

Private Company Adaptation to Climate Change

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Abstract

Despite climate risks posing a serious threat to business and business continuity, empirical research has shown little active involvement of the private sector in climate change adaptation (CCA). National plans of governments, as well as global agreements and reports, highlight the need for collaborative climate action on a global scale, placing special emphasis on private sector involvement as critical to the adaptation progress. This research explores private sector adaptation to climate change, through several methods, and ultimately seeks to answer the question of how private companies can achieve a more viable role in CCA. First, a scoping study of what is known in the scientific literature about private sector adaptation to climate change, was performed. Next, national adaptation plans of Singapore and Denmark were analysed. Lastly, annual reports of top 20 performing companies in Singapore and Denmark were reviewed, accompanied by interviews with key informants. Based on these methods, we argue that in order for private companies to have a more viable role, there needs to be; a strengthened enabling environment, with governmental policies setting long-term prioritisation for private company CCA, identifying what is expected of companies in terms of innovation, technologies and partnerships with the public sector, and how they should report on CCA initiatives. A discovery that could benefit from further research, is whether engagement with CCA is more so for small and medium-sized enterprises (SMEs), rather than larger companies, as these appear to be engaged with climate action focused on mitigation rather than merely adaptation.

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List of acronyms

ASEAN:	Association of Southeast Asian Nations
CCA:	Climate change adaptation
CSR:	Corporate social responsibility
DBS:	The Digital Bank of Singapore
EU:	European Union
EIP:	European Innovation Partnerships
GDP:	Gross Domestic Product
GHG:	Greenhouse gas
GRI:	Global Reporting Initiative
NAP:	National adaptation plan
NATO:	North Atlantic Treaty Organization
OECD:	Organisation for Economic Co-operation and Development
OSCE:	Organization for Security and Co-operation
SDGs:	Sustainable Development Goals
SE:	Social enterprise
SME:	Small and medium-sized enterprise
TCFD:	Task Force on Climate-Related Financial Disclosure
UN:	United Nations
UNDP:	United Nations Development Programme
UNFCCC:	United Nations Framework Convention on Climate Change
UNGC:	United Nations Global Compact

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1 Introduction

The following sections introduce the research project through defining the background to the concept of private sector climate change adaptation, defining the scope, purpose and need for this research topic. Following the background to the thesis, is the defining of the research aim, the questions that the research sought to answer as well as how this report is structured in chapters.

1.1 Background

The need to reduce global greenhouse gas emissions, to keep global warming to well below 2°C above pre-industrial levels, is high and multiple mitigation strategies are currently underway. However, climate change is already taking place and its impacts are affecting people, damaging natural habitats as well as infrastructure and changing people's perspectives in regard to their choices and way of living. It is clear that further impacts will not be avoided solely through mitigating greenhouse gas (GHG) emissions and requires the collaborative effort of everyone involved. Due to this fact and the need for climate action on a global scale, nations have begun to develop and implement national adaptation plans (NAPs) and climate change policies and strategies. Usually developed by specific entities within national governments, these plans and strategies, along with specific reports such as the 5th Intergovernmental Panel on Climate Change (IPCC) report and the Paris Agreement of the United Nations Framework Convention on Climate Change (UNFCCC, 2015), highlight the collaborative need for action, placing special emphasis on private sector involvement as being critical to adaptation progress (Pachauri et al., 2014; Danish Nature Agency, 2012; Bundesregierung, 2008). However, empirical research has shown little active involvement of the private sector in adaptation (Hegger, Mees, Driessen & Runhaar, 2017; Klein, Juhola & Landauer, 2017; Wamsler, 2016; Wamsler & Brink, 2015; Juhola, 2013; Hedensted Lund, Sehested, Hellesen & Nellemann, 2012) as well as little existing guidance for the private sector in adaptation (Wamsler & Brink, 2015). Research has also shown that public authorities generally frame the problem and solutions while the private sector's role is mostly in implementing adaptation measures (Klein, et al., 2017; Mees, Driessen & Runhaal, 2015; Hedenstad Lund, et al., 2012).

Despite little available information on private sector involvement in climate change adaptation, climate risks pose a serious threat to business and business continuity and climate change and

its impacts are on the minds of business leaders. A 2017 survey, by the World Economic Forum, found that business and government leaders named failing to mitigate and adapt to climate change, among the most likely and impactful risks to business in 2018 (World Economic Forum, 2018). A country's climate change adaptation (CCA) policy and/or NAP, not only sets the tone to how players within the private sector engage in CCA but also how they experience the opportunities and challenges associated with CCA engagement.

Furthermore, the relationship between private sector companies and climate change adaptation has three relevant aspects; how the company prepares for and adapts to climate change, for the sake of own gain through business continuity management and; how the company is engaged in promoting and advancing climate change adaptation through innovation and funding. The third relevant aspect is how private companies communicate with governments and vice versa. Can they affect these, usually governmentally driven policies and strategies, and have a say in framing the problem and developing solutions, or is their role solely as partners in implementing adaptation measures and reacting to impacts that could affect their business continuity?

1.2 Research Aim

The aim of the research was to achieve a greater understanding of how the private sector is positioning themselves in the climate change adaptation agenda in terms of; (1) measures aimed at protecting their current business, e.g. business continuity work, and by (2) exploring new business opportunities related to the change.

Ultimately, this research aims to provide key input to how private companies can have a more viable role in climate change adaptation and achieve greater impact through enhanced economic growth, social responsibility and environmental sustainability.

1.3 Research Questions

The thesis seeks to answer the normative question of: *How can private companies have a more viable role in climate change adaptation and achieve greater impact?*

In order to answer this question, four descriptive questions are investigated, to first allow for an understanding of *what is*, before making it possible to answer the above normative question of how to move forward:

1. What is known in the scientific literature about private sector adaptation to climate change?

2. How does it differ in two different contexts such as Denmark and Singapore in regard to national adaptation plans?
3. How do private companies communicate climate change adaptation in their reports and business strategies?
4. How do private companies view themselves and their position to climate change adaptation?

The above four descriptive questions, followed by the ultimate normative research question, are answered through the following approach; First research question is answered through conducting a so-called scoping study to give an overview of what is known in the scientific literature about private sector adaptation to climate change. To answer the second research question, NAPs of Denmark and Singapore are reviewed, as these are important policy documents, presumably having significant effect on adaptation measures taken by private companies. To answer research question three and four, annual reports of 20 top performing companies from Denmark and Singapore are reviewed, and the findings are complimented by interviews of key informants from some of these companies. Lastly, key results from each of these methods are expected to provide support for answering the normative research question.

1.4 Thesis Structure

The thesis is divided into four parts; the first three provide the reviews of literature, NAPs and selected companies as well as the findings of these. The fourth part concludes the findings, answering the research questions defined above and provides suggestions for future research;

Part 1: Scoping study

Part 2: Review of national adaptation plans

Part 3: Review of company annual reports and interviews with key informants

Part 4: Discussion of findings and conclusion

In order to facilitate the answering of the normative research question, and to increase the traceability of arguments, a systematic method of applying numbers at the end of paragraphs, highlighting a certain position, has been utilized throughout the report. As such, a number in box brackets at the end of a paragraph (fx: “*term of climate action* [4]” on page 21) corresponds to a key finding that is addressed in the final conclusion. Thus, when reading through the report and being presented with one of these number indicators, the reader can know that this is a key finding in the report which will be addressed again in the end.

2 Part 1: Scoping Study

The first part of the research was centred towards answering the descriptive research question “*What is known in the scientific literature about private sector adaptation to climate change?*” In order to do this, a systematic literature review was performed, through the methodology of a scoping study. Scoping studies provide a comprehensive approach to collecting, evaluating and presenting available research evidence for the purpose of understanding a certain area of scientific literature (Arksey & O’Malley, 2005). As such, the aim of the scoping study, was “*to map the literature on a particular topic or research area and to provide an opportunity to identify key concepts; gaps in the research; and types and sources of evidence to inform practice, policymaking, and research*” (Beerens & Tehler, 2016, p. 414). Although the scoping study is not usually an analysis of the quality of research (Arksey & O’Malley, 2005), an in-depth analysis of the study’s results is provided, as to investigate opportunities for improvements within the field of private sector adaptation to climate change.

2.1 Methodology

A scoping study has multiple steps that, logically and systematically, lead through a comprehensive analysis of literature, to ultimately answer the research question identified (Arksey & O’Malley, 2005). The following sections will describe each of these steps conducted (see also Figure 1 for a flowchart illustrating the steps of the scoping study and the narrowing down of literature results).

2.1.1 Stage 1: Identifying the Research Question

It is important to initiate a scoping study with a widely defined research question, to ensure a large breadth of coverage of the literature results (Arksey & O’Malley, 2005). In ensuring a large coverage of the literature results, through a broad search strategy, it was important to also have clearly defined concepts that guide the parameters of the search and to continuously adjust these refinements (Levac, Colquhoun & O’Brien, 2010). Doing so, ensures that the search results were kept broad, but remained relevant. The research question identified, which guided the scoping study, was therefore chosen to be “*What is known in the scientific literature about private sector adaptation to climate change?*”

2.1.2 Stage 2: Identifying Relevant Studies

The second step of the scoping study was to locate and identify relevant articles. This was done through selecting an electronic database and developing a search strategy based on the research question and the definition of key concepts (Arksey & O'Malley, 2005). Similar to the Beerens and Tehler's study (2016), a distinction between the database selection and search query identification was made.

2.1.2.1 Database Selection

Scopus (<https://www.scopus.com>), an electronic database owned by Elsevier, was selected as the sole database for searching for relevant articles. This choice was made due to Scopus being the largest multi-disciplinary, peer-reviewed literature database that covers a broad range of research fields (Beerens & Tehler, 2016). Lund University's subscription to academic journals provided the researchers with access to articles. Thus, only peer-reviewed articles published in academic journals were searched. No grey literature was searched as the focus of the first descriptive research question was limited to the scientific literature.

2.1.2.2 Search Query Identification

The Boolean approach was used to develop the search string by including certain keywords related to the research question.

The keywords, and combined keywords, selected were "Private Sector" (1), adaptation (2), and "Climate Change" (3). Due to the fact that these keywords have synonyms and related words, searching for only these words would be insufficient (Beerens & Tehler, 2016). Which synonyms to include was decided by searching thesauruses online and testing various combinations of different search strings, through value judgement, to see which string provided both a comprehensive and manageable amount of articles to continue with for the next step (see Annex A).

Since the words "company" and "enterprise" fall under the category of "private sector" these were decided to be included in the search string in singular and plural form. Since the keyword "adaptation" is very specific in the climate change literature, no synonyms were used for that word. The third and combined keyword; "Climate change" has the synonym "global warming" which was thus also included. Two other words, "climate" and "weather", were chosen as

relevant to include since both climatic and extreme weather events could be listed as reasons or motivations for adaptation. The search string thus included;

1. “Private sector” OR company OR companies OR enterprise OR enterprises
2. Adaptation
3. “Climate change” OR “global warming” OR climate OR weather

The flowchart (See figure 1, p. 16) shows the entire formulated Boolean search string and the amount of initial results (936).

2.1.3 Stage 3: Study Selection

To initiate the filtering out of articles irrelevant to the study, inclusion and exclusion criteria were decided. The criteria were decided post hoc, once familiarity with the search results was established (Levac et al., 2010), making it possible to understand what should determine the relevance of a document.

2.1.3.1 Inclusion and Exclusion Criteria

For this study, only publications published within the last ten years were included due to adaptation to climate change and the involvement of the private sector being a relatively new research topic. Another criterion for inclusion in the study, was that the publications were published in scientific journals. This meant that only the document type ‘articles’ were selected. The third inclusion criterion was that publications needed to be in English, as to make the reading of documents possible. When these inclusion criteria had been applied, 537 articles remained for further analysis.

Inclusion and exclusion criteria:

1. Published within the last 10 years (from (and including) 2009 until present time)
2. Publications written in English
3. Publications published in scientific journals (document type: article)

2.1.3.2 Title Analysis

Upon the inclusion and exclusion criteria being applied, limiting the amount of results to 537, a title analysis was conducted to further eliminate articles that seemed irrelevant to answering the research question. In skimming through titles, it became clear that many articles were

related to national adaptation strategies, which was not within the scope of this scoping study. However, national adaptation plans are examined in detail in part two of this thesis. Therefore, in performing the title analysis, only titles specifically referring to the private sector by including words such as “private” or “company” or “business” were chosen for further study. This analysis resulted in a list of 55 articles.

2.1.3.3 Abstract Analysis

Next step of the study selection, required a more in-depth understanding of the literature, to investigate if further documents should be eliminated from the study. This entailed a read-through of the 55 abstracts, out of which only four were decided irrelevant. The articles were decided either relevant or highly relevant by subjectively evaluating the abstracts and thereby the content of the articles and their focus on the private sector in climate change adaptation. For example, articles with only one case study, or introducing simply one tool, were selected as just *relevant* and not appropriate to include in the final study. The remaining 51 articles were read through in full and divided into two categories; ‘relevant’ and ‘highly relevant’. The result was that 34 of the 51 articles were assessed to be ‘highly relevant’ and that these would constitute the final study selection. A list of the 51 results that constituted the scoping study results after the abstract analysis had been performed, are presented in an annex (see Annex B).

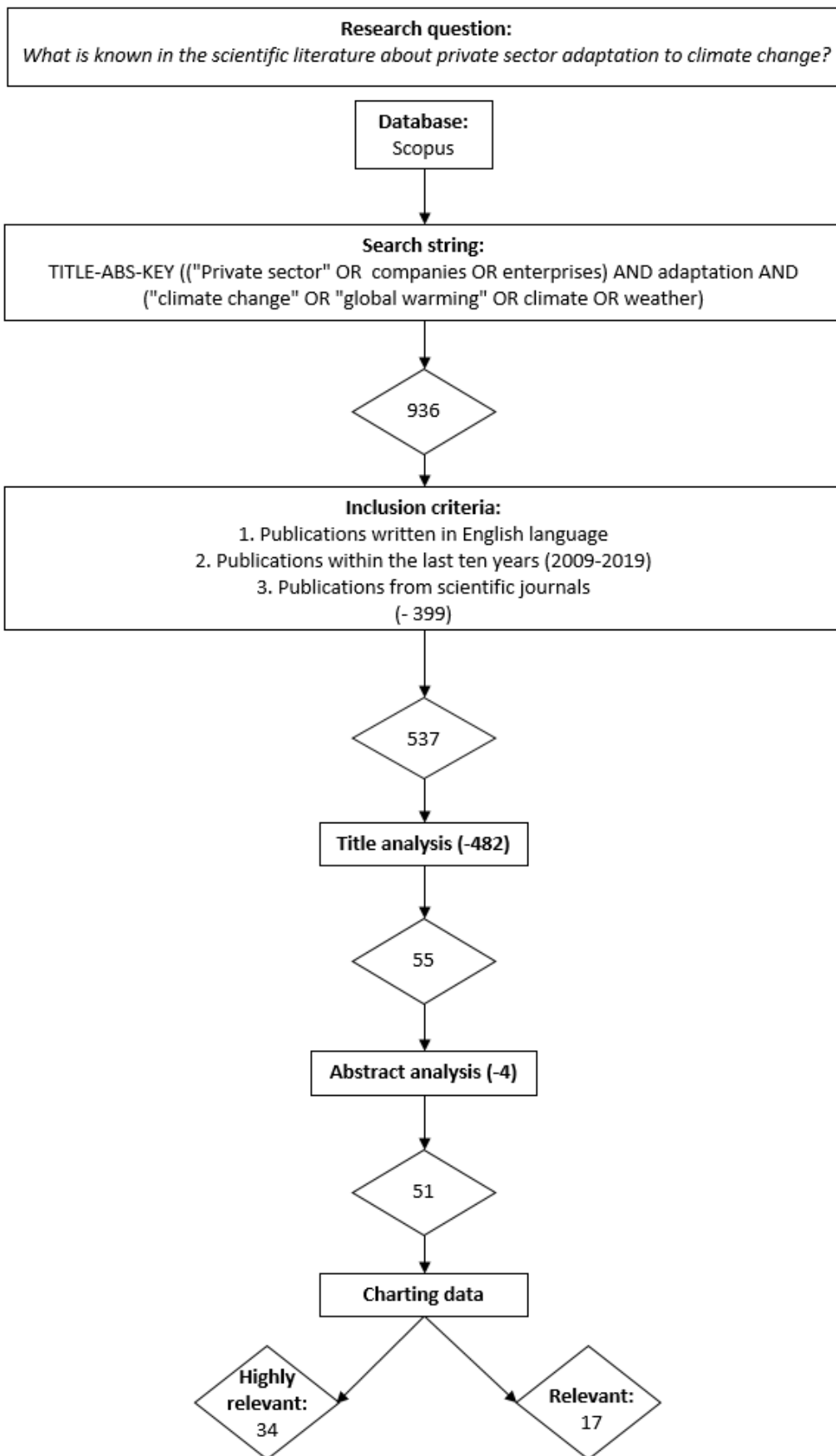


Figure 1. Flowchart of the scoping study process

2.1.4 Stage 4: Charting the Data

Following the read-through of articles, a table was developed, supporting the charting of data, and to extract contextual information, based on thematic observations across the literature (see Annex C). The process was iterative (Levac et al., 2010), which is why the table was continuously modified and adjusted to fit the context of the literature that ultimately provided information to answer the research question.

