success of the new BSC system. The company's communication group developed a comprehensive program for all levels of the organization that included a scorecard training course for managers, business meetings for the top 100 management and union leaders, an intranet site featuring performance and best practice information, and monthly letters to employees from executives with highlighted achievements and other significant impacts on performance (Field, 2008; PSE&G, 2015a).

Addition alignment with unions and employees was reached in 2003, when PSE&G introduced a shared savings program that provided a bonus if between six to ten key targets and financial budget were met. The underlying measures were derived from three out of

[31] Mr. Izzo is now Chairman and CEO of holding company PSEG.

four BSC perspectives (people, customer, and operations). They included meter-reading errors, timely response to customer service calls, and employees engagement survey results. As noted, also non-union employees' compensation was linked to key scorecard targets. The importance of employees' contribution to the company's overall performance was stressed in specially organized quarterly meetings with the union's top leaders and the executive council, whose aim was to keep them well-informed of strategic performance and to generally keep their support.

In addition, monthly meetings with the unionized workforce were held. Aside following the prime objectives of these gatherings to discuss performance and workforce target achievement, the dialogue become more substantive. As acknowledged by Mr. Izzo (Field, 2008, p. 4): "We realized that with an incentive payment program, a healthy discussion of why we were measuring certain things and how to make them better would naturally follow" (see also Figure 22). For the first time, employees were able to gain insights into the real causes of certain problems. For example, regarding why customers were not satisfied with repair services, workers could look at customer satisfaction metrics and see the reasons for those complains. All this lead to the change from reactive, emergency-type responses to day-to-day improvements.

Today, PSE&G's BSC is fully implemented and aligned with all levels of the organization, cascading from the board level down to all business units and strategic business units (see also Figure 20). Furthermore, all various business departments and employees are aligned to the overall strategic goals through a well-integrated performance management process that includes employees as well as financial, operational, and strategic goals (see also Figure 22). Hence, the research confirmed that BSC, as a performance and strategic management system, is perceived as critical to PSE&G's success (PSE&G, 2016).

Strategy reviews are essential part of PSE&G's integrated strategic management system that is based on strategy excellence and that is employed at several levels of management. The company holds monthly strategy review meetings and on the level of president such review meetings are on quarterly basis, including his direct reports and the participation of senior management (PSE&G, 2014a). The president also meets quarterly with union presidents and their top council members. Furthermore, also vice-presidents and division heads carry out monthly and quarterly reviews that engage the controlling department, strategy team, and risk management team (PSE&G, 2014a, 2016).

The information from the meetings where BSC results and their impact on overall performance is discusses is then shared on monthly basis between the president and his leadership in operational meetings and executive board's meetings (PSE&G, 2014a). On governance side, BSC results are shared with the Board of Directors' meetings, and regularly referred to in communications with shareholders, state regulators, and investors (PSE&G, 2016). Furthermore, every quarter the president meets separately with each vice-

president and his or her direct reports in order to discuss any performance gaps, identify appropriate initiatives to close those gaps, and set up a team to follow up the initiatives.

As noted in the research, the PSE&G's top leadership play also an active role in formulating a long-term strategy and the company's top 100 leaders, including union leaders, meet each quarter at a business outlook meeting (Field, 2008). The assumptions of current strategy are tested on annual basis to adapt to weak signals, but, if needed, the frequency of the meeting could increase (PSE&G, 2016).

In 2007, PSE&G was recognized as the best case for executing strategy and was inducted in HOF for "achieving new levels of measurement precision and accountability and for developing a sophisticated, cross-industry benchmarking program" (Balanced Scorecard Collaborative, 2008, p. 27). The company achieved breakthrough results especially in three key areas – safety, reliability, and costs. As recognized in the process of HoF evaluation the company's OSHA incident rate, which measures the frequency with which injured employees require medical attention, fell to 1.38% in 2006 from 3.21% in 2002 (Field, 2008, p. 5). Moreover, the OSHA accident severity rate, a measure of the amount of time an employee is absent due to injury, declined to 8.48% in 2006 from 36.21% in 2002 (Balanced Scorecard Collaborative, 2008, p. 27).

The electric outage frequency rate, which measures the percentage of customers experiencing an outage lasting more than five minutes, decreased to 0.69% in 2006 from 0.81% in 2002 (Balanced Scorecard Collaborative, 2008, p. 28) while the electric outage duration rate, which measures the average length of time a customer is out of service, decreased to 66 minutes in 2006 from 101 minutes in 2002 (Field, 2008, p. 5). These results placed PSE&G to national top-decile performance, as recognized also by many awards and recognitions for both, safety and reliability. Furthermore, the company bolstered division profitability by cost measures in its appliance service business.

Another justification for the selection and induction of PSE&G to HOF in 2007, and with the same importance as these results, was the overall transformation of the company culture. The company achieved higher level of partnership with the company's union and a shared understanding between employees and management that each individual's performance affects overall results. As Mr. Izzo acknowledged (Balanced Scorecard Collaborative, 2008, p. 28), "as an organization committed to operational excellence, we use the Balanced scorecard to keep a clear focus on our strategy and the role every employee plays in achieving high levels of performance" (PSE&G, 2015).

Encouraged by the success of the strategic management system that unified the organization around common strategic goals in PSE&G, the top management under leadership of Mr. Izzo expanded the BSC methodology throughout the entire PSEG company and to all other business and support areas (see also Figure 16). PSEG

implemented the BSC process to drive the long-term strategy implementation and performance measurement also in PSEG Power, PSEG Energy Holding, and PSEG Services Corporation. This process is the foundation for continuous improvements across all of the company's Lines of Business (LOBs), upgraded with extensive benchmarking practices to measure performance against industry standards and the best-in-class companies (see also Figure 17). Mostly, the target is to reach top quartile performance against peer companies, while for safety that is one of the most important cornerstones of PSEG's long-term success, the target is to reach top 10% performance.

PSE&G is recognizing that BSC helps eliminate a short-term mindset, balance financial and non-financial goals, translate the strategy into comprehensive set of goals and targets, and align all levels and functions. Such an approach is well illustrated in PSE&G's BSC reports, for example in the BSC report for June 2015 the results per KPI are divided into two major parts: the year-to-day part (hereinafter: YTD), with highlighted *Forecast Arrow Indicator* and the monthly review for June, with highlighted *month status indication* (see more in Figure 20). A strategic insight and foresight is obtained from comparisons with the preceding month and past YTD results, with current year-to-date results, with 2015 targets, and with forecast estimation, all for PSE&G as a whole and all its LOBs. Subsequently, the actual value results for June are also presented for overall PSE&G and individual LOBs.

For PSE&G BSC is a guarantee that strategy is a continuous process, which improves the depth and quality of strategic planning and focuses on continuous anticipation of uncertain changes (PSE&G, 2014a). Based on these underlined elements of BSC, PSE&G drives its high performance and resilience (PSE&G, 2016). As a result the company gain an operational and strategic insight through BSC integration with corporate risk management, especially for detecting and addressing early warning signals (PSE&G, 2016).

In addition, as enablers of the foresight into the future, a high share of future indicators was noted in BSC among all perspectives (see more in Figure 24). Such integration was emphasized by Malts et al. (2003) as an enabler for future performance. Finally, BSC is fully integrated with sustainability management, so that both contribute to building corporate resilience (for more see Figure 12, Figure 13, and Table 16). In the company's opinion this enables them to build the best case for future success, relying on the depth and quality of own strategic planning and the ability to retain customers over the long-term (PSE&G, 2014a).

4.4.1.2 PSE&G's Balanced Scorecard and Benchmarking integration

Since the outset of the explanatory case study I have noted that PSE&G takes a very sophisticated approach to developing strategy excellence based on BSC by using benchmarking and Six Sigma approach (PSE&G, 2014a), especially in its efforts to make

strategy a continual process. Benchmarking data are embedded into everything from strategy reviews to the budgeting process, providing an efficient way of promoting the use of best practices in other organizations and improvement of their results (PSE&G, 2016). Since the implementation of BSC as a strategy management system, all review meetings have included external benchmarking data and the annual review for top management has included a matrix used by top-performing utilities (Field, 2008). To assure service reliability the company uses numerous benchmarks, including leak reports per mile and leak response rate, with which it compares its performance with that of six leading utilities.

Likewise, in the planning process, where all metrics across all four BSC quadrants (people, operations, customer, and financial) must meet annual targets, the process of setting targets is also aligned with benchmarking performance (Field, 2008). Therefore, rather than usual historical data the targets include benchmarking performance in either the top decile or top quartile and projected three- to five-year benchmarks, along with other company-specific data (PSE&G, 2016). Through this process, the business planning group as well as business areas arrive independently at a proposed target and then jointly present it to the president for review. This is supported by benchmarking data, collected and published by the business planning group before the budget cycle begins, which allows the leadership team to include initiatives in its plan (PSE&G, 2014).

Benchmarking is also an important element of PSE&G's process improvement efforts, supported by Six sigma (PSE&G, 2016). Process improvement is now integrated into all business areas and is linked to the strategy with obligatory direct impacts on one or more BSC matrices. The key part of these activities involves incorporating key industry benchmarking data into their development. To gather this data, managers make site visits to and conference calls with leading companies in order to observe best practices in the field. PSE&G also participates in yearly best-practice-sharing sessions that bring together companies from inside and outside the industry.

For example, PSE&G might study the company with the best motor vehicle safety record to learn what it does to achieve that record and identify the steps it might adopt to achieve the same best practice. In addition, for more than twenty years PSE&G has been the sole sponsor of the Gas and Electric Utility Peer Panel, a group of two dozen organizations. Aside two major benchmarking studies for both electricity and gas delivery industry, the panel launched the third study in 2007 to support the company's customer operations group (Field, 2008). Each year, the studies collect performance results on the employee, customer, operations, and financial aspects of the business (BSC Collaborated, 2007).

As argued by PSE&G managers "benchmarking means for PSE&G much more than 'beat the competition' attitude, rather it represents a long-term competitiveness and survival factor (PSE&G, 2016) as well as the most influential factor for development of long-term strategy and its implementation (PSE&G, 2015a).

4.4.2 Strategic integration of sustainable development

4.4.2.1 PSE&G's (PSEG) Sustainability approach

Sustainability represents a business imperative for both PSE&G and its mother company PSEG. The focus on sustainability is not recent, rather it has been a driver of successful operation in the last hundred years (PSEG, 2013, p. 10) and enabler of long-term sustainability of the company. PSEG established a corporate environmental, health, and safety policy in 1996, which reflects the principles by which PSEG operates in eight areas associated with sustainable practices: associate health and safety; nuclear safety, climate change, environmental compliance, risk reduction, pollution prevention and resource conservation, open communication and continuous improvement.

While investigating the sustainability approach of PSE&G the research identified that the company associates it with its long-term survival, strong commitment to license to operate, and long-term performance (PSE&G, 2014a). Sustainability is represented in PSE&G and PSEG's vision to be a recognized as the leader in "safe, reliable, economic, and greener energy" for today and for the next 111 years (PSEG, 2014, p. 11). Such an attitude is not only well embedded in its mission, strategy, and corporate governance but it also refers to long-term dimension and strong commitment to it (PSE&G, 2015a).

Therefore, sustainability is well embedded in the core values, business plan, budget, and company's reports (PSE&G, 2014a). As acknowledged by Epstein and Birchard (1999) such integration of social and environmental accounting in the company's reports to stakeholders enable the company to reposition toward improved corporate responsibility.

There are four corporate sustainability goals that support the business model and strategic objectives of PSEG (PSEG, 2014, p. 14):

1. Goal 1: To be a clear leader in reliability and safety, customer service, and providing clean energy.
2. Goal 2: To be recognized as a great place to work with engaged employees as a differentiator.
3. Goal 3: To be a thought-leader on energy and environmental issues.
4. Goal 4: To be a strong partner with all communities they serve.

PSE&G as a part of PSEG regularly carries out sustainability materiality analyses to assess risks and opportunities aimed at identifying PSEG's most important issues. Once these are identified and confirmed, goals and management processes are developed. For example, the following were identified for 2013 (PSEG, 2014, p. 14):

- Clean air and climate change;

- Diversity and inclusion;
- Employees engagement;
- Financial performance;
- Health and safety;
- Nuclear power;
- Reliability and resilience;
- Renewable energy;
- Stakeholders engagement;
- Talent attraction and retention.

PSEG and PSE&G are recipients of numerous external recognitions for their achievements in the field of sustainability, in particular for investment in human resources and for related economic accomplishments. The major recent awards and honors are as follows:

- In 2015, for the eight consecutive year PSEG was ranked on the Dow Jones Sustainability North America Index. DJSI recognize companies that adopt sustainable best practices and are the best among their peers in meeting certain economic, environmental and social criteria (PSEG, 2015).
- In 2014, for the third consecutive year PSEG ranked second among "Top 40" designated companies of Best Energy Company's list of Public Utilities Fortnightly magazine. To reflect an overall picture of a company's value and long-term prospects the Fortnightly 40 model balances financial performance measures with a sustainable growth-rate calculation (PSEG, 2014; PSEG, 2015).
- In 2013, PSEG featured in the FORTUNE List of Most Admired Companies, ranking fourth among electric and gas companies in the United States (PSEG, 2013).
- In 2014, for the seventh consecutive year PSE&G was listed among top utilities in the nation for solar capacity according to a Solar Electric Power Association (SEPA) industry ranking (PSEG, 2014).
- In 2015, for the 14th consecutive year PSE&G received the Reliability One Award for the Mid-Atlantic region from PA Consulting, a national industry benchmarking group. PSE&G was named America's Most Reliable Electric Utility in five out of the past nine years (PSEG, 2014; PSEG, 2015).
- In 2013, PSE&G received The Edison Electric Institute (EEI) Emergency Response Award for exceptional response efforts after a storm, in particular for its outstanding storm management practices and restoring power to its nearly 1.9 million customers impacted by Sandy (PSEG, 2013; PSEG, 2014).
- Also in 2013, the company received the award Innovation in Customer Service from CS Week for communication with customers during superstorm Sandy over Twitter. This industry leading communication with customers and other stakeholders was recognized also by JD Power and Associate in 2013 (PSEG, 2013).

4.4.2.2 PSE&G's integration of sustainability into BSC

PSE&G integrates sustainability in its overall company's BSC as well as in PSEG's BSC. When exploring all BSC reporting it is obvious that both, PSEG and PSE&G, make sustainability an integral part of their strategic performance and management systems, with clearly formulated strategic objectives, sustainability related KPIs, and targets (PSE&G, 2014a). For example, the performance measures at PSE&G corporate level and across the whole company are aligned with objectives related to environmental violations, carbon footprint reduction, recognitions by external leadership indexes for sustainability as well as to the mother company PSEG's Environmental Impact Profile. The PSEG Environmental Impact Profile is an internal environmental rating system based on measurement of key environmental indicators, including air emissions, permit compliance, waste management, spills, and facility efficiency (CDP, 2011).

BSC performance and strategic management system are based on the identification of key performance measures that are linked to strategic objectives, alignment of social and environmental goals to the overall strategy, communication of objectives, targets and performance, and the measurement of these programs' impact on corporate profitability (PSE&G, 2014a). Employees across the entire company and at all levels are involved in sustainability management (PSE&G, 2015). Consequently, strong sustainability leadership is followed by employee's engagement, aligning all employees with sustainability objectives and targets through the company's incentive system (PSE&G, 2014a).

In regards to integration of sustainability into BSC as a performance management tool, the research proved that sustainability objectives are well embedded in all four BSC perspectives of the company's BSC and in its KPI's (see Figure 12 and Figure 13). Moreover, the importance if the sustainability is highlighted with the fact that one of the BSC quadrants is dedicated to green metrics. This perspective includes annual and long-term targets as well as external benchmarks for comparison with PSE&G performance. As observed through interviews and company's reports (PSE&G, 2015; PSE&G, 2015a):

- Around 33% of all KPI's are linked to sustainability in the BSC **"People"** perspectives. The KPIs in "People" perspectives include succession planning, employees wellness, and employee development.
- 18% of all KPIs in the BSC **"Safe and reliable"** perspective are related to sustainability. In the "Safe and Reliable" perspective the KPIs include emergency respond rate, regulatory inquiries, and SOS test failures.
- Around 50% of KPI's are related to sustainability in the BSC **"Economic"** perspective. In this perspective sustainability is embedded in capital project cost performance, shareholders return, ROIC, and free cash flow.

- Around 80% of all KPIs in the fourth **"Green"** perspective. KPI's in "Green" perspective are renewable energy generated, annual EE savings, solar-interconnected, and environment violations.

Merging sustainability indicators with overall BSC measures reinforces their relevance to business success (for more see Table 16). Several authors argue that it does not matter which of the BSC four perspectives is chosen for each environmental or social indicator, or if a fifth category is added to the scorecard for sustainability indicators (Epstein & Wisner, 2001; Wasenhove et al., 2003; Willard, 2005). Instead, it was the management agreement on selecting leading and lagging indicators that contributed to the company's success. In the case of PSE&G all targets are continuously improved with an aim to reach top quartile among comparable competitors (CDP, 2011).

Sustainability is also well integrated into the strategic management system of BSC through its six stages. Special emphasis is given by the PSE&G's top management to the fifth "Monitor and Learn" and to the last, 6 stage "Test and Adapt" strategy (PSE&G, 2014a). Moreover, as established in the research, the major KPIs are presented in the mother company PSEG's Sustainability Report in the form of a well selected summary of KPIs for communication with general public. This is well illustrated in sustainability reports, for example the 2015 Sustainability Report provides sustainability key performance indicators (PSEG, 2015). Most of these metrics are tracked monthly in PSE&G and PSEG's Balanced Scorecard and therefore are linked to the performance appraisal of PSE&G's employees, including senior management (PSEG, 2015, p. 17).

4.4.3 Climate change and BSC

The overall PSE&G (PSEG) management approach towards climate change, as described in Chapter 4.2.1.4, is well embedded in strategy and performance management (PSE&G, 2014a). Such approach is acknowledged also by scholars as the climate change consideration should be part of both, a strategy formulation process and the strategy implementation tools (Zingales et al., 2002).

Subsequently, PSE&G shares the same approach, built on decades of experience since 1994 when PSEG addressed for the first time strategies for mitigation of climate change (CDP, 2006). By crosschecking interviews (PSE&G, 2015c, 2016) and multiple documents and reports (PSE&G, 2014a, 2015c; CDP, 2011) I found out that the current time horizon of PSE&G's climate change strategic management is focused on the next ten years. PSE&G self-evaluates its current capabilities to respond, to mitigate, to adapt, and to recover to climate change as the best practice (PSE&G, 2014a). Likewise, it sees the company's capabilities to anticipate climate change impacts as its strength (see more in Figure 14).

The basis of PSE&G's strategic preparedness and response to climate change is the integration of climate change into the vision, mission, strategy, and corporate governance. Based on this, the overall company's BSC comprise specific goals and climate change targets that are established annually at the corporate, business unit, division, and group levels. Subsequently, they are also embedded in PSEG's corporate business plan, which is reviewed and approved by the board of directors each year, and managed through the year by BSC (CDP, 2011). All levels of the company are committed to these annual targets, while all management levels are formally responsible for leadership and implementation of climate change strategies, which is presented in overall BSC reports as well as in LOB BSC reports (for more see Figure 23 and Table 20). The climate change KPIs are linked also to compensation incentives (PSE&G, 2014a).

PSEG further developed its systems approach for addressing climate change. Research acknowledges its active role in early development of industry standards with regards to climate change mitigation (PSE&G, 2016). This was possible in parallel to PSEG's targets of a 40% reduction of GHG emissions to 2030 from 1990 levels, supported by research & development and investment in low carbon production and technologies (CDP, 2008; CDP, 2009; CDP, 2010; PSEG, 2011; PSEG, 2012; PSEG, 2013; PSEG, 2014; PSEG, 2015). Such an alignment of climate change strategies by applying BSC as a strategic management tool can drive a reduction in absolute GHG emissions and can contribute to short-term and long-term shareholder value (Meissen, 2007, pp. i–xxi).

Integration of mitigation strategies into BSC was followed by PSE&G's early leadership in respect to climate change adaptation strategies (PSEG, 2010). For example, PSE&G self-evaluation indicates the highest priority for floods safety and protection of employees with their integration in the overall current strategy (PSE&G, 2014a). Hence, the adaptation strategy as well as disaster risk management are currently recognized as critical strategic priorities in PSE&G.

4.4.3.1 PSE&G's (PSEG) climate change and risk management

When addressing integration of climate change and BSC I noted an important role of risk management in PSE&G. Climate-related risks and opportunities are identified and evaluated as an integral part of the company's monitoring activities covering its business, market, regulatory, and operational risks and opportunities. For example, the environmental, health and safety department is responsible for identifying physical risks and opportunities. The department then monitors the status of climate science and communicates significant findings to business units that may be impacted (CDP 2011). In addition, within the public affairs and sustainability department, significant findings on climate science are evaluated on an ad-hoc basis, whereas regulatory and legislative events on quarterly basis. Some of the most critical public policy initiatives are captured in the

groups “Critical public affairs initiatives” that are also key elements of the team's BSC. Furthermore, PSEG's Finance Organization[32] is in charge of the evaluation of climate-related risks and opportunities with potential financial impacts on PSEG and on the markets where it operates.

Hence, the climate risk management is embedded into PSEG’s Enterprise Risk Management Program. For example, as explained by PSE&G’s Business team leader “company uses Monte Carlo simulations, stress testing, sensitivity and scenario analyses for identification of operational risks, such as the loss of a major facility or the impact of severe weather on operations, and financial risks, such as changes in commodity prices, interest rates, and counterparty credit-worthiness (PSE&G, 2016). Commodity prices are correlated to weather and traded are products for commodity prices, weather, carbon, emissions, and renewable credits that are all included in the probabilistic models that PSEG uses to monitor the performance of its asset and trading portfolios (CDP, 2011).

Furthermore, I observed that PSEG applies two- or multi-dimensional risk analysis to illustrate the magnitude and direction of significant financial and business risks and opportunities, where business risks include market risks, fuel price risks, regulatory risks, environmental risks, and numerous elements of the energy delivery business, as they relate to selection and deferrals decisions among investments competing for limited resources (PSEG, 2015). The Enterprise Risk Management Program also uses risk maps to prioritize and facilitate discussions regarding top risks, as well plots risks based on impacts and likelihood of identifying possible risk outcomes. Risks are reported on Securities and Exchange Commission (SEC) Form K-10 and 10-Q disclosures as well as through documents and presentations published directly on the company's website.

4.4.4 Strategic management of uncertain future

The analysis of research findings reveals the long-term management mind-set (PSEG, 2014, p. 11) and the elements of resilience in both, PSE&G and PSEG. For example, PSEG publicly communicates the interconnectedness of long-term performance with the sustainability and resilience approach, because “to be sustainable, we need not just reliability, but resilience – the ability to mitigate impacts and respond more swiftly to storms that can cause so much damage” (PSEG, 2014, p. 25).

Resilience is an important aspect for PSE&G, as the company is at least once a year faced with frequent turbulences or highly uncertain threats with very significant impacts (PSE&G, 2014a). Such a business turbulence is defined as the unpredictable and swift

[32] It comprises the operation the company’s finance groups, enterprise risk management, accounting, and investors relations.

changes in an organization's external or internal environments that affect its performance (Kotler & Casoline, 2009). According to the assessment of the management during the research there are two uncertainties that could affect PSE&G in the period of the next ten years': "frequent extreme weather events" and "sever and widespread impacts of climate change" (PSE&G, 2014a; PSE&G, 2015d). As acknowledged in interview by Business team leader (PSE&G, 2016) "due to the fact that both risks are assessed with high probability and with highest level impact on the company's strategy and performance, PSE&G early organized the conference on "High impact/Low probability" event aside internal identification sessions on best practices" (see mode in Figure 19). However, the management also self-assessed that PSE&G can respond to both identified risks effectively, already has the capacity to cope with surprise, and have prepared scenarios (PSE&G, 2014a). In parallel, the company is already reducing its vulnerability and exposure.

4.4.4.1 PSE&G (PSEG) climate change resilience

PSE&G is challenged by potential severe weather events (for more see Figure 14) and therefore the need for a resilient infrastructure to improve society's ability to withstand and recover from extreme and changing weather patterns (PSEG, 2013, p. 11) was identified as one of the key climate change challenges because of which the company needs to build its resilience (see more in Chapter 5.3).

Initial PSEG's climate change strategy evolved from a mitigation into a climate-resilient strategy, based on three pillars:

- **clean energy displacement strategies and targeted long-term reductions from smaller sources** (PSEG, 2014),
- being prepared for extreme weather and reducing vulnerability to extreme weather events (for more see Figure 19), **and**
- **climate change adaptation strategies and building resilience** (PSEG, 2013, 2014).

For example, the company invested in critically needed infrastructure improvements to support greater resilience against extreme storms. In May 2014, PSE&G launched its Energy Strong Program, with an aim to build more resilient energy infrastructure in New Jersey (PSE&G, 2014). Based on the damage caused by superstorm Sandy PSE&G already began with a $ 1.22 billion program to proactively strengthen and protect its electric and gas systems against severe storms like those occurring in the past (PSEG, 2014, p. 24).

A part of the program involves creating redundancy in the system to help reduce outages when damage occurs. New Jersey has now an opportunity to begin creating a holistic model of infrastructure resilience for all sectors in the 21st century (PSEG, 2014, p. 25). In addition, in order to increase the resilience of the communities in New Jersey, Connecticut, and New York, in 2013 PSEG Foundation granted $ 1.2 million to the organizations and programs that strengthen safety systems and build resilience.

As argued by Winston (2014) global climate change and increasing constraints on resources will require a new strategic consideration, known as "the big pivot", in order to create new value for companies. When exploring this aspect at PSE&G I found profound changes in its strategy, operations, and business philosophy, starting with the communication of innovation and a long-term mind set, redefinition of performance methods, and pursuing new kinds of partnership (PSE&G, 2014a; PSE&G, 2016). In particular, several intersections with BSC can be found. They include the highlighting of "intangibles" such as support from the community, customer loyalty, reducing risks, and ability to attract and retain talent.

4.4.4.2 PSE&G (PSEG) financial resilience

Financial resilience is an important aspect of a company's long-term sustainable performance. Therefore, the financial resilience of PSEG and PSE&G was examined during the 2008 financial crisis and the following recovery in 2009. In addition, **growth rates**, **profitability rates**, **financial strengths** and **stock performance** indicators were used for observing long-term performance (2004–2014) as well as for the period of the largest volatility of oil prices drop in 2008/2007.

I chose 2009 as the year in which to test the company's preparedness and response, i.e. the year immediately following the financial crisis in 2008. For PSEG 2009 ended with a 10% drop in revenues but also a 34% higher net income growth compared to 2008. Unexpectedly, the financial analysis revealed that profitability in 2009 was above the annual average profitability in the observed decade 2004–2014, with a 13% profit margin, 6% ROA, and 18% ROE. Similarly, in 2008 after a 55% drop of oil prices in 2007, the revenue growth of PSEG nevertheless increased by 5%, with a 9% profit margin, 4% EOA, and 25% ROE (PSEG, 2005; 2007; 2008; 2009; 2011a; 2012a; 2013a; 2014a; 2015a).

In addition, the resilience of financial performance of PSEG (PSE&G) was evident in comparison of financial indicators of all three companies in the period 2008–2009, the period that represents best the effects of the financial crisis in company's performance (see Table 14). In addition, the same period 2008/2009, is recognized for its significant drops in oil and gas prices (Energy Information Administration, 2015), therefore the results could illustrative also the performance resilience in the terms of market price volatility.

Likewise, the year 2015 was extremely volatile as well, with significant drops of oil and wholesale electricity prices in 2015 (Energy Information Administration, 2015). Therefore, the financial performance in 2015 recorded a negative trend. While the average price for dated Brent crude in 2015 was down 47% from 2014, annual sales in Statoil dropped by 22% (Statoil, 2015) and the company announced the loss of 37.3 billion NOK. Conversely, PSEG was also affected by the crises, with a 4.3% drop in annual sales, however all other indicators improved compared to previous year, including net income, dividend per share and book value per share (PSEG, 2015).

Table 14. Comparison of financial performance affected by financial crisis in 2008 and 2009 among PSEG (PSE&G), S-OIL Corporation and Statoil

Financial Performance in Financial crisis 2008/ 2009	PSEG (PSE&G)	S-OIL Corporation	Statoil ASA
Growth rates			
Revenue Growth 2009/08	-10%	-24%	-29%
Revenue 2009 as % of 2004	115%	192%	173%
Net Income Growth 2009/08	34%	-39%	-59%
Net Income 2009 as % of 2004	215%	75%	151%
Profitability 2009			
Profit Margin	13%	2%	4%
ROA	6%	3%	3%
ROE	18%	7%	3%
Financial Strength 2009			
Leverage Ratio	2.27	1.31	1.81
Stock Performance			
YTD (31.2.2009)	14%	-12%	27%
31.12.2009 / 31-12-2004	51%	78%	152%

Source: Annual reports 2008–2009 from PSEG, S-OIL and Statoil.

Another dimension of financial resilience of PSEG (PSE&G) was analyzed by comparison of performance with Statoil and S-OIL in the period 2004–2014 (see Table 15). The analyze of all three companies' growth and profitability rates, aside financial strength and stock performance indicators in this period showed impressive Net Income growth, stable Return on Equity (see also Figure 8), and the highest Profit Margin Average.

Table 15. Comparison of long-term financial performance in the period 2004–2014 among PSEG (PSE&G), S-OIL Corporation and Statoil

Financial Performance 2004/ 2014	PSEG (PSE&G)	S-OIL Corporation	Statoil ASA
Growth rates			
Revenue growth 2014/2004	106%	267%	203%
Net Income growth 2014/2004	209%	-31%	88%
Profitability			
Profit Margin Average 2004–2014	11%	3.3%	8%
ROA Average 2004–2014	4%	7%	8%
ROE Average 2004–2014	14%	17%	8%
Financial Strength			
Leverage Ratio 2004–2014	4.1–1.9	1.28–1.09	1.92–1.59
Stock Performance			
31.12.2014 / 31-12-2004	64%	92%	138%

Source: Annual reports 2004–2014 from PSEG, S-OIL and Statoil.

The research established the vital role of BSC as a performance management system in building resilience. Similarly, Peljhan, Zajc Kejžar and Ponikvar (2012) found a statistically significant difference in the survival probabilities of firms that use performance management tools compared to those that do not, although only when the firm's and industry's characteristics are not taken into account.

PSE&G also acknowledged the learning aspect of the financial crisis, as the company significantly improved the following activities and processes, compared with the pre-credit crunch time (PSE&G, 2014a):

- how they integrate strategy and risk management,
- how they monitor and manage strategy execution,
- how they manage and monitor performance,
- how they divert resources into new programs and products,
- how they continuously renew the company on opportunity-driven rather than on sporadical and crisis-driven basis, and
- how they measure and report more future oriented KPIs.

4.4.4.3 PSE&G's resilience and BSC

I realized the vital role of BSC while observing climate and financial resilience. In addition, several PSE&G' capabilities were identified and the level of their contribution to the preparedness, responses, and recovery from the credit crunch crisis or to climate change. Four such resilience capabilities are the reconciliation of short- and long-term goals, balance of long-, medium-, and short-term strategies, internal and external collaboration, and adaptive, responsive, and accountable governance (PSE&G, 2014a).

All of them were assessed by PSE&G's management as being critical to the PSE&G success in the time of uncertainty. Moreover, additional capabilities identified as "very important" are the integration of risk management, early warning system, integration of adaptive management into the strategic management system, and the support from innovative, reflexive and transformative leadership (PSE&G, 2014a; PSE&G, 2016). Trying to understand the drivers of the company's long-term resilience, I also identified the following characteristics (CDP 2010; PSEG, 2013; 2014; 2015; PSE&G 2014a; 2015; 2015a; 2015b; 2015c; 2015d; 2016):

- system storm reliability and redundancy;
- use of Lean Six Sigma,
- benchmarking and best practices implementation;
- driving employee development, diversity, and comfort in speaking up;

- recognition in the community as a good steward of the environment and the creation of skilled jobs;
- long-term partnerships with suppliers and regulators, increased shareholder value, and documented transferable processes.

PSE&G is very confident of its overall resilience, hence PSE&G's Director – Business Performance & Improvement assesses that "the integration of long-term resilience in performance management as the "best practice" in industry" (PSE&G, 2014a). The system comprises BSC, Lean Six Sigma, benchmarking, and best practices implementation (see also Figure 16). There are clear strategic objectives for resilience set with KPIs and targets that are reported also to main stakeholders (PSE&G, 2014a; PSE&G, 2016). The KPIs representing resilience objectives by PSE&G are located in all four perspectives (for more see Chapter 5.3):

- People – Succession Planning, Employee Wellness, Employee Development;
- Safe and Reliable – Electric and Gas Reliability, Facility Damages, JD Power Results, Regulatory Inquiries, and Sarbanes-Oxley Test Failures;
- Economic – Shareholder Return: Free Cash Flow and ROIC;
- Green – Energy efficiency savings, Renewable Energy Generated and Environmental Violations.

The integration of resilience management into the strategic system is crucial. However, PSE&G claims that all six steps of the BSC Execution Premium are critical to success, (PSE&G, 2014a; PSE&G, 2016), in particular the integration of the following resilience capabilities and approaches into BSC and Execution Premium (for more see Figure 25 and Figure 26):

- reconciliation of short- and long-term goals,
- collaboration within the company, locally, and across the sectors,
- innovative, reflexive, and transformative leadership,
- adaptive, responsive and accountable management and governance.

4.5 Research results

This part of the dissertation provides the results of an explanatory case study of PSE&G, designed on the findings of empirical research, with the aim of exploring and explaining the potentials of BSC for strategic long-term management in the circumstances of an uncertain future. These elements were examined through the prism of climate change and validated through comparison of results from exploratory research relating to two selected companies from the same industry. Further presentation of results is organized around the research question, as raised in the Introduction under Purpose and Objectives.

To what extent are sustainability, an uncertain future, and climate change issues integrated into the vision, mission, and strategy of the company and into the processes of the company's management and governance?

The scope of integration of the sustainability management, management of uncertain future and climate change management at PSE&G has been observed since 2009. In addition, the integration has been explored in 2015 through different layers, from PSE&G up to PSEG, as well as cascading down to lines of business (see Figure 20).

Throughout the research period, **sustainability** was assessed through evidence as to whether it is an integral part of the PSE&G vision, mission, and corporate strategy. In addition, the question was considered if and how sustainability was addressed through the process of strategic and operational decisions, in particular as suggested by Epstein (2008) through performance measurement and reward systems. I found strong evidence from the research as well as from external sources showing PSE&G's full integration of sustainability and CSR objectives into all the observed aspects. I found the basis for such integration in the core message of PSEG's vision statement, valid also for PSE&G, that communicate strong commitment to people, environment, and a long-term perspective: "to be a recognized leader for People providing Safe, Reliable, Economic and Greener energy – today and for next 111 years" (PSEG, 2014, p. 11).

Consequently, sustainability is embedded in the strategy and overall company's strategic system. Through BSC, PSE&G develops social and environmental goals as a part of its overall business strategy and address them through corporate performance management with performance metrics related to sustainability goals. With such integration into performance management, PSE&G communicates the importance of sustainability and manages its added value better. This is vital, as sustainability usually spans over a long period of time and hence its results are not visible and able of being measured during usual performance controlling periods. In this case, BSC enables the management of sustainability performance while measuring whether the company is moving in the right direction to achieve its sustainability objectives.

The management of an uncertain future is also embedded into PSE&G's strategic system, and I subsequently found evidence of its integration into the performance management and measurement system over the past ten years, which was also acknowledged during interviews (PSE&G 2015, 2016). It goes beyond well-developed risk management, with frequent risk based analyses and impact evaluations. The collection of a weak signal from benchmarking and detection of "black swans" events are all integrated into the BSC strategy management system for validation of strategy, subsequently also in the BSC and KPI's. However, the perception of management is that management of an uncertain future is integrated only to some extent, in particular if we compare uncertainty management integration with integration of sustainability.

When exploring the extent of integration, it was noted that PSE&G was successfully integrating the management of uncertain but concrete threats, such as hurricanes, climate change floods, and oil price volatility. Moreover, it integrates them also into communication channels and incentive systems. However, such integration is less notable for other high impact – low probability events, before becoming materialized and visible, which are managed more in parallel.

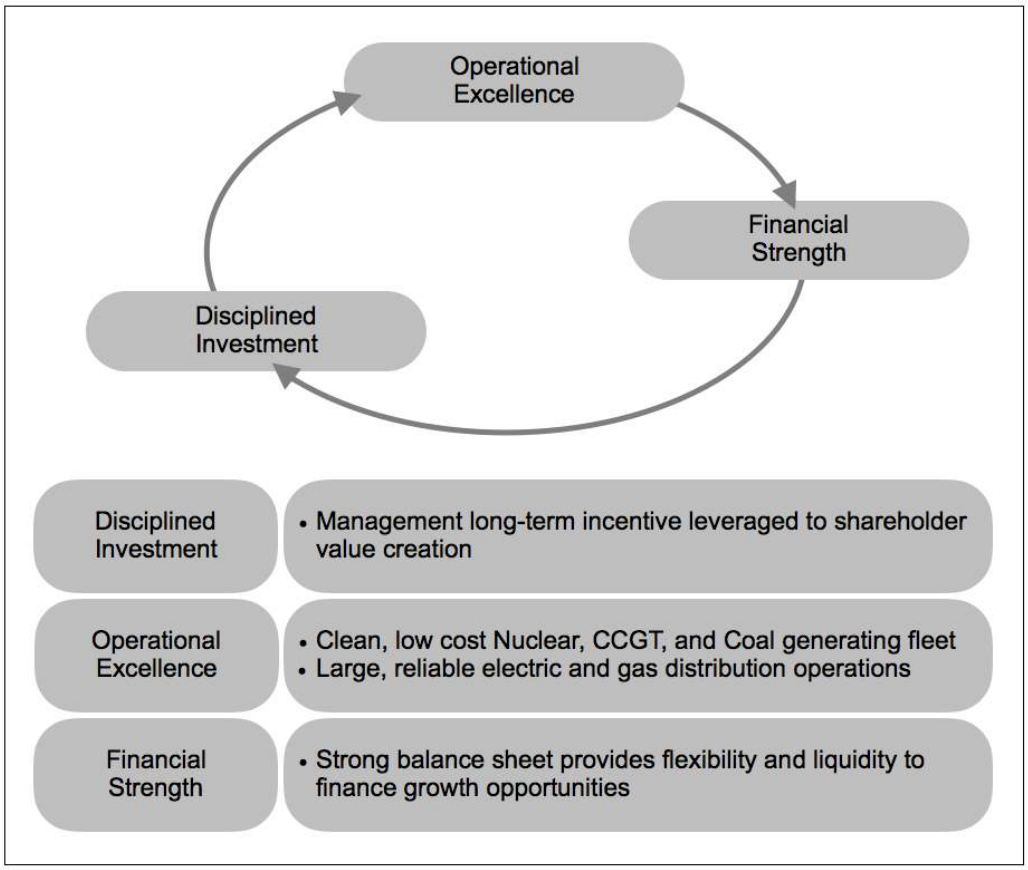
For example, **climate change strategies** that are reflected in the PSE&G vision and mission are fully embedded in the strategy and corporate governance of PSE&G. After being recognized in 1994, climate change initially had stand-alone strategies that have, since the early 2000's become an integral part of the company's strategies, initiatives, and to some extent also its budget. The evidence of strong integration is also well defined in the company's commitment and personal KPIs relating to the climate change targets of executives, managers, and all employees. Climate change strategies and KPIs are embedded into the company's BSC, although some climate change strategies are still being managed in parallel structures, which is somehow to be expected when they have no strategic character.

The information on sustainability, CSR, climate change, and an uncertain future are well integrated into corporate governance of PSE&G and at the level of the mother company PSEG. PSEG publishes Annual reports and separate Sustainability reports, which are however fully complimentary. PSE&G applies BSC with an aim to manage all three time perspectives: short-term, mid-term, and long-term through the interconnected management system. The focus of short-term management is on the business plan and budget; the focus of mid-term is on corporate strategy, investments, risk management, and uncertainty management; and the focus of long-term is on the best manifestation of its vision and in its aim to ensure the long-term sustainability of the business (PSE&G, 2014).

Consequently, the PSE&G's BSC is aligned with three strategic pillars of its mother company PSEG's strategic business model: "operational excellence", "financial strength", and the semi-integrated pillar "disciplined investment". As seen in Figure 11, all three

pillars reflect long-term perspective, strong performance focus and integration of sustainability. Each year, around 8–10 strategic objectives are set that articulate these priority goals on the PSEG and PSE&G level. After that, these objectives are communicated through meetings and channels of commnunications to all employees to help understand their respected roles and to help the company to achieve them.

Figure 11. PSEG Strategic Business Model



Source: PSE&G, *Using Metrics that Drive Bottom-Line Value Knowledge Transfer Session, 2014.*

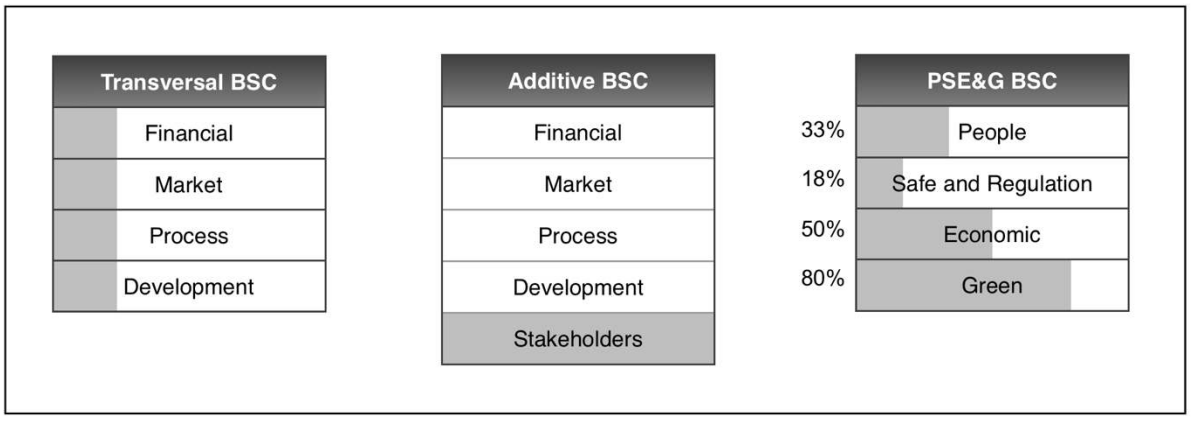
In general, PSE&G's long-term term strategic orientation was identified with full integration of all perspectives that assure long-term performance. The system is driven by the strong commitment of the top management, who actively participate in continuous co-creation of the long-term sustainable strategy and by wide communication among all employees. The continuity of such a management system is assured through testing of assumptions of the current strategy on an annual basis, with an aim to detect weak signals and to anticipate changes. Major signals and changes are subsequently integrated into the core strategy and strategy management system, as seen in the case of climate change. Based on that, PSE&G has fairly decent understanding of the company's future performance with accurate projection of results for the next 4 quarters.

How does BSC include the strategic consideration of sustainability and an uncertain future? How many perspectives does the company's BSC have? How are the sustainability key performance indicators (KPI) presented?

As already presented, PSE&G integrates sustainability into the overall company strategy, and subsequently into BSC. The company is building its leading position on clearly defined and widely communicated sustainability strategic objectives. In addition, the company integrates into BSC the management of an uncertain future from both, the identification and management of major, material threats, such as climate change. Based on such integration of both, sustainability and uncertainty, PSE&G's BSC has clear strategic objectives and KPIs linked to the future (see more in Figure 23 and 24) that are regularly monitored and measured within the overall system. The majority of these KPIs are reported to the stakeholders (PSE&G, 2015d).

Such an integrated approach is reflected also in the BSC's perspectives of PSE&G. The overview of literature portrayed mostly four perspectives of traditional BSC as defined initially by BSC authors (Kaplan & Norton, 1996). In the cases where companies have identified sustainability as being a key corporate value, Bieker & Gminder (2001) identified partial, transversal and additive approaches of a so called 'SBSC' in which some companies also create a fifth perspective. PSE&G's approach to BSC differs from these cases, combining several approaches to best fit its strategic objectives. Therefore, PSE&G's BSC consists of four perspectives, named with the same abbreviations as the name PSEG: People, Safe & Reliable, Economic, and Green (see Figure 12).

Figure 12. Integrated sustainability approach in PSE&G's BSC perspectives compared to Transversal and Additive SBSC



Source: PSE&G, 2015d; T. Bieker and C. U. Gminder, *Towards A Sustainability Balanced Scorecard*, 2001.

The research of the character of KPIs in each BSC perspective focused on sustainability, climate change, risk, and resilience. The perspective **"People"** is dedicated to employees and has approximately one third of all its KPIs related to sustainability. In addition, one third of KPIs integrate risk and uncertainty management. PSE&G's top management

believe that this perspective is significant for the company's management of the future, hence contributing to its long-term resilience. Their estimation is that around 22% of all KPIs in this perspective are leading indicators, oriented toward the future (PSE&G, 2014; 2015d).

The **"Safe and reliable"** perspective is dedicated to customers and operations, with approximately 25% of KPIs relating to risk and uncertainty management and 18% of KPIs relating to sustainability (PSE&G, 2014). The management estimates that 10% of KPIs and strategic objectives in this perspective anticipate the future, hence, several KPIs have the character of "resilience", enabling preparedness and responses to threats and uncertainty.

The **"Economic"** perspective covers mostly the standard BSC "financial" perspective, reflecting the last two strategic pillars of PSE&G. However, when exploring KPIs together with the top management, we found out that 50% of KPIs in this perspective are linked to sustainability and more than 35% to risk and uncertainty management. As a result, 30% of KPIs in this perspective are linked to climate change strategies and the company's preparedness (PSE&G, 2014). As in the case of the "People" perspective, PSE&G's management connects this "economic" perspective with future strategic foresight.

The "**Green"** perspective is dedicated to environmental objectives with 80% of all KPIs being linked to sustainability and 20% of all KPIs to risk management (PSE&G, 2014). Hence, it is not surprising that climate change strategies and preparedness are embedded in 80% of all strategic objectives and KPIs in this perspective. While not as intense as "Economic" and "People", this perspective acts as the source of future foresight.

When exploring the KPIs in each perspective, the research found that the company has well-developed sustainability KPIs (see Table 16), aligned with overall performance measurement and management. Some sustainability KPIs are also reported outside the company to main stakeholders.

Table 16. PSE&G sustainability KPIs

BSC Perspective	Sustainability KPIs in %	KPIs
"People"	33%	Succession planning, Employee wellness, Employee development
"Safe and reliable"	18%	Emergency response rate, Regulatory inquiries, SOS Test Failures
"Economic"	50%	Capital Project Cost Performance, Shareholder Return, ROIC, Free Cash flow
"Green"	80%	Renewable energy generated, Annual EE savings, Solar-Interconnected, Environment violations

Source*:* PSE&G BSC, own research 2014, 2015.

Sustainability is well addressed as an integral part in all the stages of BSC as an integrated strategy management system. However, while all six stages have also been identified as being critical for PSE&G's long-term resilience, PSE&G indicated that the stage "Test and Adapt" would require more attention in order to achieve full integration into sustainability. In addition, as seen in Table 17, PSE&G also uses KPI's with resilience character.

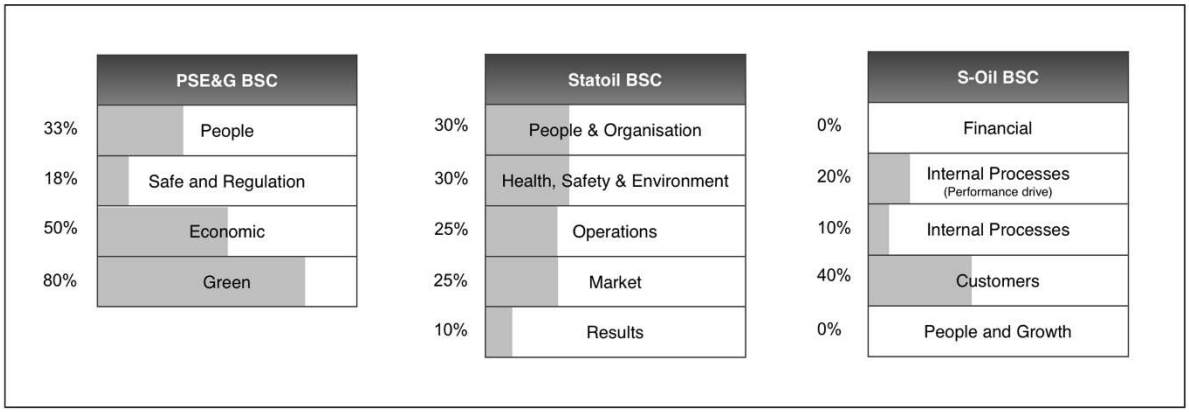
Table 17. PSE&G risk and uncertainty management KPIs

BSC Perspective	KPIs among all KPIs in %	KPIs
People	33%	Succession planning, Employee wellness, Employee development
Safe and reliable	25%	Electric and gas reliability, Facility damages, Regulatory inquiries and SOX test failures
Economic	35%	Shareholder return: Free Cash Flow and ROIC
Green	20%	Annual EE savings, Renewable energy generated and Environmental violations

Source*:* PSE&G BSC, own research 2014, 2015.

Enabled by the results of my research covering all three companies, I found the following interesting comparisons. S-OIL and Statoil both added the fifth perspective, but there is a big difference in the objective of their approaches. S-OIL (S-OIL 2015a) uses it to better address internal processes, with differentiation of performance drive and operation monitors, while Statoil puts the "Health, Safety and Environment" perspective in the second place among all perspectives. Likewise, PSE&G emphasized the importance of these topics, adding "Health" to the "People" perspective, formulating "Safety and Reliability" as a stand-alone perspective, and similarly "Environment" as a stand-alone "Green" perspective. In comparison with the other two companies. The analyses of KPIs relating to sustainability found similarities in the broader scope of integration in PSE&G and Statoil (Statoil, 2014c) and less integration in the case of S-OIL (see Figure 13).

Figure 13. Share of sustainability KPIs in BSC's perspective in PSE&G, Statoil and S-OIL



Source*:* PSE&G, *June 2015 Balanced Scorecard report,* 2015; own research 2014, 2015.

Finally, analyzing and comparing sustainability with risk and uncertainty related KPIs in PSE&G showed strong interconnection between both groups of KPIs. Consequently, the findings resulting from the comparison of PSE&G's climate change KPIs with both sustainability and risk/uncertainty KPIs indicate extensive overlapping of both groups of KPIs. Hence, my empirical findings additionally confirmed that climate change is fully recognized and embedded in the strategic and performance system of PSE&G, as well as that the strategic character of climate change could be recognized as being the issue of sustainability but also as being corporate risk and threat of an uncertain future.

How is the company responding to climate change; is the company responsive or proactive; what are the strategies? Does the company prepare long-term development plans with consideration of expected climate change, and what is the time frame? What are the initiatives for business opportunities?

As presented in previous Chapters 4.2.1.1 and 4.3.3, PSE&G has acknowledged climate change since 1994 and is addressing it equally as a risk and as an opportunity. Among all potential uncertainties and risks that were assessed throughout the study – including new financial crises, water shortages, and political instability among many others – PSE&G's management recognized stressors such as frequent extreme weather events and severe and widespread impacts of climate change (for example significant sea level rise) as being those which are very likely to have a higher level of impact on PSE&Gs strategy and on its performance over the next ten years, i.e. up to 2024.

Based on these recognized challenges, PSE&G's climate change approach is proactive and timely in order to assure preparedness for climate change. For example, I found that the company is working to reduce its vulnerability and exposure to such stressors, alongside developing its capabilities to respond effectively to climate change impacts, and dedicating time and resources to build its capacity to cope with surprise. Therefore, PSE&G is balancing proactive climate change strategies such as climate change adaptation with the Energy strong initiative, storm and flood preparedness, responsive strategies – such as climate change mitigation strategies – and transformative strategies, represented within solar and nuclear programs.

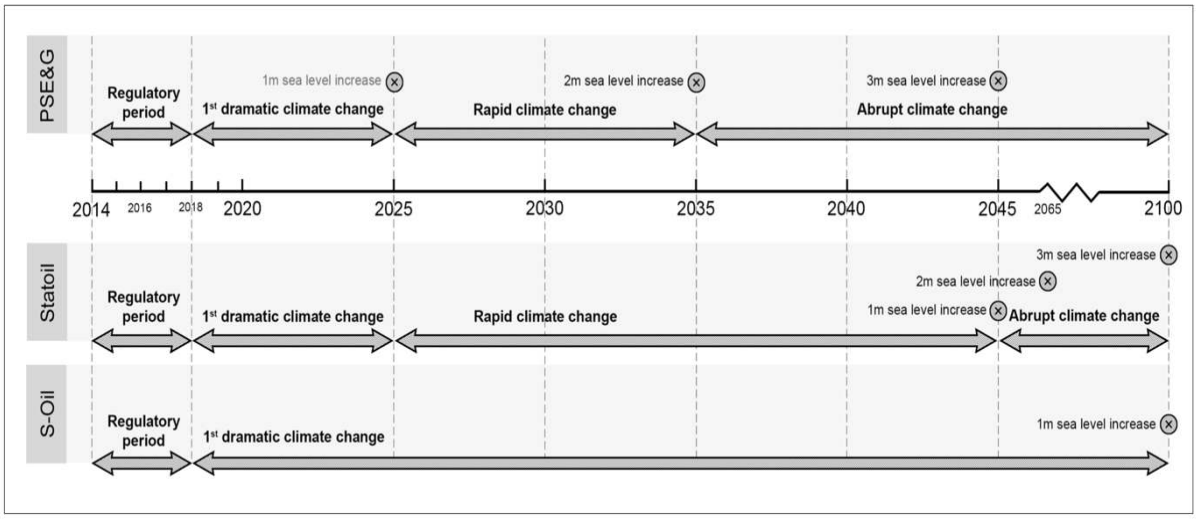
Among three main groups of corporate climate change strategies, PSE&G's is already beyond initial mitigation strategies and now focuses on disaster risk management and climate change adaptation strategies (see more in Chapter 4.2.1.4). Although mitigation strategies are still well addressed, they are not the priority. The company was among the first in the industry to set voluntary emissions targets in 1994, followed by several cycles of GHG reduction targets since that year. The comparative analysis of findings in the other two researched companies indicates that mitigation and adaptation strategies are more equally addressed in PSE&G, and that it has stronger commitments. For example, commitment to climate change adaptation is supported by several strategic initiatives and

the promotion of own best cases, such as Storm Preparedness best case in 2007, Damage Prevention best case in 2008, "High impact/Low probability" Event best case in 2011, and Emergency Response best case in 2012 (see more in Figure 19).

My empirical findings confirm IPCC's claims regarding the necessity of developing different capabilities to build resilience to climate change (IPCC, 2014a). In the past two decades, PSE&G was committed to developing the capacity to respond to climate change, the capacity to recover, and the capacity to change and adapt. As indicated in research answers, PSE&G's executives perceive their practice for all three stated capacities to be among the best practices in the industry, while they rate its capacity to anticipate and its capacity to transform as being very well-established (PSE&G, 2014). For example, as stated in PSEG's Sustainability Reports (2012, 2013, 2014, 2015) and in CDP reporting (2010, 2011), the climate change mitigation targets were reached years before the set milestones for reaching them. Likewise, PSE&G also integrated into their strategy the climate change adaptation and transformation best cases, such as Storm Preparedness and Damage Prevention since 2007. These capacities are well integrated into the strategic management system of PSE&G, reflected at the end in such KPIs as "Actual Renewable Energy Generated (MWh)" and "Energy Strong Milestones".

Aside from the physical threats of climate change, PSE&G is expecting to be affected by formal regulation of CO_2 reductions and by restrictions in energy use. The executives estimate the probability of such scenario as very high, with likelihood of above 66% in the period to 2018, while company's strategic responses are already prepared (see Figure 14).

Figure 14. Recognition of climate change milestones: comparison between PSE&G, S-OIL and Statoil for the 2014–2100 period



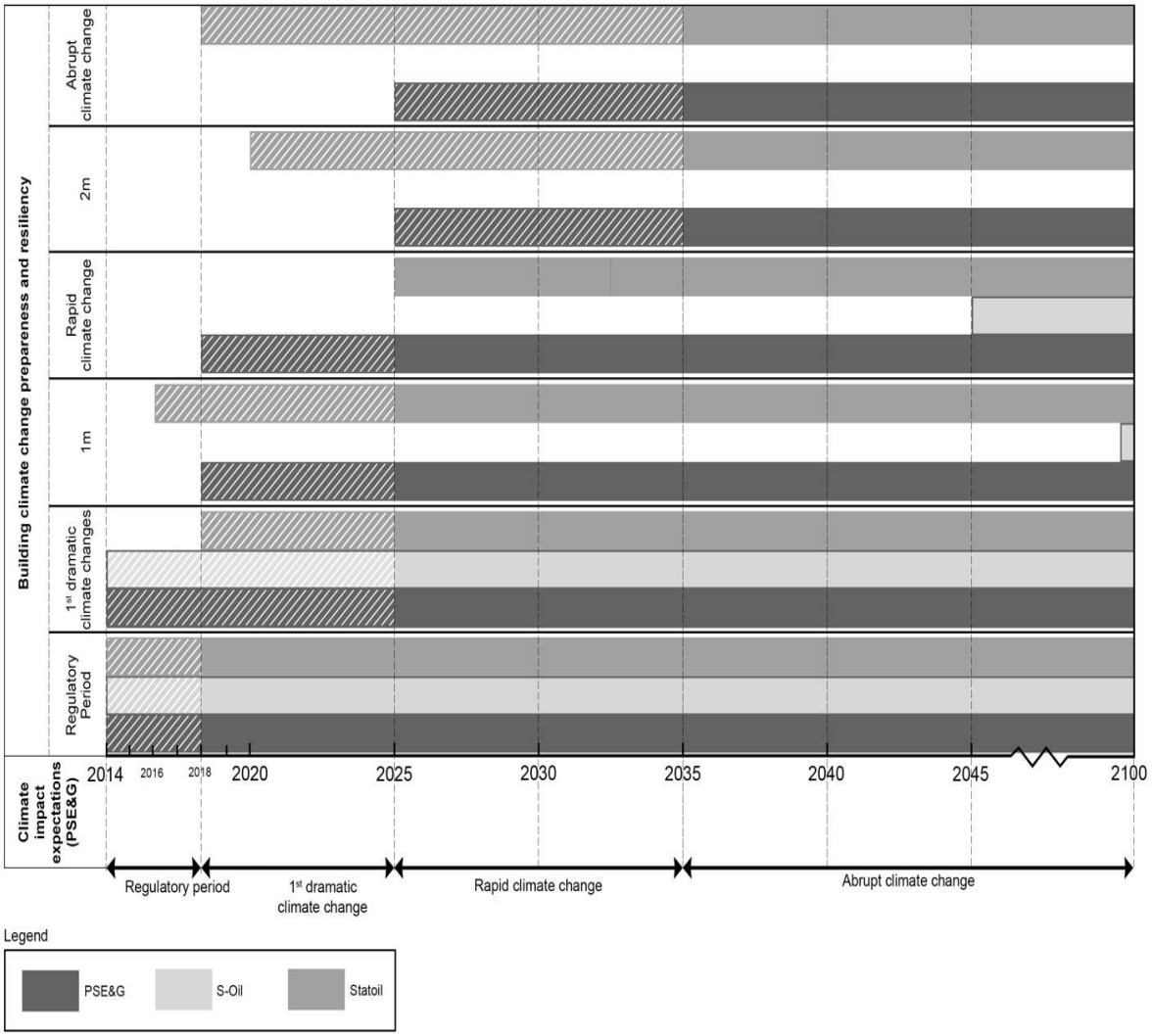
Source: Own research.

In addition, devastating climate change shocks and significant impacts of changes of climate are expected, with the same likelihood up to 2025. Consequently, the corporate

climate change strategies have been developed for the period to 2025, and present long-term horizons, beyond the usual timeframe for corporate strategies. The scope of strategic consideration ranges from two critical risks, such as expected damaging cyclones and sea level rise, followed by a high risk of extreme temperature and extreme precipitation (PSE&G, 2014). The stressors are expected in the form of several months' duration of high intensity, high frequency of damaging cyclones, and in an increased number of tornados.

PSE&G's proactiveness is built on its preparedness and adaptation capacity (see Figure 15). The foundation of such an approach is in the early recognition of potential threats, for example the company perceives that they will face an increase of 1 meter in sea level between 2025 and 2045. The estimation of sea level rise until 2045 is 3 meters, well beyond official consensus and estimates of the other two companies Statoil and S-OIL.

Figure 15. Adaptation to expected climate change scenarios: comparison between PSE&G, S-OIL and Statoil for the 2014–2100 period



Source: Own research.

In the same period, PSE&G expects the increase in risk of death, injury, ill-health, or disrupted livelihoods due to sea level rise, coastal flooding, and storm surges, at a likelihood of 66% or above. PSE&G is either already adapted to these scenarios, or will be adapted before these climate change scenarios are expected to come into effect. In addition, the comparison analysis proved that both other examined companies can effectively respond to all expected scenarios in the next twenty years (see Figure 15). However, the impact of climate change could differ between companies, with the highest exposures affecting Statoil, which operates in northern Europe, a region that could be the most affected in the case of abrupt climate change.

Aside from the usual climate change risk and strategies, preparedness could be observed also through other, indirect stressors identified by IPCC with high confidence (IPCC, 2012). In this regard, PSE&G expects to face the risk of food insecurity due to warming, drought and, flooding increases as well as the risk related to insufficient access to drinking and irrigation water up to 2035 at a likelihood of over 66% (PSE&G, 2014). Such preparedness and response were achieved through well-developed and well-timed implementation of climate strategies, such as the climate change mitigation strategy with a 40% reduction of GHG before 2030 back down to 1990 levels, initiatives on R&D, and investments in low carbon production. I recognized that all these strategies are supported by strategic objectives, such as new product development, redesign of distribution systems, and influence on industry standards, all embedded into the overall company strategy.