Charting describes a process in which information is systematically synthesized and sorted, based on key themes across the literature (Ritchie & Spencer, 2002). Developing thematic bases for the analysis of content helps researchers in utilizing the information for important decisions, rather than simply summarizing content in individual notes for each article (Pawson, 2002).

Thematic and key issues, that the charting of data was based on, and which content was divided between, consisted of the following:

- Risk perception and involvement in CCA
- Opportunities and challenges
- Incentives for adaptation
- Approaches and strategies
- Mitigation vs. adaptation
- Leadership and sense of responsibility
- Evolution of CCA in the past 10 years

The information gathered through charting the data, provided the foundation for the next step of the scoping study, in which results were collated, summarised and reported (Arksey & O'Malley, 2005).

2.1.5 Stage 5: Collating, Summarising and Reporting the Results

To conclude the scoping study, the results from the 34 'highly relevant' articles were collated, summarised and reported through the overall and in-depth analysis. To present these findings, the template of thematic bases (see Annex C) was used, to provide a comprehensive, thorough and logical approach to disseminating the content. In doing so, certain assumptions were applied in deciding which thematic bases would be focused on to answer the research question. This clearly presented some limitations and possible wrongful conclusions on literature content, which

should be taken into account, when reading the results (Arksey & O'Malley, 2005). Findings from the study are presented in the following sections.

2.2 Results

The following sections present the key findings of the scoping study, including both an overall analysis with focus on a descriptive numerical summary, as well as an in-depth analysis focusing on supporting the numerical analysis with a qualitative thematic content analysis.

2.2.1 Overall Analysis

Totality of the 51 articles selected for overall analysis were examined to identify broad trends and characteristics. Overall, the articles were classified according to year and country of publication, subject area as well as country focus. The overall analysis results were divided into; results of the entire 51 articles as well as results for the articles identified as 'Group 1' or those deemed *highly relevant* (n=34) and subject to the in-depth analysis.

Table 1
Summary of the articles' subject categories

Subject Area		Total (n=51)		Group 1 (n=34)	
Articles belonging to one or more category	Environment and Earth Sciences	41	80%	29	85%
	Social Sciences	25	49%	19	55%
	Business and Economics	13	25%	7	21%
	Agriculture and Biological Sciences	8	16%	3	9%
	Engineering	5	10%	2	6%
Articles belonging to only one category	Only Environment and Earth Sciences	13	25%	9	27%
	Only Social Sciences	2	4%	1	3%
	Only Business and Economics	2	4%	1	3%
	Only Agriculture	1	2%	0	0%
	Only Engineering	1	2%	1	3%
Most common article category overlaps	Environment and Social Sciences	19	37%	16	47%
	Environment and Business and Econ.	7	14%	5	15%
	Social Sciences and Business and Econ.	6	12%	3	9%
	Agriculture and Environmental Sciences	7	14%	4	12%

Article subject area was identified and defined using Scopus categorisations and through the analysis of the abstracts and titles. Due to the multifaceted nature of the articles, covering subject areas that often intersect and interlink with each other, it was deemed too simplistic to allocate one subject area to each article. Table 1, enlists a summary of the articles' subject categories, the number of articles that only belonged to one category and the most common overlapping categories. The table also lists separately all of the 51 articles selected as relevant (n=51) as well as the articles listed for in-depth analysis ('Group 1' n=34). As can be seen in

Table 1, five main subject areas were identified; Environmental and Earth Sciences, Social Sciences, Business and Economics, Agriculture and Biological Sciences and Engineering. The most common subject areas identified were Environmental and Earth Sciences and Social Sciences. Out of 51 articles, only 19 belonged to one subject area (12 for ‘Group 1’), providing stronger evidence to the field’s interdisciplinary status. The most common subject areas that overlapped were Environment and Earth Sciences with Social Sciences, with 37% of the total articles belonging to both of these categories. The same was found for the in-depth group of articles (n=34), but with a slightly higher percentage of 47% of the articles belonging to these two categories.

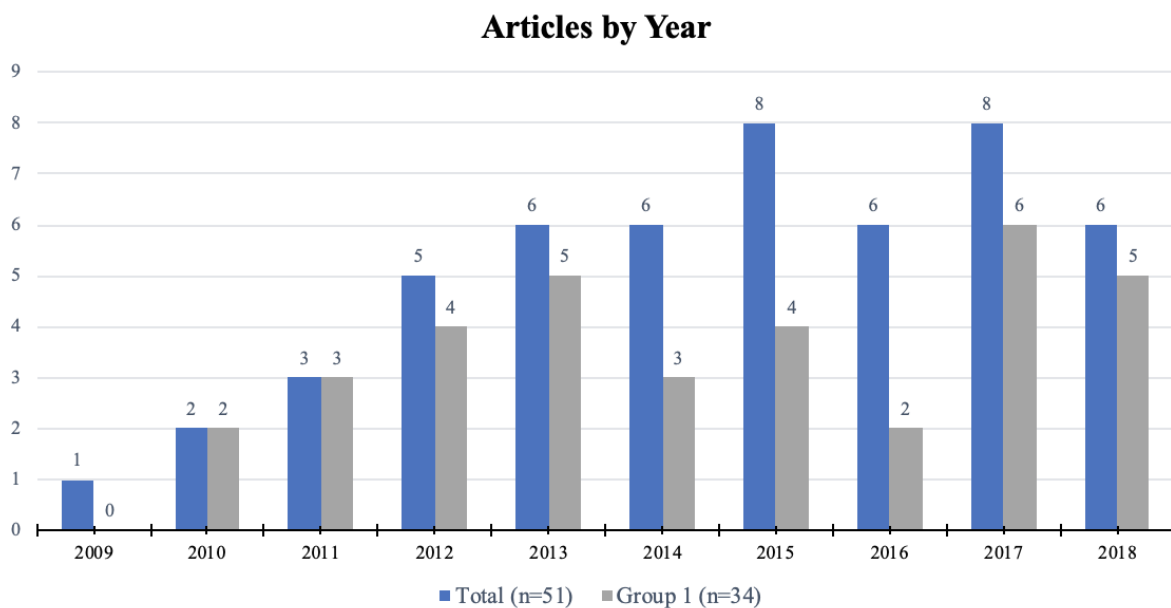


Figure 2. Articles by year

Charting the articles was performed through identifying the year of publication indicated in Scopus. As can be seen in Figure 2, both the group containing the total amount of relevant articles was charted (n=51) as well as the publication year for the articles meant for further in-depth analysis (n=34). Over this ten-year period, the number of articles published each year increased from one article published in 2009 to an average of seven articles published yearly since 2015. After 2015 there seems to be a ‘levelling off’ period where a similar number of articles are published each year. No articles were found for 2019, which is not surprising since the scoping study was performed in January and February of that year. As can be seen in Figure 2, the articles meant for further in-depth analysis were published during a nine-year period from 2010-2018.

Table 2
Author's institutional location and main area of focus

Country	Main Author's Institution Location				Main Country/Area of Focus			
	Total (n=51)		Group 1 (n=34)		Total (n=51)		Group 1 (n=34)	
Australia	8	15%	5	15%	7	14%	5	15%
Austria	1	2%	1	3%	1	2%	1	3%
Brazil	1	2%	1	3%	-	-	-	-
Canada	1	2%	-	-	1	2%	-	-
China	-	-	-	-	1	2%	1	3%
Croatia	1	2%	-	-	1	2%	-	-
Finland	4	8%	3	9%	1	2%	-	-
France	1	2%	1	3%	1	2%	1	3%
Germany	8	15%	5	15%	3	6%	2	6%
Indonesia	1	2%	-	-	1	2%	-	-
Italy	1	2%	1	3%	-	-	-	-
Japan	1	2%	1	3%	1	2%	1	3%
Netherlands	1	2%	1	3%	1	2%	1	3%
Norway	1	2%	1	3%	-	-	-	-
Philippines	1	2%	-	-	1	2%	-	-
Russia	1	2%	-	-	1	2%	-	-
South Africa	1	2%	-	-	1	2%	-	-
South Korea	1	2%	-	-	-	-	-	-
Spain	1	2%	1	3%	-	-	-	-
Taiwan	1	2%	1	3%	1	2%	1	3%
United Kingdom	11	21%	8	23%	6	12%	4	12%
United States	4	8%	4	11%	2	4%	2	6%
Zambia	-	-	-	-	2	4%	1	3%
Multi / World	-	-	-	-	11	21%	9	26%
Scandinavia	-	-	-	-	3	6%	3	9%
South America	-	-	-	-	1	2%	-	-
South Africa	-	-	-	-	1	2%	-	-
Developing countries	-	-	-	-	2	4%	2	6%
Total	51	100%	34	100%	51	100%	34	100%

A decision was made to analyse the articles based on the main author's institutional location as well as the articles' main country/area of focus, and can be seen in Table 2. This was done both for the total number of articles (n=51) and articles for in-depth analysis (n=34). The reason for looking into these characteristics was to show the global interest of the climate adaptation field. As can also be seen in Table 2, the distribution between both location of author and area of interest is quite broad. The most common country for each category is Australia where eight of the authors had institutional affiliations and on which seven of the articles were focused. At the bottom of the table there is a list of more broad categories that the articles were assigned to when it proved difficult to pinpoint a location of focus (e.g. when an article covered a literature review of documents from all over the world). A total of 11 articles covered literature that could be categorized as belonging to regions of the entire world. The overall distribution was similar for both the total articles (n=51) and the in-depth articles (n=34), where little variation occurred between categories (see Table 2).

2.2.2 In-depth Analysis

Articles from the ‘highly relevant’ category were read in full and analysed in detail, in order to identify factors that affect and influence how the private sector adapts to climate change. The in-depth analysis of content across the literature was based on a thematic analysis, in which critical issues and central aspects of the literature combined was identified. The areas of interest relate to the key issues and topics used for charting the data, and have been summarised into sections concerning; *Tools and Strategies*, *Adaptive Capacity* and *Need for an Enabling Environment* under which a collection of sub-thematises and their content in the literature are reported. The in-depth analysis has the purpose of adding a narrative to the descriptive numerical summary from the overall analysis (Levac et al., 2010; Arksey & O’Malley, 2005), in order to further understand the literature studied, and to answer the research question.

2.2.2.1 Introducing Private Sector Adaptation

Throughout the last ten years, the focus on adaptation to climate change, especially within the private sector, has grown increasingly noticeable. The scoping study found that, risk assessments within private companies, through the United Kingdom Climate Change Risk Assessment (UKCCRA), has shifted its focus from domestic risks to international risks, and that the inclusion of public policies is now a standardised consideration (Surminski et al., 2018). Moreover is the emergence of various initiatives such as the C40 (About C40, 2019) and Clinton Climate Initiative (Clinton Foundation, 2019), that have helped push forward the evolution and strength of adaptation activities and shape an increasing focus on the importance of considering the changing climate in private sector activities (Whiteman et al., 2011).

Before presenting the key thematises from the scoping study, there are two issues important to present to help introduce the field and the research results. These issues relate to assumptions made prior to conducting the study, which, although expected to be of significant presence, were proven to not show contribution to the analysis. The assumptions related to defining climate change adaptation and confusing mitigation with adaptation.

Defining Climate Change Adaptation

Having clear definitions of issues that require focus, is essential for establishing a common understanding of key issues and for identifying and operationalizing indicators for solutions, monitoring and progress (UN General Assembly, 2016). However, only four of the 34 articles expressed a definition of climate change adaptation. Whether this purely means that the

definitions were not reported but may still have been known and applied, or that they are lacking and thus may contribute to insufficient adaptive capacity, has not been possible to assess, proving as a surprising revelation that should be accounted for, and which may benefit from further research.

Lei, Voss, Clegg & Wu identified adaptation as a “*process whereby decision-makers assess the changing organizational environment and then formulate strategic responses*” (2017, p. 99). This definition has a very organizational approach which corresponds well with the research scope. However, the definition does not incorporate the changing natural environment and thus has a more business-oriented focus and aim, shaping the foundation and incentive for adaptation initiatives. This approach risks seeing the purpose of adaptation as something beneficial solely to private companies, rather than acknowledging that, securing business continuity through adaptation is beneficial to all those in society that are reliant on the goods of the company. In adopting a more climate oriented definition to adaptation, Schneider uses the definition of adaptation formulated by the Intergovernmental Panel for Climate Change (IPCC) in which adaptation is defined as “*adjustments in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderate harm or exploit beneficial opportunities*” (2014, p. 1). The approach, including the climatic aspect and the changing natural environment in the definition, is part of the other two definitions identified in the literature as well. However, whether adaptation is for the sake of not only securing business continuity for the sole benefits of the company, or whether it is for the sake of beneficiaries too, is not expressed in any of the four definitions, except for the one by IPCC, in which “beneficial opportunities” is included, although who the beneficiaries are is not. Identifying this aspect in defining CCA may be important in ensuring incentives for adaptation rooted in a systems perspective, understanding the complexities and interrelatedness and -dependencies that entities in society have.

Mitigation vs Adaptation

Second to defining climate change adaptation, or lack thereof, and the surprise towards this fact, was the fact that mitigation and adaptation were not as confused as initially expected. An assumption towards private sector adaptation being mistaken for mitigation initiatives, was made prior to the scoping study. However, no article was identified to blur the lines between the two concepts, but rather outlined the linkages between them. Though mitigation and adaptation are two rather different concepts, many of the articles within the research

acknowledged the difference between them, while stating that the two go hand-in-hand, with mitigation leading the way for long term risk management, determining the need for adaptation initiatives (Gasbarro, Rizzi & Frey, 2016; Leventon, Dyer & Van Alstine, 2015; Linnenluecke, Griffiths & Mumby, 2015; Whiteman et al., 2011) - all under the umbrella term of climate action [4].

2.2.2.2 Tools and Strategies

The 34 articles read and analysed provided a clearer picture on how businesses and enterprises engage in CCA. One way of doing so is by using a variety of different tools and strategies. A number of the articles included in the analysis also provided new tools developed for the private sector to utilize and facilitate adaptation measures, taken within a sector and/or company (Sepúlveda & Mendizabal, 2011). Many different factors that either facilitate or hinder the use of tools and strategies became apparent through analysing the literature and will be further discussed in the challenges and opportunities section below. It is however important to note, while reading this section, the factors that frequently came up as important to consider were; the size and industry of a company, national laws and policies to which the company adheres to, motivated and knowledgeable leadership within the company, knowledge and recognition of climate change impacts and the uncertainty regarding future impacts of climate change. It is also important to note that the concepts of tools and strategies are interlinked and often difficult to separate. The use of a tool can be considered a strategy as well as the implementation of a strategy can be enhanced or supported by the use of tools.