In regards to climate change adaptation strategies, they are part of PSE&G's location planning and reallocations, investments aimed at increasing the water, energy and flood safety of production units, and protection of employees' safety. Likewise, they are also embedded into the overall strategy. As seen in Figure 15, PSE&G is already well-prepared and adapted for the expected regulatory period to 2018, which is comparable to both other two case companies, Statoil and S-oil; both have also fully adapted to expected regulatory measures and legislation. The period of first dramatic climate change is expected between 2018 and 2025 by PSE&G and Statoil, while PSE&G was already fully adapted in 2014 and Statoil expected to be adapted by 2017. While S-oil does not expect such an impact, it is already fully adapted to potential changes. PSE&G expects to be adapted to a 1 m sea level rise by 2018, 2m by 2025 and 3m by 2035 (see Figure 14). It is also a front-runner in adaptation to rapid climate change, to which it will be adapted by 2018 (see more in Figure 15). While Statoil is not expecting imminent sea level rises, it is already adapted to abrupt climate change and to sea level increases of 2m, both by 2018 and 2020.

Finally, proactiveness could be recognized in the engagement with stakeholders and policy makers, with an aim to encourage further actions towards mitigation and adaptation to climate change. PSE&G collaborated with the U.S. Department of Energy, along with sixteen other utilities, in the launch of the Partnership for Energy Sector Climate Resilience in April 2015 (PSEG, 2015; PSE&G, 2015a). In addition, its mother company

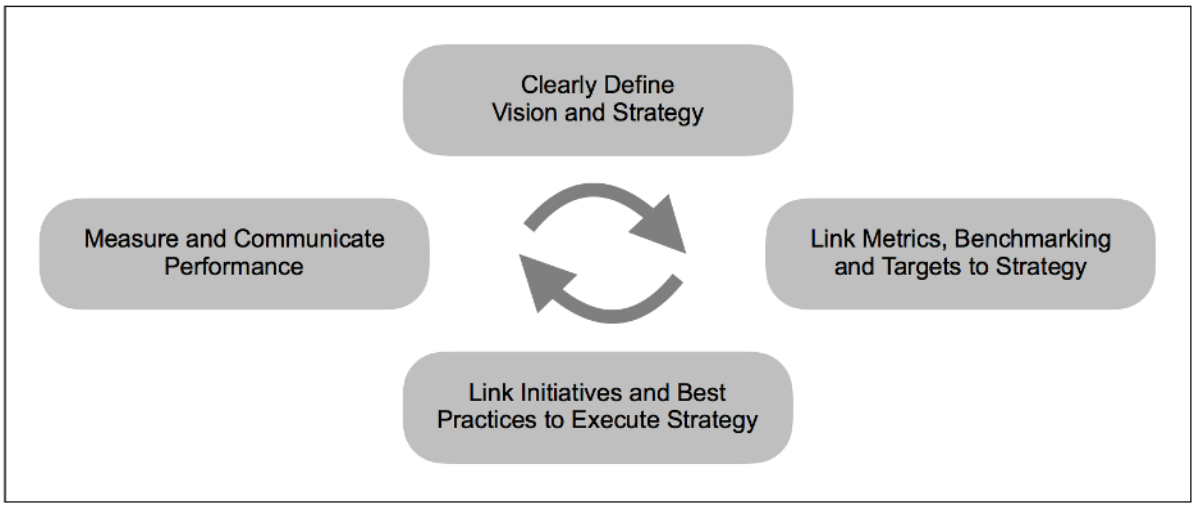
PSEG is a founding member of the Clean Energy Groups, a coalition of electric power companies dedicated to responsible energy and environmental stewardship, with the "Clean Air Policy Initiative", which is active in promoting federal cap-and-trade climate change legislation. PSEG CEO Ralph Izzo serves on the Climate Task Force of the Edison Electric Institute. At the state level, PSEG worked individually and in collaboration with the industry coalition and think tanks to set a mandatory cap on USA greenhouse gas emissions, to adopt policies that will accelerate the development and deployment of low carbon technologies, and to assist customers during the transition to a low carbon economy (CDP, 2011). PSEG is also an active member of Clean Air-Cool Planet, a leading organization dedicated to finding and promoting solutions to global warming.

Based on the information collected from surveys and interviews, I was able to ascertain that PSE&G's capacity to reconcile short- and long-term goals as well as its adaptive, responsible, and accountable governance are critical for PSE&G's preparedness for expected climate change. To enable both capacities, the strategic and performance management is supported by governance and with close collaboration with shareholders play an important role in reaching so needed consensus for strategic decisions.

How does the company achieve the balance between short-term performance goals pressures and mid- and long-term measures of mitigating and adapting to climate change that require immediate consideration?

PSE&G is ultimately committed to long-term sustainability, which is interpreted among executives and in public documents as being the long-term survival of the company with a long-term successful performance. During the research, I also recognized among executives a presence of several different interpretations of sustainability, linked also to CSR and to the objective "not to compromise license to operate".

Figure 16. PSE&G Performance Measurement Process

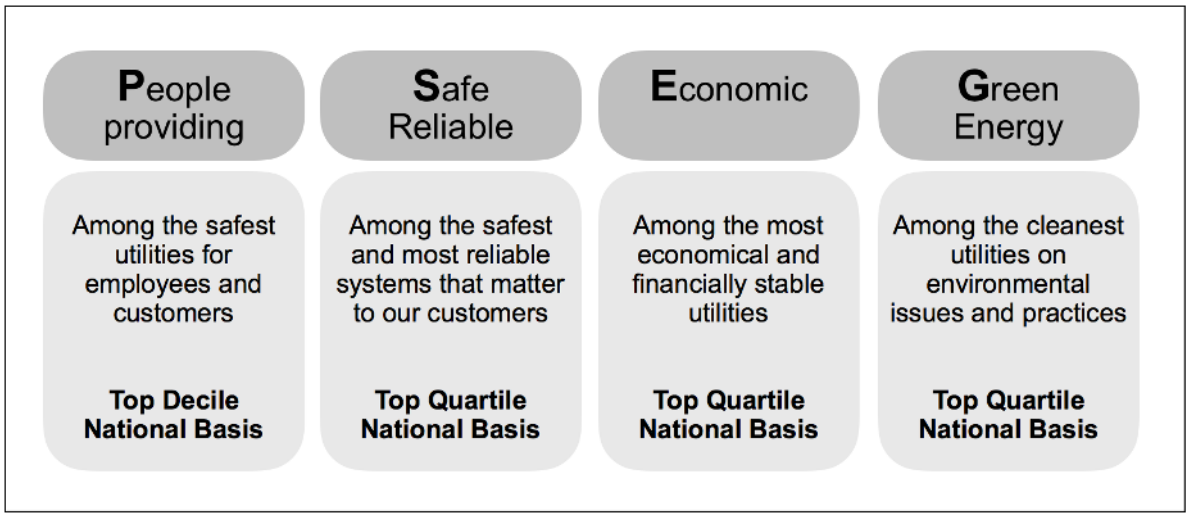


Source: PSE&G, *Using Metrics that Drive Bottom-Line Value Knowledge Transfer Session, updated version;* own research 2014, 2015.

On these foundations, the leadership commitment to climate change is well recognized, with formal responsibility for climate change objectives and with KPIs linked to compensation incentives. Such an approach is in line with other levels of the company's organization, where PSE&G is using performance management processes based on BSC with integrated benchmarking (see Figure 16).

The effectiveness of such an approach was analyzed with a comparison of how executives manage the business now, compared with pre-BSC implementation. The perception of executives is that they significantly improved the way that the company eliminates the short-term mindset, makes strategy a continuous process, focuses on continuous anticipation and preparation for uncertain changes, drives high performance, and builds company long-term resilience.

Figure 17. PSE&G approach to translate vision to strategy

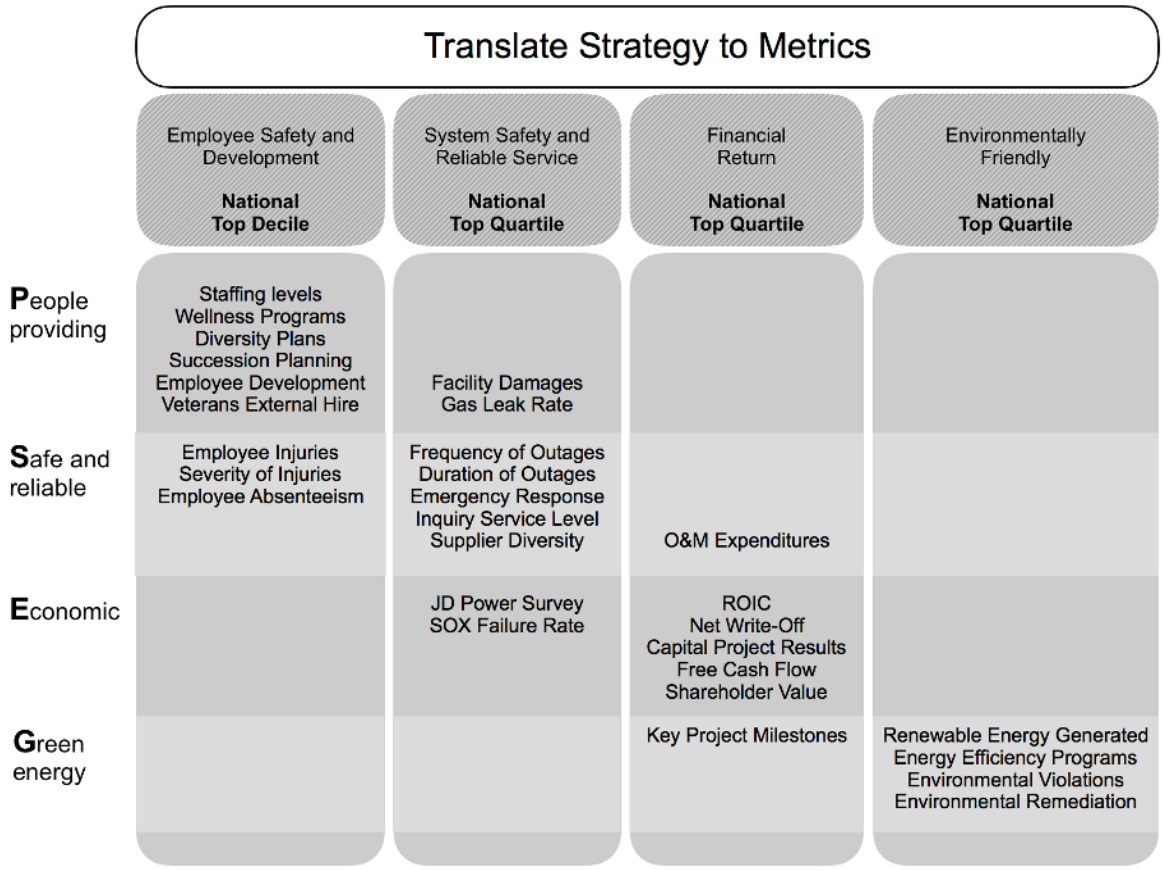


Source: PSE&G, *Using Metrics that Drive Bottom-Line Value Knowledge Transfer Session, updated version;* own research 2014, 2015.

As already discussed, the basis of such short-term and long-term balance is the company's vision statement "People Providing Safe, Reliable, Economic and Greener Energy – Today and for Next 111 Years" (PSEG, 2014, p. 11). This vision is clearly addressing a short-term result together with long-term sustainable performance, and is subsequently translated through its performance measurement process into PSEG's strategy as seen in Figure 17.

PSE&G's approach of vision translation to strategy follows Kaplan and Norton's recommendations in their book *The Execution Strategy* (PSE&G 2014, p. 11), specifically through quantification of success indicators and the definition of niches and timelines for execution. After that, the well defined strategic themes are translated into metric for all four BSC perspectives (see Figure 18).

Figure 18. PSE&G's approach to translating strategy to performance metrics

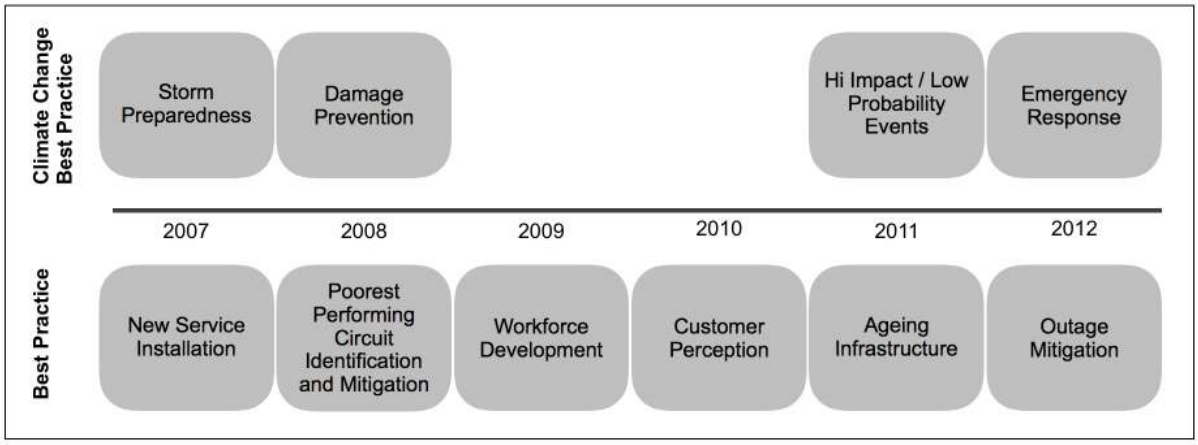


Source*:* PSE&G*, Using Metrics that Drive Bottom-Line Value Knowledge Transfer Session, updated version;* own research 2014, 2015.

Judging by the respondents' statements, and by observing the company's internal documentation, I was able to establish the immense importance of PSE&G's benchmarking approach. When coupled with BSC and business improvement intelligence, I find it to be the vital element in driving continuous improvement across PSE&G business processes. Above and beyond using a benchmarking as a ranking system, it provides PSE&G with information on gaps and understanding regarding what the top performers did differently to achieve superior results. In addition, I found that PSE&G integrates benchmarking data into its BSC target setting process.

One of the ways in which PSE&G closes identified gaps is by focusing on best practices that drive improvements and their implementation. As seen in Figure 19, PSE&G frequently launches such best cases, several of which are closely related to climate change. The timing of launches as well as the goals of these climate change-related best cases on adaptation, disaster preparedness, and emergency responses, correspond to the proactive approach of PSE&G to climate change.

Figure 19. Timeline of PSE&G's best practices and climate change related best practices



Source: PSE&G, *Using Metrics that Drive Bottom-Line Value Knowledge Transfer Session, updated version;* own research 2014, 2015.

An important pillar of PSE&G BSC's balance of multiple time dimensions is its process of translating strategy into initiatives. Although climate change impact seems to be a threat in the long run, PSE&G has already invested $ 1.7 billion in infrastructure through several initiatives to achieve climate change adaptation and resilience objectives. Its main initiatives related to climate change are (PSEG, 2011, 2013, 2014, PSE&G, 2014, 2015a):

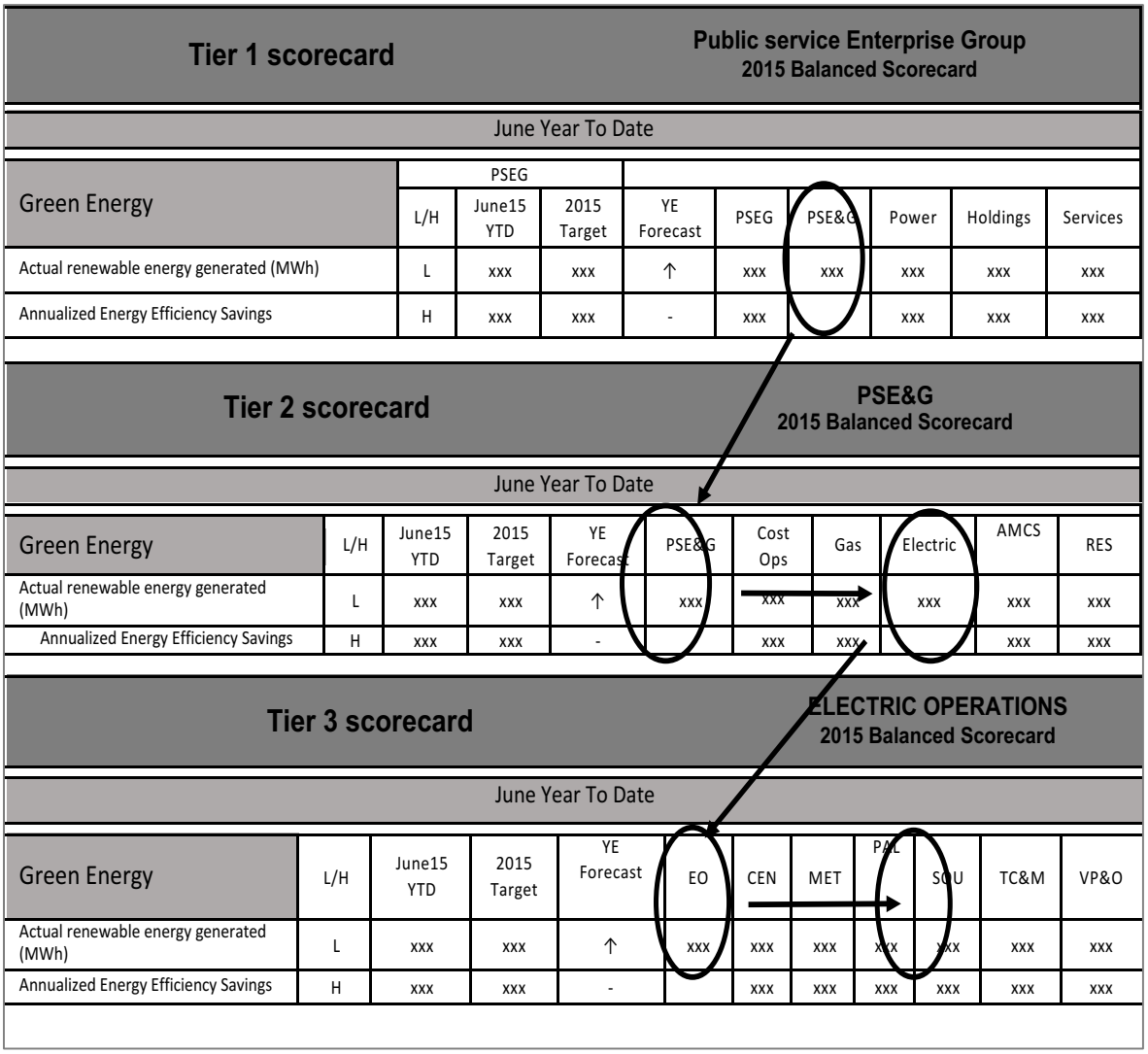
- **Energy strong** is an initiative for infrastructure improvement, as reliability is no longer enough and resilience is needed.
- **Solar Panels on Poles** is the world's first project to install solar panels on 200,000 poles.
- **Solar Loan Program** refers to $ 105 million in loans for solar projects.
- **Solar 4 All Program** is an initiative for renting roof space of government buildings, schools, public housing for solar panels.
- **Deep Water Wind Farm** is the development of a 96 wind turbine farm operating 20 miles off the New Jersey shore.
- **Expand/Upgrade Grid** is an initiative for upgrading the existing system and the construction of over 200 miles of new high voltage lines.
- **Re-lamping Street Lights** is an initiative for replacing 100,000 streetlights with high efficiency units.

In addition, I found that when assessing initiatives, PSE&G measures their effect on financial performance, corporate reputation, regulatory management, competitive advantage, all of these things contributing to the ultimate objectives of long-term survival, long-term sustainable performance, and saving the planet and humanity.

Finally, on the basis of interviews in 2015 with Mark Kahrer, Director of Business Performance and Improvement and Joseph Martucci, Business Team Leader I found that

the most important aspect of how PSE&G achieves balance is also in using cascading scorecards. This relates to the four tiers of scorecards, in which PSE&G's BSC represents Tier 1 scorecard and PSEG's BSC represents Tier 2 scorecard. For example, to portray the alignment between different tiers of BSC, the performance of the KPI "actual renewable energy generated" in MWh is presented with traceable linkage through the whole cascade (see Figure 20).

Figure 20. PSE&G's BSC within PSEG's cascading BSC 3 tiers system



Source: PSE&G, *June 2015 Balanced Scorecard report,* 2015; *Using Metrics that Drive Bottom-Line Value Knowledge Transfer Session, updated version;* own research 2014, 2015.

Similarly, PSE&G is addressing investment that must be aligned with its strategic objectives. Hence, the investment decision process comprises also KPIs that are used for the overall BSC, which ensures the integration and contribution of new investment into overall performance and strategy implementation.

Which strategic excellence principle was the most important as regards climate change? How did the early warning system based on the BSC work?

My empirical findings confirmed that the case company has been among the group of early response companies to climate change, and among early adopters to climate change impacts, much before industry standards or regulatory pressure appeared. Therefore, when exploring the contribution of strategic excellence principles of the integrated strategic management system developed by Kaplan and Norton (2008), I identified that PSE&G executives asserted the first four stages of BSC as being vital for the integration of the company's mitigation and adaptation strategies to the overall strategy. The stages "Develop the Strategy", "Plan the Strategy", "Align the Organization" and "Plan Operation" contributed critically to the company's successful response to and preparedness for climate change. The level of response was confirmed through the development of clear strategic objectives and KPIs on climate change as well as their integration into the overall strategy and corporate BSC.

PSE&G (PSEG) was among the first companies that recognized the threats of climate change and addressed it with voluntary targets as early as 1994. Due to the time elapsed, it was not possible to address with scientific argumentation the drivers that enabled such early recognition of climate change. Therefore, I used climate change adaptation and abrupt climate change to observe tools used for early detection in the past ten years. While the company's focus is aligned with what is currently in focus of the management (Gilad, 2006), rather than the focus on early warning systems, I found that weak signals are detected by balancing BSC perspectives, by benchmarking, and by environmental scanning, such as identification of early signals of possible changes in the environment (Aguilar, 1967).

The findings confirmed that the processes of an early warning system, in particular scanning threats, testing the assumptions of a current strategy, and adapting the strategy to anticipated changes caused by climate change, are well integrated in BSC. When locating the intersections of the six stages of the Execution Premium model, I found out that they are embedded in three among six stages: stage 5 "Monitor and Learn", stage 6 "Test and Adapt" and stage 1 "Develop the Strategy".

For example, the risks and opportunities of climate change are discussed on a monthly basis, at formal BSC review meetings (Stage 5 "Monitor and Learn"). In this stage the company organizes quarterly meetings to engage all employees for deeper dives at business unit level as well as senior leadership. The company perceives the engagement of the controlling department, risk management team, executive managers, top management, and the strategy team members of significant importance and as being critical to the company's success. In particular, such communication of changes and of the results of strategy review meetings is asserted by PSE&G executives as being the "best practice".

Subsequently, the flow of information between the strategy review meetings, executive board meetings and board of director's meetings was portrayed as being critical, while there is also a substantial flow of information between risk assessment meetings, sustainability board's meetings and climate change board's meetings (PSE&G, 2015b).

As a result of these processes, I found that PSE&G's "best practices" approach served as learning from experience of Stage 5, based on which "PSE&G develop in advance and in a timely fashion the *System Storm Hardening* and its infrastructure redundancy to enable the operation also in the circumstances of storms" (PSE&G, 2016).

The related strategic assumptions are, after Stage 5, reviewed on quarterly basis and if the real threats and opportunities are identified, the overall strategy is tested and modified on an annual basis in Stage 6 "Test and Adapt" (see Figure 21). However, assumptions and assessments may also be updated and reported more frequently as the response to major external factors and events. In stage 6 "Test and Adapt", the company tests its strategy against the changes and signals from its internal and external environment. In case it is proved they could affect and impact the efforts achieving operational excellence or the company's financial strength, PSE&G would consider adapting the strategy to identified changes. Specifically, the ultimate objective of this phase is to assure such adjustments that will contribute to sustained and improved performance.

Interestingly, while Step 5 "Monitor and Learn" and Step 6 "Test and Adapt" was evaluated by the company as being very important but not as critical as the other four for the success of climate change response, the research findings indicate that these two steps played a much more significant role in the strategic management of climate change, especially in the detection and recognition of events of uncertain future.

While all stages in this cycle are essential, I recognized the importance of using triggers for forced-ending of the execution cycle, when changes in external and/or internal business context indicate that the current strategy is no longer valid. Aside from evidence in PSE&G, also the Statoil's approaches Beyond Budgeting and Ambition to Action acknowledged that it is an on-going process rather than a pre-described cycle (see more in 4.2.3.3).

When addressing the six stage integrated strategic cycle, I need to emphasize that through interviews and surveys I noticed that the PSE&G executives perceive BSC mostly as a performance measurement (KPIs), performance management, and strategy management system, all of which are assessed as "being critical to the company's overall climate change performance, more than the integrated six stages Execution Premium Cycle". A possible explanation of such self-assessment could be the interpretation of BSC as the initial performance management system and Strategy-focused organization, both developed much prior to the Execution Premium strategy management system. However,

as acknowledged in interview with Martucci: “all six stages are in use, adapted to PSE&G philosophy, but with key elements in permanent use” (PSE&G, 2015a). In addition, I also noted that the company is profoundly dedicated to scoreboards. However, when I tested the company's long-term resilience, PSE&G executives claimed that all six steps of the Execution Premium were equally critical to success in building the company's resilience.

Finally, I cannot claim that all success for early recognition of climate change and PSE&G preparedness is due to the company's BSC approach. PSE&G uses lean Six Sigma, benchmarking and best practices implementation to build its long-term resilience. Although they are all integrated into BSC, they have a recognized contribution to corporate risk management, the early warning system, and sustainability management. In general, such an integrated approach is perceived by the company's executives as being critical for PSE&G’s success. For example, when testing the company's preparedness through the lessons learned from the 2008 credit crunch crisis, the executives emphasized that they significantly improved the integration of strategy development and risk management and that they also improved the way they anticipate critical uncertainties and accept uncertainties. For example, as explained by Joseph Martucci (PSE&G, 2015b): “after the financial crisis in 2008, PSE&G gave more attention to risk- based analyses and on collecting weak signals from benchmarking. In addition, we organized in 2011 a global conference under the chair of Mr. Martucci on how to prepare for Black swan events which went by the title ‘The Certainty of Uncertainty’ ”.

How are climate change strategies integrated into the BSC-based strategic management system and into tools for performance measurement?

The integration of climate change strategies into the strategic and performance system of PSE&G is enabled by prior integration and alignment of PSE&G’s climate change strategies into its vision, mission, and strategy. The company has well-defined climate change strategies with notable strategic objectives within its overall corporate strategy.

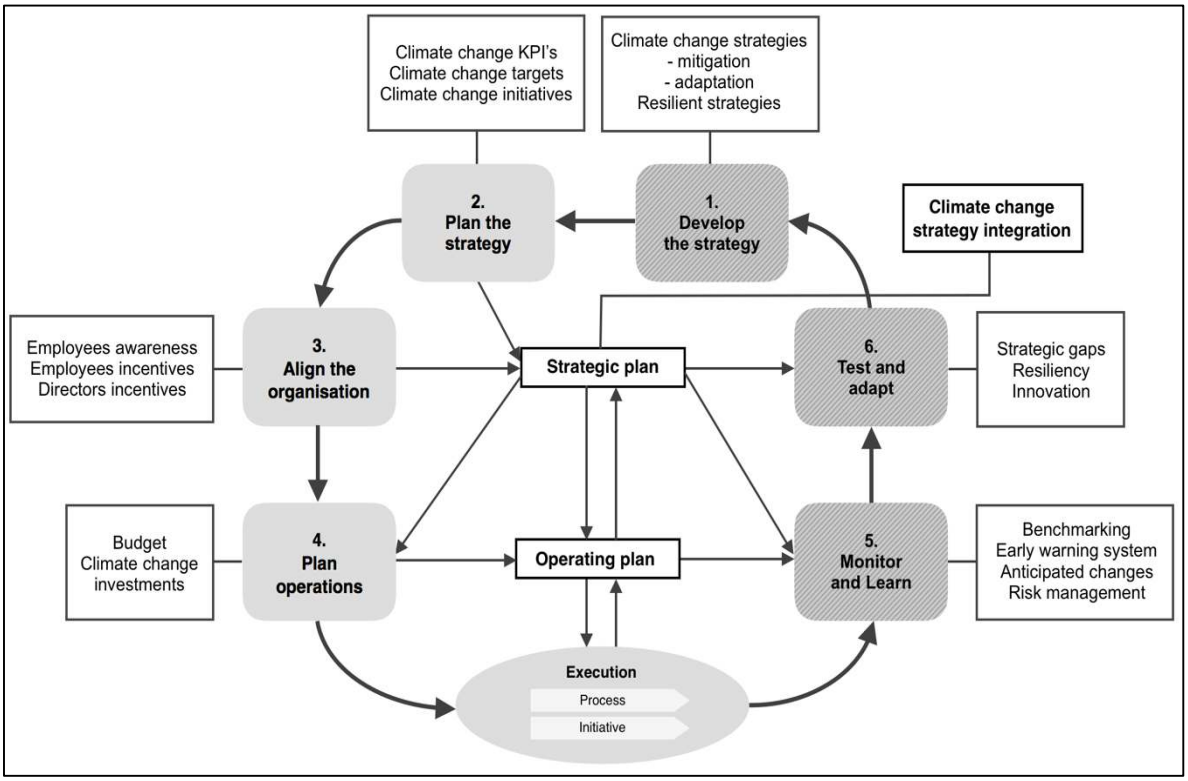
The strategic consideration of climate change is supported by the measurement and management system within the company’s performance framework, which consists of BSC, Six Sigma and KPI Dashboard, with a set of climate change related KPI’s. There is no stand-alone BSC for climate change, but it is embedded into the company’s BSC. Thus, the process towards attainment of defined climate-related goals and targets is monitored through the corporate BSC and integrated strategic management processes.

PSEG's scorecard defines specific operational goals and targets related to delivering energy efficiency to customers, developing and generating renewable energy, lowering the carbon intensity of power generation, reducing greenhouse emissions, and achieving energy savings within its own operations.

The progress on climate change strategies and targets is monitored at the top management level on a monthly basis as part of the performance management system. In addition, scanning threats, testing of the assumptions of current strategy and adapting it to detected weak signals and anticipated changes caused by climate change is embedded in three among six of the steps of Execution Premium: Step 5 "Monitor and Learn", Step 6 "Test and Adapt" and Step 1 "Develop the Strategy" (see Figure 21).

Furthermore, PSE&G is integrating climate change strategies at the operational level. Firstly, these strategic objectives are reflected in the annual business plan and budget, usually embedded in Step 4 of the Execution Premium "Plan Operation".

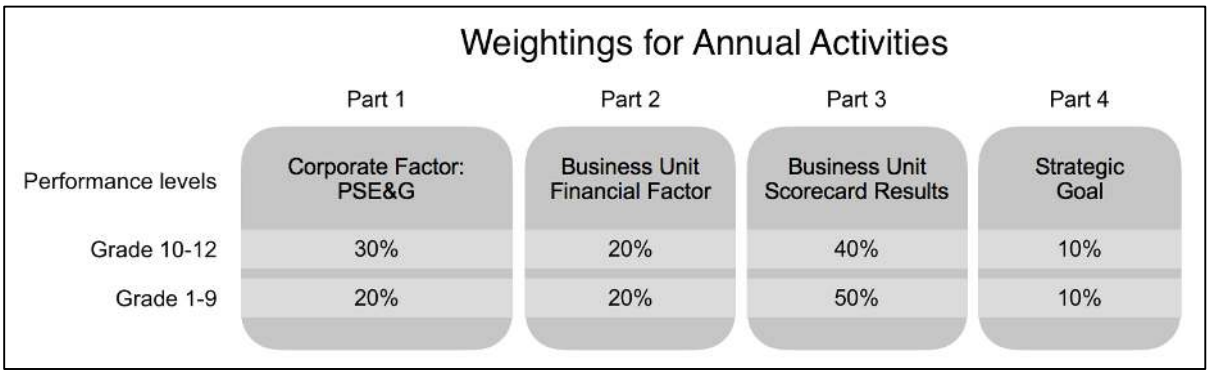
Figure 21. Strategic integration of climate change



Source: R. S. Kaplan and D.P. Norton, *The Execution Premium,* 2008*;* Own research.

I also found out that PSE&G is cascades and aligns the climate change strategic objectives into other parts of the organization. For example, climate change consideration has been notable in relation to the management of new products, supply chain management and regulatory issues. Notably, climate change consideration is in continuous demand and is a standard for investment planning, preparing or implementing environmental strategies, managing distribution and transportation infrastructure, and protecting employees and their communities.

Figure 22. PSE&G's BSC incentive compensation program



Source: Own research 2014, 2015.

In addition, PSE&G correlates performance of all employees with climate change targets. There is a strong commitment to climate change objectives within the company, thus, through the incentive compensation program all employees have personal KPIs related to climate change (see Figure 22). However, only C-level executives, business unit or functional managers, plant managers and corporate strategies have their compensation incentives linked to the specific and direct results of climate change KPIs.

How is the company prepared for the following expected periods in climate change development in the regulatory period: Scenario 1 – The period of first expected devastating climate change shocks, and Scenario 2 – Abrupt climate change.

PSE&G, as part of energy industry, faces the biggest risks around regulation, such as cap and trade schemes, air pollution limits and carbon taxes. All of these risks are expected to impact within three years (CDP, 2014, p. 20). While there is always some uncertainty and unclarity regarding the scope and the timing of these regulations, PSE&G is very confident about its leadership and its proactiveness in this field. Likewise, the research acknowledges the preparedness and full adaptation to expected changes in this period of all three case study companies, not only PSE&G but also Statoil and S-oil.

Aside from this initial regulatory period, PSE&G has also been examined regarding two other scenarios, which have been prepared on the basis of the findings of IPCC's 2013 and 2014 reports, with an aim to test the company's preparedness, response and resilience. Such scenario testing enables insights into real preparedness while observing different levels of adaptation. Scenario 1 presents the period of first expected devastating climate change shocks, while Scenario 2 predicts the circumstances of abrupt climate change.

Scenario 1 has foreseen extreme climate events with extreme impact, such as damaging cyclones, increased number of tornados, intense and very long droughts and extreme precipitation events that could occur any day in the period from now until the end of 2018.

Table 18. PSE&G preparedness on climate change stressors of Scenario 1

Stressor/Preparedness	Reducing Vulnerability & Exposure	Could respond effectively	Scenarios & Strategies	Adapting to stressor	Preparing transfor-mation
Several months of extreme warm days	✔	✔	✔		
Several months of damaging cyclones	✔	✔	✔	✔	✔
Increased number of tornados	✔	✔	✔	✔	✔
Several months of intense droughts		✔	✔		
Multiple extreme floods within one year	✔	✔	✔	✔	✔
Two or more above stated stressors at the same time	✔	✔	✔	✔	✔

Source: Own research, 2014, 2015.

The research confirmed that PSE&G is prepared for major climate stressors that could occur in this scenario. The company reduced vulnerability and exposure to several months' duration of extreme weather, damaging cyclones, increased numbers of tornados and multiple extreme floods occurring within one year. In addition, the company can respond to these stressors effectively and have prepared scenarios and strategies. On all stated stressors, PSE&G is already adapting or is preparing transformative strategies, except to the stressor of several months' duration of extreme warm days (for more see Table 18).

I found also strong confidence among executives who believe the company to be able to respond effectively to all observed risks, and that have already prepared scenarios and strategies for climate change risks such as "death, injury or ill-health of employees, customers, population", "transport chaos", "breakdown of infrastructure networks", "electricity reductions", "risks of food insecurity due to warming, drought, floods", and to "insufficient access to water for more than two weeks". In addition, the company is undergoing the process of adaptation, and is preparing transformative changes to "risk of death, injury or ill-health of employees, customers, population", "breakdown of infrastructure networks" and "electricity reductions".

In general, a very high level of preparedness has been identified in regards to the risk of an increased number of tornados. This is a very important finding, as, according to the CDP Climate Performance Leadership Index, tropical cyclones are reported to be the biggest short-term physical risk for energy companies due to the costly damage that can be inflicted on fixed assets, which are often located in exposed areas (2014, p. 20). PSE&G claim to possess the capability to deal with two or more stated climate change related stressors at the same time. For example, if all foreseen climate change stressors were to

occur in November 2014 (during the time that Scenario 1 research has been conducted), the company would already be fully resilient to the extreme climate events of Scenario 1. Slightly lower, but still adequate, resilience is anticipated for 2018 if the same stressors were to occur at a higher magnitude. Based on that, PSE&G's executives estimate that the company's performance would remain stable in such circumstances.

When identifying the elements of resilience, PSE&G's executives believe that a strategic and performance management capacity based on the following essential elements of such a strategy system has enabled corporate resilience in the circumstances of Scenario 1:

- Reconciliation of short and long-term goals,
- Adaptive management integrated into strategy system,
- Early warning system with scanning, anticipating, predicting and responding,
- Availability of scenarios, variety or strategies, collaboration, leadership, and corporate governance were identified as being critically needed. Moreover, additional capabilities were identified as very important: multiple collaborations, innovative and transformative leadership, and responsive, accountable and adaptive governance.

Scenario 2 has been developed around particular climate change assumptions to allow testing of the climate stressors of rapid climate change with respect to severe increases of mean temperatures until 2025, followed by abrupt changes in climate with cooling as early as 2065. Such a scenario would cause devastating impacts, especially on North and Central Europe. PSE&G claims it will be prepared and able to effectively respond to both extreme increases of daily minimum and maximum temperatures as well as to abrupt cooling (for more see Table 19). The company is reducing its vulnerability and exposure to such stressors, and is already developing strategies and scenarios. However, the company is not yet in the phase of adapting or preparing transformative changes to such a new reality.

Table 19. PSE&G preparedness on climate change stressors of Scenario 2

Element (Stressor/Preparedness)	**Reducing Vulnerability & Exposure**	**Could respond effective**	**Scenario & Strategy**	**Adapting to stressor**	**Preparing transformation**
Simultaneous exposure to all risk and stressors of Scenario 1 in 2025	✔	✔	✔	✔	✔
Increase in extreme daily minimum and maximum temperatures for more than 4–7°C in 2025	✔	✔	✔		
Simultaneous exposure to multiple risk and stressors of Scenario 1 and to extreme daily minimum and maximum temperatures for more than 4–7°C, all in 2025	✔	✔	✔		
Abrupt cooling in 2065	✔	✔	✔		

Source: Own research, 2014, 2015.

The results of the testing Scenario 2 risks in this research show that executives believe the company to be able to respond to all of them effectively. PSE&G is already preparing scenarios and strategies for climate change risks of the scenario of "death, injury or ill-health of employees, customers, population", "transport chaos", "breakdown of infrastructure networks", "several months of electricity reductions", "months long risk of food insecurity due to warming, drought, floods", and to "insufficient access to water for several months". In addition, the company is undergoing preparations for adaptation and preparedness to "risk of death, injury or ill-health of employees, customers, population", "breakdown of infrastructure networks", and "several months of electricity reductions".

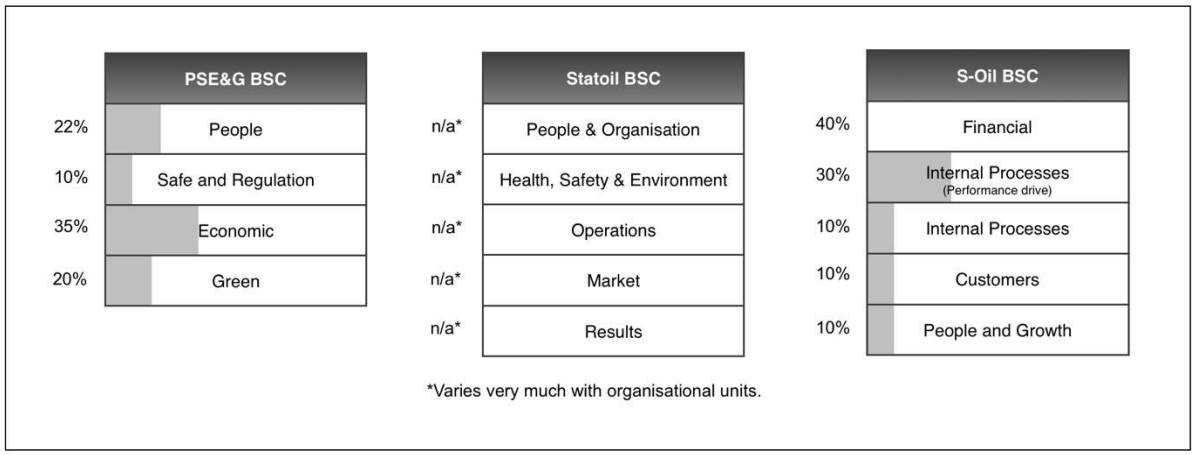
Identified company resilience for Scenario 2 is very high until 2025, though it is currently less resilient towards 2065. However, when exploring the influence of climate change impacts of scenario 2 on performance, PSE&G executives estimate that the performance would stay stable in both periods, in 2025 as well as in 2065. PSE&G claims to achieve this using the same capabilities as for Scenario 1, building on its strategic and performance management capacity to reconcile short and long-term goals, and through an adaptive management integrated into strategy system, together with the early warning system and with a variety of strategies. Furthermore, collaboration, leadership and corporate governance have been again identified as being critically needed.

What KPI does the company use for the area of climate change, and what is their potential influence on the BSC perspectives?

My empirical study has confirmed the assumption that climate change could be represented in a performance measurement and management framework with standalone indicators, or with KPIs that indirectly embed climate change. During the survey and interviews, PSE&G executives estimated that approximately 30% of KPIs in the PSE&G's BSC perspective "Economic" are embedding climate change strategies and around 80% of all KPIs in the "Green" perspective.

These findings have been compared to findings from the other two case study companies, Statoil and S-OIL (see more in Figure 23). A similar percentage has been identified for the Finance perspective (25% and 30%) and somehow a lower integration of climate change into KPIs in the Environment perspective (60% and 30%). However, both other two companies have climate change-linked KPIs also in the perspective Internal Processes, with names such as "Safe and Reliable" in PSE&G, "Operations" in Statoil and "Internal process. Operation monitoring" in S-OIL, where both companies identified around 25% of such KPIs.

Figure 23. Share of climate change related KPIs in each BSC perspective in PSE&G, Statoil, S-OIL



Source*:* PSE&G, *June 2015 Balanced Scorecard report,* 2015, own research 2014, 2015.

While PSE&G excel in adaptation strategies, I found more KPIs related to mitigation rather than adaptation to climate change strategies (see mode in Table 21). The company measures progress in generation of own renewable energy, savings in energy efficiency and results of own initiatives that enable deployment of solar energy. These objectives are supported by the provision of financing for solar projects in business and community, with direct development of solar projects, and with decreases in environmental violations.

Table 20. Main climate change KPIs in PSE&G and PSEG

Perspective	KPIs
Economic	Capital cost performance; Key Project Milestones, Operating and Maintenance Costs
Green	Renewable energy generated, Energy efficiency Savings, Solar – Interconnected (Solar Loan, Solar 4 all), Environmental violations, GHG Direct – Scope 1 (corporate level BSC), GHG indirect – Scope 2, (corporate level BSC), $NO_{x,}$ (corporate level BSC), Mercury, (corporate level BSC) Energy Strong completion (adaptation and building resilience KPI)

Source: Own research, 2014, 2015.

During the period of research, an additional four climate change mitigation KPIs have been identified that are not included into PSE&G's BSC but into the corporate BSC, due to the very complex and expensive process of monitoring and calculating of GHG emissions. These KPIs are calculated on the corporate level, comprising all daughter companies' data, including PSE&G data. As a result, PSEG met its 2015 goal of a 25% reduction in GHG emissions (using 2005 emissions as a baseline) by 2011. In regards to adaptation, the

company monitors the performance of the initiative Energy Strong, the completion of which will have a direct result in building the company's resilience (see Table 20).

In addition, four more climate change KPIs have been identified during the research at Statoil, two of them measuring the same emission targets from different perspectives "Carbon emissions targets per asset in 2020", "Carbon emission reductions each year" and KPI "Carbon price till 2040 for all investments" and "Asset design criteria for facilities to adapt to climate change". Statoil acknowledges that setting 2020 carbon efficiency targets and key performance indicators have been the most substantial business decision. In addition, long-term investments in natural gas have also been influenced by Statoil's climate strategy (CDP, 2014).

How are climate change, sustainability and uncertain future management embedded into the strategic management system, and to what extent?

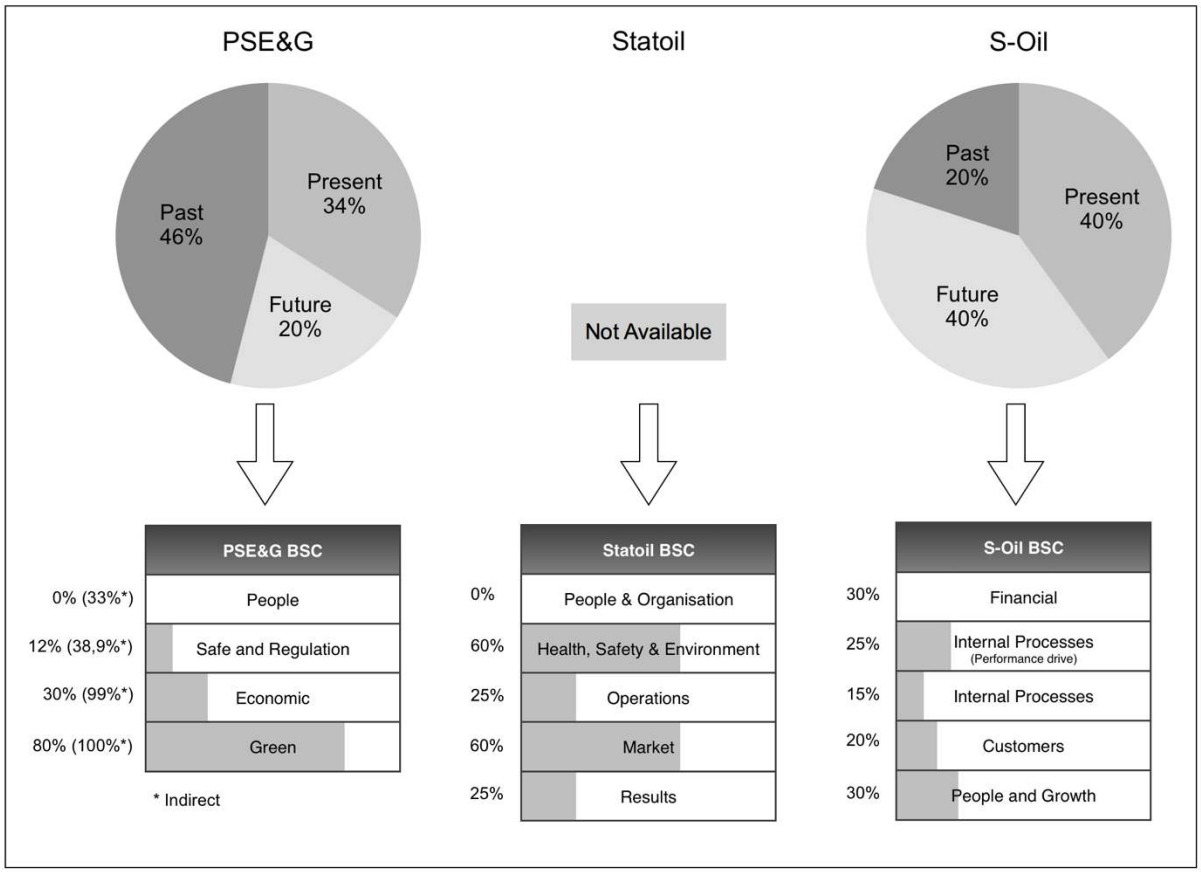
As presented through the climate change and sustainability perspective of this research, their embedment into PSE&G's BSC as a performance and strategic management system is critical for strategic consideration and implementation. Likewise, similar evidence has been found for uncertain future management. Based on such integrations that cascade from vision down to employees' KPIs and incentives systems, and based on the continuity of the strategic management cycle, I recognized several elements that seem to be interconnected and contribute to PSE&G long-term resilience.

The performance of resilience on climate change is currently not possible to measure, as major impacts are not effected yet. However, in the particular case of PSE&G, I was able to observe it through the company's response to recent disasters (extreme weather events such as superstorm Sandy). Furthermore, empirical findings confirm good company performance also in periods of turbulence caused by other stressors such as the financial crisis in 2008 and energy price drops in 2015. The key driver for such strong performance is derived from the operational excellence of PSE&G, resulting in balancing the maximization of the underlying value of the company in the long-term while optimizing short-term performance. To achieve such long-term performance, PSE&G integrates different management tools, such as Six sigma, Benchmarking and risk metrics into the BSC strategic management process.

The PSE&G strategic cycle enables dynamic adaptations of strategies when circumstances change. If needed, the company uses customized, shortened strategic cycles and increases the frequency of strategic transformation. Through strategic cycle and knowledge sharing from best practices, PSE&G builds on its ability to systematically learn from outcomes of implemented strategies, for example from superstorm Sandy.

The integration of specific threats of the future, such as climate change, is enabled firstly through leadership recognition of their strategic materiality and enhanced by the company's strategic approach of managing triple time horizons: short-term, medium-, and long-term. I established the key processes in this regards, such as weak signals collection, recognition of future threat, assessment, testing assumptions of current strategy, and potential strategy adaptation. In addition to these processes, the performance system using KPIs plays an essential role, primarily when it comes to constantly striving for their balance in multiple aspects. For example, I investigated the scope of KPIs that reflect future, present, and past in the overall BSCs of the three case study companies (see more in Figure 23). When introducing the initial BSC, authors Kaplan and Norton argued that the majority of strategic objectives and KPIs reflected past rather than present and future (1992, 1996a). As seen in Figure 23, this is not the case anymore with PSE&G's BSC, in which 54% of KPIs reflect present and future[33].

Figure 24. Time dimension of BSC: share of future oriented KPIs in each perspective in PSE&G, Statoil and S-oil



Source: Own research 2014, 2015.

[33] The comparison with other two researched companies indicate that around 80% of PKI's in S-oil somehow reflect present and future while in Statoil data varies very much among organizational units.

To gain strategic foresight, the set of objectives and KPIs should be more future-oriented, and PSE&G has estimated that they have around 34% of KPIs that represent the present and 20% that represent the future (see Figure 24). Although the financial aspects traditionally reflect past data, 35% of PSE&G's KPIs and 40% of S-oil KPIs in this perspective reflect the future (see Figure 23). It is also noted that all BSC perspectives consist of future-reflecting KPIs[34].

Within PSE&G's performance system, the majority of KPIs are measured and controlled through BSC on a year-to-yearly trend, on a monthly trend, on internal benchmarking and on external benchmarking. The company uses forecasts benchmarks for 5-year trends using rolling three-year average results, always aligning targets with either "Top Quartile or Decile" goals. Where metrics do not fulfill the strategy, the gap is expected to be closed within the first year. If no benchmark information is available, the approach of PSE&G is "to apply 1% improvement rate over the best performance level in the three most recent years" (PSE&G, 2015).

Based on observations and interviews, I found that transparency and fairness of incentives and compensations, whereby motivating employees to be aligned with change, are important contributors to long-term resilience. Furthermore, I found out that PSE&G's executives recognized the role of BSC with its depth and quality of strategic planning and its contribution to balancing benefits for owners, employees, the local community, country and planet. Finally, when exploring BSC capabilities regarding managing in the circumstances of uncertainty, several uncertainty stressors have been explored in order to be able to identify and observe the key resilience elements that played a significant role for preparedness and response to the credit crunch crisis in 2008 and their integration into BSC as a performance and strategic management system (see Figure 25 for key elements). The following resilience elements were identified as being the most significant while fully available within BSC:

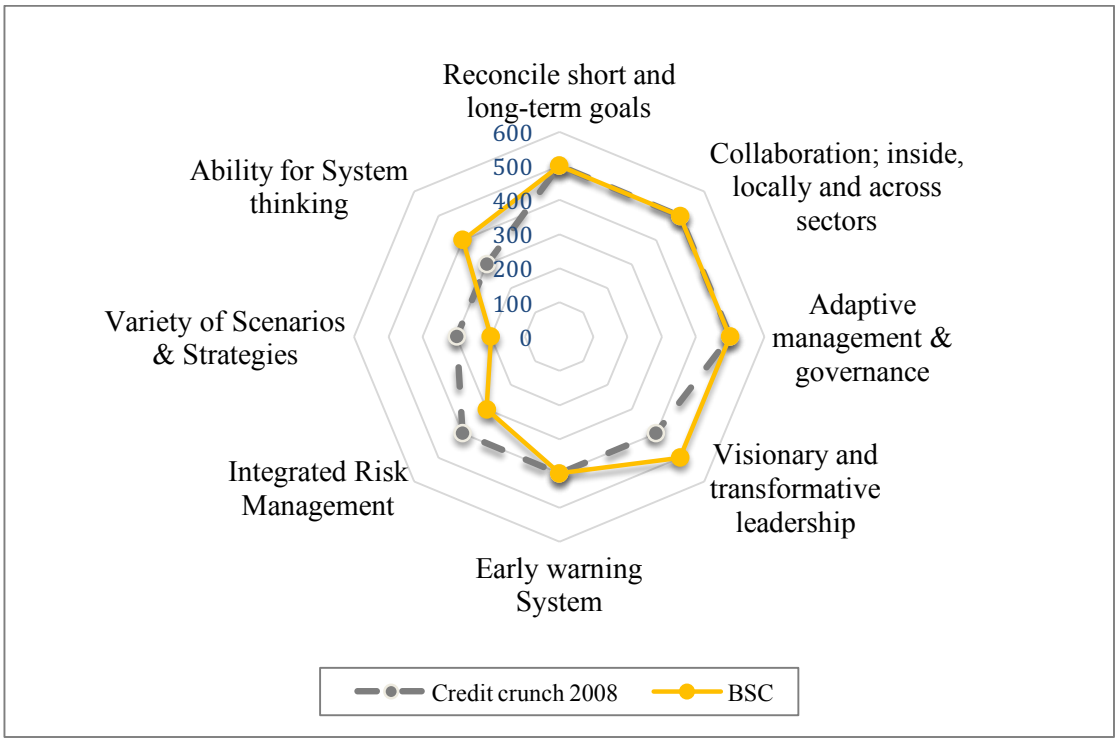
- Balancing short-term performance with long-term survival through managing and implementing constantly revised strategies and with reconciliation of short-, medium- and long-term goals.
- Adaptive management and governance.
- Collaboration inside, locally and across the sectors.

BSC also enables a resilience element "Strong visionary and transformative leadership", although it was not identified as being significant for preparedness for financial crises. The demand regarding "early warning system" matches fully with the capability of BSC. A mismatch was identified between "integration of risk management" and "variety of

[34] The data for Statoil was not available as it varies too much among organizational units.

scenarios and pre-prepared strategies" where BSC did not support the demand or their requirements. Finally, important BSC resilience capability is found in the ability of system thinking, where PSE&G failed to see a major role in credit crunch.

Figure 25. Resilience elements identified as crucial for PSE&G preparedness for the credit crunch in 2008 and as identified in its BSC



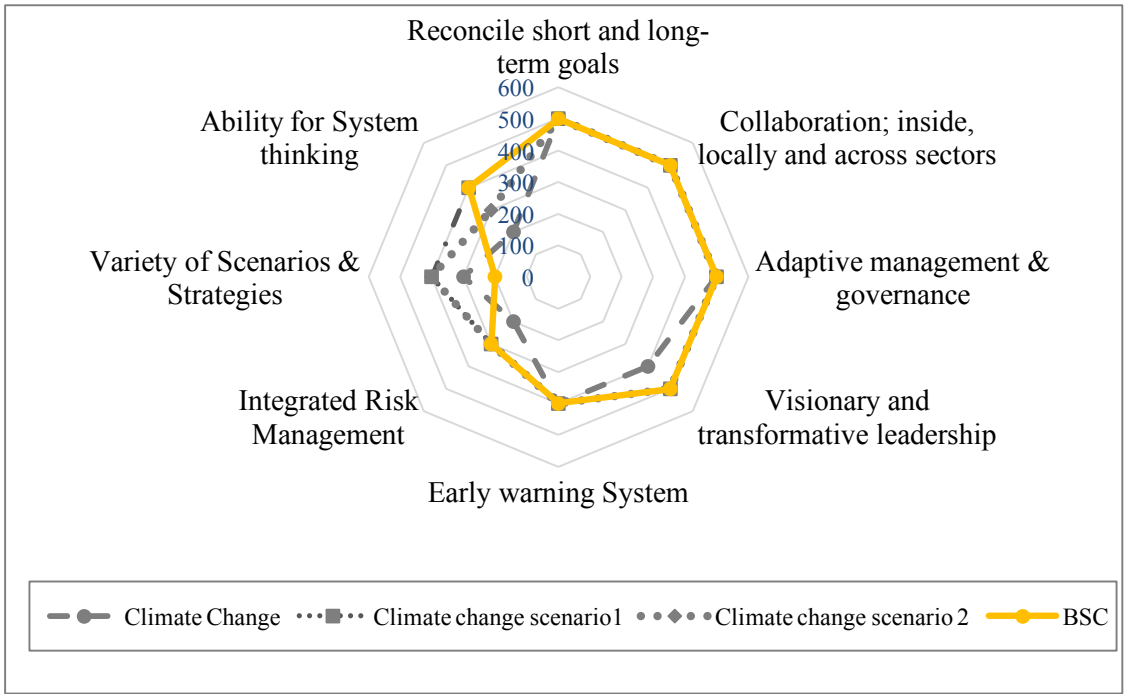
Source: Own research 2014, 2015.

Based on these findings from empirical research, I found that PSE&G executives believe that these same capabilities play a significant role in PSE&G's resilience to uncertainty, including to climate change (see Figure 26). This potential has been explored through climate change as a general threat and through two scenarios, Scenario 1 and Scenario 2.

While BSC fully enables most needed resilience elements, there are a few specific findings of this segment of the research:

- Climate change with both scenarios is more an issue of uncertainty than risk management.
- The needs for early warning systems completely match with BSC capabilities.
- The major mismatch is in availability of BSC capability for a variety of scenarios and strategies, and much higher needs for climate change in general but in particular for both two scenarios.

Figure 26. Resilience elements identified as crucial for PSE&G preparedness for climate change, using climate change scenario 1 and climate change scenario 2



Source: Own research 2014, 2015.

Beyond the case study research, I found several pieces of evidence from a variety of conferences and events documents in which PSE&G's leaders referred to BSC and uncertainty management[35]. Similarly, I have found similar evidence on uncertainty integration in Statoil. As former Statoil CEO Helge Lund stated, "We have a management model which is very well-suited to dealing with turbulence and rapid change. It enables us to act and reprioritize quickly, so that we can fend off threats or seize opportunities." (Bjarte Bogsnes, 2011).

[35] For example, Joseph Martucci, the PSE&G business team leader also responsible for BSC, chaired in 2011 the Transmission and Distribution Committee of EUCG, a global association of energy and electric utility professionals, on "The Certainty of Uncertainty", focused on a variety of issues, including the High Impact / Low Probability Events, and best practice on safety and reliability.

5 DISCUSSION

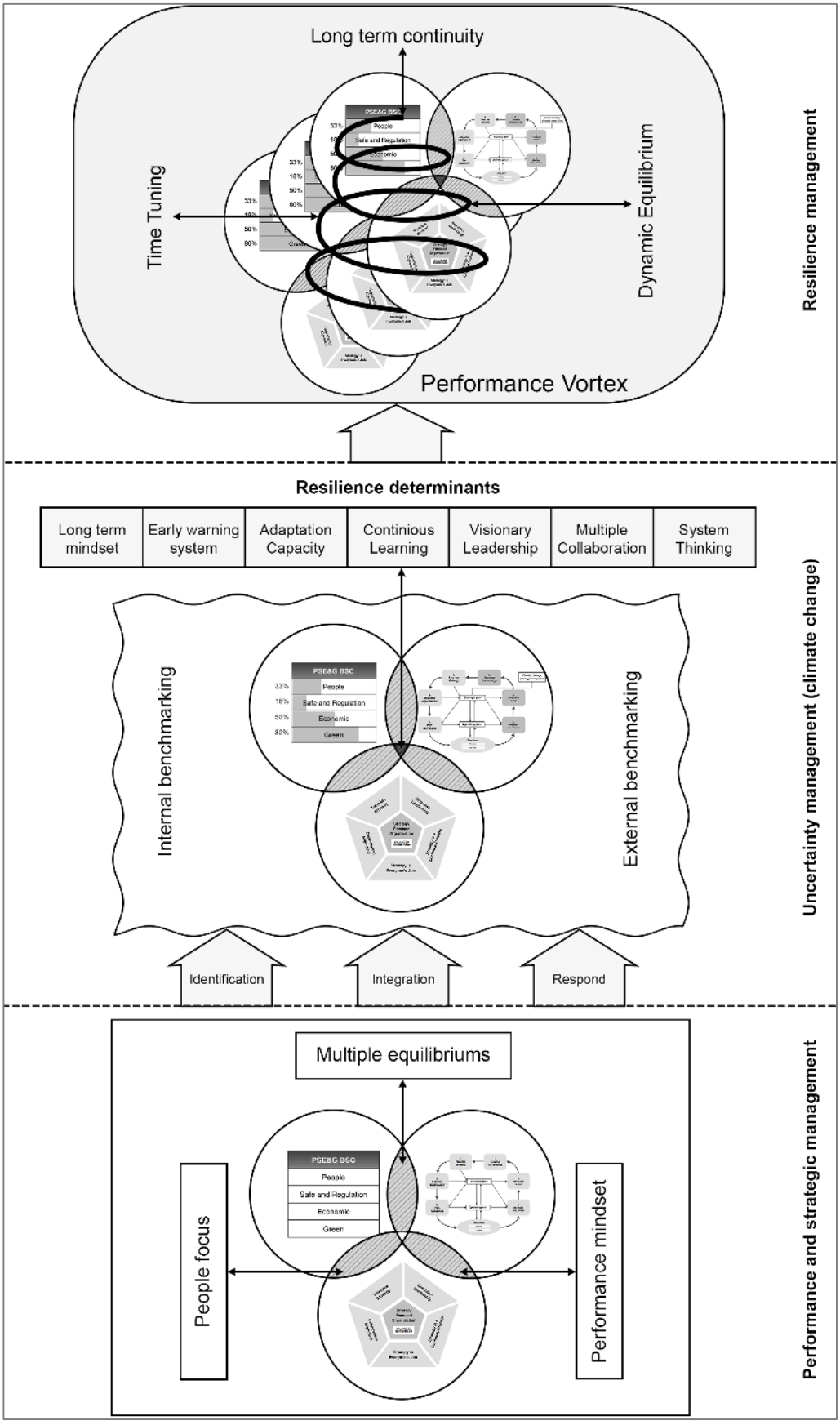
This chapter is organized around the discussion of the main objectives of the doctoral thesis. The longitudinal practice and the in-depth explanatory case study enabled generation of exhaustive data on performance and strategic management of uncertainty, observed through the prism of climate change, with an aim to add new dimensions to the existing theory. The key elements of discussion flow are presented in Figure 27, evolving from best practices of BSC towards integration of uncertainty management, explored through the case of climate change in PSE&G, and finally towards building corporate resilience, based on parameters of performance vortex.