Tools

There exists a number of tools for the private sector to utilize in climate change adaptation. Sepúlveda and Mendizabal mention, that when it comes to climate change challenges, preventive measures and proactive attitudes are the most effective (2011). By utilizing opportunities that emerge from climate change, higher long-term economic gains are provided, compared to derived losses, and every long-term business plan should thus incorporate climate change (Sepúlveda & Mendizabal, 2011; Schaltegger & Synnestvedt, 2002). To facilitate decision making related to climate change, Sepúlveda and Mendizabal designed a model with the purpose to assist industries in reducing uncertainty towards climate change and impacts to their industry, while identifying opportunities that these industries might come across. Other tools for the private sector to utilize new business opportunities, emerging from climate change, are highlighted in Biagini and Miller's (2013) article. There, they mention the Clean

Technology Fund, a part of the multi-donor and multilateral trust fund of the Climate Investment Funds, which provide private companies subsidized loans for the commercialization of new energy technologies (Biagini & Miller, 2013). Other tools focus on assessing risks and barriers for private sector adaptation to climate change. Surminski et al., (2018) discuss the UK Climate Change Risk Assessment process (UKCCRA), a tool for assessing risks within corporations related to climate change and provide valuable comparison of the first two versions of the tool. The possibility of combining different risk management tools in order to enhance the resilience of enterprises to climate change is highlighted in Gasbarro et al.'s. (2016) article while Herrmann and Guenther (2017) delve into the barriers for adaptation and present a comprehensive scale that identifies organizational barriers for adaptation to climate change, while identifying possible causal factors and ways of overcoming them (see Annex D) [1].

Strategies

When analysing the articles for strategies used by the private sector for climate change adaptation, it became clear that there is no one formula or recipe for what adaptation should entail. Responses to climate change are context specific and thus goal-oriented, subjective and intertwine with other actions, decisions and outcomes (Fleming, Rickards & Dowd, 2015). Adaptation strategies within companies are often viewed as part of business continuity and/or a part of 'normal operations' for increased market/business resilience (Surminski et al., 2018; Leventon et al., 2015; Wedawatta & Ingirige, 2012; Marshall, 2010; Sato & Seki, 2010). Diversification is a common strategy for business continuity and increased resilience, whether it is intensification of agriculture (Leventon et al., 2015) or provision of new products or services (Kaesehage et al., 2014). Another common theme that emerged from the literature is the difference in strategies due to the size of the company. Medium and smaller sized companies adopt strategies that are often reactive in nature, whereas larger companies seem to focus more on proactive strategies for long-term risk reduction or benefits (Surminski et al., 2018; Qiu & Prato, 2012; Marshall, 2010). This was evident in Inderberg and Løchen's research on electric distribution companies in Norway and Sweden, where a previously experienced hazard prompted adaptation measures (2012). The type of measures taken were in part influenced by the size of the company, where the smaller companies focused more on repairing and strengthening their distribution network, while the larger companies opted for more longer-term measures aimed at increasing resilience, such as going beyond measures required by law (Inderberg & Løchen, 2012).

A reliance on the insurance industry and insurance products as a strategy for adaptation to climate change was also found in the analysed literature. Biagini and Miller (2013) describe the perceived competitive advantage of the agriculture sector in securing crop insurance while Gasbarro et al., (2016) as well as Wedawatta and Ingirige (2012) found that relying on insurance could limit financial implications. Finally, the literature revealed that the private sector often relies on acquiring climate change information from multiple sources. Kaesehage et al's., (2014) article examined business leaders of SMEs that are engaged in multiple measures related to climate change. They found that business leaders relied on each other for information on climate change which then influenced their ability to implement adaptation measures [1] [4].

2.2.2.3 Adaptive Capacity: Challenges and Opportunities

Adaptive capacity is defined as “*the key attributes of a system that influence its ability to adapt*” (Fleming et al., 2015, p. 203) and depends on various factors such as legislative frameworks, location and size of the company as well as the sector it operates within and the resources it has to utilize (Surminski et al., 2018; Dépoues, 2017).

When looking at influences of the breadth and depth of such adaptive capacity, we first look at one factor identified in the literature, that relates to the system in which the company operates, affecting the ability to adapt to climatic changes. Such systems are both intra-organizational structures that make up the company and societal contexts, the governmental structures that create the frames for how the company can and should operate in the societal context it is within. Since the actual implementation of adaptation measures is usually done locally, adaptive capacity at company level should be analysed on the basis of these national framework conditions, while also being sensitive to other organisation-specific factors that influence the ability to adapt to climate change (Inderberg & Løchen, 2012).

Thus, these structures not only influence the adaptive capacity of the organization, but are also influenced themselves by contextual barriers including incentives and disincentives for adaptation (Herrman & Guenther, 2017) and whether climate change adaptation is perceived to bring challenges or opportunities to the company, will shape the adaptation initiatives. The following sections investigate these topics further and analyse what constitutes adaptive capacity and what challenges and opportunities influence the adaptive capacity of private companies [1] [4].

Governmental Barriers

In a paper intending to analyse and compare adaptive capacity in the cities of New York, United States and Helsinki, Finland, Klein and Juhola found that in New York City, adaptation initiatives were heavily influenced by the Anglo-American administrative traditions that have formed the governmental structure (2018). The state-market dualism, operating a contractual form between the public and private sector has influenced the initiatives for adaptation in New York City, making adaptation a comprehensive strategic plan, immensely supported by the inclusion of the private sector (Klein & Juhola, 2018).

In Helsinki, the governmental structure is based on Nordic European traditions of a strong welfare state, with emphasis on universalism and equality (Klein & Juhola, 2018). In this constellation, society is deeply intertwined and organically related to the state, in which the public sector has a very dominating role that both the private sector and citizens turn to for direction. This is clearly reflected in adaptation initiatives, in that these have been thus far rather exclusive of the private sector, instead focusing their strengths on the public sector and citizen contributions (Klein & Juhola, 2018).

In achieving a strong adaptive capacity for the private sector, the state systems and governmental structures are imperative to acknowledge, as they hugely influence the way in which adaptive measures are applied and how inclusive they are of the private sector. Although it may have been an assumption prior to the scoping study, that well-functioning welfare states, acknowledging the need for climate change adaptation, would be states to turn to for good practices in private sector adaptation, the literature shows that welfare states may actually be a hindering factor in achieving beneficial initiatives from the private sector. Rather, states relying more heavily on market-based elements, are proving to be further advanced when it comes to the private sector showing initiative in adapting to climate change issues. As such, it is not enough to merely shift responsibility from public to private sector in terms of adaptation tasks in order to further the involvement of businesses in the private sector. Especially in states of welfare, the public sector must identify the path for private sector involvement and provide a clear position of how public-private partnerships and activities are expected [1] [2] (Klein et al., 2017).

Organizational factors

The general limitation of how much is understood of adaptation practices and the lack of clearly defined roles and responsibilities of, and within, organisations of different sectors, also greatly

contributes to challenging adaptive capacities of private sector companies (Mitter, Schönhart, Larcher & Schmid, 2018; Klein et al., 2018). Thus, capacity for adaptation is not only dependent on governmental structures, but organisational factors, such as strong leadership and existing organisational barriers (Herrmann & Gunther, 2017).

Another important factor influencing adaptive capacity is that most information on exposure and vulnerability is not within public reach. This limits information sharing and the possibility of learning from other sectors and further the understanding of climate risk complexity and the interdependency between spatial levels (Surminski et al., 2018; Dépoués, 2017; Linnenluecke et al., 2015). Depoués (2017) found that methodological approaches and institutional frameworks to assess climate change risks and engage with climate science are lacking, limiting possibilities of establishing adaptive capacity that is multi-sectorally inclusive and scientifically informed.

Whether there exists focus on climate change adaptation within a company, was found to be partly influenced by high-level leadership and personal values of leaders (Dépoués, 2017; Kaesehage et al., 2014). Lei et al. (2017), including Sato and Seki (2010), discovered that, in order to mainstream adaptation within an industry and for companies to accomplish long-term climate change objectives, strong leadership is required that strategically formulates a specific vision to go by [1].

Risk Perception

The lack of belief in climate change predictions as well as the effect it will have on business processes, is causing some businesses to be less concerned with focusing efforts towards climate change initiatives (Lawrence & Marzano, 2014). This tendency seems to be expressed in sectors less directly exposed to climate changes. As such, companies more directly exposed to climate change, such as companies dealing with forestry, construction, transportation and agriculture, tend to have a perception of climate change being more important and are thus more involved with climate change adaptation activities (Surminski et al., 2018; Fleming et al., 2015; Linnenluecke, Griffiths & Winn, 2013; von Detten & Faber, 2013; Marshall, 2010). For some sectors, incentives to involve themselves in climate change adaptation come from wanting to gain a competitive advantage (Biagini & Miller, 2013) to other firms by “*leveraging capabilities to configure assets in a unique way and by adapting earlier than others to external changes*” (Lei et al., 2017, p. 99). These companies see climate change adaptation as a chance of seizing opportunities that allow them to avoid or alleviate negative developments, such as

seen in the agricultural sector (Mitter et al., 2018) and in industrial companies subjected to impacts from water shortages in Taiwan (Chen et al., 2017).

Such opportunities may be presented as new ways in which services can be delivered. In the case of energy and utility companies, researched across different continents, water shortages due to droughts, have forced these companies into seeking new ways in which energy can be delivered to their customers that are less dependent on water, such as gas-fired generation. As such, being presented with climate change impacts, opportunities not only for individual companies to evolve are emerging, but also innovative and sustainable solutions are arising (Gasbarro et al., 2016) [1].

2.2.2.4 Need for an Enabling Environment

A common theme emerging from the literature was that businesses consider the uncertainty of climate change as high, and thus, seem to shy away from implementing long-term adaptation measures. Some even expressed the fear of implementing a costly adaptation measure that might prove beneficial in the first few years but, due to climate impact variability, that same measure could become useless, or even harmful, in the years after (Biagini & Miller, 2013). Connected to this, the literature also points to an increased will within the private sector for the public sector to; provide clear adaptation policies and governmental incentives where a stronger focus is placed on collaborative public-private partnerships that bridge top-down public sector approaches with bottom-up private initiatives, often influenced and/or led by high-level leadership within the company. These issues will be discussed in turn in dedicated sections below.

Adaptation Policies and Governmental Incentives

A common agreement in the literature exists, on the public sector's role in incentivizing and supporting private sector adaptation. Tompkins and Eakin (2012), discuss in their article on managing private and public adaptation to climate change, that the line between what the government and the private sector should be responsible for, is often very thin. This was then further highlighted in Schneider's (2014) article on responsibility of the private sector, where the public sector was considered responsible for measures that protect the delivery of public services, even when that particular service was under private control. Policy incentives were identified to be likely to facilitate adaptation actions however, with the possibility to stifle them if too restrained or cause confusion if uncertain (Mitter et al., 2018; Surminski et al., 2018;

Fleming et al., 2015; Schneider, 2014). Lawrence and Marzano (2014), recognized in their research, that forest managers in Wales, often worried about short lived policies having no long-term focus, while Pauw and Pegels (2013) found that in developing countries, when the public sector developed national adaptation plans, it created a path dependency focused on acquiring grants that left the private sector out of the decision making process.

A number of articles mention that, the public sector's role is to lead and/or support adaptation. Biagini and Miller (2013) discovered that the levels of company engagement appeared dependent on levels of public sector engagement, while Leventon et al., (2015) recommend that in the case of climate governance, the public sector must lead and define desirable outcomes [1] [2].

Public-private Partnerships

Many of the analysed articles highlighted that the public sector and the private sector often engage in partnerships in regards to adaptation to climate change. A common theme that emerged throughout and which seemed to underscore this need for partnerships was the understanding that climate change affects all, and no single sector can adapt on its own (Klein et al., 2017; Steiner & Atterton, 2015; Kaesehage et al., 2014; Schneider, 2014). When done efficiently, Biagini and Miller (2013) point out that these partnerships can foster innovation and provide new business opportunities. While examining adaptation measures of energy and utility companies, Gasbarro et al. (2016), discovered that many of the measures undertaken by companies were complimented with the engagement of local government [1].

Top-down Public Sector Approaches vs. Bottom-up Private Initiatives

A part of public-private partnerships seems to depend on a balance between public sector approaches, that are often quite top-down heavy, and bottom-up private initiatives. Some contrasting opinions exist in the literature on the value of top-down approaches where Linnenluecke et al. (2013), found, through their literature analysis of firm and industry adaptation to climate change, an objection to top-down approaches and a preference for decentralized decision making. However, some of the articles point to top-down measures and agreements, such as the Paris Agreement and the Kyoto Protocol, as helpful guiding tools in framing the issues and promote shared responsibility, where the role of the company can be more inclined towards bottom up initiatives such as education (Klein et al., 2018; Sato & Seki, 2010). In their research of 30 SMEs, Kaesehage et al. (2014), suggested that, in order for SMEs to create formal and informal knowledge, a shift towards marrying these top-down

governmental frameworks and goals with bottom-up local aspirations and desires is required. Mitter et al., (2018) come to a similar conclusion where they note that achieving a systematic coordination of these top-down and bottom-up activities can increase adaptation efficiency allowing industry considerations into sector specific policies [1].

3 Part 2: Review of National Adaptation Plans

In this chapter, what is known in the broader literature, is narrowed down to what is within the content of national plans, and whether results from the literature review are represented in those plans. As such, this part 2 of the report, seeks to investigate the second descriptive research question, of *'how does it differ in two different contexts such as Denmark and Singapore in regards to national adaptation plans?'*

According to UNFCCC, adaptation is a necessary component in planning at all levels of a nation (2012). Thus, as a way to facilitate this imperative development of adaptation plans at national level across all nations of the world, UNFCCC has developed a national adaptation plan process that guides nations in developing an adaptation plan. NAPs have the objective of reducing vulnerability to climate change through resilience and adaptive capacity building (UNFCCC, 2012). Moreover, NAPs are developed for the purpose of integrating adaptation to existing national policies in a coherent manner, particularly for the sake of sustainable development planning. Through developing NAPs, countries are presented an opportunity to identify vulnerabilities, mainstream climate risks and ultimately apply these identifications into adaptation initiatives (UNFCCC, 2012).

The following section, describes the review process of the Danish and Singaporean NAPs. Denmark's NAP presents an action plan with particular focus on adaptation, opposed to Singapore's, which is presented as a strategy targeting both mitigation and adaptation (Danish Nature Agency, 2012; National Climate Change Secretariat, 2012).

3.1 Country Contexts - A Brief Overview

Denmark and Singapore are two countries roughly 10.000 kilometres apart. The Kingdom of Denmark is part of the Scandinavian countries located in North-Europe with a surface area of 42,920 km². The country has a history of monarchy, with the absolute monarchy coming to an end in 1849 when the constitution of Denmark was signed. Denmark is classified as a constitutional monarchy with a parliamentary democracy and currently has a full democracy classification by the Democracy Index compiled by the Economist Intelligence Unit (EIU, 2019).

The Republic of Singapore is a city-island state located in Southeast Asia just off the southern tip of the Malay Peninsula and has a size of just 722.5 km². Singapore, a former British colony, became a part of Malaysia in 1963. However, it separated from Malaysia two years later and

became a sovereign nation in 1965. Singapore has a unicameral and unitary parliamentary government which operates under the Westminster system and has since self-government been governed by the People's Action Party. According to the Democracy Index, Singapore is currently classified as a flawed democracy where regulated media is often cited as the main cause for this ranking (EIU, 2019; Wikipedia contributors, 2019a).

Despite being situated in different continents the countries share some demographic similarities. Denmark has a total population of 5.8 million while Singaporeans are 5.6 million (Population Figures by Country, 2019). The countries also rank high in regard to social and economic development. The Human Development Index, a composite statistic of income per capita, education and life expectancy indicators, ranks Singapore in 9th place with Denmark following closely behind in 11th place (United Nations Development Programme, 2018). The countries' gross domestic product (GDP) is very similar, where Denmark is in 36th place with US\$354,683 million and Singapore in 38th place with US\$346,621 million according to the International Monetary Fund (2018). The highly developed market economy of Singapore is considered free, ranking in 2nd place according to the Index of Economic Freedom. According to the same index, the developed, competitive and mixed Danish economy ranks in 14th place as mostly free (World Heritage Foundation, 2019; Schwab, 2017). The economy of Singapore is considered innovative and dynamic with more than 7,000 multinational corporations operating in Singapore (Wikipedia Contributors, 2019a; Global Innovation Index, 2018; Williams, 2015). According to the World Bank, Denmark and Singapore are some of the best countries for business-friendliness, ranking in 3rd and 2nd place respectively (The World Bank, 2018).

Denmark and Singapore both play an important role in the international community. Denmark was one of the founding members of the United Nations, NATO, OECD, OSCE and the Nordic Council and is a part of the Schengen area. Singapore was one of the founding nations of ASEAN and hosts the Pacific Economic Cooperation Council Secretariat (PECC) and the Asia-Pacific Economic Cooperation Secretariat (APEC) and is a member of the United Nations (Wikipedia Contributors, 2019a; Wikipedia Contributors, 2019b).

3.2 Country Selection Rationale

As identified above, Denmark and Singapore share a long list of similarities, in terms of population, GDP, having a unicameral parliament, ranking high in social and economic development and playing an active role in the international community. Due to these

similarities, the two countries were chosen, making a cross-national comparative design possible (Inderberg & Løchen, 2012), viewing Denmark as a Europeanised country and Singapore as an Asianised country.

Thus, performing a research of countries allowed to a high degree, to establish an understanding of the two specific countries and to some degree, an understanding of Europe and Asia. However, George, Bennett, Lynn-Jones and Miller argue that having a comparative design as such, will present vulnerabilities to the results, since a degree of indetermination must be present (2005). These limitations and possible shortfalls to the design, must be taken into consideration. However, presenting a cross-national comparative context, provides a possibility to present results from a larger context (Inderberg & Løchen, 2012) which was the desire in this research, as it allowed for a broader understanding of the topic and made room for continent-specific factors that may influence adaptation, to be illuminated.

3.3 Methodology

To provide a means of comparing the content of the two national adaptation plans, different methods were applied to provide varying perspectives on how the plans both include similarities as well as differing focuses (Weber, 1990). Chapter three, from Singapore's NAP was eliminated, as it was explicitly focused on mitigation (National Climate Change Secretariat, 2012), which was not within the research scope of this report. Moreover, even with chapter three excluded, it is important to note that the national adaptation plan for Singapore was approximately 110 pages long, opposed to the Danish national adaptation plan, which was merely 32 pages. This was taken into account in presentation of word counts through which counts were indexed in order to compare them respectfully.

The first method used was word-frequency lists, which provided an understanding of most frequent words in the documents, providing an ability to analyse main focuses (Weber, 1990). An online word counter tool was used (<https://wordcounter.com/>) to create the high-frequency lists from the two documents. In using this tool, small words such as *it*, *this* and *the* etc., generally known as high-frequency words, were removed (Weber, 1990).

In addition to the word-frequency count, a subjective thematic word count was applied in which words from the results of the scoping study, as well as words appearing as important themes during the review of the NAPs, were examined in their appearance throughout the two plans. As such, these words were chosen based on a subjective evaluation of their relation to the topic of CCA in the private sector. From the scoping study, themes were decided as *adaptive*

capacity, opportunities, tools, framework, challenges or barriers, responsibility and leadership. The words were chosen from the study to examine whether the themes observed here, as focus areas for private sector adaptation, were identified as key areas in national contexts as well. To further examine key thematises throughout the two national documents, in terms of how the documents differentiated as well as had similarities between them, a list of 18 other keywords, identified as important during the review of the documents, were included in the category analysis. These consisted of; *uncertainty, innovation, emissions, technology, solutions, green, clean, energy efficiency, learning, vulnerability, international, collaboration/cooperation/partnership, private sector/business/enterprise/companies, mitigation, adaptation, government, ministry, public.* The number of times a certain word or combined keyword is present in a document, indicates the importance of the concept and the focus it has within the document compared to other words (Pauw & Pegels, 2013).

Lastly, content and key aspects of the documents are presented in a table comparing each aspect between the two countries, such as seen in Biesbroek et al.'s comparative analysis on national adaptation strategies (2010). These aspects consist of topics such as drivers for developing plans, hazard focuses, adaptation measures applied and inclusion of innovation. These topics were used in a coding scheme to chart the data in the two plans, much like the methodology applied during the scoping study (see Annex C). The comparison between the two country documents was supported further by an in-depth analysis, highlighting key similarities and differences in light of the country contexts that Singapore and Denmark both operate within, as presented above. As such, the in-depth analysis was conducted by investigating the presence of the emerging topics from the scoping study in the two country documents as well as additional key thematises found during the review of the documents. These thematises were then analysed by same method of charting the data as in the scoping study (see Annex C).

3.4 Results

The following sections present the results from methods used as defined above as well as an in-depth analysis, comparing the content of national adaptation plans of both Denmark and Singapore.

3.4.1 Word-frequency Lists

In performing the word-frequency query, both documents were given a top 25 list of words most frequently used. Table 3 displays the query results, in a descending order, with the most

frequent word used showing at the top. Because the two documents are different in size, the word counts were normalized by dividing them with the number of pages they are spread over, in order to provide a better foundation for comparison. As such, the words are presented as both the actual amount of times they appear, and as normalized numbers through indexes, ranging from 0 to 100 - 100 being the word with the highest frequency (see Annex E).

Table 3
High-frequency word lists from national adaptation plans

Denmark			Singapore		
Rank word	Frequency	Index	Rank word	Frequency	Index
Climate	237	100	Singapore	492	60
Change	216	91	Climate	397	49
Adaptation	156	66	Change	373	46
Ministry	80	34	Energy	257	32
Government	70	30	Develop	217	27
Denmark	69	29	Emission	173	21
Water	68	29	Water	136	17
Plan	62	26	Global	128	16
Environment	52	22	Green	111	14
Danish	48	20	National	111	14
Municipality	46	19	Country	108	13
European	43	18	Carbon	102	13
Initiative	41	17	Research	101	12
Develop	40	17	Environment	158	19
Action	40	17	Sustainable	81	10
Effort	39	16	Effort	80	10
Project	38	16	Reduce	77	9
Ensure	35	15	Public	73	9
Management	34	14	International	70	9
New	32	14	Growth	65	8
Cloudburst	30	13	Solution	64	8
Knowledge	30	13	Future	61	7
Green	29	12	Help	61	7
Solution	29	12	Build	60	7
Climate-proof	29	12	Manage	58	7

What is un-noteworthy and expected, is that words such as *climate* and *change*, as well as the name of each document's respective country, rank high on the lists. What is noteworthy, is that *adaptation* ranks as third highest in the Danish plan and does not appear in the top 25 words of the Singaporean plan at all. *Adaptation* has an index of 66, being a more frequent word than even the most frequent of all in the Singaporean document (which is the word *Singapore* with an index of 60). Moreover, most frequent words in the Danish plan include words such as

ministry, government and municipality - words that do not appear on the Singaporean list, but may be compared to words such as *global, national, country and international* that appear on the Singaporean list and not on the Danish one. This indicates that Denmark has a strong focus on public responsibility and initiative, well in line with the welfare state system that Nordic European countries are traditioned to be inclined to (Klein & Juhola, 2018), and that Singapore has a stronger focus on placing themselves in relation to the broader international community.

Both country documents have the words *water, green and environment* ranking high in the frequency lists, indicating that both countries have a proximity to climate risks related to water and that they are focused towards a greener and sustainable future for the environment. Singapore frequents the words *energy, emission and carbon*, while Denmark's plan is focused towards cloudbursts and risks that these pose to the country.

The above high-frequency lists are also presented below in Figure 3 and 4, where each square represents a word from the NAPs and the size of the square corresponds to the frequency it appears with in the document.

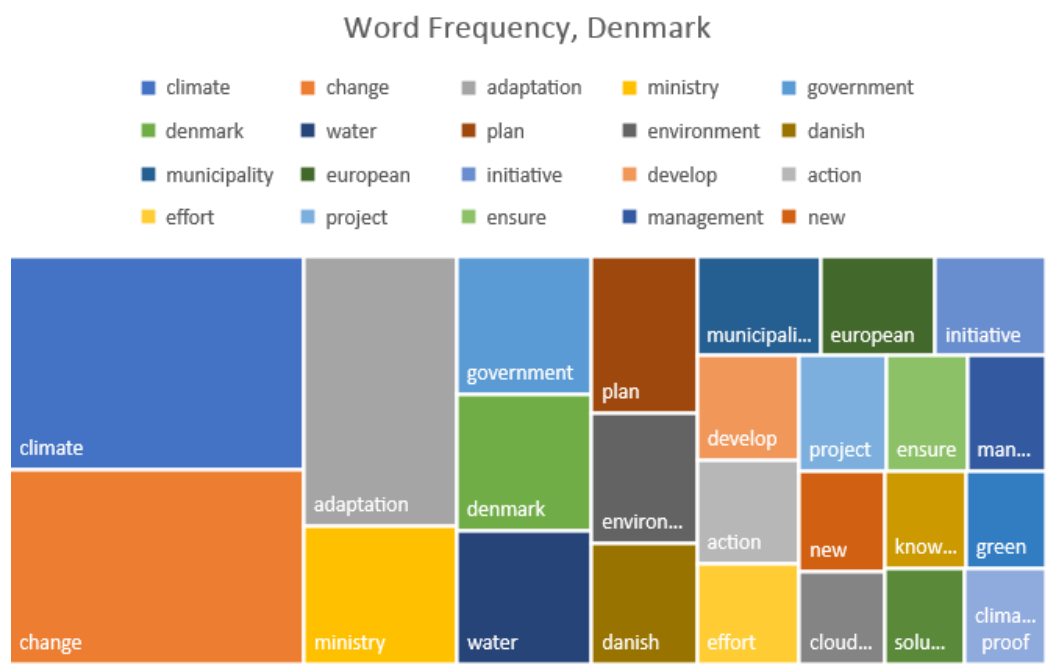


Figure 3. Word-frequency illustration - Denmark

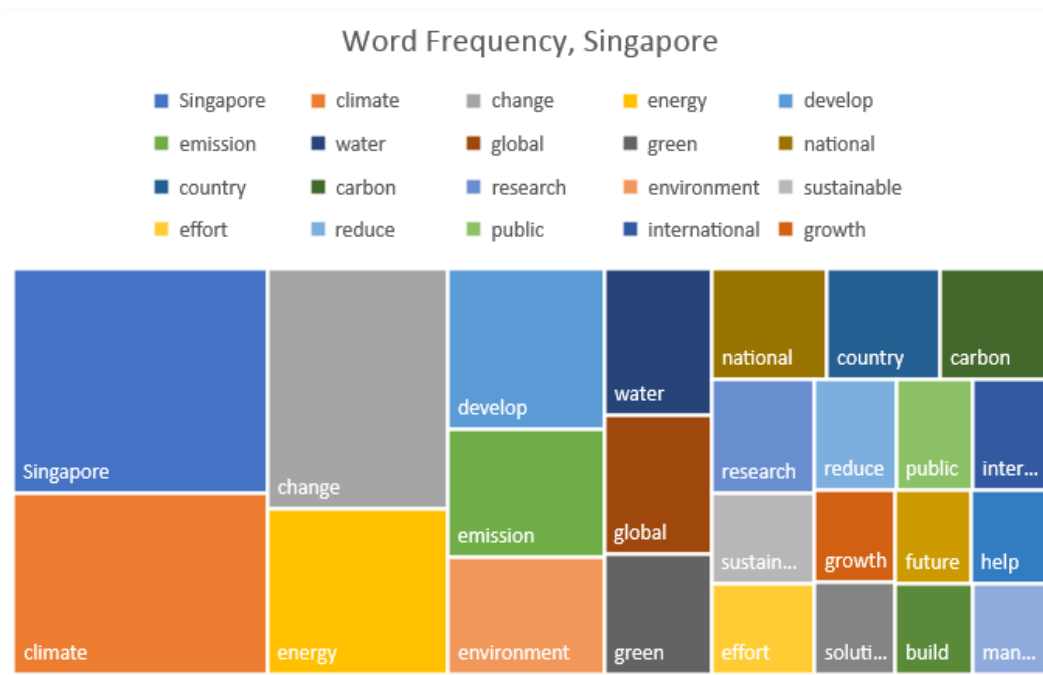


Figure 4. Word-frequency illustration - Singapore

3.4.1.1 Thematic Word Count

A supplemental list was created, as additional words to examine the frequency off, that were expected to be present in the documents, based on the scoping study results, and thematises occurring during reviewing the documents. These words were also ranked in indexes, taking account for difference in document lengths, through calculating the normalized word count and converting into indexes (see Annex E).

Table 4 shows words derived from the scoping study presented above the dotted line, with words derived from reviewing the national adaptation plans presented below the dotted line.

Table 4
Thematic word counts from national adaptation plans

Thematic word	Denmark		Singapore	
	Frequency	Index	Frequency	Index
Adaptive capacity	0	0	0	0
Challenges or barriers	27	5	52	9
Framework	18	3	17	3
Leadership	0	0	4	1
Learning	0	0	2	0
Opportunities	9	2	44	8
Responsibility	6	1	16	3
Uncertainty	3	1	1	0
Adaptation	166	100	49	9
Clean	0	0	81	14
Collaboration or Cooperation or Partnership	45	8	71	12
Emissions	2	0	176	31
Energy efficiency	0	0	29	5
Government	70	12	44	8
Green	31	5	161	28
Innovation	20	4	36	6
International	11	2	71	12
Ministry	80	14	17	3
Mitigation	0	0	24	4
Private sector or Businesses or Companies or Enterprises	35	6	109	19
Public	10	2	77	13
Solutions	28	5	65	11
Technology	9	2	106	19
Tools	12	2	0	0
Vulnerability	6	1	14	2

What is noteworthy from the word counts is that none of the documents mention adaptive capacity, and only mention leadership, learning and uncertainty to a very small degree, which was assumed to have a higher presence, in light of the findings from the scoping study. This indicated the need for high-level leadership and continuous learning. However, the combined keywords *adaptive capacity* not being explicitly expressed in the documents, may not be indicative of the concept of adaptive capacity not being acknowledged, but rather that the words are not appearing in this form, but are expressed implicitly through the actions and initiatives outlined in the documents.

What is interesting, but not surprising, is that Singapore frequents the words *emission*, *technology*, *clean* and *energy efficiency* at a higher degree than Denmark, receiving indexes

31, 19, 14 and 5 respectively in the Singaporean document and indexes 0, 2, 0 and 0 respectively in the Danish document (see Table 4). This clearly illustrates the differing perspectives and approaches to CCA that the two countries have, in which Singapore is highly focused on lowering GHG emissions, through innovative technology (National Climate Change Secretariat, 2012).

Comparing the words of *mitigation* and *adaptation*, it is interesting that the word *mitigation* receives an index 4 in the Singaporean document and an index 0 in the Danish document, compared to the word *adaptation* that receives a whopping index 100 in the Danish document, compared to merely index 9 in the Singaporean document. This indicates that Denmark has a much stronger focus on climate change *adaptation* rather than *mitigation*, opposed to Singapore, that applies a relatively equal weight on the two concepts. However, in this relation, it must be noted that the national adaptation plan of Denmark is specifically developed as an action plan for adaptation whereas Singapore's document is a broader strategy for both mitigation and adaptation.

3.4.2 Content Comparison

Table 5
Key aspect comparison of national adaptation plans

Focus	Denmark	Singapore
Name of plan/strategy	How to manage cloudburst and rain water. Action plan for a climate-proof Denmark	Climate Change & Singapore: Challenges. Opportunities. Partnerships. National Climate Change Strategy
Year of publication	2012	2012
Main author / developing body	The Government of Denmark - Ministry of Environment and Food	The Government of Singapore - the Ministry of Environment and Water Resources and Ministry of National Development.
Key drivers for the plan/strategy	Climate change is considered real	Climate change is considered real
	Sense of urgency to act	Sense of urgency to improve energy efficiency and lower GHG emissions
	Responsibility towards being prepared	Responsibility towards being prepared
	Engaging the entire society towards action	Engaging the entire society and the international community towards action
	A need to map vulnerability	Vulnerability
	Economic opportunities Green transition Operating within a multilateral framework	Economic opportunities Green transition Operating within a multilateral framework
Influence from older plans/strategies	The Danish Planning Act (2000) and Mapping climate change - barriers and opportunities for action (2012)	Singapore Green Plan (1992), Sustainable Singapore Blueprint (2009)
	Increased precipitation	Increased precipitation
	Flooding	Flooding
	Sea level rise	Sea level rise
	Rise in groundwater levels	Rise in groundwater levels
Focus on particular hazards / potential risk factors	Increased temperature	Increased temperature
	Heatwaves	Heatwaves
	Dry spells	Drought
	-	Fires
	-	Disruption to food supply Disruption to business supply chains
Soft and green adaptation measures	New policies for municipalities developing their own plan, flood risk mappings, legislative amendments, revision of railway and building standards, awareness campaigns, Portal for CCA	New regulations, restoring mangroves, monitoring risk areas, outreach programs for citizens residing in at risk areas, promoting public transport, vulnerability assessments, insurance for risk transfer.
Hard / grey adaptation measures	Retention basins and canals, use of excavated soil for dikes and dams, increased pump capacity.	Seawalls, rock slopes, raising roads and ground levels for flood risk mitigation and diversification of water sources.
Innovation	Investments in wastewater area to support innovation. Funding for green technology.	Vertical indoor farming, innovation hubs - CREATE centers, forming partnerships between the government, research community and businesses for export of innovative solutions.