The first objective was to outline and emphasize the openness and many possibilities of BSC, as a tool for performance and strategy management, with its limitations and advantages – and to define its key success factors for long-term performance;

This dissertation provides the findings on **BSC** potentials as a performance and strategic management system, based on the results of the explanatory case study of PSE&G which was supported by the key findings of the exploratory case study of the three selected HoF companies. BSC is often successfully used with other management tools, such as ABB and VBM as presented in the case of HoF company Aktiva Group (see more in Chapter 3.5.3). My research confirms that BSC has a **synergistic ability –** as proved by the PSE&G's use of BSC in combination with benchmarking and Six Sigma – as well as an **integrative ability** – as evidenced by Statoil's unique strategic and performance management system Ambition to Action that encompasses integration of BSC into Beyond Budgeting. BSC synergistic ability was confirmed for complementarity with Six Sigma and Hoshin Kanri, the latter dealing with resistance to change (DeBusk & DeBusk, 2011, pp. 7–9). Moreover, integrative ability of BSC was acknowledged for integration with ABB (Kaplan, 2010, p. 28), Six Sigma (Nagel, 2005), and TQM (Queazada, 2005; Kesterson, 2014, p. xiv).

BSC openness, in particular its ability for **integration into a comprehensive and overreaching management tool,** were identified as a BSC's strength also when addressing **sustainability**. Being an openly-structured tool (Bieker & Gminder, 2001; Figge et al., 2002b, p. 27) BSC provides high potential for sustainability integration, enabling sustainability strategies to become integral part in the wider context of strategic management. While the exploratory case study showed different approaches and sustainability strategies, all three companies integrate sustainability into their overall corporate strategies and subsequently into their BSC management system. Hence, sustainability is well integrated from vision to corporate governance, and incentive system. Moreover, I found evidence that all three examined companies set clear performance frameworks that include KPIs, objectives, and target approach for managing sustainability itself or they use a special BSC for managing sustainability which is applied in addition to BSC integrated at the corporate level, as is the case in S-Oil.

Figure 27. BSC performance and strategic management system model for uncertainty management



Consequently, such integration is not only the precondition for successful implementation of sustainability strategies (Eccles et al., 2013; Epstein, 2008; Kiron, et al., 2013; Zingales et al., 2002) but results in an alignment of the overall strategy and corporate performance with sustainability (Epstein & Rejc Buhovac, 2014; Figge et al., 2002). For example, three out of four PSE&G's BSC perspectives (People, Safe & Reliable, Green) have clear connotation of social aspects and sustainability, while all four perspectives including the fourth (Economic) comprise sustainability related KPIs. In addition, the fact that long-term sustainability is the imperative is substantiated in the following statement by the Chairman and CEO of PSEG: "Sustainability is a business imperative as we chart our course for the next 110 years" (PSEG, 2013).

While it is unlikely that any company has fully integrated sustainability (Epstein & Rejc Buhovac, 2014, p. 3), sustainability must be embedded into all perspectives of how a company does business (Epstein & Rejc Buhovac, 2014, p. 21; Laszlo & Zhexembayeva, 2011). Namely, it has to go beyond public relations, stand-alone strategies, as well as beyond the often parallel approaches of environmental, social, and economic management systems implemented in the past. Such integration of sustainability was seen in PSE&G where it is a driver of the company's long-term survival, its long-term successful performance, and its ability to maintain "the license to operate" (PSE&G, 2014a).

Based on the recognition of BSC's potential, extensive results of exploratory case research, and insights from the longitudinal practical use of BSC, I identified the **key success factors of BSC** that drive strategic performance and that could be used also by other companies facing contextual variables similar to those faced by the companies covered by my exploratory research:

Strong performance mindset:

- BSC require a *systematic and constant focus* of the management on the operational and strategic performance over the time and over the whole organization, as found out in all three researched companies. This ability of BSC was recognized as a competitiveness and one of the major advantages also by Olve et al. (1999).

- *Performance mindset* is recognized at all levels of PSE&G. Employees understand drivers of performance management, they are an active part and their performance is incentivized. PSE&G uses BSC also as a powerful tool for communication (PSE&G, 2014a). These factors of performance-driven behavior were recognized as factors which energize the culture and performance of PSE&G (Field, 2008). Furthermore, they support similar findings of Peljhan (2005, p. 207) and Tekavčič, Dimovski, Peljhan, Škerlevaj (2007a) in the case of a Slovenian company.

Performance striving for multiple equilibriums at the same time:

- The equilibrium of BSC is a well explored topic, in particular BSC's ability to balance the short-term and the long-term, financial and non-financial, external and internal, and leading and lagging indicators. The research acknowledges the existence of continuous need for such balances in PSE&G's strategic and performance system that assure trade-offs between different dimensions of performance. In particular *time equilibrium,* was identified as the key contributor to managers' long-term view and the key enabler of the performance mindset that goes beyond the short-term[36].

  Although Schneiderman, who coined the term "corporate scorecard", claims that "the most valuable use of a scorecard is as a driver of a strategically focused improvement process and as such it need not and usually should not be "balanced" (2001a), the research findings, on contrary, strongly support the driving value of the "balance" request as interpreted by Sundin, Granlund and Brown (2010, p. 232): "Essentially, this balance needs to be understood as a continuous balancing (verb) process as well as an outcome: there may be more balance at one point of time than at others. Balance needs maintenance and continuous effort".

- PSE&G is emphasizing such key role *of BSC's multiple equilibriums* for the company's long-term performance (PSE&G, 2016), as the management of limited resources in limited time determines limit the scope of managers' decisions. Consequently, it optimizes the set of strategic objectives. If the management fails to enable *"confrontation", collaboration, and calibration"* between these multiple balances with the overall management process in order to reach a balance or consensus in specific moment among all, it fails also to create long-term value and can even be a value destroyer. This dynamic capacity of BSC to continuously maintain the balance was identified by the management in PSE&G (PSE&G, 2016) and Statoil (Statoil, 2016) also as a source of weak signals, specifically deriving from the balance between financial and non-financial indicators.

People-focused performance:

- Employees and customer motivation were identified to be a critical driver for successful and long-term sustainable performance of the company. This claim can be substantiated by the results of the global survey in 2007 that found the correlation between BSC companies with breakthrough results and significantly higher motivation behavior compared to other companies (Palladium, 2007, p. 11). However, this research proves that the precondition for achieving outstanding results by using BSC as

[36] I noticed repeated reference to "the next 110+ years"" in PSEG's and PSE&G's Sustainability reports and documentation. This is most likely due to the longevity of PSEG that was incorporated back in 1903.

a tool for communication, motivation, and alignment, is the authentic engagement of people and their active collaboration, not only "formal" one. Such case is also PSE&G that introduced KPI to measure the conform of employees to speak up.

- The alignment of performance metrics and strategic objectives with the incentive compensation system is a critical separator between BSC companies that achieve breakthrough results from other BSC companies (Palladium, 2007). PSE&G was recognized as a case for developing incentives that lead to a new understanding (Field, 2008, p. 4). The company introduced an unique incentive compensation program based on weighing annual bonuses with financial outcomes, BSC results and strategy goals (see more in Figure 22). While weighing for different performance levels differ, the weighing for BSC results is the biggest and accounts for 40% for the management and 50% for employees. As such it not only motivates and aligns employees with corporate strategy but also engages them as the most important resource for detecting weak signals, collecting signals, detecting patterns of change, and/or suggesting solutions to minimize undesirable outcomes. As asserted by Rees et al. (2016, p. 54) only by interacting directly with employees, could companies identify challenges and innovative solutions that are visible only at local level.

The second objective was to test the preparedness for climate change in the selected companies and to find out whether these strategies are embedded into the corporate performance and strategic management systems of today.

In order to explore the ability of BSC for long-term sustainable performance, it was essential to test also its ability to provide timely responses to threats of an uncertain future. The importance of uncertainty in relation to BSC was first noted by Lawerie and Cobbold (2004) within an attempt to find a solution with the 3rd generation BSC. The present research tests the level of uncertainty through PSE&G's responses and preparedness for climate change threats and the readiness of its climate change strategies. The results prove the early identification, recognition, and responses to climate change together with a strategic approach and voluntary GHG reduction targets since 1994, followed by a set of well prepared climate change strategies and targets. I also found that PSE&G integrates climate change strategies into its current corporate performance and strategic management systems and that the role of BSC in the implementation of climate change mitigation strategies is emphasized in both companies PSE&G and PSEG (2008). As a result, both reached all major mitigation targets by 2011, four years ahead of the commitment period.

Today, PSE&G aims to build on this success to further reduce emissions and provide more low-carbon energy, as well as to implement programs for climate adaptation and resilience. In general, PSE&G's climate strategy shifted after 2011 from an overall reduction approach to adaptation and resilience strategies with particular emphasis on investments that expand access to the benefits of energy efficiency and solar energy (PSEG, 2015).

When exploring the relation between PSE&G's timely responses to climate change and its use of BSC as a performance and strategic system, I identified the key enablers of early recognition of climate change threats:

- BSC's ability to detect weak signals from non-financial indicators, equilibrium process, and environment changes;
- BSC ability to engage employees in strategic processes;
- Adaptation capacity of BSC derived from a continuous, non-episodic focus on strategy implementation.

PSE&G not only identified the abilities of BSC but also recognized the vital role of **internal and external benchmarking**, which was particularly helpful in the identification of existing or emergent gaps. Such complementary application of BSC with other management tools, here notably benchmarking, in the process of threat recognition was confirmed in all three examined companies. The most significant role of internal and external benchmarking was found in PSE&G and Statoil, followed by risk radars, and scenario planning.

Benchmarking enables measuring performance in relative and not in absolute terms. As such, benchmarking was identified as a source of global competitiveness and even resilience (PSE&G, 2016), encompassing peer industry benchmarking, benchmarking of technology similar industries, and internal benchmarking (the latter enabling the comparison between different units and locations). In this respect PSE&G is among the leaders, having mature benchmarking processes, using cross-industry benchmarking, and integrating benchmarking into performance measurement, planning, and best practice management. Such all-in performance is in line with PSE&G's objective to be the leading company in USA.

The importance and complementarity of benchmarking were recognized also by Kaplan (2007) who acknowledges the contribution of benchmarking to a company's efficiency and ultimate competitiveness, but also warns about the limitations of simplified benchmarking. Furthermore, Lawrie and Cobbold (2002a) found several cases of developing BSC with the use of a "benchmark" or comparative data for selecting measures and for target setting. In general, Kaplan and Norton (2001, p. 314) suggested that the organization stays alert and vigilant through feedback generated from its own strategy system, in order to be able to compare with competitor's actions and performance, to prepare external assessment and to closely follow the trends in external environment, and continuously identify and support emergent strategies.

While the research findings support Kolk and Pinkse (2005) and Porter and Reinhardt (2007) assertions about the necessity for the integration of climate change strategies into the overall strategy, I also found out the critical role of BSC SFO principle *"Make strategy*

a continual process". My findings correspond to the findings of HoF report by Field on well-rounded programs of initiatives and strategy reviews meetings (2008, p. 5)**.** In addition, the systems use of other principles of a SFO was identified in the process of addressing uncertainty of climate change in PSE&G (see more in Table 21).

Table 21. Climate change management and SFO principles

Process	SFO Principle	Evidence
Identification of Climate Change Threats	Make strategy everyone's everyday job Make strategy a continual process Mobilize leadership for change	• Weak signal from employees, internal and external benchmarking, from internal/external collaboration • BSC enable a long-horizon view • Addressing weak signals from strategic learning
Response and strategies development	Make strategy everyone's everyday job Make strategy a continual process Mobilize leadership for change	• Leadership focus • Strategic awareness of employees, stakeholders • Balance short-term, mid-term and long-term objectives • Adaptive capability – dynamic and feed back loop. • Ability to take decisions
Implementation of a strategic response	Translate the strategy to operational terms Align the organization to strategy Make strategy everyone's everyday job Make strategy a continual process Mobilize leadership for change	• BSC strength in performance & results: for climate change mitigation, management targets, KPIs, performance management • Performance driven behavior – employees, targets, incentives • Strategy validation

Source: Own research.

PSE&G applies the principle "Make a strategy a continual process" with two critical stages of the Execution Premium cycle: stage 5 "*Monitor and Learn"* and stage 6 *"Review and Test"*. In stage 5 "Monitor and Learn" PSE&G uses strategic assessment meetings to analyze the performance (i.e. to what extent strategic objectives are met) and to take corrective actions upon the portfolio of strategic and risk mitigation initiatives and their specifics, such as resources, responsibility, priority, etc.

In stage 6 "Review and Test" PSE&G conduct strategic analyses that are performed within an annual strategic execution cycle which involves re-evaluating the strategic gaps and re-defining the overall strategic priorities and goals.

The third objective was to explore determinants of corporate resilience, and to examine their intersections with the BSC as the performance and strategic management system

The dissertation's corporate resilience framework was identified and developed based on the research of emerging literature on corporate resilience (Moberg & Simonsen, 2014), in particular on strategic resilience (Hamel & Valikangas, 2003; Kupers (Ed), 2014; Reeves et al., 2016), resilience in the age of turbulences (Kotler & Caslione, 2009) and the climate change resilience (IPCC, 2014a). Based on these sources the following ten major overreaching characteristics of resilience are apparent, comprised of *three structural features* such as **diversity**, **redundancy**, and **modularity**, and *seven management elements:* **(1) long-term mind-set, (2) an early warning system, (3) capacity of adaptation, (4) continuous learning & innovation, (5) leadership, (6) multiscale collaboration, and (7) system thinking & unity with planet.**

The research acknowledges the PSEG's dedication to three structural features such as **diversity – *diverse portfolio***, building **redundancy,** in particular in past ten years after extreme weather disasters, and **modularity.** Consequently, the changing environment with frequent extreme weather, for example Super storm Sandy, has shifted focus from mitigation climate change towards assets protection, infrastructure resilience, diversity of portfolio, human protection, changing human processes and building the redundancy. While they are vitally important for robustness of the company long-term, there are less evidences with connection to BSC.

On contrary, the in-depth explanatory case study of PSE&G, backed with the results from the exploratory research of three selected companies, has enabled the identification of key intersections of BSC with management elements of the resilience. While all seven elements could be found in PSE&G's BSC, notably four among them have the greatest impact in sustaining PSE&Gs long-term performance, in this case in the circumstances of climate change long-term mind-set: an early warning system, capacity of adaptation and in continuous learning & innovation. Hence, they can be used by other companies facing similar contextual variables:

Long-term mind-set

To be able to fight short-termism, companies must rethink their vision and test it by impacts of climate change so that they are able to explore their ability to reach long-term goals (Winston, 2014). To achieve this, companies must develop multiple visions based on scenarios with a wide range of possible future variations of climate change effects (IPCC,). In addition, as argued by Kotler & Caslione (2009, p. 171), companies need to balance the short-term objectives with the long-term, by applying the triple planning method that involves short-term, mid-term and long-term horizon.

In the research period 2009–2016 a long-term view with strong performance focus was noted in PSE&G's BSC. The study acknowledged that the BSC can successfully balance short-term pressures on financial performance with long-term sustainable performance and that BSC can be used as a sound tool in managing triple planning (PSE&G, 2014a; 2016). This BSC capacity enables companies to survive in the long run – it enables them to continuously balance multiple time horizons with a continuous request for multiple equilibriums. In addition to BSC I also noticed that scenarios method is used as a supplement to the BSC Execution Premium.

An Early Warning System

Companies should be sensitive about the economic, social, technological, and environmental changes and they should collect signals, detect patterns, imagine plausible impacts, and take appropriate actions. Aside risk management PSE&G obtains *early warning signals* through the BSC performance and strategic system based on a proactive and holistic approach, while making strategy everyone's every day's job (PSE&G, 2016). For example, the early recognition of climate change as a threat in 1994 was enabled by the fact that PSE&G's leaders focused on weak signals, and that PSE&G lead in reduction of toxic emissions, and in putting pressure for industry standards.

At the time the present study was used to test the applicability of BSC for anticipating and preparing for uncertain changes, PSE&G's BSC business team leader Joseph Martucci asserted that the success from early warning system primarily derived from "the continuous request for optimization of strategic objectives in different BSC perspectives at the very same time, in particular of balancing the financial with non-financial KPIs" (PSE&G, 2016). The most valuable weak signals were obtained from "People" sources and from non-financial KPIs. This was acknowledged also by Aktiva's CFO as stated in the Hall of Fame Report 2006 that "because of its (BSC) emphasis on leading and lagging indicators, BSC become a kind of an early warning system that is crucial in our business" (Balanced Scorecard Collaborative, 2006, p. 5). In addition, following the BSC Strategy Execution model, managers can also address unpredictable and unprecedented occurrences that create existential risk, also termed as Level 3 risk (Kaplan, 2009).

Capacity of adaptation

The quest for resilience is defined as a forever morphing strategy, forever adapting itself to emerging opportunities and incipient trends (Hamel, Valikangas, 2003, p. 3). The capacity of adaptation is essential in particular in the case of climate change threats and turbulences (IPCC, 2014). The study discovered the BSC capacity to manage, evolve, and/or adapt the strategy continuously, non-episodic, in particular through the performance of Stage 6 "Test and Adapt" of the Execution Premium. In the observed period PSE&G identifies key

strategic challenges based on detection and collection of weak signals, followed by impact evaluation, based on which the company challenges its vision each year by testing the hypotheses and choices on which its strategy is formulated before moving to strategic planning for the new strategic execution cycle.

Consequently, and up to the results of the test, PSE&G makes decision if to continue with the same strategy or to validate it. Although this process is performed on an annual basis, the company reacts more frequently in the case of significant signals, for example in 2015's volatility of oil prices (PSE&G, 2016). The research acknowledges that such adaptive system played a significant role in PSE&G development of corporate resilience. The best case of strategic continuity is Statoil, the company that introduced an ongoing strategic process, with multiple iterations within the year.

The key identified elements of adaptation capacity of BSC are as follows:

- *The continuity* derived from the BSC on-going strategy performance cycle.
- *The frequency* of Stages 5 and 6 of the Execution Premium cycle have been identified as critical for PSE&G's (PSEG's) preparedness to climate change, enabling a company to consider and to address sudden changes or weak signals.
- The *urgency* to respond accordingly, as the consequence of bringing change into the management focus and consequently taking strategic management decisions in Stages 5 and 6 of the Execution Premium. As a result, the change is manifested either though the continuous adaptation of present strategies or through continues force for reformulation of PSE&G's strategies.
- The *feed-back loop* capability is therefore very important for building resilience. Reeves et al. (2016) claim the high importance of process that force the selection and improvement of the fitness of the system. While the effect is again related to the performance of Stages 5 and 6, PSE&G added its advanced model of disseminating its best practices (see Figure19). As stated in HoF report in 2008 PSE&G hosts yearly best practice sharing sessions that bring together companies from inside and outside the industry (BSC Collaborative, 2008, p. 28).
- The *alignment* with adaptive governance. The adaptive, responsive, and accountable governance was identified in the research as a key resilience driver in all three observed companies. As acknowledged by PSE&G, adaptive governance is one of the key enablers of a proactive approach to climate change adaptation and resilience.

The adaptation capacity observed in BSC of PSE&G revealed major transformation towards climate changed world in the 1998–2011 period, with early identification, responses, and strategy implementation. The climate change adaptation strategy followed that phase and is still in underway, being frequently adjusted to learning experience from extreme weather events. For example, after the super storm Sandy and the damage caused

by the flooding of power stations, PSE&G is raising its power stations, developing more barriers, and investing in infrastructure redundancy.

In addition, due to increased uncertainty and turbulences, the research found indications that the company's organization structures are becoming flatten and modular and there are evidences that strategic cycles are becoming more dynamic, interactive, with fast and direct communication between all levels of the company (PSE&G 2014a, 2014b, Statoil 2014b). Such an approach shortens the decision making process and in particular *shortens the planning, budgeting, and strategy execution cycles***.** Based on that a company could be able to execute increased magnitude and frequencies of strategic transformation in shorter time with less expenses and lower emotional energy (Hamel, Valikangas, 2003).

Continuous learning & innovation

Adaptation is enhanced by company's learning capacity, in particular from its iterative process of systems learning from the outcomes of implemented strategies, form learning by doing and from learning from facing risks (IPCC, 2014). Stage 5 of Execution Premium "Monitor and learn" increases company's ability to react, as seen in PSE&G. In addition, monitoring meetings facilitate ex-ante planning and enable the open environment for new solutions and innovations, both social and technological. These meetings allow the aggregation of decisions on corrective actions from the departmental level to the corporate level. The company also build a set of best practices resulting from the findings of previous strategic assessments.

The study acknowledges the existence also of other three managerial drivers of resilience:

- **Leadership:** The analyze of BSC companies that achieve breakthrough results confirmed the critical requirement for the active role of leadership in driving strategy execution (Palladium, 2007). In addition, the present research in PSE&G several times acknowledged its vital role for initiating and sustaining resilience over time, in particular for difficult choices, making trade-offs, providing directions, understanding the implications for the company and for communication purposes.
- **Multiscale collaboration:** Beyond the internal collaboration with employees, cross-function, customers and shareholders the resilience demands development of deep and formal engagement with internal and external stakeholders. Such collaboration is building support from the community, is bringing inclusive innovation and collective consideration of the wide range of risks and assessment of their impact. The employees are the prime source for building resilience as explained at the beginning of this chapter. PSE&G embedded people centric approach with aligning incentives, and introducing new KPIs that are measuring the real engagement of the people (PSE&G, 2014a). In addition, the source of PSEGs early recognition of climate change has its roots in collaboration with NGOs and communities (PSE&G, 2016).

- **Systems thinking and unity with planet:** Humans and nature are strongly inter-connected, therefore the humans can sustainably live on this planet only within Earth's boundaries. Such approach calls for systems thinking, valuation of natural capital with management of externalities, and the advancement of social-ecological innovation. While the research found several evidences on systems thinking in Statoil, PSEG's president and CEO Izzo claims that difficult but necessary trade-offs are needed, for example "it will require utilities and regulators to embrace new ways of thinking and new business models. Most electric utilities are still financially rewarded when customers use more energy. That made sense 50 years ago, but it is precisely the wrong incentive today" (Izzo, 2015). As argued by V. Bulc (2012) such shifts, while aligned with transformation, improvement, adjustment and generation of value, could suggest a move of a society and individuals towards a larger paradigm shift.

Finally, the fourth objective was to suggest further development of the BSC as an integrated strategic framework with embedded levers of resilience for sustaining long-term performance.

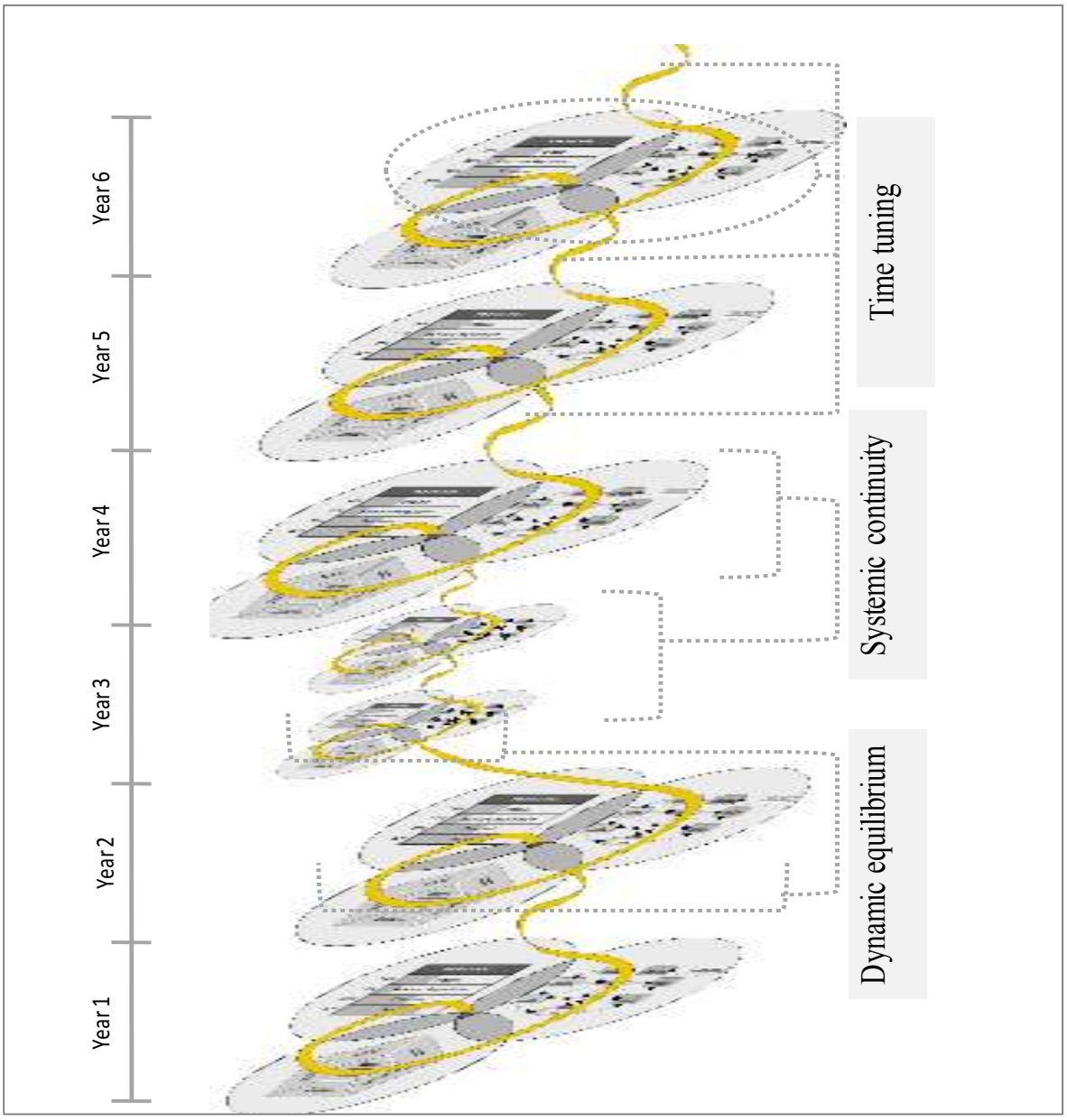
To conclude the discussion chapter, this study acknowledges the thesis assumptions about BSC capabilities to enhance company's performance and strategic management in the case of uncertainty, tested through the prism of climate change. As presented in this dissertation these capabilities evolve from previously fully implemented performance and strategic excellence framework as developed by R.S. Kaplan and D. P. Norton.

Hence such companies implement BSC as a multidimensional framework for strategic performance measurement, as an advanced strategic and performance management tool, and as integrated strategic management system, that includes Execution Premium's architecture, and combine it with several other specific managements tools, such as in the case of PSE&G benchmarking, scenarios management and Six sigma. In addition, if this performance and strategic management system is fully integrated from company's vision to employee's incentives and if there is a clear force for continuous maintenance of process balancing and effort for balanced outcome, such strategic system successfully integrates long-term sustainability, as advocated also by the BSC authors and other practitioners.

To enable the use of such BSC performance and strategic framework in the circumstances of uncertainty I am proposing further development of the initial framework rather then to upgrade Kaplan and Norton BSC framework. A detailed documented course of action and a set of procedures, which encompass BSC best practice use and the exploratory and explanatory case study of BSC HoF companies combined with my longitudinal field-work with BSC, generated exhaustive data of BSC use. The methodology embodies critical aspects of BSC such as strong performance focus, multiple equilibriums and people focus, areas that contribute considerably to the success of the BSC to drive long-term performance, also in the circumstances of uncertainty but which are mostly overlooked in

other BSC research. The findings enabled me to propose a further development of the existing theory, stemmed from sustainability integration and enhanced by determinants of resilience that both enable continuous adaptations and timely responds on threats. Such integrated BSC strategic management framework could further evolve into **performance vortex** for sustaining long-term performance (see more in Figure 28). Although in the form of spiral, I named it vortex as it is a major component of turbulent flow (see vortex).

Figure 28. Performance vortex for resilience management in uncertainty



Source: Own research 2014, 2015, and 2016.

This further development of BSC is embracing calibration of **time dimension, dynamic equilibriums and long-term continuity.** The integration of future looking orientation with time calibration and continuation, shaped by the frequency and the length of strategic cycles as respond on the changes in internal and external environment, all within the

performance vortex, could reach dynamic equilibriums continuously over specific time periods. Such performance vortex covers the important aspects of a BSC synthesis but goes also beyond traditional performance and strategic system, hence could serve for resilience management in the long run (see Figure 28).

Time-tuning

Inspired by the car GPS example, where calibration of scale cause either too short view which offer too limited time for on-time preparedness for the fast reactions either too long view, where final destination is visible but the path is pretty unclear thus being too distant for any understanding on needed next actions, I have noticed the same need in the corporate world. The combination and calibration of multiple time scale navigations at the very same time is essential for the full understanding about performance of the company in present and about indicators of its future performance. Especially, as explained by Mintzberg and Quinn (1996) strategy should be clear on long-term goals, but adapting shorter terms activities and outputs are essential due to changing circumstances.

Unfortunately, this is still not the case according to research findings by Marr (2012) as only 11% of companies focus on real time performance and only 7% focus on the future performance. The study acknowledges some levels of time calibration in PSE&G with connectivity of short, medium and long term performance information, in particular with integration of future oriented KPIs into overall BSC (see more Figure 24) and with balance of past, present data with future visions into BSC reporting, widely backed by benchmarking information on trends and gaps (PSE&G, 2015d).

In addition, as companies are challenged with **"moving targets"** in current business environment, hence the trajectory of current strategies based on current business logic and business model are constantly challenged as well. I have noted the need for p**erformance navigation function with "lookout"**, enabling alternative trajectories in the time of uncertainty. For example, to build the robustness to negative Black swan events that could occur and to be able to exploit positive Black swan events (Taleb, 2010) company needs to assure forward looking orientation (Topazio, 2014).

The lookout for any divergence is possible when new scenarios are developed based on the level of residual uncertainty, for example for "a clear enough future", "alternative futures", "range of futures" or "true ambiguity" (Courtney, 2001). In addition, company could use formal methods such as modelling, simulation, market forecasts etc. and informal methods such as strategic planning, brainstorming (Lawrie & Cobbold, 2002a). Finally, strong collaboration is needed with employees, customers and wide range of stakeholders., although it could raise resistance to change inside a company (Kotter, 2005), in particular when the indications could undermine the current validity of its business model and strategy (Kotter, 1996).

Long-term Systems Continuity

The building blocks of long-term systems continuity that manifest conscious focus on continuity, hence the future orientation, are:

a) Cycle based learning approach, also named by Zook and Allen (2001) "learning curve effect": as uncertainty has no evidences, hence the learning is the only "tool" to build the capacity for preparedness and respond. The best practice model can be of huge support (see more in Figure 19).

b) The conscious focus on continuity of the integrated strategic cycle and on adaptation: systemes collection of weak signals, risk radar for high impact but low probability risks, and integration with risk management are essential but not sufficient strategic responses on uncertainty. The company must adapt to new circumstances all the time.

c) Shorten strategic cycles if needed: the circumstance might rapidly change and in such period the company cannot address with the full BSC strategic management cycle but could focus on key element only or/and perform them faster. In the time of turbulences, the company could validate its position and validity of its strategy multiple time per year, as explained by Beyond budgeting concept in Statoil.

Dynamic equilibrium

The reach of the multiple balances of all objectives of company's employees, financial performance, community benefits, industry competitiveness and planet wellbeing is not possible in each moment of the time. Dynamical equilibrium represents "the continuous request for making choices and optimization among different BSC perspectives while managing the limited resources in limited time" (PSE&G, 2016). Needless to emphasize, that any benefit on the cost of other perspective, such as the planet resilience that is vital for the survival of our and future generations, is jeopardizing the future existence and performance of all other as well. Consequently, the quest for time equilibrium in corporate performance is a potential solution. Strategic balance of long-term and short-term objectives should be impartially combined to achieve a desired level of equilibrium (Bordum, 2010). Such strategic balance, while the company is competitive and is coping well with the change internal and external, is possible to measure over longer time period.

To conclude Discussion, even though every attempt is made in generalizing the concepts presented in this paper, company specific factors, such as the depth of BSC implementation and use, as well as size, strategy, resources etc., that are requiring deviations from the proposed methodology, will always need to be considered while using BSC as integrated strategic system for resilience management. Furthermore, we should not overlook that its benefit is highly dependent on authentic purpose and the overall corporate mindset in the company. However, some among key determinants identified, in particular for climate change management, could be used also in the companies that are not using BSC.

CONCLUSIONS

The business world of the 21st century is facing complexity, growing uncertainty, intensifying competition, and powerful mega trends. Due to such uncertainties managers are confronted with heightened levels of overall risk, great speed of change and shocks of great magnitude. Company's long-term sustainable performance now depends on the anticipation and timely reaction to unexpected changes in the external environment as well as on the company's ability to timely adapt to new market circumstances that arise from these changes. These aspects can be properly discussed by considering climate change that is essentially a sustainability phenomenon, requiring immediate strategic attention. Climate change has been identified as one of the most unpredictable and threatening factors, representing both, the biggest threat and a new opportunity in the development of mankind.

This dissertation provides new and important insights into the potential of the Balanced scorecard framework for timely and strategic responses to uncertain threats, such as climate change, on which a dynamic, balanced, and continuous strategic system can be built. The study was based on ample evidence that excellence in operational performance is a prerequisite for successful strategic performance of a company, acknowledged also by the strategy expert Porter (2006) who claims that a strategy cannot be implemented without an excellent operational and governance process. BSC, as developed by Kaplan and Norton, is one of the management tools that can be used for this objective.

BSC concept, developed by Kaplan and Norton, is undergoing continuous dynamic development; it evolved from a performance measurement and management framework towards a strategic management system. This was subsequently further extended into BSC various activities for strategy development, planning, alignment, operational planning, and operational and strategy control in a closed-loop comprehensive system. Latest development referred to various integrations, also with risk management approach and with framework for co-creating and delivering a shared value strategy, one that simultaneously delivers economic, environmental, and community performance. The research results proved that all three examined companies strive for operational excellence and strategic performance and that they apply BSC for sustainability integration. Subsequently, as confirmed also by several studies in this research field, that the continuous use of BSC can contribute to better business performance, the research companies mostly outperform competition, in particular in long-term perspective.

However, in such a rapidly changing environment companies need to understand uncertainties they are facing and act accordingly, as past performance is not sufficient anymore. Hence, this dissertation showed that BSC can provide a framework for timely and strategic responses to uncertain threats, including climate change, with a dynamic, open, and focused strategic systems which take account of continuous evolvement and provide signals for timely responses to future challenges. Given BSC's continuous

reformulation or adaptation of a company's strategies based on strategic consideration of sustainability and uncertain threats, such as climate change, BSC has the ability to balance the short- and mid-term with the long-term demand which enables a company to attain long-term sustainable performance.

Hence, this research identified the stable financial performance of examined companies using BSC also in circumstances of uncertainty, including financial crisis, sudden price shocks, and natural disasters. One such example of PSE&G's successful long-term performance is the fact that it uninterruptedly paid dividends for 117 years. Consequently, I analyzed the ability to perform and use a strategic system through the preparedness and resilience to climate change. I selected climate change as the criterion because it is inevitable and therefore goes beyond the voluntary CSR or sustainability management. The findings of the explanatory case study of PSE&G indicate that PSE&G has integrated climate change into its overall BSC performance and strategic management. These findings were indicated already by the exploratory case study of the three selected companies, conducted with the objective to make the findings stronger and not random.

As shown by the results, this dissertation primarily upgrades the existing theory in terms of the identification of the key success factors of BSC as a performance and strategic system. Based on my research, I suggest the combination of strong performance focus and mindset, performance based on multiple equilibriums, and performance based on people-focus. This combination led to continuous successful performance and strategy implementation in the selected companies. The inclusion of BSC elements simultaneously facilitated and/or enabled a high level of sustainability integration, accompanied with climate change integration into performance and strategic framework. While the potential of BSC to successfully integrate sustainability into performance systems was thoroughly explored and further developed by several scholars, in my research I emphasize the need for sustainability (and climate change) integration into the overall strategy and overall corporate performance system as in the case of PSE&G. The other two examined companies produced similar evidences.

Secondly, another important research conclusion is the identification of BSC's resilience capacity demonstrated in timely responses to threats of an uncertain future, with resilience determinants being a long-term mind-set, early warning system, adaptation capacity, continuous learning and innovation, all supported by leadership, multi-scale collaboration, systems thinking, and unity with planet. It is thus not surprising that the PSEG's Sustainability report for the year 2013 was named "With Resilience comes Sustainability".

Thirdly, this dissertation suggests that further development of BSC lies in the evolution from a performance and strategic integrated management system, enriched with resilience determinates towards reaching the continuous performance vortex. The parameters of such a performance vortex are time-tuning, dynamic equilibriums, and long-term continuity. I

believe that the format of proposed further development of BSC has an evolutionary character, as it adds the time dimension of continuity and conscious adaptive capacity into the performance and strategic management system. Although there is no firm evidence about the origin of Darwin's statement "it is not the strongest who will survive but the most adaptable to change", it nevertheless well illustrates the rationale behind the proposed performance vortex (see more in Figure 28).

While all the three researched companies represent best cases of BSC performance and strategic management (see bottom part of Figure 27), PSE&G and Statoil excel in uncertainty management and climate change management thanks to their application of BSC. In particular PSE&G leads in the area of identifying and integrating gaps with benchmarking, while Statoil is a pioneer in dynamic time-budgeting with its "beyond budgeting" and "ambition to action". However, I identified systems thinking (Jere Lazanski, 2009) as the weakest resilience determinant, aside unity with the planet. These resilient determinants are critical for the survival of humanity, but of course the toughest one to implement in the current economic systems and market economy.

Likewise, a similar situation was identified with regards to dynamic equilibriums. While the concern about employees and community is emphasized, planet issues are limited to environmental dimensions and material sustainability. Even though such an approach is in line with current business theory, it may not be sufficient to reach planet resilience due to the limits of the planet. In general, the parameters of performance vortex in PSE&G have a strong base in resilience determinants, in particular PSEG's visionary leadership. However, a systems and conscious decision will be needed to evolve current performance and strategic system into continuous performance vortex.

The dissertation's contributions to science are the following:

1. The first contribution is the deepening and extending of the current knowledge in the research area of the BSC, as performance measurement and strategic management system. The present study contributes to existing theory on what are identified key parameters of BSC that enable successful long-term performance. In particular, the dissertation has looked at tension between short term successful performance and integration of sustainability challenges, such as climate change. Due to the character of uncertainty the study of climate change preparedness and resilience enabled the exploration of capabilities for uncertainty management. The conclusion is that BSC enable the development of corporate resilience and is assuring long-term performance.
2. Second contribution is with discussion of the uncertainty management, resilience and long-term viability, the topics that are emergent in current business literature. However, although the resilient determinates are well-known there is still a lack of their integration to the overall performance and strategic management system. Therefore, the

dissertation upgrades the existing theory with exploration of resilience determinants and their integration into the BSC strategic management system.

3. Thirdly, an important contribution of this dissertation is in regards to inevitability and strategic character of climate change. While the climate change has become one of the most widely researched subjects in science in last decades, the business and academic literature indicates that the appropriate climate related business strategies are inadequately elaborated among other environmental and sustainability issues. Furthermore, the discussion of the climate change in business literature generally focuses on mitigation strategies and targets, rather than to adaptation climate change strategies, disaster management and transition to new, low carbon world. Therefore, an important scientific contribution of the doctoral dissertation is in strategic and holistic business discussion of climate change. Even if companies do not use BSC, they can use main findings as the guide how to manage climate change (see more in Chapters 2.4, 2.5, 4.3.2, 4.3.3, 4.3.4, and 4.5) as well as how to address similar threats of uncertain future (see more in Chapters 4.3.4 and 4.5).

4. This study upgrades the existing theory of performance and strategic management with consideration of time, continuity, and equilibriums dimensions. The study suggests the further development of BSC into performance vortex, hence enabling company to survive and sustain successful performance.

5. An important contribution of the doctoral dissertation is its study of the business practice of companies with operational and strategic excellence, as the research is based on an extensive practical work in HoF companies. The dissertation studies their preparation for climate change, their capability of balancing short-term and long-term objectives and managing sustainability and uncertain future. These are the challenges that the majority of companies cannot address because of the scarce human resources, knowledge and experience. That is why the presentation of best practice from worldwide companies is so important to encourage other to follow.

Consistent with the research design and methodology, **the scope of this research was limited in some aspects**. One of the major limitation is that BSC abilities have been explored only at the companies with proved level of BSC implementation (HoF), hence with skillsets, expertise and believe around BSC potential and results. Therefore, the results cannot be simply applied at companies that have never used BSC and achieved visible results out of its use. However, if the company implement and use BSC within this framework, in such case neither the size neither the type of company play limitation as its use is not connected with additional time and resources, as seen in Aktiva Group case.

Secondly, both exploratory and explanatory case studies have been conducted online and over audio conferences. Third, the industry, the exploratory companies and the explanatory company have been selected based on present criteria for selection (see Chapter 4). Fourth, by coincidence all selected companies proved to be best cases in benchmarking. In

particular PSE&G pave the internal and external benchmarking integration to build company's competitiveness and resilience. However, in the business practice there are multiple evidences of bad benchmarking that is misleading strategic decisions. This could be a serious challenge in particular for environmental and climate change issues. Another limitation is a single investigator, which did not allow me to perform the investigator triangulation. Therefore, all findings have been validated by key informants.

Such enhancement of the BSC theory represents the starting-point for further research and organizational learning, also the one that enables "practice from refined theory" learning. Furthermore, as some minor changes in the research plan and sub-stream have been made based on the logic of answers, the results of the research could be used in the future for comparison or for further research, in particular as the results of the research questions confirmed all assumptions on BSC potentials.

Directions for the future research stem from the dissertation's findings as well as from missed opportunities. Firstly, resilience determinants, in particular weak signals, preparedness, and adoptive ability could be researched within other management tools. It would be also worthwhile to conduct a longitudinal study on all BSC companies, not only HoF, to explore how and when they integrated climate change into performance and strategic system, with a special emphasis on adaptation and transformation strategies.

Secondly, the explanatory's case study results indicate the need for further work into researching the performance vortex parameters and the longitudinal effect of performance vortex. Testing the performance vortex in a real environment would be of great help for further clarification of the resilience determinants and of performance vortex parameters. Future research should gradually lead to the development of comprehensive model of continual performance vortex, which should eventually achieve general validity when tested in different environments and continuously improved. In this regards, I would much encourage interdisciplinary studies, in particular with quantum physics. My personal interest for BSC began with my conscious awareness of the effects of law of entropy in the business world. When observing daily gradual decline into disorder, I found the BSC as an enabler of maintaining simplest level of the order. Moreover, the parameters of the proposed enhancement of BSC towards performance vortex could be illustrated with syntropy, as presented by Detela (2014). Although syntropy (also named as negentropy) is used in mathematical sense as *negative entropy,* pertaining to complex non-linear dynamical systems (Detela, 2014, p. 39), it represents the *self-organizing ability of nature*[37] with regards to natural phenomena (see more in Detela, 2014, pp. 378–379).

[37] Detela (2014) argues that certain complex quantum systems can grow towards a state with higher internal order – even without external influence. Therefore, Nature displays a self-organizing ability, called syntropy.

Furthermore, as asserted by Detela, in quantum physics all time aspects, past, present, and the visions of future, are entwined together. While these elements could be recognized within the spiral of performance vortex, in natural equilibriums, in time intersection of past, present and future, and in particular in so much emphasized continuity of the proposed BSC resilience model, this is beyond management accounting and business administration research and also beyond my understanding and knowledge, hence should be subject of additional researches.

Another important direction of potential research is linked to shareholders. The research results indicate the vital role of shareholders and the governance system, in particular for early recognition of responses on threats, for reaching consensus on adaptation and for aligning long-term expectations. Therefore, further research could focus on correlation between the shareholder's profile and governance system on one side and the early climate change responses and corporate resilience on another side. Finally, I propose the research that would enhance the systems thinking and unity with planet with corporate strategic and performance systems, in particular with BSC. Such an integration of externalities into performance and strategic system and ability of long-term equilibriums between human/employees, company, society and planet, might play the most important role in resources constrained world. In addition, I assume that there are other management tools that could provide similar key resilience determinants, such as Hoshin Kanri (Kesterson, 2014) and third and fourth generation BSC (Lawrie & Cobbold, 2004; Lawrie et al., 2005).

To conclude, the quest for corporate long-term survival is not new. For example, company Hoshi Ryokan, Japanese spa founded in Komatsu in the year 718, use for more than millennia a very practical mission statement "Take care of fire, learn from water, cooperate with nature" (O'Hara, 2014). The essence of the resilience could be found also in the mission statement of even older company Kongo Gumi, Japanese construction company that has operated since 578 until its takeover in 2006, stating "Challenge new things with new perspectives." Centuries later this statement is acknowledged by several prominent authors who emphasize that the long-term survival requires a constant change, understanding of company's environment, generation of strategic options, and realignment of company's resources faster then rivals (Collins & Porras, 2004; Hamel & Valikangas, 2003; Kaplan & Norton, 2001; Kotler & Caslione, 2009).

It is my firm believe that this dissertation with further development of BSC based on resilience determinants and with elements of performance vortex is aligned to this ancient wisdom and to the ultimate aim of humanity as outlined by the definition of sustainability "meeting the needs of the present without compromising the ability of future generations to meet their own needs"[38].

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[38] Brundtland Commission, n.d.; World Commission on Environment and Development, 1987.

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APPENDICES

LIST OF APPENDICES

Appendix A: List of Abbreviations

ABB	Activity-based budgeting
BSC	Balanced Scorecard
CCGT	Combined Cycle Gas Turbine
CCS	Carbon capture and storage
CDP	Carbon disclosure project
CDS	Carbon Trust Standard
CEC	Confederation Europeenne des Cadres
CGMA	Chartered Global Management Accountant
CMER	Center for the Management of Environmental Resources
COSO	Committee of Sponsoring Organizations of Treadway Commission
CO2	Carbon dioxide
CPLI	Climate Performance Leadership Index
CSR	Corporate social responsibility
DJSI	Dow Jones Sustainability Index
EABIS	European Academy for Business in Society
e-BSC	Okoljevarstveni sistem kazalnikov (Environment-related Scorecard)
EHS	Environmental, Health and Safety (mostly used for company's department)
ESG	Environment, social and governance
GDP	Gros domestic product
GHG	Greenhouse gas
GRI	Global reporting initiative
HoF	Hall of Fame for Executing Strategy, latelly Palladium Hall of Fame for Executing Strategy®
IPCC	Intergovernment panel on climate change
IWE-HSG	Institut für Wirtschaftsethik – University St. Gallen
KEWP	Korean East West Power
KPI	Key performance indicator
LOB	Lines of Business (terminology used at PSEG)
MGDs	The United Nations Millennium Development Goals
NOK	Norwegian Krone
NO2	Nitrogen dioxide
OECD	Organisation for Economic Co-operation and Development
OSHA	The Occupational Safety and Health Administration
PSEG	Public Service Electricity Group
PSE&G	Public Service Electricity and Gas
ROIC	Return on invested capital
SAM	Sustainable Asset Management, now Robeco SAM, manager of DJSI
sBSC	Sustainability Balanced Scorecard
SFO	Strategy-focused organization
SSUS	Shared Service Units Scorecard
TBL	Triple bottom line
UN	United Nations
UNGC	United Nations Global Compact
USA	United States of America
VBM	Value Based Management
YTD	Year-to-date

Appendix B: Research questions "A – Background Information"

What is the time horizon for your company's:

	less than one year	1 year	up to 5 years	up to 10 years	up to 15 years	up to 20 years	more then 30
Vision							
Strategy							
Business plans							
Budgets							
Investments							
Sustainability							
Risk Management							
Uncertainty Management							

If less than 1 year or more than 30 years please provide exact timeframe

How often does your company face turbulences, highly uncertain threats with very significant impact? (Select one answer only)

Uncertainty and turbulences are "A New Reality". Please access the impact of following risks on your company's strategy and performance in 2024?

	No impact	Small level of impact	Impact	Higher level of impact	Significant impact
New Financial crisis					
Technological discontinuities					
Regulatory upheavals					
Abrupt shifts in consumer tastes and behaviour					
Hordes of non-traditional competitors					
Geopolitical & Social unrest					
Terrorism and Wars					
Demographic imbalances (too many people or too old population)					
Depleted natural resources					
Frequent extreme weather events					
Water shortage					
Polluted and destroyed environment					
Severe and widespread impacts of climate change (sea rise,...)					

Please evaluate the current preparedness of your company on the following uncertainties and turbulences? (Tick all that apply)

	Not prepared	We can respond effectively	We have capacity to cope with surprise	We are reducing Vulnerability & Exposure	We have prepared scenarios & strategies	We are adapting to this	We are transforming because of this
New Financial crisis							
Technological discontinuities							
Regulatory upheavals							
Abrupt shifts in consumer tastes and behaviour							
Hordes of non-traditional competitors							
Geopolitical & Social unrest							
Terrorism and Wars							
Demographic imbalances (too many or too old population)							
Depleted natural resources							
Frequent extreme weather events							
Water shortage							
Polluted and destroyed environment							
Severe and widespread impacts of climate change (sea rise,...)							

Does top leadership (the executive team) play an active role in formulating long-term sustainable strategy which includes defining your organization's vision, mission, and core values, and driving strategy execution, and how?

Which framework do you use to manage performance?

How often does your company review your performance and progress against your strategic objectives?

Rate your organization's visibility, or "line of sight", to accurate, future performance results. The intent of the question is to understand how much visibility your organization has into future events to predict performance results.

Please indicate in what direction is your company's performance headed over next 3 years?

Appendix C: Research questions "B – Balanced Scorecard"

For how many years is your company using the Balanced Scorecard?

What is the implementation scope of Balanced Scorecard within your company (Please explain if you are using any updated version of BSC, such as 3rd generation BSC)

BSC has evolved over the time from performance measurement to strategy system. Please indicate your company's satisfaction with each among BSC developments.

	Not very satisfied	Somehow satisfied	Satisfied	Very satisfied	Critical to our success	N/A
BSC as Performance measurement (KPIs)						
BSC as Performance management (reports)						
BSC as Strategic Objectives and Strategy Maps						
BSC as Strategy Management System for strategy execution (Strategy Focused Organization)						
BSC as continuous six stage Execution Premium Kaplan-Norton Strategy Management System						

Is the strategy reviewed through formal Balanced Scorecard review meetings (Step 5 Monitor and Learn of BSC "Execution premium") and how often?

Please rate the involvement of different actors in strategy reviews process (Step 5)

	Insignificant	Somehow active	Active	Very active	Significant, critical to our success
Employees					
Functions specialists					
Controlling departments					
Strategy team					
Risk management team					
Management					
Executives Managers					
Board of Directors					
Main Shareholders					

How does your company detect changes in its environment that have low probability but very high impact on your corporate strategy? Please explain.

How often does your company test the assumptions of your current strategy and adapt it to detected weak signals and anticipated changes? (Select one answer only)

Is the process of testing and adapting your strategy embedded into your BSC? In particular, please explain the integration in Step 5 Monitor and Learn, Step 6 Test and Adapt, and Step 1 Develop the Strategy.

How often is the strategy tested and adopted through the formal Balanced Scorecard meetings (Step six Test and Adopt of BSC "Execution Premium")?

How does your company determine whether the strategy being executed is the right strategy?

Please indicate your company's current status about the information flow between the strategy review meetings and selected meetings as stated below?

	We are poor at this	Not good at this	We are good at this	We are very good at this	We are Best practice
Operational review meetings					
Risk assessment meetings					
Sustainability (board) meetings					
Climate change (board) meetings					
Executive board meetings					
Board of Directors meetings					

How would you respond to ".....Comparing how we manage our business now vs pre-BSC implementation, we have significantly improved the way we...."?

	Disagree	Somehow agree	Agree	Strongly agree	Strongly agree, critical to our success	N/A
Eliminate short term mindset						
Balance financial with non-financial goals						
Translate the strategy into comprehensive set of goals and targets						
Align all levels and functions						
Collaborate with external stakeholders						
Embed Sustainability into performance and control						
Make strategy as continuous process						
Improve depth and quality of strategic planning						
Focus on continuous anticipation/preparation on uncertain changes						
Drive high performance						
Build company long-term resilience						

BSC strategic objective and KPIs can reflect more future or present or past. From the enterprise view please distribute the value of 100% among these three time horizons as reflected in your company's BSC. For example: Past xx%, Present xx%, Future xx% (The sum should be exactly 100%)

Please rate the following statements: "...BSC use in our company proved its high potential for...."

	Disagree	Somehow agree	Agree	Strongly agree	Strongly agree, critical to our success	N/A
Balancing short term performance with long term survival and success						
Managing and implementing constantly revised strategies						
Allowing the strategy itself to fast evolve in response to all new challenges						
Continuously managing complexity, uncertainty and risks						
Achieving transparency & fairness of incentives and compensations						
Balancing benefits for owners, employees, local community, country & planet						
Focusing on circumstances defined by sudden changes and survival treats						
Building company's long-term resilience						

Please indicate your company's current status how the BSC use for managing:

	We don't use BSC for this	We use partially BSC for this	We use & somehow satisfied	We use & very satisfied	We use & critical to our success
Operational Insight					
Strategic Insight					
Generation of new knowledge to improve operational and strategic decision-making					
Strategic Foresight					
Corporate Risk Management					
Early Warning System					
Uncertainty Management					
Sustainability Management					
Corporate Resilience					

Aside four standard BSC perspectives Finance, Customer, Internal processes, People & growth many companies use only three or even more than five perspectives. Please name the perspectives of your company's BSC.

1 perspective	
2 perspective	
3 perspective	
4 perspective	
5 perspective	
6 perspective	

Appendix D: Research questions "C – Sustainability and Balanced Scorecard"

Please rank how are dimensions of long-term Sustainability reflected in your company's understanding and priority, where (1) means the lowest priority and (7) means critical priority. You can use one response only one time per column!

	1	2	3	4	5	6	7
Long-term survival of company							
Long-term successful performance							
Licence to operate							
Corporate social responsibility – CSR							
Shared value for all stakeholders							
Zero impact operation on planet & societies							
Unity with Planet							

Please evaluate the current status of your company's ability to perform these specific dimensions of long-term sustainability.

	We are poor at this	We are somehow good at this	We are good at this	We are very good at this	We are Best practice
Long-term survival of company					
Long-term high performance					
Operation with licence					
Corporate social responsibility					
Shared value for all stakeholders					
Resilient on uncertain future and turbulences					
Zero impact operation on planet & societies					
Unity with Planet					

Are sustainability and CSR already embedded in your company's:

	We are poor at this	We are somehow at this	We are good at this	We are very good at this	We are best practice
Vision					
Mission					
Core values					
Strategy					
Business plan					
Budget					
Corporate governance					
Incentives & Compensation					

In order to achieve full integration of Sustainability, does it need same, more or much more attention during the six stages of BSC "Execution Premium" by Kaplan-Norton? Please evaluate each stage.

	Same attention	More attention	Much more attention	N/A
1. Develop the Strategy				
2. Plan the Strategy				
3. Align the Organization				
4. Plan operations				
5. Monitor and Learn				
6. Test and Adopt				

Does your company have a special BSC for Sustainability?

How does your company embed Sustainability into the strategic performance management?

	We are poor at this	We are not good at this	We are good at this	We are very good at this	We are "best practice" at this
We have clear strategic objectives					
We have KPIs					
We measure KPIs					
We report these KPIs to main stakeholders					
We embed strategic consideration of sustainability into strategic system					

Please indicate intuitively how much are strategic objectives & KPIs in each of your BSC's perspectives embedding SUSTAINABILITY & CSR. Use 0% – 100% per each perspective.

Please name the most important KPI's that represents sustainability strategic objectives in all relevant perspectives of BSC (please write also the perspective of KPI)

Appendix E: Research questions "D – Resilience and Balanced Scorecard"

Please indicate your current company's status regarding your corporate resilience capabilities:

	We are poor at this	We are somehow good at this	We are good at this	We are very good at the	We are Best practice
Ability to dynamically reinvent business models and strategies as circumstances change					
Capacity to use shocks to spur renewal					
Ability to MAX underlying value of company in long term while optimising short-term performance					
Ability to continuously anticipate and adjust to changes					
Ability to change before the case for change become obvious					
Capacity to increase magnitude & frequency of strategic transformations in shorter time, with less expenses					
Ability to systematically learning from outcomes of implemented strategies					
Capability to free the resources to support a broad array of strategic experiments					

Please estimate the level of contribution of the following capabilities and responses on your company's preparedness, respond and recovery on/from credit crunch.

	Irrelevant	Somehow important	Important	Very important	Critical to our success	N/A
Reconcile short and long-term goals						
Balancing long-, medium- & short-term strategies						
Integrated Risk Management						
Early warning System; scanning, anticipating, predicting, responding						
Pre-time own researches						
Variety of Scenarios & Strategies						
Adaptive management integrated into strategy system						
Experimentation & Learning						
Radical Innovation						
Conservatism in finance						
Shorter planning, budgets and strategy cycle						
Collaboration; inside, locally and across sectors						
Innovative, reflexive and transformative leadership						
Adaptive, responsive and accountable governance						
Ability for System thinking						

How do you agree with the following statements? ".....Comparing how we manage our business now vs pre-credit crunch, we have significantly improved the way we...."

	Disagree	Somehow agree	Agree	Strongly agree	N/A
Integrate the strategy development and risk management					
Integrate the management of strategy execution and risk management					
Manage and monitor strategy execution					
Manage and monitor performance					
Anticipate critical uncertainties					
Accept uncertainties (free of denial, nostalgia, arrogance)					
Develop more alternatives as well as awareness on uncertainties					
Divert resources from yesterday's products and programs to tomorrow's					
Renew company continuously and opportunity-driven rather than episodic and crisis-driven					
Build company's research and learning					
Measure and report more future oriented KPIs					

Please name the most important strategy and performance tools, concepts, systems that are enabling your company's long-term resilience.

Please estimate the contribution of six steps of BSC "Execution Premium" by Kaplan-Norton for building your company long-term resilience before change occur?

	Irrelevant	Somehow important	Important	Very important	Critical to success	N/A
1. Develop the Strategy						
2. Plan the Strategy						
3. Align the Organization						
4. Plan operations						
5. Monitor and Learn						
6. Test and Adopt						

How does your company embed long-term resilience into the strategic performance management?

	We are poor at this	We are not good at this	We are good at this	We are very good at this	We are "best practice" at this
We have clear strategic objectives					
We have KPIs					
We measure KPIs					
We report these KPIs to main stakeholders					
We embed strategic consideration of uncertainty and turbulences into strategic system					

Please name the most important KPI's that represents Resilience objectives in all/any relevant perspectives of BSC (please write also the perspective of KPI)

Please evaluate intuitively the share of strategic objectives & KPIs that are anticipating the Future dimension in each among your BSC's perspectives.

Please indicate intuitively how much are strategic objectives & KPIs in each among your BSC's perspectives embedding RISK management.

Please indicate your current status on the following Future Success Measures

	We are poor at this	We are somehow good at this	We are good at this	We are very good at the	We are Best practice	N/A
Depth and quality of strategic planning						
Anticipating/preparing for unexpected changes in the external environment						
Extend of strategic alliances and collaboration to gain competitiveness in new technologies						
Investment in new technology development						
Understanding/forecasting Megatrends						
Investment in R&D (% of sales)						
High level of technology forecasting						
% of our products that have potential to generate revenue in climate change world						
Customer retention rate						
Quality of new product development and project management processes						
Quality of cross-learning						
Retention of top employees						

Please indicate the level of integration of the following capabilities and response approaches with your company's Balanced Scorecard and Execution Premium.