A comparison of the key aspects of Denmark's and Singapore's NAP was made in order to gain an overview of the documents' main focus. Both documents were produced in the year

2012 and by a similar body within the government - the Environmental Ministry. Although Singapore places energy efficiency and GHG emission mitigation as a country priority, similar key drivers for the development of both documents were found. Singapore and Denmark recognise climate change as a real phenomenon, a certain responsibility that extends from the government to the private sector and civil society to act in an urgent manner, while also recognising the need for the global community to come together. Both countries are motivated towards a green transition and identify certain economic opportunities with climate change adaptation. Moreover, both country documents focus on similar hazards and potential risk factors. Most apparent were hazards related to water, from having too much water, e.g. increased precipitation, to lacking water, e.g. droughts and dry spells. Singapore recognises that hazards manifesting elsewhere could potentially place Singapore at risk, disrupting both the country's food supply and business supply chains. Similar adaptation measures are being applied in both countries where the use of hard/grey, soft and green measures are highlighted. Innovation is also promoted in Singapore and Denmark, recognising specific potentials for developing solutions, that may later be exported for the benefit of the global community. Denmark sees potential in innovative wastewater solutions whereas Singapore has developed strategic innovation hubs offering businesses the access to form partnerships with the government and researchers towards developing innovative and exportable solutions.

3.4.3 In-depth Content Comparison

The documents *Action plan for a climate-proof Denmark* and Singapore's *National Climate Change Strategy 2012* were read in full and analysed in detail in order to identify and compare the two countries in how they address and possibly include the private sector in their country specific adaptation plans. The in-depth document analysis is based on the scoping study results, where emerging themes in the scientific literature were identified and reflected upon. The scoping study results indicated a need for an *enabling environment* where the government has more influence on implementing a facilitating path, where actors within the private sector have a clear idea of what the national priorities are and thus what is expected of them, what funding, tools and guidelines are provided and where certain opportunities for growth and innovation can be expanded upon. These themes were adjusted in accordance to additional themes that emerged during the national document analyses and have been summarised into two sections concerning *enabling environment* and *opportunities for growth and innovation* under which a collection of sub-thematises and their content in the documents are reported.

3.4.3.1 Enabling Environment

A key factor for private sector climate change adaptation emerging from the scoping study was the private sector's desire for the public sector to provide a more structured and guiding environment. The private sector experiences uncertainty towards climate change impacts and necessary preventive measures. There is a wish for policies clearly indicating what is expected of companies where opportunities for economic growth are presented and are sustainable for the long-term. Thus, there seems to be a call for an enabling environment. Various factors influence whether an environment can be considered enabling. The United Nations Development Programme (UNDP) defines the enabling environment as "*the term used to describe the broader system within which individuals and organizations function and one that facilitates or hampers their existence and performance*" (UNDP, 2008, p. 5). An enabling environment for businesses is defined by the United States Agency for International Development (USAID) as "*...the set of policy, institutional, regulatory, infrastructure and cultural conditions that govern formal and informal business activities. It includes the administration and enforcement of government policy, and national and local institutional arrangements that affect the behaviours of relevant actors who, together, comprise many of the important players in the business-enabling environment*" (USAID, 2011, p. 4). To examine how such an enabling environment could or should exist for the private sector in climate change adaptation, Denmark's and Singapore's plans were reviewed, with a specific focus on tools and solutions, guidelines and strategies, incentives, opportunities, partnerships and innovation [1].

Tools and Solutions

A number of tools to facilitate the private sector in CCA were identified through the in-depth analysis of the scoping study. Tools can be used in the development and implementation of adaptation solutions where the private sector, being well versed in adapting to new business environments, is arguably the best suited entity to engage with, for the development of both solutions and tools.

The use and mentioning of tools are barely touched upon in Singapore's plan. The document only lists tools in relation to research for the purpose of increased insight to climate change impacts related to scientific research and modelling purposes. Despite this, Singapore places a strong emphasis on solutions and the opportunity of the private sector's proactive role in developing *innovative technologies and solutions* (National Climate Change Secretariat, 2012,

p.12). Being a small city-state, Singapore has needed to be innovative in the past. Now the country sees an opportunity to support businesses in their quest to develop and test new green-growth and innovative solutions with the end goal of exporting them. As was reflected upon in the country context chapter, Singapore is a business-friendly country with more than 7,000 multinational corporations operating there. This solutions-based welcoming strategy of Singapore is thus highly reflected in their NAP and the number of multinational corporations deciding to operate from Singapore.

Unlike Singapore's plan, the Danish plan highlights the availability of tools for companies to assess risks relating to sea level rise and potential property damage through their portal for CCA: klimatilpasning.dk. Denmark, like Singapore, is looking towards opportunities for the private sector to develop and export solutions. The document explicitly mentions that in relation to water solutions, a number of companies have already developed solutions attracting international demand (Danish Nature Agency, 2012) [1].

Guidelines and Strategies

Due to Singapore's small size and renewable resource scarcity, the country has holistically mainstreamed adaptation and has, since independence, been focused on strategic measures aimed for long-term resilience, particularly in regard to energy efficiency and water diversification. In fact, from as early as the 1960's Singapore has highlighted that in terms of liveability, environmental sustainability is key and the whole of society is engaged in the formulation of environmental policies due to various stakeholders' perspectives being integrated. The Singaporean government also recognises for policies addressing climate change to be both flexible and nurture the potential to develop solutions beneficial to the world. The strategy addresses the private sector explicitly in the need for companies, in the case of extreme weather events and possible disruptions, to review their business continuity plans. The strategy then mentions a few examples where companies are doing their part in guiding and inspiring their business partners in water conservation and energy efficiency actions (National Climate Change Secretariat, 2012).

The Danish NAP offers some concrete examples of guidelines and policy initiatives aimed at the private sector. Like Singapore's plan, the Danish plan explicitly mentions the importance of local stakeholders' specific knowledge for adaptation decisions and that the government's role is to ensure "...a framework that makes an economically viable, timely and coherent effort possible" (Danish Nature Agency, 2012, p. 8). The Finance Act includes a new policy for

business-and-growth where Danish companies are encouraged to participate and gain a share in the green solutions global market. Denmark also works with the EU on ensuring that sector policies in e.g. fisheries and agriculture incorporate impacts and changing conditions resulting from climate change. On the more local level, municipalities are provided with guidance on how to incorporate climate change into their local development plans (Danish Nature Agency, 2012).

Incentives - Funding and Initiatives

Both the governments of Singapore and Denmark have ambitiously developed facilitating initiatives and funding schemes for climate change adaptation, especially for green growth and innovation. Singapore and Denmark recognise that initiatives need to have a cross-sectoral approach with broad objectives, that transition towards climate resiliency can be costly for the average individual and SMEs, and therefore, support through incentives is necessary. An example of this is Singapore's S\$100 million *Green Mark Incentive Scheme for Existing Buildings* (gmiS-EB), where building owners can offset a part of the cost of retrofitting their buildings for energy efficiency. For the purpose of green growth and technology, the Danish government has earmarked DKK 122,6 million towards the development and marketing of technical solutions with CCA potential (Danish Nature Agency, 2012). Singapore is then funding multiple research and development projects aimed towards green growth, energy and environmental sustainability (National Climate Change Secretariat, 2012).

3.4.3.2 Opportunities for Growth and Innovation

As defined above, and found in the results from the scoping study, the government should provide an enabling environment in which a framework for inclusion of the private sector is addressed, in order for the private sector to be included and supported in achieving national adaptive capacity. In doing so, imperative to achieving a successful enabling environment, is that this environment, set forth by national policies such as the NAPs, are identifying key opportunities for growth and innovation within the private sector, so that private businesses achieve a clear picture of their path, benefits, responsibility and opportunities for growth within the adaptation scene.

Such opportunities for growth in the private sector, as defined in the NAPs, can be divided into issues related to partnerships and innovation as a basis for creating opportunities within the

private sector. The following two sections will dive into how national adaptation plans address these issues in specific relation to private sector inclusion in adapting to climate change.

Partnerships with the Private Sector

Biagini and Miller (2013) point out that public-private partnerships, when done right, can foster and provide new business opportunities. Thus, these partnerships both benefit private companies as well as governments seeking to address climate change issues, in that new innovative technologies are emerging, allowing for new business opportunities, economic growth and better solutions to adapt to climate change (Gasbarro et al., 2016).

In the Danish national adaptation plan, new cooperation forums are presented that have the objective of supporting new partnerships as Denmark expresses that “*dealing with the climate challenge requires collaboration between authorities, organisations, private enterprise and individuals*” (Danish Nature Agency, 2012, p. 5). To ease and further support the collaboration of public and private entities, Denmark has implemented new legislative amendments, such as the amendment to the Water Sector Act, in which wastewater companies are now allowed to invest, to allow for projects being co-financed by two opposing sectors. Moreover, the government has outlined a criterion for municipalities defining that, in order to obtain state funding, they must engage in cooperation with private companies (Danish Nature Agency, 2012). As such, Denmark explicitly expresses the intention for the government to engage in public-private partnerships in the national adaptation plan as it will allow for innovative solutions, that in return will benefit economic growth.

The Singaporean NAP also has a rather explicit mentioning of the intention of partnerships. The title being “*Climate Change & Singapore: Challenges. Opportunities. Partnerships*” includes the word *partnerships*, and the forewords of the document state that these are key elements of Singapore’s effort to address climate change (National Climate Change Secretariat, 2012). The document highlights a strong focus for international collaboration in order to achieve the ultimate goal of lowering GHG emissions in order to transition into a low emission economy. Much like the Danish plan, the Singaporean one acknowledges the need for a comprehensive cross-sectoral engagement in addressing climate change issues, stating that “*the people, private and public sectors need to work in close partnership to increase gains in energy efficiency*” (National Climate Change Secretariat, 2012, p. 67). One way Singapore is already well immersed in public-private partnerships, is through the initiative of solar systems that the government is leasing from private companies, which are fully owned, financed,

designed and maintained by the private companies (National Climate Change Secretariat, 2012).

Innovation in the Private Sector

As the scoping study found, both Denmark and Singapore identify in their national adaptation plans, partnerships between the public and the private sector will foster opportunities for growth if done right (Biagini & Miller, 2013; National Climate Change Secretariat, 2012; Danish Nature Agency, 2012), and especially through new innovative solutions that may not have emerged had the cross-sectoral cooperation not been established. As such, new innovative solutions are emerging in the climate adaptation scene (Gasbarro et al., 2016) and in the following, some of the tendencies in relation to private sector inclusion, are highlighted.

In the Danish NAP, most efforts to foster partnerships and innovative solutions, are applied in the wastewater area, through investments and funding for green technology. To support these investments, knowledge institutions are identified as a means of reaching competencies that will contribute to innovation (Danish Nature Agency, 2012). An example of such knowledge institutions, is the five European Innovation Partnerships (EIPs) as part of the 2020 Innovation Union - one of seven flagships in the Europe 2020 Strategy (Aho et al., 2014). One of the EIP's (the EIP Water), is established with the aim of developing innovative solutions for challenges related to water across all nations of the EU (European Commission, 2016). As such, the innovation centre of the EU, adds a supporting background for the Danish efforts to create public-private partnerships to develop innovative solutions tackling climate change issues.

Like the EU, Singapore has engaged in developing innovation hubs, under the name of CREATE (Campus for Research, Excellence and Technological Enterprise), that have explicit focus on developing technologies to address climate change issues through adaptation and mitigation (National Climate Change Secretariat, 2012). The centres facilitate close collaboration with private companies (especially technology start-up companies) and Singapore's universities and research institutes (National Climate Change Secretariat, 2012). As such, Singapore has strong emphasis on forming partnerships between the government and the private sector for the benefit of developing new innovative solutions to support the goal of addressing climate change issues through transitioning to a low emission nation (National Climate Change Secretariat, 2012) [2].

4 Part 3: Company Reviews

The aim of this section is to answer the last two descriptive research questions put forth in the beginning of the report on; *'how companies communicate climate change and climate change adaptation in their annual business reports?'* and *'how do private companies view themselves and their position to climate change adaptation?'* Thus, in order to answer these questions, this third part of the report is divided into two sections; a review of company annual reports and interviews with key informants.

4.1 Methodology

The Singapore Straits Times Index (STI) and the Danish Gold 1000 list (Top 30 companies from Singapore's STI, 2019; Laugesen & Kongskov, 2018) were examined in order to identify the largest listed companies from both countries. To facilitate comparison of reports from these two countries a decision was made to only look at 20 companies from each country that were among the highest grossing companies listed. This was done under the assumption that, in order to eliminate the possible influencing factor of company size and resources available to engage with climate change adaptation, it would be best to only look at companies of similar size. This in turn would also provide reports that during their development, followed similar guidelines and were of similar length and scope.

To identify how much focus the annual reports placed on climate change and climate change adaptation, a list of keywords was developed with the purpose of encompassing a broad scope of words to capture all possible mentions of climate change and CCA in the reports. In order to identify the relevant words for the list, words that had come up from parts 1 and 2 of the report such as; *monitoring and evaluation*, *climate-proof* and *adaptive capacity*, were used. Other words deemed important to include were identified through the most recent IPCC Special Report glossary (IPCC, 2018). This produced a list of 43 keywords to search for in the reports. A few words, such as; *adaptation pathway*, *disaster risk reduction* and *extreme weather* produced zero to very few hits and were, along with 19 others, eliminated from the list. The end result comprised 24 words that were deemed important. The full list of keywords can be seen in an annex (see Annex F).

To account for the different lengths of the annual reports, the method of word-count normalisation used in part 2 was also used here. This allowed for a ranking of the 20 companies from each country, 40 in total, based on the number of keywords listed in their reports. At the

time of review, not all of the companies had published their annual report for 2018. When that was the case, reports from 2017 were reviewed. Two of the 20 companies from Denmark; NEAS Energy A/S and USTC A/S, did not have an annual report from neither 2017 nor 2018 and were therefore excluded from the analysis leaving a total of 38 reports for review.

In order to gain further insight to how companies communicate climate change and CCA in their reports, an in-depth analysis of the two companies from each country that had the highest word-count ranking was conducted.

An initial wish was to choose companies that operated within the same sector, across the two different countries. However, since the 20 companies at review from each country were from very different sectors, this was not possible. Instead, the four companies, two from each country, were chosen for review, based on results from the word counts. Here we chose to look at the companies from each country that received the highest ranking word score, thus placing the highest emphasis on CCA in their reports. This was done to review the companies that were assumed to be delivering the best practises for engaging with climate change and CCA, in order to derive these applied frameworks for input on how private companies can have a more viable role in CCA.

Key concepts for the in-depth analysis were identified based on emerging thematises from the scoping study, review of country NAPs and through review of the business reports themselves. This inclusion of thematises from previous parts of the report was done for the purpose of identifying which thematises appeared in the documents and which did not. The identified key thematises that emerged were; *integrated reporting*, *sense of responsibility*, *strategies applied and results achieved*, along with their sub-thematises and can be seen in the following results chapter.

To support and further investigate findings from the scoping study, review of NAPs and annual reports, interviews were conducted with the private companies at review. This allowed for us to gain a field perspective to complement and test our key findings. All four companies were contacted with the hopes of obtaining key informants to represent the company. Of the four companies, Danfoss and Novo Nordisk, the two Danish companies under review, provided their sustainability spokesperson, resulting in semi-structured interviews conducted with these two. The framework for the semi-structured interviews with identification of connection of questions to thesis results, as well as interview transcripts, can be viewed in the annexes (see Annex I; Annex J; Annex K). The framework developed for the semi-structured interviews

with identification of connection of questions to thesis results, as well as interview transcripts, can be viewed in the annexes (see Annex I; Annex J; Annex K). The interview framework identified both the initial questions for the informants as well as possible follow-up questions, dependent on the assumed answer given during the interview. This can be seen in the framework, as well as the connection of the questions and their answers to the thesis findings. This allowed for testing the findings with a field perspective (see Annex I)

4.2 Results

The four companies ultimately chosen for review, were Sembcorp Industries Ltd and DBS Group Holdings Ltd from Singapore, and Danfoss A/S and Novo Nordisk A/S from Denmark, as these were identified to have the highest word-count frequency (see Table 6). The complete word-count frequency list can be seen in an annex (see Annex H).

Sembcorp Industries Ltd operates in multiple markets worldwide providing solutions related to energy and utilities, marine and offshore engineering and urban development. Sembcorp sees potential in the global energy transition with a portfolio in thermal power plants, renewable solar and wind power assets, energy-from-waste facilities and biomass. The company employs more than 7000 people with total assets over S\$22 billion (Sembcorp, 2019).

DBS Group Holdings Ltd is a multinational banking and leading financial services group headquartered in Singapore. Last year, the bank celebrated 50 years and was awarded by Global Finance the prize of World's Best Global Bank (2018). In 2003, the company changed its name from the Development Bank of Singapore to the Digital Bank of Singapore, representing their changing role in a digitalized world (DBS, 2017).

Danfoss is an engineering business, delivering innovative solutions across a wide range of industries, operating since 1933. The core areas of Danfoss' business is within power solutions, cooling and heating systems, electric motors, firefighting systems, high pressure pumps and industrial automation (Danfoss, 2019). The company is in 14th place of the top performing companies in Denmark (Laugesen & Kongskov, 2019).

Novo Nordisk is a pharmaceutical company, delivering medical products for diabetes care as well as other serious chronic diseases, with more than 95 years of experience and operations in more than 170 countries (Novo Nordisk, 2019). The company is in second place of the top performing companies of Denmark (Laugesen & Kongskov, 2018).

The following sections dive into results from the annual reports of these four companies; divided in sections of a numerical word frequency analysis of the reports, followed by a thematic analysis related to *integrated reporting, sense of responsibility, strategies applied and results achieved*.

4.2.1 Annual Reports Results

4.2.1.1 Word-frequency List

The four highest ranking companies and their respective word count can be seen in Table 6 below.

Table 6
Word-count of the four highest ranking companies

Words	Singapore				Denmark			
	DBS		Sembcorp		Novo Nordisk		Danfoss	
	Numerical	Index	Numerical	Index	Numerical	Index	Numerical	Index
Adapt	6	1	7	1	14	3	0	0
Adaptation	4	1	0	0	0	0	0	0
Climate	40	7	150	28	53	10	43	8
Climate Change Adaptation	2	0	0	0	0	0	0	0
Climate change or global warming	36	7	79	14	11	2	18	3
Disaster	4	1	0	0	4	1	4	1
Emission	54	10	160	29	201	37	54	10
Energy efficien[...]	10	2	17	3	7	1	58	11
Environment[...]	145	27	419	77	389	72	80	15
Environmental or climate risk	0	0	21	4	0	0	0	0
Green energy	0	0	2	0	0	0	7	1
Hazard	0	0	0	0	7	1	0	0
Impact assessment	0	0	2	0	4	1	0	0
Innovat[...]	102	19	83	15	177	33	152	28
Kyoto protocol	0	0	0	0	0	0	0	0
Mitigat[...]	82	15	43	8	25	5	43	8
Paris Agreement	2	0	5	1	4	1	11	2
Recycl[...]	28	5	36	7	18	3	7	1
Resilien[...]	14	3	7	1	0	0	0	0
Risk assessment	20	4	19	4	7	1	11	2
Risk manage[...]	313	58	191	35	35	7	457	84
Sustainab[...]	207	38	364	67	212	39	544	100
Sustainable development	26	5	29	5	32	6	25	5
Sustainable development goals	8	1	21	4	14	3	11	2
Average numerical word count	46		69		51		64	
Average index		8		13		9		12

To allow for more representative comparison between the word counts, the results were estimated numerically and represented by indexes ranging from 0 to 100, with 100 indicating the word with the highest frequency across all 38 reports and 0 indicating the least frequent word. The calculation of indexes, as well as the results of the normalized word counts, can be seen in the annexes (see Annex E; Annex H). In choosing which four companies to review, the total index was summed up for each company report and averaged, which can be seen at the

bottom of the table. The average index for the highest scoring annual reports ranged from 8 to 13.

On average, the reports included 17 out of the 24 words deemed important to include. Amongst the most common words and word-roots for all reports were; *sustainab..*, *'risk management'* and *environment..*

4.2.1.2 Integrated Reporting

When companies report on climate change adaptation initiatives, it is most often done through chapters of their annual reports concerning sustainability issues, corporate social responsibility (CSR) or social responsibility. In doing so, private companies often rely on the guidance of various frameworks developed for disclosure of climate-related issues such as the Task Force on Climate-related Financial Disclosures (TCFD), the Global Reporting Initiative (GRI) and the Ten principles of the UN Global Compact. Moreover, Singapore adds the Singapore Exchange (SGX) sustainability reporting guide to the list of guidelines for climate-related issues reporting.

The GRI is a United States based non-governmental organization with the purpose of delivering a clear framework for businesses to identify, gather and report on climate related environmental, economic and social impacts, in order to understand their position in environmental challenges and empower decision-making that benefit all stakeholders involved (Global Reporting Initiative, n.d.). The GRI delivers global standards for companies to deliver a sustainability report, including reporting on the Sustainable Development Goals (SDGs) (Global Reporting Initiative, n.d.). As such, many companies are seen publishing a separate sustainability report next to their annual reports, intended for presentation to stakeholders including investors. Doing so can be argued as a positive and negative initiative, as it on one side shows commitment from businesses in sustainability reporting and engagement with climate change issues, but on the other hand, can be argued to hide the content of such reports away, including perhaps their focus, since these reports are not intended for presentation to investors, but rather serve as supplemental reading.

The Danish company, Novo Nordisk, published an integrated report for this precise reason - the only one of the four companies under investigation to do so. The company has done this to present a report inclusive of all activities within the company in a uniform integration of performance, progress, positions and strategic initiatives, in relation to financial,

environmental and social aspects (Novo Nordisk, 2018b). Thus, instead of relying on the GRI standards, that push for a separate sustainability report, Novo Nordisk bases the annual report on the International Integrated Reporting Framework alongside the ten principles of the UN Global Compact (UNGC) (Novo Nordisk, 2018a). The ten principles of the UNGC, define fundamental responsibilities related to human rights, labour, environment and anti-corruption, that a company should operate within (United National Global Compact, 2018), and drive the content elements of the annual report of the Danish Company, Danfoss as well as the Singaporean company, Sembcorp (The Danfoss Group, 2018; Sembcorp, 2017).

In Table 7, the difference between the four company annual reports is shown, in relation to the composition of report documents and the frameworks on which content is based for reporting on climate related issues [3].

Table 7
Reporting frameworks

Company name	Reporting type	Frameworks applied				
		Global reporting initiative	Ten principles of UNGC	International Integrated Reporting Framework	The Task Force on Climate-related Financial Disclosure	SGX Sustainability reporting guide
Development Bank of Singapore	Separate sustainability report	x				x
Sembcorp, Singapore	Separate climate change strategy	x	x		x	x
Danfoss, Denmark	Separate sustainability report		x			
Novo Nordisk, Denmark	One consolidated report		x	x	x	

4.2.1.3 Sense of Responsibility

Another influencing factor on how private companies are communicating and engaging with their climate change adaptation initiatives, is the stance they take on climate change, the role they believe they have in a society attempting to adapt and thus the sense of responsibility the companies have. In this relation, it seemed a determining factor, whether companies thought of themselves as a facilitator of climate change, or as supporting agents of climate change mitigation.

An example of this stance to accountability is shown in the annual report of the Danish company Novo Nordisk, in which the company states that, what drives their initiatives is first and foremost the goal of defeating diabetes and other chronic diseases. This sense of purpose, then extends to their responsibility as a corporate citizen - being a citizen much like individuals

of society, whom must all do their part if the world is to achieve the sustainability goals set forth by the UN, and to achieve a global society adaptable to climate change (Novo Nordisk, 2018a). The importance of engaging with climate change adaptation is an understanding shared by all of the four companies at review. And all companies, have adopted relatively the same position as Novo Nordisk, acknowledging their own GHG emission part-taking, as well as their overall environmental footprint from operations. However, where Novo Nordisk views themselves as a contributing citizen, the other Danish company under review, Danfoss, has larger emphasis on how the company can contribute to solutions that will combat climate change, rather than viewing their operations as contributing factors. Nevertheless, from Danfoss merely having *climate* as a key element for consideration in their 2017 report, *climate change* is now on top of their business strategy for 2018 (The Danfoss Group, 2017).

This stance to climate change drives the initiatives set forth by the companies and the opportunities they see in the issue of climate change, which the scoping study findings also highlight. An example of this is the way Danfoss acknowledges the Sustainable Development Goals, as a potential for creating sustainable solutions that the world needs - through innovative engineering, combined with their application know-how (The Danfoss Group, 2018). The Singaporean Company, DBS, also realises the opportunities climate change presents, in that banks can play an influential and important role in a society transitioning to a low carbon economy (Digital Bank of Singapore, 2017). This too, is well in line with how Sembcorp positions themselves in relation to a transition to a low carbon economy, in that a such a transition will entail an energy transition that Sembcorp can play an imperative role in, being an energy and utility provider (Sembcorp, 2017). As such, the incentives for engaging with climate change, are quite equal around all four businesses at review; each of them acknowledges their own environmental footprint and need for doing their part in combating climate change, although each to a different degree, and realising that climate change presents opportunities for economic growth that should be seized [4].

4.2.1.4 Strategies Applied

The annual reports easily communicate how companies view climate change and their role and responsibility in climate change through statements from CEO's and overall integration of climate change rhetoric throughout the reports. However, actual engagement with climate change can be further investigated by how the companies apply and innovate CCA measures, engagement with the SDGs and other public-private partnerships for adaptation. It is however,

important to highlight that these four companies belong to different sectors and therefore have different entry points for CCA according to their sector specifics that will both provide them with different opportunities and limitations for engagement. This sector difference was evident when the companies' engagement with the SDGs, and what SDGs they recognise as important to their business, was investigated. The SDGs are 17 global goals that the United Nations General Assembly set in 2015 as foundation for the 2030 Agenda for sustainable development. The broad and interdependent goals have a list of targets to achieve and have been mainstreamed into national policies as well as business plans and strategies (Sorg & Hamelen, 2018; Dongxiao, Esteves, Martines & Scholz, 2017; Assembly, 2015). The four companies under review all mention the SDGs in their annual reports and have chosen two to four specific goals that they believe the company can achieve the greatest positive impacts towards. The goals the companies chose to focus on, can be seen in Table 8.

Table 8
List of SDGs mentioned in the annual reports

Company	Sustainable Development Goals mentioned
DBS	SDG 7 – Affordable and Clean Energy SDG 8 – Decent Work and Economic Growth SDG 12 – Responsible Consumption and Production SDG 13 – Climate Action
Sembcorp	SDG 6 - Clean Water and Sanitation SDG 7 - Affordable and Clean Energy
Danfoss	SDG 6 - Clean Water and Sanitation SDG 7 - Affordable and Clean Energy SDG 11 - Sustainable cities and communities SDG 12 - Responsible consumption and production
Novo Nordisk	SDG 3 - Good health and well-being for people SDG 12 - Responsible consumption and production

As is visible in Table 8, Goal 7 (Affordable and clean energy) and Goal 12 (Responsible Consumption and Production) were mentioned as key goals to focus on by three out of the four companies in question. Goal 7 is an obvious choice for these companies, since they either operate within the energy sector or provide financing to it. Highly related to this goal, is Goal 12, where the companies advocate for responsible consumption and production of their products or influence their partners through financing standards. Other goals such as Goal 6 and Goal 3, can be argued to be more sector specific, referring to those companies providing solutions for clean water (Sembcorp and Danfoss) and health (Novo Nordisk). Although the remaining Goal 8 and Goal 11, could be adjusted to fit the context of each company, only DBS chooses to include the goal of decent work and economic growth (Goal 8) as a priority and

only Danfoss includes the goal of sustainable cities and communities (Goal 11) (Novo Nordisk, 2018a; The Danfoss Group, 2018; Digital Bank of Singapore, 2017; Sembcorp, 2017).

The sector specifics are also evident when CCA measures applied within the companies are investigated. It is important to note, that a broad definition of CCA was applied when measures were evaluated to belong to either mitigation or adaptation. Many measures applied within the four companies, could be argued to be mitigation, as their overall role is to reduce emissions. However, in this new global environment where energy efficiency and renewable solutions are becoming the norm, due to anticipated climate change impacts, any new products developed for this purpose, are for the ultimate purpose of adapting to this new reality and can thus be considered adaptation to climate change. All four companies aim to reduce their emissions both through the process of shifting to renewable energy as well as being more efficient with their use of energy. As an example, Novo Nordisk aims to have all of their production sites emission free in 2020 and by 2030, both Novo Nordisk and DBS aim to have their operations with zero environmental impact (Novo Nordisk 2018a; Digital Bank of Singapore, 2017). Another type of improved resource efficiency can be seen with Sembcorp's, Danfoss' and Novo Nordisk's measures to reduce water consumption and provide solutions through innovation, where energy generation and water consumption are part of an integrated smart system. As the Singaporean NAP identified, where there are fewer opportunities to improve water efficiency, like with DBS, the company has implemented ways to go beyond their operations and use their power as a loan provider to influence their customers. In 2017, DBS became one of the first companies within Singapore to issue a Green bond and revised their lending policies to make sure that environmental, social and governance issues were considered for all credit applications (Digital Bank of Singapore, 2017).

An important aspect of adaptation for these companies is to develop new solutions in new emergent markets of innovative climate smart products, through developing partnerships focusing on research and development and stakeholder engagement, where their ideas and concerns surrounding climate change are considered and ways for further engagement are identified. This is a way for Novo Nordisk, Sembcorp and Danfoss to be competitive within their own markets. However, DBS recognises the value in these emergent markets and therefore invests in and supports SMEs towards energy efficiency as well as social enterprises (SEs) that deploy innovations of social nature, in areas of agriculture and environmental sustainability (Digital Bank of Singapore, 2017). While the measures applied for Sembcorp, DBS and Danfoss are in most parts aimed towards seizing corporate growth opportunities

through doing their part in adapting to climate change, Novo Nordisk goes beyond efficiency, reduction and growth targets and has paired up with The International Federation of Red Cross and Red Crescent Societies (IFRC), by using their specific position as a pharmaceutical company to improve the provision of insulin to vulnerable individuals affected by natural disasters (Novo Nordisk 2018a). A summary of the implemented measures can be seen in Table 9 below [3] [4].

Table 9
Explicit measures implemented by the four companies under review

		Singapore		Denmark	
		DBS	Semcorp	Danfoss	Novo Nordisk
Sector:		Finance	Energy and utilities	Engineering for power solutions	Pharmaceuticals
Measures	Energy efficiency	x	x	x	x
	Water efficiency	x	x	x	x
	New technology	x	x	x	x
	Funding	x		x	
	Innovation for adaptation	x	x	x	x
	Research and development		x	x	
	Partnerships for adaptation / increased resilience	x	x	x	x
	Green Bonds	x			
	Improve institutional capacity	x			x
	Mitigation	x	x	x	x

4.2.1.5 Results Achieved

The four companies under review have identified certain results and impacts achieved from implementation of their measures and strategies as well as certain awards for environmental performance. All provide an overview of emissions reduced and indicators of efficient water use and reduced waste (Novo Nordisk, 2018a; The Danfoss Group, 2018; Digital Bank of Singapore, 2017; Sembcorp, 2017). DBS highlights achieved impacts through mentioning the number of SEs (4800) that have received funding of S\$1.23 million and their financing of a wide range of technologies for geothermal, hydro and waste-to-energy. Singapore seems more inclined than Denmark to deliver specific awards to companies that align with governmental policies of energy efficiency, where buildings in Singapore can receive a certain grade, a *Green Mark*, dependent on how efficient they are in terms of energy, water, sustainable management and more. All of DBS' Singapore office buildings are recognised for their efficiency (Digital Bank of Singapore, 2017).