	Weakly integrated	Somehow integrated	Integrated	Very integrated	Critical to our success	N/A
A capacity to reconcile short and LT goals						
Balancing long-, medium- & short-term strategies						
Integrated Risk Management						
Early warning System; scanning, anticipating, predicting, responding						
Pre-time own researches						
Variety of Scenarios & Strategies						
Adaptive management integrated into strategy						
Experimentation & Learning						
Radical Innovation						
Conservatism in finance						
Shorter planning, budgets and strategy cycle						
Collaboration; inside, locally and across sectors						
Innovative, reflexive and transformative leadership						
Adaptive, responsive and accountable governance						
Ability for System thinking						

Appendix F: Research questions E – Climate Change

When addressing and dealing with climate change what is the time horizon its impacts for your company?

Please asses your company's risk of "climate related drivers of impact", all of which are identified by IPPC with high confidence.

	No risk	Low risk	Risk	High risk	Very high risk
Warming trend					
Extreme temperatures					
Drying trend					
Extreme precipitation					
Longitudinal precipitation					
Changes in Snow cover					
Damaging Cyclones					
Sea level rise					
Ocean acidification					
Carbone dioxine fertilization					

Until when is your company expecting to be affected by the following climate change impacts? Probability likelihood should be "Likely" or higher (66% – 100%)

	until 2018	until 2025	until 2035	until 2045	until 2065	until 2100	after 2100
Formal regulation on C02 reductions							
Strict regulations with restrictions in C02 emissions and energy use							
Devastating climate change shocks							
Significantly changed climate compared to present							
Rapid climate change							

How is the impact of climate change viewed within your company?

Please estimate until when your company is expecting to face the following climate change scenarios:

	It's here already	2018	2025	2035	2045	2065	2100	2100	after 2100
Several months duration of extremely warm days (in any season)									
Increase of extreme daily maximum over 35C for many subsequent days									
Several months duration of high intensity, high frequency of damaging cyclones									
Increased number of tornados within one year									
Intense and several months long hydrological droughts									
Frequent and devastating floods within one year									
Increase in extreme coastal high water									
Increase in mean sea level for 1 meter									
Increase in mean sea level for 2 meters									
Increase in mean sea level for 3 meters									
Abrupt climate changes with 7 m sea rise									
Abrupt cooling (including UK, France, Germany,...)									

Please estimate how many years would your company need to fully adapt to the new circumstances of climate change scenarios.

	We are already adapted	less than 2 year	until 2018	less than 10 years	less than 20 years	less than 30 year	less than 50 years	less than 85 years	more than 85 years
Several months duration of extremely warm days (in any season)									
Increase of extreme daily maximum over 35C for many subsequent days									
Several months duration of high intensity, high frequency of damaging cyclones									
Increased number of tornados within one year									
Intense and several months long hydrological droughts									
Frequent and devastating floods within one year									
Increase in extreme coastal high water									
Increase in mean sea level for 1 meter									
Increase in mean sea level for 2 meters									
Increase in mean sea level for 3 meters									
Abrupt climate changes with 7 m sea rise									
Abrupt cooling (including UK, France, Germany,...)									

When assessing the key risks, all of them identified by IPPC with high confidence, what is the expected time horizon of your company to be affected by them with "likely" probability, 66% or higher?

	until 2018	until 2025	until 2035	until 2045	until 2065	until 2100	after 2100
Risk of death, injury ill-health, or disrupted livelihoods due to sea level rise, coastal flooding, storm surges							
Severe ill-health and disrupted livelihoods for large urban populations due to inland flooding							
Systemic risks due to extreme weather events leading to breakdown of infrastructure networks, electricity, water supply,...							
Mortality, morbidity during periods of extreme heat							
Risk of food insecurity due to warming, drought, flooding increases							
Risks related to insufficient access to drinking and irrigation water							
Risks of loss of marine ecosystems, diversity and ecosystem goods							
Risks of loss of terrestrial ecosystems, biodiversity, ecosystem goods							

Please rate your company's current status regarding development of the climate change capacities.

	We are poor at this	We are somehow good at this	We are good at this	We are every good in this	We are Best practice
Capacity to Anticipate					
Capacity to Respond					
Capacity to Recover					
Capacity to Change & Adapt					
Capacity to Transform					

Is your climate change strategy already reflected and embedded in your company's:

	We are poor at this	Partially	We are good at this	We are very good at the	We are Best practice
Vision					
Mission					
Core values					
Strategy					
Business plan					
Budget					
Corporate governance					
Incentives & Compensation					

Which of following actions for climate change mitigation have you already integrated to your overall current strategy?

	Not addressed yet	Weakly embedded	Embedded	Fully embedded	We are Best practice
40% greenhouse gas emissions reduction target for 2030, from 1990 levels					
Energy and fuel efficiency					
Redesigning distribution systems					
Supply change measures					
Reducing energy, waste, materials					
Research, developments, and investment in low carbon production and process-related technologies					
Reductions obtained through emission offsets and trading					
Activities to reduce "upstream" and "downstream" emissions along the value chain					
New product development					
Influencing industry standards					
Radical innovation for carbon neutral strategy					

Which of following actions for climate change adaptation have you already integrated to your overall current strategy?

	Not addressed yet	Weakly embedded	Embedded	Fully embedded	We are Best practice
Location planning and reallocations					
Investments for increasing the water, energy, and floods safety of production units					
Redesign material use					
Planning redesign of transportation routes					
Actions regarding the protections of employees safety					
Research, developments, and investment in "new climate" production and process-related technologies					
New product development					
Influencing industry standards					
Radical innovation for transitional business models					

Please indicate the priority of the following objectives of the climate change strategies for your company?

	Not addressed yet	Low priority	Priority	High priority	Critical Priority
Disaster risk management					
Mitigation of climate change					
Adaptation to climate change					
Transformation to new reality					

How would you response to the following statement? "....The current company's activities to address climate change are..."

	We are poor at this	Somehow good	We are good at this	We are very good at this	We are Best practice
Embedded into operations					
Embedded in performance measurement					
Embedded in risk management and fiduciary responsibilities					
Embedded in industry collaboration					
Embedded in multi stakeholders partnership					
Embedded into strategies and operations of subsidiaries					
Embedded into investor's relation strategy					
Embedded into global supply chain management					

What are the commitments and responsibilities of top leadership and employees related to climate change?

	Weak commitment	Strong commitment	Best case for leadership	Formally responsible	Personal KPIs related to this	Compensation incentives linked to this
Board of Directors						
C-level executives						
Corporate level strategists						
Business unit or functional managers						
Legal and regulatory experts						
Plan managers						
All employed						

What are measurements used for the assessment of initiatives on climate change?

Please indicate the importance of multiple climate change capabilities and response approaches for you company's preparedness on expected climate change.

	Irrelevant	Somehow important	Important	Very important	Critical for our success	N/A
A capacity to reconcile short and long-term goals						
Balancing long-, medium- & short-term strategies						
Integrated Risk Management						
Early warning System; scanning, anticipating, predicting, responding						
Pre-time own researches						
Variety of Scenarios & Strategies						
Adaptive management integrated into strategy system						
Experimentation & Learning						
Radical Innovation						
Conservatism in finance						
Shorter planning, budgets and strategy cycle						
Collaboration; inside, locally and across sectors						
Innovative, reflexive and transformative leadership						
Adaptive, responsive and accountable governance						
Ability for System thinking in unity with planet						

How often does your company take into the consideration the issues of climate change risks and impact for....

	Seldom, never	Occasionally	Frequently	Always for this	N/A
Overall corporate strategy					
Corporate Risk management					
Managing corporate reputation					
Managing environmental issues					
Protecting employees and their communities					
Developing and/or marketing new products/services					
Planning investments					
Purchasing, supply chain management					
Developing regulatory strategy					
Distribution and transportation infrastructure					
Product development					
Product sales					
Product use					
Post-consumer product recycling & reuse					
Trading in carbon emission rights					
Managing strategies and operation of subsidiaries					
Investor's relation strategy					

Does your company have a special BSC for Climate change? Please explain.

Please indicate how important/relevant have been particular stage among six steps of "Execution Premium" by Kaplan-Norton for company's preparedness and adaptation on climate change and its integration into strategy.

	Irrelevant	Somehow important	Important	Very important	Critical to success	We don't use this
1. Develop the Strategy						
2. Plan the Strategy						
3. Align the Organization						
4. Plan operations						
5. Monitor and Learn						
6. Test and Adopt						

What are your responses to climate change within your company's strategic performance management.

	We are poor at this	We are not good at this	We are okay at this	We are very good at this	We are best practice
We have clear strategic objectives					
We have KPIs					
We measure KPIs					
We report to all stakeholders these KPIs					
Yes, we embedded strategic consideration of climate change in strategic system					

Please estimate intuitively how much is your climate change strategy embedded into your strategic objectives and KPI's. Use 0% to 100% per each BSC perspective. Example: Internal process 50%.

1 perspective	
2 perspective	
3 perspective	
4 perspective	
5 perspective	
6 perspective	

Please name the most important KPI's that represents your company's climate change strategic objectives

Climate change Research Questions related to Climate Change SCENARIO 1

SCENARIO 1: Extreme climate event with extreme impact. Damaging cyclones, increased number of tornados, intense and very long droughts and extreme precipitation events can occur any day in the period from now until 2018.

Please estimate the preparedness of your company on Scenario 1' climate stressors that could in this scenario occur on any day in the period from tomorrow until the end of 2018.

	We are not prepared	We are reducing Vulnerability & Exposure	We can respond effectively	We have scenarios & strategies	We are adapting to this	We are preparing transformative changes
Several months duration of extreme warm days						
Several months duration of damaging cyclones						
Increased number of tornados						
Several months duration of intense droughts						
Multiple extreme floods within one year						
Two or more above stated stressors at the same time						

Please assess risks and indicate the preparedness of your company on climate change risks if they would occur on any day until the end of 2018.

	Not relevant for us	We are not prepared	We have reduced Vulnerability & Exposure	We can respond effectively	We have scenarios & strategies	We are adapted to this	We are preparing transformative changes
Risk of death, injury ill-health of employees, customers, population							
Transportation chaos							
Severe ill-health and disrupted livelihoods for large urban populations in developing countries							
Breakdown of infrastructure networks							
Electricity reductions							
Mortality, morbidity during periods of extreme heat over 35C							
Risk of food insecurity due to warming, drought, flooding increases, transportation chaos							
Insufficient access to water for more than two weeks							

Please estimate the scope of the crisis caused to your company by extreme climate of Scenario 1 events if they would occur tomorrow and until the end of 2018.

How would the Scenario 1 affect your company's performance in the period until 2018? Please explain.

Company's adaptation to climate change and weather extremes request development of multiple capabilities and response approaches. Please indicate their contribution to your pre-time anticipation and preparedness.

	Irrelevant contribution	Somehow important	Important contribution	Very important	Critical to our success	N/A
A capacity to reconcile short and long-term goals						
Balancing long-, medium- & short-term strategies						
Integrated Risk Management						
Early warning System; scanning, anticipating, predicting, responding						
Pre-time own researches						
Variety of Scenarios & Strategies						
Adaptive management integrated into strategy system						
Experimentation & Learning						
Radical Innovation						
Conservatism in finance						
Shorter planning, budgets and strategy cycle						
Collaboration; inside, locally and across sectors						
Innovative, reflexive and transformative leadership						
Adaptive, responsive and accountable governance						
System thinking & integration of unity with planet						

Climate Change research questions related to SCENARIO 2

SCENARIO 2: Rapid climate change with severe increases of mean temperatures until 2025 that will lead to abrupt changes in climate and with abrupt cooling already around 2065, with devastating effects especially on North and Central Europe

Please estimate the preparedness of your company on rapid climate change with severe increases of mean temperatures until 2025 that will lead to abrupt changes and abrupt cooling until 2065. (Tick all that apply)

	We are not prepared	We are reducing Vulnerability & Exposure	We can respond effectively	We have scenarios & strategies	We are adapting to this	We are preparing transformative changes
Simultaneous exposure to multiple risks and stressors of Scenario 1 in 2025						
Increases in extreme daily minimum and maximum temperatures for more then 4 - 7 C in 2025						
Both above stated stressors at the same time in 2025						
Abrupt cooling (including all UK, Germany, France,...)						

Please asses the risks and evaluate the preparedness of your company on the below climate change risk if they occur in 2025.

	Not relevant for us	We are not prepared	We have reduced Vulnerability & Exposure	We can respond effectively	We have scenarios & strategies	We are adapted to this	We are preparing transformative changes
Risk of death, injury ill-health of employees, customers, population							
Transportation chaos							
Severe ill-health and disrupted livelihoods for large urban populations							
Breakdown of infrastructure networks							
Several months of electricity reductions							
Mortality, morbidity during periods of extreme heat over 40C							
Months long risk of food insecurity due to warming, drought, flooding increases							
Insufficient access to water for several months							

Please evaluate the scope of the crisis caused to your company because of the rapid climate change with severe increases of mean temperatures until 2025 that will lead to abrupt changes in climate with ice-age effects already around 2065.

Please estimate the influence of Scenario 2' rapid climate change in the period until 2025 on your corporate performance.

Please indicate the influence on your company's performance caused by Scenario 2' rapid climate change that would lead to ice-age in the period until year 2065.

Please estimate the importance of multiple capabilities and response approaches contribution to your on time anticipation and preparedness on Scenario 2.

	Irrelevant	Somehow important	Important	Very important	Critical to our survival	N/A
A capacity to reconcile short and long-term goals						
Balancing long-, medium- & short-term strategies						
Integrated Risk Management						
Early warning System; scanning, anticipating, predicting, responding						
Pre-time own researches						
Variety of Scenarios & Strategies						
Adaptive management integrated into strategy system						
Experimentation & Learning						
Radical Innovation						
Conservatism in finance						
Shorter planning, budgets and strategy cycle						
Collaboration; inside, locally and across sectors						
Innovative, reflexive and transformative leadership						
Adaptive, responsive and accountable governance						
System thinking & integration of unity with planet						

Appendix G: Summary overview: short-listed companies energy & utility

Energy & Utilities (industry) *Alphabetically*	Country	Inducted in BSC Hall of Fame	Evidences of enduring and recent active BSC use	Climate change responses, actions, initiatives, strategies	Finan-cial trend	CDP reports /score
Aquafin (Utility – water) http://www.aquafin.be/nl/indexb.php?s=116&n=90	Belgium	2004	**Fair evidence** Strong evidence on web about revision of BSC in 2013 and its use in last 10 years, Evidence in annual report.	**Sustainability report 2013** **Significant evidence on Climate change mitigation and adaptation** with strong evidence from annual report. The "climate" factor in company's parameters and in 2013, developed the methodology for the creation of a well-researched storm water plan, based on a real test case for a Flemish municipality.	OK Reven. 30%, profit 40%, debt increased	CDP no
Blue Ridge Electric Membership Corporation (Energy) http://www.blueridgeemc.com	USA	2012	**Some evidence** Web, some evidence in annual reports, some evidences in PR	**No sustainability report** **No evidence on Climate Change** many green initiative, Cooperative = high social attitude	OK	CDP no
Bord Gais Eireann (Utility – water Energy – gas) http://www.bordgais.ie/corporate/index.jsp?p=94&n=157	Ireland	2008	**Some evidence** BSC more in internal control, BSC mentioned one time in annual report 2013	**No Sustainability report** **Weak evidence on Climate change, some mitigation strategies** Weakly addressed, green initiatives: Energy Usage Fleet Consumption Facilities Consumption NSC Awards and BREEAM Accreditation of Environmental Management Systems, Smarter Travel	OK, Up	CDP no
Chilectra S.A. (Energy – Electric Utilities) http://www.chilectra.cl/wps/wcm/connect/NGCHL/chilectracl/la+compania/	Chile	2006	**Weak evidence** not so much on company web page, no annual report only consolidated financial data	**Sustainability report 2013** **Some evidence on Climate change, mostly mitigation strategies** Climate change mitigation (CO_2 reduction) GRI reporting Eco initiatives	OK	CDP yes/ **2013 Not scored**
Endesa (Energy – Electricity, Gas,	Spain	2005	**Some evidence** Weak on web page	**Sustainability report 2013** **Strong evidence on Climate change**	OK	CDP yes/ **2014**

Energy & Utilities (industry) *Alphabetically*	**Country**	**Inducted in BSC Hall of Fame**	**Evidences of enduring and recent active BSC use**	**Climate change responses, actions, initiatives, strategies**	**Finan-cial trend**	**CDP reports /score**
Industry Group: Electric Utilities) http://www.endesa.com/en/sustainability/POLITICASOSTENIBILIDAD/PLANDEENDESA/challenges/RETOCAMBIOCLIMA/home http://informeanualendesa.com/index-en.php#informes			Strong in Sustainability Scorecard (CEO) Weak in Annual report	**mitigation and adaptation strategies, low carbon.** Companies for energy efficienc platform Climate change mitigation – Designing and calculating Endesa's carbon footprint. Flexible mechanisms to reduce emissions based on projects, known as Clean Development Mechanisms (CDMs), represent a significant area of Endesa's climate change strategy. Endesa's activity to identify and develop CDM and Joint Action (JA) projects forms part of Enel's Carbon Strategy Unit. Mitigation progress, measures, Trading Climate Change Adaptation Climate Change initiatives		**97 A** **A LIST**
Hindustan Petroleum Corporation Limited (Energy – Industry Group: Oil, Gas Consumable Fuels Sub Industry: Oil & Gas Refining & Marketing http://www.hindustanpetroleum.com	India	2010	**Strong evidence** Strong in Web, BSC stated in annual reports, BSC in HRM; BSC in Performance BSC Sustainability report,	**Partial Sustainability report 2013** **Some evidence on Climate change, mostly mitigation strategies** Global compact HPCL strives to inculcate the responsibility of environmental preservation and management in not only our employees but among other stakeholder groups such as contractors, suppliers, and customers.	OK, high growth	CDP yes 2014/ **36 not scored**
Korea East-West Power (Energy – Utilities Industry Group: Independent Power Producers Energy Traders Sub Industry: Independent Power Producers & Energy Traders) **http://www.ewp.co.kr/kor/main/main.asp**	South Korea	2006	**Some evidence** Web, mostly under achievements Some info in Korean Weak in annual report Many PR and cases	**Sustainability report 2013** **Strong evidence Climate Change, strong on mitigation, low carbon, less evidences on adaptation strategies.** Climate change in Green Vision + strategy, UN Global compact, Reporting GRI G3 Low carbon management, green growth: - GHG Reduction Goals & Current Emissions –	Ok – MORE in attach SALES 2003–2012 multipl	CDP yes/ **2014** **76 D**

Energy & Utilities (industry) *Alphabetically*	**Country**	**Inducted in BSC Hall of Fame**	**Evidences of enduring and recent active BSC use**	**Climate change responses, actions, initiatives, strategies**	**Finan-cial trend**	**CDP reports /score**
http://www.ewp.co.kr/eng/sustainability/sustainability03.asp http://www.ewp.co.kr/eng/investor_relations/news_room/news_room01.asp http://www.ewp.co.kr/kor/download/brochure/2014En_Web_Spread.pdf				EWP's emission goal is to reduce its GHG emission up to 10% from the BAU (average emission for three years from 2007 to 2009) by 2020. - World-Class Efficiency of the Power Plant Facilities - Disclosure of GHG Emission through Carbon Information Disclosure Project Carbon management report in 2010, 2011, 2012, 2013: to disclose EWP's greenhouse gas emission information and to inform EWP's effort to deal with climate changes to its stakeholders. In addition, EWP joined spontaneously in an international climate change response project, the CDP	e growth, 2013 small decline Profit double d 2003 –2012 (drop 2012)	
Korea South-East Power Co (Energy) http://www.kosep.co.kr/kosep/fr/main.do	Korea	2013	**Some evidence** Web – strong evidence Not in annual report	**Sustainability report 2013** **Some evidence on Climate change, mostly mitigation.** YES in CDP: 2014 no response from company	OK	CDP yes/ **Not scored**
Mobil North America Marketing & Refining Now a part of the company Exxon Mobil Corporation (Energy – Industry Group: Oil, Gas Consumable Fuels) http://corporate.exxonmobil.com	USA	2000	**Weak evidence** Web is only for mother company Exxonmobil – weak Evidence in report 2006	**Sustainability report under the name Corporate Citizenship report 2013** **Strong evidence Climate Change, mitigation, adaptation and resilience** Report energy & Climate Climate change mitigation Climate change adaptation Energy efficiency projects Report to shareholders	OK	CDP yes/ **2014 76 C**
New Brunswick Power Group (Utility – Electricity,	Canada	2008	**Strong evidence** Not so much in web,	**Sustainability report 2008/09** **Some/good evidence Climate Change (good**	OK	CDP no

Energy & Utilities (industry) *Alphabetically*	**Country**	**Inducted in BSC Hall of Fame**	**Evidences of enduring and recent active BSC use**	**Climate change responses, actions, initiatives, strategies**	**Finan-cial trend**	**CDP reports /score**
electricity generation and utility) http://www.nbpower.com/Welcome.aspx?lang=en			In strategy plan 2016–2025, http://www.slideshare.net/fmi_igf/mhaleylandmarkca	**for governmental, somehow on corporate level)** Sustainable energy Integrated resource plan		
North Delhi Power Ltd. **Part of Tata power CO** (Utility, electricity distribution) http://www.ndpl.com/index.aspx	India	2008	**Evidence** Partially on web, strong in annual reports, some in sustainability reports	**Sustainability report 2012/13** **Strong evidence Climate Change, mitigation, less adaptation.** Green customer initiative UN Global Compact Climate change mitigation CSR and corporate BSC are integrated!	OK Stable, slightly + trend Mar 2015	CDP yes for Tata Power/ **2014 53 not available**
Nova Scotia Power **Owned by Emera** (Utility, vertically (generation, transmission and distribution) integrated electric utilities) https://www.nspower.ca/en/home/default.aspx	Canada	2000	**Strong evidence** Not on web page, Strong evidence of Balanced Scorecard Subcommittee in Annual report 2014 Evidence Annual shareholders meeting – BSC communication BSC plan for 2014	**No Sustainability report** **Some evidence on Climate change, mostly mitigation.** Air emissions reporting Renewable energy standards First biomass power plant opened in 2013	OK Loss in 2014	CDP no Emera yes/ **2014 68 C**
Power River Energy Corporation (Energy) http://precorp.coop	USA	2013	**Strong evidence** of BSC on web site: Strategy map, BSC, strategic initiative, Not in reports	**Sustainability report 2013** **Some evidence on Climate change** Storm instructions, tornado help…. Yes environmental policies, great biodiversity protection, no climate change…	OK	CDP no
Public Service Electric & Gas Company (Energy – electricity Utility –Multi-Utilities)	USA	2007	**Strong evidence** Very strong presence on web page In vision: The Balanced	**Sustainability report 2014** **Strong evidence Climate Change mitigation, adaptation and resilience.** **https://www.pseg.com/info/environment/sustainability/2014/sustainability_report/HTML/index.html**	OK, See full data 2004–	CDP yes/ **2011 79 C**

Energy & Utilities (industry) *Alphabetically*	**Country**	**Inducted in BSC Hall of Fame**	**Evidences of enduring and recent active BSC use**	**Climate change responses, actions, initiatives, strategies**	**Finan-cial trend**	**CDP reports /score**
			Scorecard is our tool to translate our priorities into tactical measures of success. In Sustainability reports	**https://www.pseg.com/info/environment/sustainability/2013/sustainability_report/HTML/index.html** Improving the Resiliency of the Electric Grid http://www.ezodproxy.com/pseg/2013/pseg201210k/HTML2/tiles.htm floods, storm safety https://www.pseg.com/home/customer_service/outage_info/flood_safety/index.jsp	2014	
Reliance Industries (Energy – exploration and production of oil and gas, petroleum refining and marketing, petrochemicals) **http://www.ril.com**	India	2011	**Weak evidence** Web not accurate – some information until 2010, Partially in annual report, some in sustainability plans	**Sustainability report 2013/14** **Strong evidence Climate Change mitigation, some adaptation.** GRI reporting World Business Council for Sustainable Development (WBCSD) Strategic risk climate change – climate	OK	CDP no/ No responce
S-Oil (Energy Industry Group: Oil, Gas Consumable Fuels Sub Industry: Oil & Gas Refining & Marketing) http://www.s-oil.com/siteEng/index.asp	Korea	2012	**Strong evidence** In sustainability report, all strategy in company web BSC backed evidence in annual reports	**Sustainability report 2013** **Strong evidence on Climate change mitigation, adaptation, low carbon leader** Climate change addresses significantly in sustainability report Carbon trust standard, UN Global Compact Adaptation and mitigation responses… Dow jones sustainability index UN global compact…	OK See full data 2004–2014	CDP yes/ **2014** **96 A** **A LIST**
Statoil ASA (Energy – Industry Group: Oil, Gas Consumable Fuels Sub Industry: Integrated Oil & Gas) **http://www.statoil.com/annualreport2012/en/strategy/pages/ourcorporatestrategy.aspx**	Norway	2007	**Strong evidence** **Part of the Statoil Book** **http://www.statoil.com/en/About/TheStatoilBook/Downloads/The%20Statoil%20Book.pdf** **Several articles Beyond Budgeting and Ambition to Action** **http://www.managementexchange.com/story/taking-reality-seriously-towards-more-self-regulating-management-model-statoil**	**Sustainability report 2013** **Strong evidence Climate Change mitigation, adaptation. Call for resilience in 2015 by shareholders.** CDP Global 500 Climate Change Report 2012 – Statoil one of the most carbon efficient international oil and gas companies Strategic objective to be industry leader in carbon efficiency Monitoring/reporting gas emissions, including CO2, CH4, **CDP report**	OK See full data 2004–2014	CDP yes/ 2014 **82 C**

Energy & Utilities (industry) *Alphabetically*	**Country**	**Inducted in BSC Hall of Fame**	**Evidences of enduring and recent active BSC use**	**Climate change responses, actions, initiatives, strategies**	**Finan-cial trend**	**CDP reports /score**
				http://www.statoil.com/en/EnvironmentSociety/Sustainability/Downloads/CDP%20Statoil%20response%202013.pdf		
Tennessee Valley Authority (Utility – Electric Utility) http://www.tva.gov	USA	2003	**Strong Evidence** Evidence on Web, Integrated resource plan, Use of Metrics & Scorecard Design, Sustainability scorecard	**Sustainability report 2012/13** **Strong evidence Climate Change mitigation, less on adaptation.** • Greenhouse Gas (GHG) • Reduction in Energy Intensity • Renewable Energy Use • Greenhouse Gas (GHG), Green Buildings • Reduction in Fleet Petroleum Use	OK	CDP no
Western Water (Utility – water) http://www.westernwater.com.au/aboutus/Pages/Strategies-and-plans.aspx http://www.westernwater.com.au/SiteCollectionDocuments/Reports/Annual%20Reports/Corporate%20Report%202013.pdf	Australia	2004	**Good Evidence** E-mail by Julie Green (BSC mgt), Not in annual report, Yes in strategy doc: 2013/14 http://www.westernwater.com.au/SiteCollectionDocuments/Reference%20Documents/Strategic%20Plan%202014%20-%202024.pdf	**Sustainability report included in Annual report** **Good evidence on Climate change mitigation and adaptation.** In 2010, the Climate Change Strategy was developed to build on the Greenhouse Reduction Strategy and encompasses progress and plans in: Climate change mitigation contribution to reducing the greenhouse gas emissions that are causing climate change, and: - Climate change adaptation – how we are preparing for the impacts on our business, and our customers, of changes in the climate that have already commenced.	OK	CDP no

Appendix H: Summary in Slovenian language / Daljši povzetek disertacije v slovenskem jeziku

Opis znanstvenega področja

Poslovni svet 21. stoletja se sooča s povečano konkurenčnostjo, z vse težje obvladljivimi kompleksnimi sistemi in z izpostavljenostjo mega trendom. Dolgoročna in trajnostna uspešnost poslovanja podjetij je zato odvisna tudi od predvidevanj in pravočasnih odzivov na povečano negotovost. Pomemben vidik negotovosti so podnebne spremembe, ki skupaj z omejenostjo naravnih virov predstavljajo enega izmed najbolj nepredvidljivih in grozečih dejavnikov za poslovni svet in za obstoj človeštva.

Področje doktorske disertacije se v okviru poslovno-organizacijskih ved uvršča na področji ekonomike poslovanja in strateškega managementa, s poudarkom na managerskih orodjih za uresničevanje strategij in obvladovanje uspešnosti poslovanja ter znotraj njih na **uravnoteženi sistem kazalnikov** (USK) in njegove nadgradnje. USK sta kot nov pristop merjenja uspešnosti poslovanja podjetij v začetku 90. let prejšnjega stoletja razvila avtorja Kaplan in Norton. Poslovni svet ga je sprejel kot rešitev na izzive informacijske dobe, ki zahtevajo usmerjenost na neopredmetena sredstva, in na neučinkovitost tradicionalnih sistemov za merjenje uspešnosti poslovanja, zaradi njihove usmerjenosti v preteklost, v kratkoročnost, podatkovno preobremenjenost in zaradi nepovezanosti s strategijo (Johnson, Kaplan, 1987; Chandler, 1990; Kaplan, 1984a; Neely, 1998, Ittner et al., 1998).

Osnovni model USK je ponudil rešitev za prevedbo vizije in strategije podjetja v obvladljiv niz kazalnikov uspešnosti (v strateške zemljevide) in omogočil povezavo managerskega sistema s štirimi medsebojno odvisnimi vidiki poslovanja: finančni vidik, poslovanje s strankami, notranji poslovni procesi ter učenje in rast (Kaplan & Norton, 1992). Ob tem je vpeljal uravnoteženost med kratkoročnimi in dolgoročnimi cilji, med kazalniki z zamikom in vnaprejšnjimi kazalniki, med finančnimi in nefinančnimi kazalniki in med zunanjimi in notranjimi vidiki uspešnosti poslovanja (Kaplan & Norton, 1996a).

USK se je z vključitvijo orodij in procesov, ki jih podjetja potrebujejo za razvoj strategije in njenega izvrševanja ter za njuno obvladovanje in izboljšanje učinkovitosti, razvil v načela **strateško-usmerjene organizacije (SUO)**[39] (Kaplan & Norton, 1996b, 2002) ter v nov **sistem managementa za strateško odličnost**[40] (Kaplan & Norton, 2008, 2008a, 2008b). Slednji temelji na (1) razvoju strategij, (2) načrtovanju strategij s preoblikovanjem strategij v dejanja, (3) usklajevanju organizacije s strategijo, (4) poslovnem načrtovanju, (5) povratnih informacijah in učenju ter (6) na testiranju in preoblikovanju strategij, s čimer vzpostavi neprekinjen strateški proces.

[39] Model je opredelil 26 najboljših praks oziroma podnačel petih vidikov SUO (Kaplan & Norton, 2002).
[40] Avtorja USK sta jo poimenovala Execution Premium (Kaplan & Norton, 2008a). Zasnovana je na modelu najboljših praks SUO, večina nagrajenih z "Balanced Scorecard Hall of Fame for Executing Strategy™".