4.2.2 Interview Results

In the section below, results from interviews with Kaitlin Fangel Vernon, Associate Project Manager of the Corporate Environmental Strategy at Novo Nordisk and Julia Panzer, Head of Public Affairs and Sustainability at Danfoss, are presented. The answers from the interviews have been summarised in an annex (see Annex L), and grouped into sections relating to *responsibility, tools, partnerships* and *future prospects*. Due to technical reasons, answers to question one and two from the interview with Danfoss, have not been recorded, and are therefore not part of the interview transcript (see Annex J), but have been received in a written form, and are instead included in the summary of answers (see Annex L).

4.2.2.1 Responsibility

As the scoping study found, there is a need for incorporating the private sector in initiatives for climate adaptation, and that the involvement and adaptive capacity of such will depend on the sector the respective companies operate within. Both representatives from Danfoss and Novo Nordisk, believe that private corporations are corporate citizens that have an equally big role to play in adapting to climate change on a societal level, as any other stakeholder in society (see Annex J; Annex K).

Danfoss, being an engineering company, supplemental to having a responsibility to do their part in lowering GHG emissions, believes they have a responsibility in disclosing technological engineering possibilities to policy makers, as to allow for them to set realistically ambitious targets, based on what is feasible. And Danfoss has the capabilities to deliver many of the solutions needed to reach these targets in the carbon free agenda (see Annex J). Novo Nordisk, also realising their responsibility of contributing to CCA, has set the ambitious goal of reaching circular zero for waste by 2030, in which zero waste goes to landfills. This involves all of their upstream supply chain and product management from production to disposal [1] [4].

4.2.2.2 Tools

To support private sector involvement in CCA, a deeper level of governmental support, through policy making and communicating the use of available tools, was found needed in the scoping study. This is well supported by Novo Nordisk, listing multiple frameworks and tools to help private companies in their environmental reporting, such as the TCFD recommendations, but that expectations related to these are still very much uncertain (see Annex K). Danfoss too, is

well aware of many tools being available for them to utilize, but identifies a need for them to be further implemented, rather than changed or more tools being developed at this point (see Annex J).

A way in which both companies seek information regarding CCA and their possibilities of engaging, is through memberships with various international forums and by engaging with the SDGs that shape the need for private sector involvement. Forums and guidelines like the SDGs, serve as meaningful tools imperative to private companies seeking to obtain knowledge from the climate debate. However, as the scoping study found, this information on company exposure and vulnerability, is of limited access to the public, and as Julia Panzer identifies, may be a resource only obtainable by larger, more resourceful companies (see Annex J), such as Danfoss and Novo Nordisk, leaving SMEs without the necessary tools and foundation for CCA engagement [3] [4].

4.2.2.3 Public-private Partnerships and an Enabling Environment

The Danish and Singaporean national adaptation plans, highlight the necessity of all stakeholders to work on climate action and adaptation collaboratively. However, when asked directly, neither representatives from Danfoss nor Novo Nordisk had much knowledge on the existence of the NAP, let alone the content of it (see Annex J; Annex K). Despite of this, Danfoss (in line with what Gasbarro et al. (2017), found), as well as Novo Nordisk, are according to their representatives, engaged with local governments towards finding solutions for decarbonization and energy and waste efficiency, because “*action happens locally*” (see Annex J). Danfoss finds, that the company both has a say in and a responsibility to participate in the policy making dialogue, partly due to Danfoss’ position in being able to provide technical solutions for climate change. According to Danfoss’ representative, it is important for decision makers to know what is technically achievable in order for them to set higher targets for climate action. Although not specifically engaged in the governmental decision-making dialogue, Novo Nordisk has ideas on how they could have a say, especially in regards to governmental incentives towards energy transitions in transportation (see Annex K).

The Danish context affects both companies due to the Danish government’s prioritisation towards green and renewable energy. This facilitates long-term business continuity investment decisions at Danfoss, pushing them in one direction rather than another and has influenced Novo Nordisk’s environmental strategy (see Annex J; Annex K). The need for private-public collaboration in a clear and enabling environment, is underscored by Danfoss’ representative,

when she highlights the inclusive nature of the government having a facilitating effect on Danfoss' desire to divulge information, so that policy makers know what is being done and what can be achieved technologically and for the private sector to know where they stand and how to move forward (see Annex J) [1] [2].

4.2.2.4 Moving Forward

In terms of recent temporal changes with Danfoss' and Novo Nordisk's engagement with climate change, both feel a shift in priority facilitated by global initiatives such as the SDGs, the Paris Agreement and the RE100 (see Annex J; Annex K). According to Danfoss' representative, there has also been a shift from climate action and consideration being "*something that is nice to do*" to "*something Danfoss wants to do*" (see Annex J).

Novo Nordisk has broadened their scope of action, encouraging their suppliers to also consider the climate and their company's specific climatic impact. The engagement with suppliers has not been without challenges and Novo Nordisk's representative also cites the lack of appropriate infrastructure as a barrier towards a renewable energy shift (see Annex J). Danfoss' representative, then mentions challenges for supplementing discussions on climate action with actual action and following through with planned initiatives.

Both representatives highlight a will for increased engagement from and with the government, with Danfoss underscoring the need for governments to trust the private sector and what they can bring to the table, and Novo Nordisk's wish for more collaboration in terms of developing incentives for the private sector. When the representatives were specifically asked about how the private sector can have a more viable role in climate change adaptation for greater impact, Danfoss' representative wished for companies to move beyond the mantra of 'business as usual' with more ambitious goal setting and recognizing that there is no one solution to climate change with this being a collaborative effort (see Annex J). Novo Nordisk highlighted the need for companies to be able to quantify their environmental impact for overall disclosure, in order for environmental decisions to have the same weight as other considerations, ultimately impacting investment decisions (see Annex K) [1] [3] [4].

5 Part 4: Discussion & Conclusion

5.1 Findings

To present the key findings of this research project, and to answer the normative research question, each of the four descriptive research questions will be discussed and answered in the following chapter. The answers to these four research questions provide contributions to the overall research question of *how can private companies have a more viable role in climate change adaptation and achieve greater impact?* Following the answer to the overall research question, is a presentation of limitations to the project's methodology and a discussion of how these may have influenced the findings. Finally, this chapter concludes the thesis with a summary of findings and a way forward, with recommendations for future research.

As introduced in the beginning of this report, the thesis is structured in the way that results from each method influence how the methods that follow are approached and what assumptions are made when a new method is worked with. Thus, the scoping study, and especially the in-depth analysis, laid the foundation to understand what is known in the scientific literature about private sector adaptation to climate change. And following, the key thematises that emerged from this first method, influenced what key thematises were searched for and analysed in the NAPs. The key thematises that later emerged from NAPs, alongside the key thematises from the scoping study, then influenced what was searched for in reviewing the business reports and the development of interview questions. Together, the results from each of these methods applied, comprised the input for answering the normative question in the end.

5.1.1 Research Question 1

What is known in the scientific literature about private sector adaptation to climate change?

Part 1 of this thesis, has provided understanding of what the scientific literature has reported on, in relation to private sector adaptation to climate change, and what knowledge can be obtained from it, to support the aim of furthering the viability of the private sector in climate change adaptation.

The overall analysis of the scoping study found, that literature reporting on the topic overlapped in sciences and thus displayed an interdisciplinary nature, with articles from all over the world,

highlighting the global problem of climate change and the need for adaptation. The analysis also found that, although mitigation and adaptation are two different concepts, many articles acknowledged the difference between them, while stating that the two go hand-in-hand, with mitigation leading the way for long-term risk management, determining the need for adaptation initiatives [4].

The in-depth analysis of the scoping study underscored that, what is known in the scientific literature, and what may contribute to understanding the private sector achieving a more viable role in CCA, strongly relates to tools and strategies, adaptive capacity and the need for an enabling environment.

Findings regarding tools and strategies show that, the emergence of various international forums and initiatives, such as the SDGs, the TCFD, the UNGC, the C40, the Clinton Climate Initiative and the Paris Agreement alongside publications of IPCC reports, have, to a great extent, driven the engagement of private sector adaptation. These initiatives have provided companies tools to utilize, shaped the dialogue on climate action and helped to prioritise internal initiatives. What the literature also reported, was that these climate action initiatives, should be incorporated into long-term business plans (Sepúlveda & Mendizabal, 2011; Schaltegger & Synnestvedt, 2002) and that there is no one formula or recipe for what adaptation should entail. Responses to climate change are context specific, goal-oriented, subjective and intertwine with other actions, decisions and outcomes (Fleming et al., 2015) [3].

In terms of adaptive capacity, the scoping study findings, defined what constitutes, and namely, what hinders adaptive capacity within private companies. One common theme emerging from the literature was that, businesses shy away from implementing long-term adaptation measures, due to perceiving uncertainty of climate change as high. Another important factor influencing adaptive capacity is that, most information on exposure and vulnerability is not within public reach. This limits information sharing and the possibility of learning from other sectors and furthering the understanding of climate risk complexity and the interdependency between spatial levels. Moreover, for adaptive capacity to be strengthened within private companies, there needs to be a strong and incentivising external push [1].

The third emerging topic from the scoping study, related to the above mentioned external push, is; the need for an enabling environment from governments, so actors within the private sector, have a clear idea of what the national priorities are and thus what is expected of them, what

funding, tools and guidelines are provided, and where certain opportunities for growth and innovation can be expanded upon [2].

Many of the analysed articles, also highlighted that the public and private sector often engage in some sort of partnerships in regard to adaptation to climate change. A common theme, emerging throughout and underscoring this need for partnerships, was the understanding that climate change affects all, and no single sector can adapt on its own. This is also evident in how private companies are shifting their risk management focus, from domestic risks to international risks, that include public policies as a general consideration in risk assessments [1].

5.1.2 Research Question 2

How does it differ in two different contexts such as Denmark and Singapore in regards to national adaptation plans?

The scoping study identified that, in states of strong welfare, there is a great need for the public sector to set forth the path for private sector involvement in CCA and provide a clear position of how public-private partnerships and activities are expected (Klein et al., 2017).

As such, the way in which the national adaptation plans, in two different contexts such as Denmark and Singapore differ, is in regards to their spatial positioning as well as the degree to which responsibility to act, is put on the governmental structures. The Danish national adaptation plan is focused on the governmental initiative and municipal responsibilities of carrying out the activities outlined in the plan. This is supported by the literature as key features for states of welfare, such as Denmark, and has moreover, been highlighted in statements from private companies themselves. In fact, when speaking with representatives of both Danfoss and Novo Nordisk, it appears that even the largest companies in the country, have little familiarity with the national adaptation plan and low awareness of ways in which they should or could cooperate with municipalities to realise activities outlined in the NAP. Therefore, it seems that the Danish national adaptation plan, is subject to such heavy positioning of responsibility on the public sector, that the private is almost forgotten [2].

Contrasting the Danish NAP, Singapore is more focused on placing themselves within the international arena, being a country dependent on international relations and less self-sufficient than Denmark. Moreover, the Singaporean document, places much more emphasis on contributions from the private sector, than Denmark, and identifies various innovation hubs in

which the private sector has the opportunity to and is invited to participate in, for the purpose of contributing solutions to CCA [2].

5.1.3 Research Question 3

How do private companies communicate climate change adaptation in their reports and business strategies?

When companies communicate CCA in their reports and business strategies, it is most often done through chapters of their annual reports, or separate sustainability reports, concerning sustainability issues or CSR. In doing so, large private companies, may rely on the guidance of various frameworks developed for disclosure of climate-related issues such as the ones mentioned in the findings for research question one.

One company, Novo Nordisk, uses integrated reporting, instead of providing a separate sustainability report, to add validity and transparency to their environmental reporting, pointing out, that applying this method on a broader scale, supports the goal of companies having a more viable role in CCA (see Annex L). Moreover, all four of the companies selected for in-depth review, identify which SDGs they are targeting, as a strategy for shaping their initiatives. Selecting SDGs to focus on, seems to facilitate companies in reporting on climate change. However, reporting on climate change seems to be the key phrase here. Most of these large companies have CCA, mitigation and sustainability under an umbrella term of what can be coined as *climate action*. This focus on climate action is being mainstreamed through various company reports, identifying the changing global environment as something needing to adapt to, adjusting their ‘business as usual’ strategies to proactively include climate considerations for longer-term risk reduction strategies and/or for seizing climate related benefits and opportunities. This change can be seen explicitly with the shift in Danfoss’ business strategy model, from having *climate* as a key element for consideration in their 2017 report, to *climate change* being at the top of their business strategy for 2018 (The Danfoss Group, 2018; The Danfoss Group, 2017) [3].

5.1.4 Research Question 4

How do private companies view themselves and their position to climate change adaptation?

How companies view themselves and their position to climate change adaptation, relates to the degree to which private companies see themselves as responsible for adapting and contributing climate information to society. This varying degree of responsibility influences the type of measures implemented and is motivated by both the sector and country context the company operates within, as well as the size of the company.

The scoping study results highlight that companies within industries such as forestry, construction, transportation and agriculture, are more involved with climate change adaptation activities due to them perceiving their business as more affected by climate change. For companies in industries less directly exposed to climate change, adaptation to climate change is less outspoken, unless the company is of larger size, such as the ones under review in this research. Larger companies tend to have a more proactive approach to climate change, implementing adaptation and mitigation under *climate action*. As was found in the interviews, this is mainly due to larger companies having the resources to go beyond business as usual and stretch further than what is required of them in the field of adaptation. The Singaporean company, DBS, shows this by funding SEs, for technological advancement, and Novo Nordisk is engaging beyond own production to their entire upstream supply chain to reach as efficient an outcome as possible [4].

These large, resourceful companies all view themselves as corporate citizens with the responsibility of adapting, alongside all other stakeholders in society, and engage in policy dialogue by obligating themselves to disclose climate information to help drive the debate, based on what is technologically feasible, and thus how ambitious climate targets can be set forth by governments [4].

However, in positioning themselves in the climate action agenda, private companies are not only driven by their sense of responsibility to engage, but are finding the needs for doing so globally, as a source of opportunities for economic growth, as it provides them a competitive advantage, being a company well versed in the climate change scene.

5.1.5 The viable role of private companies in CCA

To address the normative research question; *How can private companies have a more viable role in climate change adaptation and achieve greater impact?* each of the four questions delivered results that can be used to answer this question and was explained in more detail at the beginning of part four.

Firstly, it seems important for governments to become more actively engaged with the private sector, perhaps through some form of partnerships, than what might normally be the case. In short, the literature clearly describes the need for governments to set clear long-term priorities for climate action, incorporate the private sector efficiently through public-private partnerships, trust the private sector with the knowledge and technology they can bring for more ambitious goal-setting, and improve the reach of national adaptation plans. Having a NAP that highlights the need for public-private partnerships without further engaging said private industry, risks the development of a ‘paper plan syndrome’, where establishing a plan creates the illusion of preparedness (Auf der Heide, 1989). This not only creates an illusion of preparedness but fails to have the plan as ambitious as it can be, since knowledge on helpful technology and support from the private sector is missing and information on helpful incentives for increased private sector involvement is lost [1] [2].

Secondly, existing tools need to be further implemented and their purpose clarified. The existence of tools and the use of them has, like issues related to government engagement, been established throughout the report. The scoping study, annual reports, NAPs and interviews with key informants established that multiple tools exist, such as the SDGs, and that these should be incorporated into long-term planning. How this is supposed to be achieved is debatable. Novo Nordisk’s representative suggests a standardised approach to the TCFD recommendations, where environmental reporting receives the same weight as financial reporting. The need for tools to be flexible in order to be implementable within different contexts and sectors cannot be understated. However, standardisation could in turn provide a way to quantify environmental impact, thus affecting investors and investing decisions to the same degree as other considerations [3].

Lastly, using integrated reporting of climate related initiatives, that goes through a standardised auditing process, might be a way for companies to further their engagement with CCA, providing a platform for honest internal reporting by employees and opportunity to mainstream

climate action throughout business activities. This in turn, allows companies to go beyond business as usual, furthering their stance as a corporate citizen [3].

5.2 Limitations

When conducting a research project at a master's studies level, a number of potential research limitations can appear. The limitations that could have the most impact on this particular project relate to; the potentially too broad nature of the scoping study, the subjective choice of emerging topics for; in-depth analysis of the scientific literature, the NAPs and annual reports; the choice of countries under investigation; only viewing annual reports from top performing companies; choosing only four companies for in-depth review, and only obtaining two interviews, both within the Danish context.

Due to the broad scope of the scoping study the authors might have missed out on further representative results on private sector adaptation. To address this issue, multiple choice string combinations with additional synonyms were tested in order to review only the most relevant articles. Subjective choice of emerging topics throughout the report was influenced by the research questions set forth at the start of this project. These topics allowed for developing focused research delimitations that, instead of a simple review, provided a more in-depth analysis.