USK je predmet številnih akademskih in strokovnih razprav ter vsebinskega nadgrajevanja tako s strani obeh soavtorjev kot drugih, zaradi česar je koncept v nenehnem dinamičnem razvoju. Ob tem raziskava Bain & Company ugotavlja, da je USK eden izmed najbolj razširjenih managerskih orodij, z 39 % deležem med podjetji, zajetimi v raziskavo v letu 1996, 66% v letu 2006 in 38 % v zadnjih dveh raziskavah v letih 2012 in 2014 (Rigby & Bilodeau, 2007, 2015)[41]. Pričujoča disertacija zato nima namena nadgrajevati ali preverjati temeljev koncepta USK, ki jih v celoti prevzemam na osnovi raziskave najboljših praks in pozitivnih izkušenj njegove uporabe v praksi.

Drugo področje raziskave je povezano z naraščajočim pomenom trajnostnega delovanja podjetij. Dolgoročna uspešnost poslovanja podjetja je odvisna tudi od vključenosti družbenih in okoljevarstvenih vidikov ter od predvidevanja in pravočasnega odziva na pričakovanja tveganja in nepričakovane spremembe v zunanjem okolju. Navedeno lahko najbolje ponazori obravnava podnebnih sprememb, ki so v svojem bistvu pojav trajnostnega razvoja, sočasno pa predstavljajo visoko nepredvidljivost glede obsega, velikosti učinkov in časovnice pojavnosti, zato zahtevajo vnaprejšno strateško obravnavo.

Številne raziskave dokazujejo, da bo sprememba podnebja neizprosno zaznamovala naše ekonomsko in ekološko okolje (IPCC, 2007; Stern, 2007; Llewellyn, 2007), kar lahko privede do nenadnih in katastrofalnih dogodkov (Kajfež Bogataj, 2008a). Medvladni panel za podnebne spremembe (IPCC, 2007; 2014) ugotavlja, da vsebnost CO_2 v ozračju že 200 let stalno narašča, kar je posledica tudi človekove dejavnosti. Taljenje arktičnega ledu po letu 1978 in raztezanje morske vode je že povzročilo dvig morske gladine (Kajfež Bogataj, 2008b) in pogostejšo pojavnost ektremnih vremenskih pojavov (IPCC, 2014).

Višanja temperature zraka in površin oceanov povzročajo različne učinke, od povečanja vlažnosti do pogostosti suš. Podnebne spremembe z ogrevanjem ozračja, oceanov, s taljenjem ledu in snega in z višanjem gladine morij zato zahtevajo strateško obravnavo, saj gre za resničen, dolgoročen in globalen problem. IPCC uporablja štiri skupine scenarijev ter predvideva, da lahko z veliko gotovostjo pričakujemo dvig temperature, ki lahko znaša v primeru najboljšega scenarija +1,8°C (glede na obdobje 1961 do 1990) oziroma +4°C pri nadaljnjem naraščanju izpusta toplogrednih plinov in z zgornjo mejo +6,4°C do konca stoletja (IPPC, 2007), vendar z različno pojavnostjo po regijah in državah.

Poslovne strategije za podnebne spremembe so v obstoječi literaturi opredeljene kot niz ciljev in izvedbenih načrtov za blaženje velikosti podnebnih sprememb. Usmerjene so v zmanjševanje izpustov in v sočasne prilagoditve podnebnim spremembam, ki se bodo odražale na trgih, v javni politiki in fizičnem svetu, ter vključujejo tudi načrtovanje ustrezne zaščite. Od podjetij se zato pričakujejo jasno opredeljene strategije blaženja

[41] Od leta 1993 podjetje Bain & Company izvaja raziskave managerskih orodij in trendov.

velikosti podnebnih sprememb kot tudi prilagajanja na nove podnebne pogoje, njihova pravočasna izvedba ter razvoj novih tehnologij in izdelkov, ki bodo omogočali brezogljično delovanje. Gre za kompleksne zahteve, ki predstavljajo skupaj s pritiskom kratkoročne uspešnosti poslovanja s strani lastnikov kapitala zelo zahtevno nalogo in sočasno velik izziv. Dosedanji pristop managerjev, ki okoljska tveganja obravnavajo skozi prizmo trojnega problema sistemske ureditve, potencialne odgovornosti industrijskih nesreč in izpustov onesnaževalcev, ne bo več zadoščal, saj so podnebne spremembe poslovno tveganje, opredeljene z globalnimi vzroki in posledicami, z dolgoročnimi učinki in visoko nepredvidljivostjo (Stern, 2007).

Žal so pristopi podjetij do podnebnih sprememb v večini odzivni in ne strateški (Porter & Kramer, 2006; Porter & Reinhardt, 2007; Schwartz, 2007) ter izogibni in ne proaktivni (Kolk & Pinkse, 2004). Podjetja, ki želijo preživeti in biti uspešna v svetu podnebnih sprememb, bodo morala pravočasno prepoznati njihovo neizogibnost, predvideti posledice za panogo, v kateri delujejo, se prilagoditi in preoblikovati svoje strategije[42]. Disertacija zato temelji na sledečih predpostavkah:

- da dolgoročna poslovna uspešnost zahteva ne samo operativno odličnost, temveč tudi strateško odličnost z obvladovanjem trajnosti in različnih razsežnosti prihodnosti;
- da so podnebne spremembe dejstvo in resna nevarnost, ki zahtevajo s strani podjetij tako strategije blaženja velikosti podnebnih sprememb kakor tudi strategije prilagajanja in iskanja novih razvojnih priložnosti;
- da proučevanje podjetij, ki so že dosegla strateško odličnost in so nagrajena s Palladium Hall of Fame for Executing Strategy®, omogoča verodostojno raziskavo strateškega managerskega sistema z vidika trajnostne uspešnosti poslovanja in obvladovanja negotovosti, četudi gre za izbrana podjetja v izbrani panogi, saj lahko zaradi njihove strateške odličnosti pričakujemo prenosljivost ugotovitev, upoštevaje posebnosti posameznih panog in geografskih območij.

Namen doktorske disertacije in raziskovalna vprašanja

Pričujoča disertacija raziskuje, ali in kako uravnotežen sistem kazalnikov poslovanja (USK) omogoča pravočasen strateški odziv na grožnje, povezane s podnebnimi spremembami, in kako vzpodbuja nenehno nadgrajevanje in prilagajanje strategij ter sočasno uravnoteži kratkoročne, srednjeročne in dolgoročne strateške cilje. Disertacija poleg teoretične obravnave raziskovalnih vprašanj vključuje tudi raziskavo o vključenosti obvladovanja podnebnih sprememb v USK v izbranih podjetjih s strateško odličnostjo, saj so podnebne spremembe že presegle prostovoljni odzziv in zahtevajo takojšnje ukrepanje.

[42] Nekateri avtorji omenjajo tudi nova moralna in etična načela pri poslovanju (Laszlo, 2005).

Temeljna teza disertacije je, da USK lahko zadosti potrebam pravočasnega obvladovanja strategij podnebnih sprememb z dinamičnim, naprednim in osredotočenim strateškim okvirom, ki omogoča stalne spremembe in pravočasen odziv na izzive prihodnosti, ter s tem kot celovit sistem strateškega managementa podjetjem omogoči doseganje trajnostne uspešnosti poslovanja. S strateško obravnavo trajnosti in podnebnih sprememb lahko USK uravnoteži kratkoročne pritiske po predvsem finančnih vidikih uspešnosti poslovanja z dolgoročnimi zahtevami, ki podjetjem omogoča dolgoročno preživetje in razvoj na temelju obvladovanja prihodnosti z nenehnim dopolnjevanjem in nadgrajevanjem strategij.

Cilji doktorske disertacije so naslednji:

- raziskati in poudariti odprtost in številne zmožnosti USK kot orodja za merjenje uspešnosti poslovanja in sistema strateškega managementa, z njegovimi omejitvami in prednostmi, ter opredeliti ključne dejavnike uspešnosti;
- prikazati in preveriti zmožnosti USK kot strateškega okvirja za obvladovanje trajnosti in odpornosti na negotovo prihodnost;
- v izbranih podjetjih s strateško odličnostjo preveriti pripravljenost strategij podnebnih sprememb (ter posledično njihovo odpornost na ogroženost zaradi negotove prihodnosti) in njihovo vključenost v sistem strateškega managementa in obvladovanja uspešnosti;
- ugotoviti morebitno povezavo med uporabo USK in pravočasnim odzivanjem podjetij na podnebne spremembe in predlagati nadgradnjo USK s strateško obravnavo odpornosti na negotovo prihodnost.

Za uresničitev namena in ciljev doktorska disertacija ob teoretičnem delu vključuje tudi raziskavo, ki temelji na poizvedovalni študiji primerov podjetij s strateško odličnostjo in se z namenom proučitve raziskovalnih vprašanj nadgradi s pojasnjevalno študijo.

Struktura in vsebina doktorske disertacije

Disertacijo sestavlja pet glavnih poglavij, ki sledijo uvodu in se zaključujejo s sklepi ter s seznamom uporabljene literature in virov. Raziskovalno področje je obrazloženo na začetku uvodnega poglavja, ki mu sledijo izhodišča za opredelitev namena in ciljev ter teza disertacije. V nadaljevanju uvodnega dela predstavim uporabljeno metodologijo, prispevek disertacije k znanosti, in terminologijo, ter nalogo zaključim s prikazom vsebine.

Prvo poglavje disertacije "Trajnostni razvoj in poslovno okolje" vključuje pregled literature in virov s področja trajnostnega razvoja in njegovega pomena za poslovni svet. Začenjam ga z definicijo trajnostnega razvoja in nadaljujem s predstavitvijo treh različnih konceptov trajnostnega razvoja in družbene odgovornosti podjetij. Poglavje se zaključuje z razpravo o strateški vlogi trajnostnega razvoja ter s pregledom njegove strateške obravnave v poslovni praksi.

V **drugem poglavju** predstavim vidike negotove prihodnosti in na kratko orišem ključne izzive, kot so omejenost planeta, podnebne spremembe, demografski in tehnološki trendi. V drugem podpoglavju se prikaže nujnost poslovne obravnave negotove prihodnosti, s poudarkom na obvladovanju tveganj, prilagajanju, konkurenčnosti za prihodnost in ustvarjanju novih rešitev. Tretje podpoglavje se osredotoča na podnebne spremembe kot globalno grožnjo, s predstavitvijo dokazov, mehanizmov in scenarijev podnebnih sprememb, ekonomskih učinkov in potrebnih ukrepov. Nadaljujem s predstavitvijo vpliva podnebnih sprememb na poslovni svet, s tveganji in priložnostmi. Poudarjam različne vplive na posamezne industrije in predstavljam ukrepanje podjetij ter obstoječe poslovne iniciative. Ker podnebne spremembe zahtevajo strateški pristop so predstavljene strategije blaženja velikosti podnebnih sprememb, strategije prilagajanja ter strategije razvoja novih priložnosti k prehodu na brezogljično družbo.

Temeljno področje doktorske disertacije, USK, je predstavljen v **tretjem poglavju** skupaj z njegovo evolucijo. Poglavje na začetku predstavi inovacije v pristopih za merjenje in obvladovanje uspešnosti poslovanja, nato pa se osredotoči na predstavitev USK od njegovega nastanka kot orodja za merjenje uspešnosti do njegovega razvoja v strateško-usmerjeno organizacijo in strateški managerski sistem. Da bi se osvetili posamezni vidiki raziskave, navajam najboljše primere iz prakse, podjetja, ki so prejela tako imenovano nagrado Palladium Hall of Fame for Executing Strategy®. Izmed njih izpostavim podjetje Aktiva Group za predstavitev integracije USK z drugimi managerskimi orodji in podjetje Amanco – kot primer dobre prakse uporabe USK za obladovanje družbene odgovornosti in trajnostnega razvoja podjetja. Poglavje zaključujem s predstavitvijo pogledov različnih avtorjev glede pomanjkljivosti USK in njegovih kritik.

Četrto poglavje je posvečeno empirični raziskavi in vključuje pet podpoglavij. Prva so namenjena pregledu zasnove raziskave, s predstavitvijo tehnik pridobivanja virov in informacij in s predstavitvijo raziskovalnega procesa z vsemi štirimi raziskovalnimi obdobji. Predstavim tudi metodologijo večletne raziskave. S poizvedovalno študijo primera proučujem uporabo USK za obvladovanje različnih razsežnosti podnebnih sprememb in posledično trajnostnega razvoja v treh izbranih podjetjih s področja energetike, PSE&G, S-OIL, in Statoil, ki so bila nagrajena s Palladium Hall of Fame for Executing Strategy®. Raziskavo nadgrajujem s pojasnjevalno študijo primera podjetja PSE&G, s katero ponazorimo vključenost USK v procese obvladovanja negotovosti in izgradnje odpornosti podjetja na potencialne grožnje.

Študija primera je empirično raziskovanje, ki preverja izbrane teme znotraj konteksta realnega življenja. Uspešna študija primera ponuja nove in drugačne vidike, opazovanja in poglobljeno interpretacijo posameznega ali večjega števila raziskovanih predmetov. Pri izbiri podjetij v okviru empiričnega dela doktorske disertacije zastavljen cilj ni zgolj dokumentirati povprečno prakso, temveč se učiti od inovativnih in najboljših primerov podjetij s sledečimi kriteriji za izbiro podjetij:

- podjetje je prejelo prestižno nagrado Hall of Fame for Executing Strategy™;
- podjetje izkazuje strategije in delovanje na področju podnebnih sprememb z merljivimi dosežki strategij blaženja velikosti podnebnih sprememb in prilagajanja;
- zaradi različne podnebne prizadetosti posameznih geografskih območij in panog je bil pri izboru podjetij upoštevan tudi ta kriterij, s čimer se je zagotovila raznolikost pridobljenih podatkov.

Kakovost raziskave je dosežena z uporabo štirih splošnih metod testiranja za družboslovna znanstvena področja (Atkinson & Shaffir, 1998, 60–62; Kidder & Judd, 1986, 26–29): konceptualna veljavnost, notranja veljavnost, zunanja veljavnost in zanesljivost.

V tretjem podpoglavju predstavljam podjetje PSE&G, in na kratko orišem osnovne podatke za ostali podjetji. Ključna področja raziskave so nato pojasnjena v četrtem podpoglavju, kjer na primeru podjetja PSE&G predstavim USK kot managerski in strateški sistem za uspešnost poslovanja, dolgoročno družbeno odgovornost in trajnostni razvoj podjetja, odpornost na podnebne spremembe in na finančno krizo ter management podnebnih sprememb.

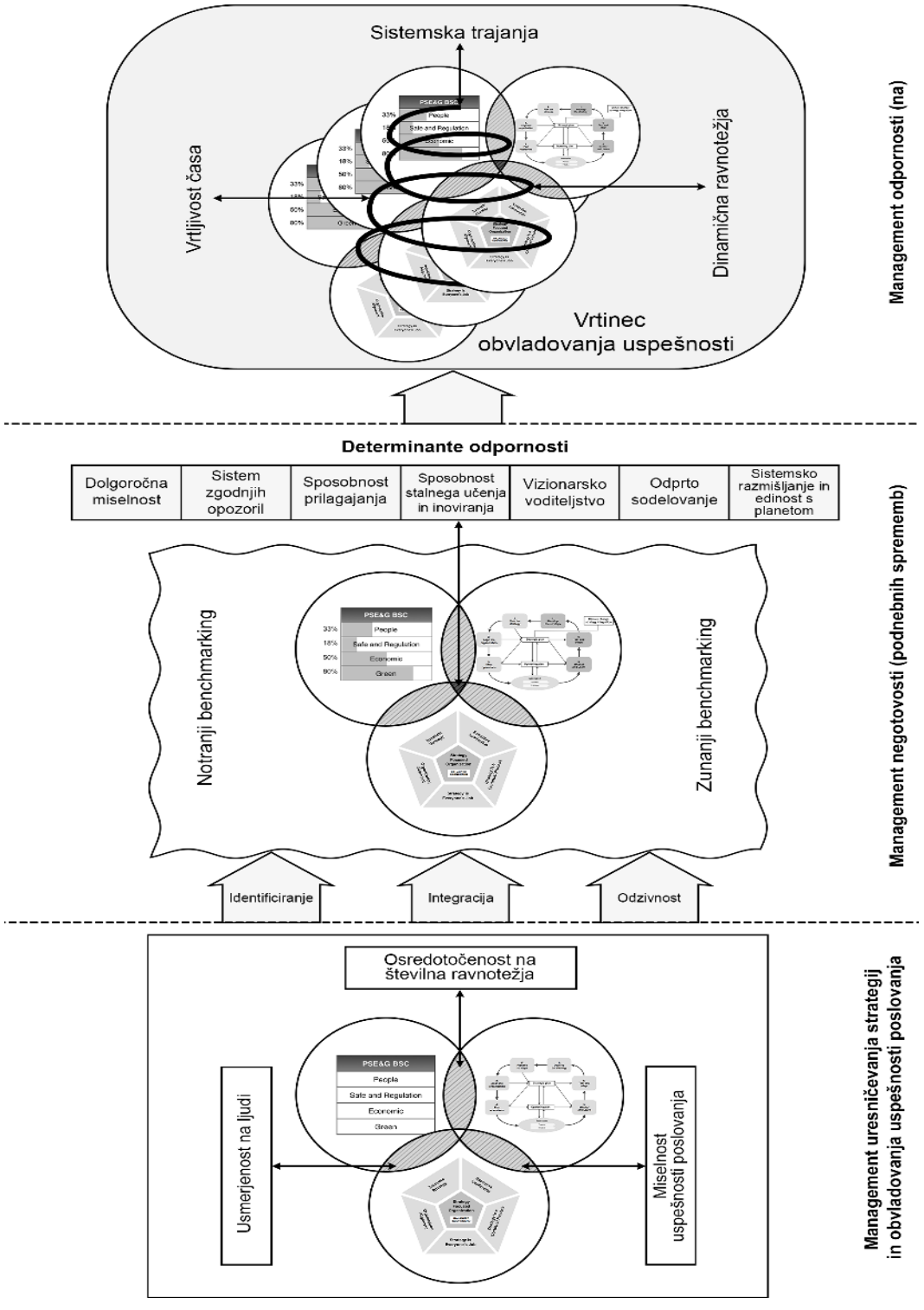
Na koncu poglavja testiram sposobnosti USK z devetimi raziskovalnimi vprašanji, s ciljem predstaviti, kako USK omogoča pravočasno oblikovanje in obvladovanje strategij podnebnih sprememb, prilagajanje stalnim spremembam in pravočasen odziv na izzive prihodnosti. Raziskavo zaključujem s preverjanjem pripravljenosti podjetja PSE&G na nenadne ekstremne podnebne spremembe. Kjer je ustrezno, rezultate, pridobljene iz raziskave v podjetju PSE&G, primerjam ali ustrezno podkrepim z rezultati, pridobljenimi iz drugih dveh podjetij.

V **petem poglavju** Razprava povzemam ključne ugotovitve posameznih ciljev dizertacije, ki jih poskušam sistematično nadgraditi v predstavljeni model USK za obvladovanje negotovosti (glej Slika 1). Rezultati raziskave potrjujejo zmožnosti USK kot managerskega orodja za pravočasen odziv na grožnje negotove prihodnosti, s sposobnostjo krepitve odpornosti podjetja na ogroženost in s tem zagotavljanja dolgoročne uspešnosti poslovanja. Uporaba USK v ta namen in njegova uspešnost sta pogojeni s stopnjo razvoja in globine vpeljave USK v podjetju.

Dizertacija nadgrajuje obstoječo teorijo USK z določitvijo temeljnih gradnikov USK za uspešnost poslovanja, identificiranih na presečiščih uravnoteženega sistema merjenja kazalnikov uspešnosti poslovanja, strateško-usmerjene organizacije in strateškega managerskega sistema: miselnost uspešnosti, osredotočenost na multipla ravnotežja in usmerjenost na ljudi (Sslika 1). Le-te je treba nato nadgraditi z determinantami odpornosti na ogroženost, kot so dolgoročna miselnost, sistem zgodnjih opozoril, sposobnost prilagajanja, stalnega učenja in inoviranja, vizionarsko voditeljstvo, odprto sodelovanje,

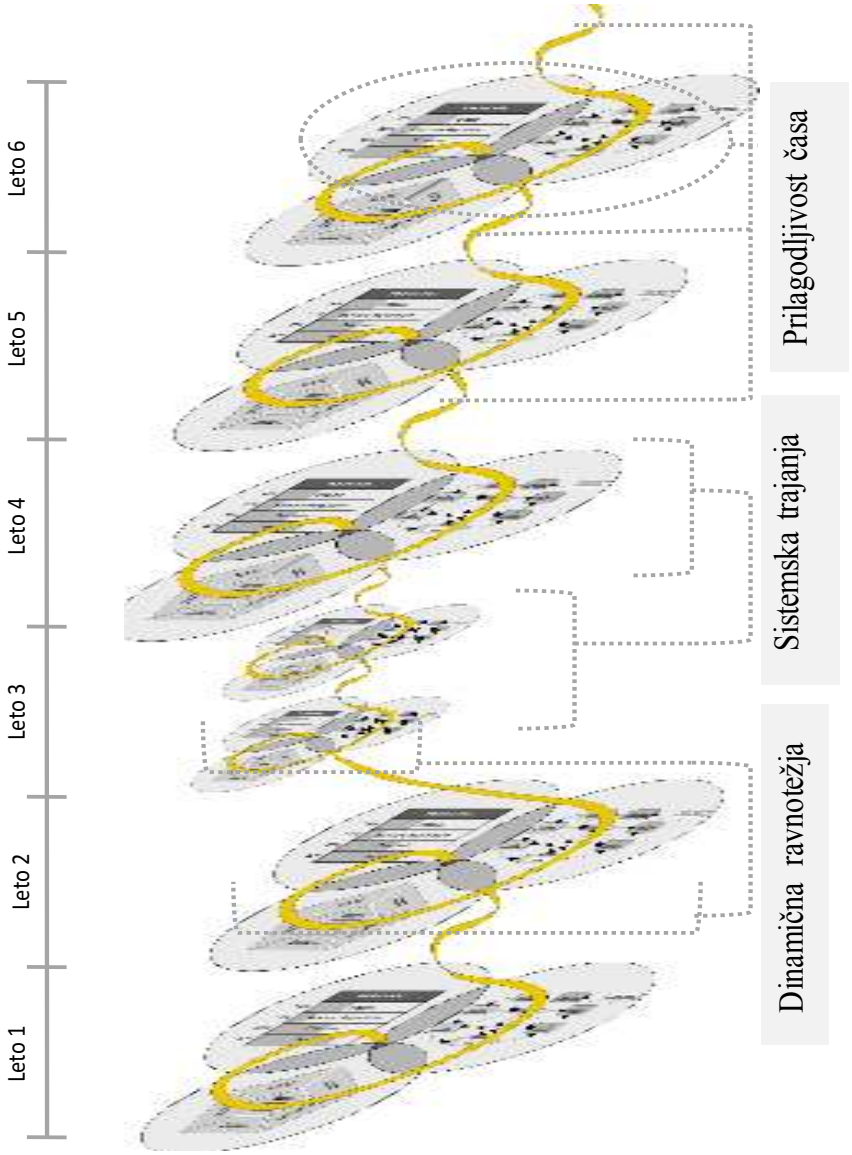
sistemsko razmišljanje in edinost s planetom, ki skupaj predstavljajo splošni okvir managementa negotovosti (podnebnih sprememb) za identifikacijo, odzivnost in integracijo sprememb in groženj iz notranjega in zunanjega okolja podjetja.

Slika 1. Management odpornosti na negotovo prihodnost z vrtincem obvladovanja uspešnosti poslovanja



Disertacijo zaključujem s predlogom za nadaljnji razvoj modela managementa odpornosti na ogroženost, izpeljanega iz USK, z vzpostavitvijo vrtinca obvladovanja uspešnosti, ki omogoča prilagodljivost dimenzije časa, dinamična ravnotežja in sistemsko trajnost, kot je podrobneje prikazano v sliki 2.

Slika 2. Vrtinec obvladovanja uspešnosti poslovanja



Zaključek

Raziskava razširja obstoječo teorijo USK s strateško integracijo podnebnih sprememb in determinant odpornosti v krovni sistem USK managementa uspešnosti poslovanja, ki s svojim mehanizmom uravnoteženja blaži napetosti med dolgoročnimi in kratkoročnimi cilji podjetja ter s tem omogoča njegovo preživetje kot tudi njegovo uspešnost poslovanja

na dolgi rok, tudi v razmerah negotovosti.

Obvladovanje dejavnikov negotove prihodnosti in odpornosti na ogroženost v poslovni teoriji in praksi nima zadostne obravnave (Hamel & Valikangas, 2003; Kotler & Caslione 2009; Moberg & Simonsen, 2014), prav tako ni predstavljenih integriranih strateških rešitev, zato je prispevek doktorske disertacije v identifikaciji ključnih elementov odpornosti na negotovost in njihova vključenost v krovni sistem strateškega managementa in obvladovanja uspešnosti USK.

Kljub dejstvu, da so podnebne spremembe postale ena od najbolj raziskanih znanstvenih področij v zadnjih desetletjih (Hansen et al., 2007; IPCC, 2001, 2007, 2008, 2008a, 2014a; Jones et al., 1999; Lovelock. 2007; Mann et al., 2003; Stern, 2007; Wigley, 2005) in realna grožnja, so v poslovni in akademski literaturi ustrezne podnebne strategije podjetij nezadostno obravnavane ali le delno pojasnjene znotraj okoljevarstvenega in trajnostnega konteksta. Dosedanji izsledki s področja managementna podnebnih sprememb ne ponujajo celostnih managerskih orodij za obvladovanje teh sprememb v sklopu krovne strategije podjetja (Porter & Kramer, 2006), kar je nujen pogoj tudi na področju managementa trajnostnega razvoja (Epstein & Rejc Buhovac, 2014; Figge et al., 2002).

Ob tem je obravnava podnebnih sprememb v večini primerov usmerjena zgolj na ukrepe blaženja podnebnih sprememb, še posebej na ukrepe, procese in tehnologije, usmerjene v zmanjševanje izpusta toplogrednih plinov (Kolk & Pinkse, 2008; Lash & Wellington, 2007). Zato je pomemben prispevek doktorske disertacije k znanosti v strateški in celostni obravnavi podnebnih sprememb, vključujoč strategije prilagajanja in transformacije k brezogljični družbi, kjer blaženje več ni mogoče (IPCC, 2008b, str. 59). Zaključki s področja managementa podnebnih sprememb so primerni tudi za podjetja, ki sicer ne uporabljajo USK (poglavja 2.4, 2.5, 4.3.2, 4.3.3, 4.3.4 in 4.5).

Doktorska disertacija nadgrajuje obstoječo teorijo z obravnavo časovne dimenzije, sistemske kontinuitete in dinamičnega uravnoteženja, s predlogom za nadaljnje raziskave in razvoj USK, na primer z vzpostavitvijo vrtinca obvladovanja uspešnosti. Prispevek doktorske disertacije vidim tudi v proučevanju poslovne prakse strateško odličnih podjetij (Kaplan, & Norton, 2006b; Balanced Scorecard Collaborative, 2007, 2008; Palladium group, 2009, 2010, 2011, 2013), saj raziskava temelji na obsežnem praktičnem delu v podjetjih, ki so razvila in dosegla strateško odličnost, in preučuje njihovo pripravljenost na podnebne spremembe, sposobnost uravnotežene obravnave kratkoročnih in dolgoročnih ciljev podjetja ter obvladovanja odpornosti na negotovo prihodnost. Gre za izzive, ki se jih večina podjetij ne loteva zaradi pomanjkljivega znanja, resursov in izkušenj, zato so primeri najboljših svetovnih podjetij na tem področju še toliko bolj pomembnejši.

S temi ugotovitvami in nadgradnjami se odpirajo številna nova področja raziskave, na primer v disertaciji navajam, da bi bile potrebne raziskave determinant odpornosti na

negotovost pri uporabi drugih managerskih orodij oziroma v podjetjih, ki uporabljajo USK, a niso bila nagrajena s "Palladium Hall of Fame for Executing Strategy®". Prav tako so potrebne dolgoročne raziskave uporabe vrtinca obvladovanja uspešnosti ter njegov vpliv na dolgoročno uspešnost poslovanja podjetja. Za testiranje delovanja prilagoditve dimenzije časa, sistemske kontinuitete in dinamičnega uravnoteženja bi vzpodbudila interdisciplinarne študije, na primer sodelovanje poslovno-organizacijskih ved s kvantno fiziko, kjer so vsi vidiki časa, preteklost, sedanjost in prihodnost, medsebojno prepleteni (Detela, 2014). Pri tem bi še posebej želela izpostaviti področje sintropije (Detela, 2014), ki predstavlja samo-organizacijsko sposobnost narave (Detela, 2014, str. 378–379).

Zanimivo področje nadaljnjega raziskovanja je vezano na lastnike podjetij – delničarje. Sistem upravljanja podjetja in podpora odločitvam managementa sta se nakazala kot ključna pri zgodnjem prepoznavanju groženj ali priložnosti ter pri pravočasnem odzivu na spremembe. Zato ne preseneča, da je bila sposobnost prilagajajočega se upravljanja izbrana s strani raziskovanih podjetj med ključne determeninate odpornosti na negotovost. Med slednjimi bi kot potencialno področje nadaljnjega raziskovanja izpostavila še sistemsko razmišljanje in edinost s planetom, predvsem njuno vključenost v strateški sistem in management uspešnosti. Ocenjujem namreč, da bo ravnotežje med ljudmi/zaposlenimi, podjetji, družbo in planetom imelo vedno večji pomen v današnjem svetu omejenem z viri, predvsem zaradi njihove vitalne povezanosti in soodvisnosti. Poslovanje na dolgi rok se tako ne bo več moglo izvajati na škodo drugih, s čimer predvidevam, da se bodo postavili pogoji in zahteve za vključitev eksternalij v sistem obvladovanja uspešnosti poslovanja podjetij.

Za zaključek: stremljenje podjetij k dolgoročni uspešnosti ni nekaj novega. Navsezadnje obstajajo podjetja, ki poslujejo že več kot tisoč let, kot sta Hoshi Ryokan in Kongo Gumi (O'Hara, 2014). Kot navajajo številni avtorji, takšen dolgoročni obstoj in razvoj zahtevata stalno spremembo, dobro razumevanje notranjega in zunanjega okolja podjetja, ustvarjanje številnih strateških priložnosti in prerazporejanje virov podjetja hitreje, kot konkurenca (Collins & Porras, 2004; Hamel & Valikangas, 2003; Kaplan & Norton, 2001; Kotler & Caslione, 2009).

Verjamem, da pričujoča disertacija z nakazanim nadaljnjim razvojem USK na osnovi vključenosti determinant odpornosti na negotovost in ogroženost (podnebne spremembe) in z vrtincem obvladovanja uspešnosti, prenaša modrost teh podjetij in nagovarja takšno poslovanje in uspešnost podjetij, kratkoročno ali tisočletno, ki je v skladu s ključnim ciljem človeštva, kot ga opredeljuje definicija trajnostnega razvoja, "da se ne ogroža zmožnost prihodnjih generacij pri zagotavljanju njihovih potreb"[43].

[43] Prevod "meeting the needs of the present without compromising the ability of future generations to meet their own needs". Brundtland komisija, n.d.; World Commission on Environment and Development, 1987.