Choosing Denmark and Singapore, as a way of comparing NAPs and annual business reports, was justified due to the countries' demographic similarities, while operating within different global contexts. The country similarities, found throughout this report, have further emphasized the global nature of climate change.

Only reviewing top performing companies, provides a one-sided picture of what challenges and opportunities exist in private sector CCA engagement, and should be considered while reading this report. Finally, only being able to obtain two out of four interviews, risks focusing more on Danish companies, taking away from the aim of providing a comparative analysis. However, due to the global nature of climate change, and the supported results derived from the literature, the authors believe, that, the normative advice provided, for the ultimate research question, can be assigned to the private sector in general.

5.3 Conclusion

This research project set out to investigate and identify how the private sector is positioning itself in the climate change adaptation agenda in terms of; measures aimed at protecting their current business, e.g. business continuity work, and by exploring new business opportunities related to the change. What was discovered, through various methods, was that these measures are often accomplished through innovation and partnerships and by mainstreaming climate change in all company activities for long-term planning, benefitting both business continuity and the global environment.

This long-term planning and investment decision-making, performed by private companies, is both influenced by internal top-level initiatives, as well as national priorities set forth by governments. Thus, for private companies to achieve a more viable role in CCA, governments must provide a stronger enabling environment, in which it is informing of climate change initiatives needed, so uncertainty towards climate change is alleviated, and private companies are aware of long-term national priorities and their role in these, as well as related opportunities for growth and tools, funding and strategies available, that help the engagement [1].

This enabling environment should extend to not only informing of international initiatives for the private sector to engage with, such as frameworks developed for disclosure of climate-related issues like the TCFD recommendations and the Sustainable Development Goals, but also to the implementation of NAPs. For the Danish context, it was discovered that, although national adaptation plans are important policy documents, their purpose seems to be mostly geared towards facilitating governmental planning. As such, a way in which governments can do more for creating an enabling environment, is through implementing the NAP, at private sector level, and securing that activities outlined in the NAP, incorporating private companies, are realised [2]. This is especially for states of welfare such as Denmark, that could seek inspiration from governments such as Singapore and their efforts towards public-private innovation hubs.

Negative environmental and climate change exacerbating effects, from private company operations, could potentially have the same weight for investment decisions if a standardised mechanism for reporting is developed. A promising tool for a quantifiable reporting method is the TCFD framework, alongside added focus on integrated reporting to enhance validity and transparency to environmental reporting. Disclosure according to a standardised framework, could further steer investment and funding decisions towards sustainable practises with

decreased environmental impacts, achieving the goal of the private sector ultimately considering itself as a corporate citizen, able to bring forth innovative solutions that not only benefit the company itself but also the fight against climate change [3].

These improvements to structures and engagements, would thus further the viable role of private companies in CCA. However, what has become apparent in this research, is that what must first and foremost be settled, before applying these improvements, is the size of the company it is aiming at. As has been identified, large private companies, such as the ones under review in this research, seem to be engaging with climate change under the term *climate action*, rather than merely climate change adaptation, perhaps because they engage more with mitigation than adaptation at its simplest form [4] - which may in fact be argued to be a more ethical approach, if available resources are there.

As such, it could be argued that there exists a logical flaw in the statement that the private sector should be doing more for climate adaptation - especially if the definition of adaptation is limited to adjusting systems to limit harmful impacts (Parry, M. L., Canziani, O. F., Palutikof, J. P., Van der Linden, P. J., & Hanson, C. E., 2007), i.e. adapt business for protection against severe weather events. This is a rather passive engagement with climate change - and one that is far less effective than what is needed at this point in time, if we want a chance at saving what is left of the global natural environment. Large corporations should not be allowed to merely adapt to the harmful impacts of a changing climate, if the resources exist of going beyond the “business as usual” approach and contribute to mitigating climate change instead. These must rather be held accountable to mitigating climate change in total, making adaptation in its simplest form unnecessary.

Ultimately, by examining adaptation for private companies, this might be more applicable in the specific context of SMEs and not the larger corporations, as SMEs do not necessarily have the resources to engage with mitigation to an extent where adaptation is no longer necessary, and do in fact need to adapt to the changing climate in order to keep up business continuity. In this situation, the improvements suggested above, especially those of improving the enabling environment, to further this role in viability, might find their most efficient applicability here.

5.4 Recommendations for future research

Spinning off of the conclusion, the aim of this project, would greatly benefit from future research that answers the questions of how large private sector companies, could have a more viable role in climate change mitigation, and the contrasting question of how SMEs could have a more viable role in climate change adaptation.

As the limitations have identified, there have been assumptions and choices made in this research, that may have shaped the findings and limited the applicability of findings in the private sector across varying company size or contextual circumstances. As such, testing the findings on a broader scale with more than just four companies and in multiple country settings and sectors, would make for an interesting future research that would benefit the acquired knowledge in whether it applies in a broader context than that under review in this thesis. Such future research scope would also provide knowledge on whether there are causal links between company sizes and ways in which companies engage with CCA.

Moreover, the thesis has found a lack of implementation in the TCFD recommendations, especially in how these are expected to be applied in reporting. Thus, investigating opportunities for standardising reporting through the TCFD, would support the development of private sector engagement with CCA with a comparable application of climate action across all sectors, company sizes and external structures that these private companies operate in.

6 References

- About C40 (2019). Retrieved from <http://www.c40cities.org/about>
- Aho, E., Schwaag Serger, S., Mönig, W., Wilson, P., Garmendia, C., Steinberg, M., & Swieboda, P. (2014). Outriders for European Competitiveness—European Innovation Partnerships (EIPs) as a Tool for Systemic Change. Retrieved from http://ec.europa.eu/research/innovation-union/pdf/outriders_for_european_competitiveness_eip.pdf#view=fit&pagemode=none
- Arksey, H., & O'Malley, L. (2005). Scoping studies: towards a methodological framework. *International journal of social research methodology*, 8(1), 19-32.
- Assembly, U. G. (2016). Report of the open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction. *United Nations General Assembly: New York, NY, USA*, 41.
- Auf der Heide, E. (1989). Disaster response: principles of preparation and coordination. In *Disaster response: Principles of preparation and coordination*. Canada. CV Mosby Company.
- Beerens, R. J. J. & Tehler, H. (2016). Scoping the field of disaster exercise evaluation—A literature overview and analysis. *International Journal of Disaster Risk Reduction*, 19, 413-446.
- Biagini, B., & Miller, A. (2013). Engaging the private sector in adaptation to climate change in developing countries: importance, status, and challenges. *Climate and Development*, 5(3), 242-252.
- Biesbroek, G. R., Swart, R. J., Carter, T. R., Cowan, C., Henrichs, T., Mela, H., ... & Rey, D. (2010). Europe adapts to climate change: comparing national adaptation strategies. *Global environmental change*, 20(3), 440-450.
- Bundesregierung, D. (2008). Deutsche Anpassungsstrategie an den Klimawandel. *Vom Bundeskabinett am*, 17.
- Chen, P. Y., Huang, S. J., Yu, C. Y., Chiang, P. C., Liu, T. M., & Tung, C. P. (2017). Study on the Climate Adaption Planning for an Industrial Company with Regional Risk of the Water Supply System—A Case in Taiwan. *Water*, 9(9), 682.
- Clinton Foundation (2019). Climate Clinton Initiative: About Us. Retrieved from: <https://www.clintonfoundation.org/about>
- Danfoss (2019). About Danfoss: Our Business. Retrieved from <https://www.danfoss.com/en/about-danfoss/our-businesses/>
- Danish Nature Agency (2012). Action plan for a climate- proof Denmark—How to manage cloudburst and rain water. Retrieved from: <https://climate-adapt.eea.europa.eu/metadata/publications/national-adaptation-plan-denmark>

- DBS Group (2017). About DBS. Retrieved from <https://www.dbs.com/about-us/default.page>
- Dépoues, V. (2017). Organisational uptake of scientific information about climate change by infrastructure managers: the case of adaptation of the French railway company. *Climatic Change*, 143(3-4), 473-486.
- Digital Bank of Singapore (2017). DBS Group Holdings Ltd. Annual Report 2017. Retrieved from <https://www.dbs.com/annualreports/2017/index.html>
- Dongxiao, C., Esteves, P., Martinez, E., & Scholz, I. (2017). Implementation of the 2030 Agenda by G20 members: how to address the transformative and integrated character of the SDGs by individual and collective action. *G20 Insights*.
- European Commission (2016). EIP Water. Boosting Opportunities - Innovating Water. Retrieved from http://ec.europa.eu/environment/water/innovationpartnership/index_en.htm
- Fleming, A., Rickards, L., & Dowd, A. M. (2015). Understanding convergence and divergence in the framing of climate change responses: An analysis of two wine companies. *Environmental Science & Policy*, 51, 202-214.
- Gasbarro, F., Rizzi, F., & Frey, M. (2016). Adaptation measures of energy and utility companies to cope with water scarcity induced by climate change. *Business Strategy and the Environment*, 25(1), 54-72.
- George, A. L., Bennett, A., Lynn-Jones, S. M., & Miller, S. E. (2005). *Case studies and theory development in the social sciences*. mit Press.
- Global Finance (2018). World's Best Bank Awards 2018. Retrieved from <https://www.gfmag.com/magazine/may-2018/best-bank-awards-2018>
- Global Reporting Initiative (n.d.). About GRI. Retrieved from <https://www.globalreporting.org/Information/about-gri/Pages/default.aspx>
- Hedensted Lund, D., Sehested, K., Hellesen, T., & Nellemann, V. (2012). Climate change adaptation in Denmark: enhancement through collaboration and meta-governance?. *Local Environment*, 17(6-7), 613-628.
- Hegger, D. L., Mees, H. L., Driessen, P. P., & Runhaar, H. A. (2017). The Roles of Residents in Climate Adaptation: A systematic review in the case of the Netherlands. *Environmental Policy and Governance*, 27(4), 336-350.
- Herrmann, J., & Guenther, E. (2017). Exploring a scale of organizational barriers for enterprises' climate change adaptation strategies. *Journal of Cleaner Production*, 160, 38-49.
- Inderberg, T. H., & Løchen, L. A. (2012). Adaptation to climate change among electricity distribution companies in Norway and Sweden: lessons from the field. *Local Environment*, 17(6-7), 663-678.

- International Monetary Fund. (2018). World economic and financial surveys. World economic outlook database. Retrieved from <https://www.imf.org/external/pubs/ft/weo/2018/02/weodata/index.aspx>
- IPCC (2018): Annex I: Glossary [Matthews, J.B.R. (ed.)]. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. In Press. Retrieved from https://www.ipcc.ch/site/assets/uploads/sites/2/2019/02/SR15_AnnexI_Glossary.pdf
- Juhola, S. (2013). Adaptation to climate change in the private and the third sector: case study of governance of the Helsinki Metropolitan region. *Environment and Planning C: Government and Policy*, 31(5), 911-925.
- Kaesehage, K., Leyshon, M., & Caseldine, C. (2014). Communicating climate change— Learning from business: challenging values, changing economic thinking, innovating the low carbon economy. *Fennia-International Journal of Geography*, 192(2), 81-99.
- Klein, J., & Juhola, S. (2018). The influence of administrative traditions and governance on private involvement in urban climate change adaptation. *Review of Policy Research*, 35(6), 930-952.
- Klein, J., Araos, M., Karimo, A., Heikkinen, M., Ylä-Anttila, T., & Juhola, S. (2018). The role of the private sector and citizens in urban climate change adaptation: Evidence from a global assessment of large cities. *Global Environmental Change*, 53, 127-136.
- Klein, J., Juhola, S., & Landauer, M. (2017). Local authorities and the engagement of private actors in climate change adaptation. *Environment and Planning C: Politics and Space*, 35(6), 1055-1074.
- Laugesen, M. & Kongskov, J. (2018). Se listen: Her er Danmarks 1000 største virksomheder. Retrieved from: <https://www.berlingske.dk/virksomheder/se-listen-her-er-danmarks-1000-stoerste-virksomheder>
- Lawrence, A., & Marzano, M. (2014). Is the private forest sector adapting to climate change? A study of forest managers in north Wales. *Annals of forest science*, 71(2), 291-300.
- Lei, L., Voss, H., Clegg, L. J., & Wu, X. (2017). Climate change strategies of multinational enterprises in China. *Journal of Cleaner Production*, 160, 98-108.
- Levac, D., Colquhoun, H., & O'Brien, K. K. (2010). Scoping studies: advancing the methodology. *Implementation science*, 5(1), 69.

- Leventon, J., Dyer, J. C., & Van Alstine, J. D. (2015). The private sector in climate governance: opportunities for climate compatible development through multilevel industry-government engagement. *Journal of Cleaner Production*, 102, 316-323.
- Linnenluecke, M. K., Griffiths, A., & Mumby, P. J. (2015). Executives' engagement with climate science and perceived need for business adaptation to climate change. *Climatic change*, 131(2), 321-333.
- Linnenluecke, M. K., Griffiths, A., & Winn, M. I. (2013). Firm and industry adaptation to climate change: a review of climate adaptation studies in the business and management field. *Wiley Interdisciplinary Reviews: Climate Change*, 4(5), 397-416.
- Marshall, N. A. (2010). Understanding social resilience to climate variability in primary enterprises and industries. *Global Environmental Change*, 20(1), 36-43.
- Mees, H. L., Driessen, P. P., & Runhaar, H. A. (2015). "Cool" governance of a "hot" climate issue: public and private responsibilities for the protection of vulnerable citizens against extreme heat. *Regional environmental change*, 15(6), 1065-1079.
- Mitter, H., Schönhart, M., Larcher, M., & Schmid, E. (2018). The Stimuli-Actions-Effects-Responses (SAER)-framework for exploring perceived relationships between private and public climate change adaptation in agriculture. *Journal of environmental management*, 209, 286-300.
- National Climate Change Secretariat (2012). *Climate Change & Singapore: Challenges. Opportunities. Partnerships. National Climate Change Strategy 2012*. Prime Minister's Office, Republic of Singapore. Retrieved from <https://www.nccs.gov.sg/docs/default-source/publications/national-climate-change-strategy.pdf>
- Novo Nordisk (2018a). *Novo Nordisk Annual Report 2018*. Retrieved from <https://www.novonordisk.com/annual-report.html>
- Novo Nordisk (2018b). *Integrated reporting. Novo Nordisk Annual Report 2018*. Retrieved from <https://www.novonordisk.com/sustainable-business/performance-on-tbl/more-about-how-we-work-and-report/integrated-reporting.html>
- Novo Nordisk (2019). *About Novo Nordisk*. Retrieved from <https://www.novonordisk.com/about-novo-nordisk.html>
- Pachauri, R. K., Allen, M. R., Barros, V. R., Broome, J., Cramer, W., Christ, R., ... & Dubash, N. K. (2014). *Climate change 2014: synthesis report. Contribution of Working Groups I, II and III to the fifth assessment report of the Intergovernmental Panel on Climate Change* (p. 151). IPCC.
- Parry, M. L., Canziani, O. F., Palutikof, J. P., Van der Linden, P. J., & Hanson, C. E. (2007). *Impacts, adaptation and vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)*.
- Pauw, P., & Pegels, A. (2013). Private sector engagement in climate change adaptation in least developed countries: an exploration. *Climate and Development*, 5(4), 257-267.

- Pawson, R. (2002). Evidence-based policy: in search of a method. *Evaluation*, 8(2), 157–181.
- Qiu, Z., & Prato, T. (2012). Economic feasibility of adapting crop enterprises to future climate change: a case study of flexible scheduling and irrigation for representative farms in Flathead Valley, Montana, USA. *Mitigation and adaptation strategies for global change*, 17(3), 223-242.
- Ritchie, J., & Spencer, L. (2002). Qualitative data analysis for applied policy research. *The qualitative researcher's companion*, 573(2002), 305-29.
- Sato, M., & Seki, M. (2010). Sustainable business, sustainable planet—A Japanese insurance perspective. *The Geneva Papers on Risk and Insurance-Issues and Practice*, 35(2), 325-335.
- Schaltegger, S., & Synnestvedt, T. (2002). The link between 'green' and economic success: environmental management as the crucial trigger between environmental and economic performance. *Journal of Environmental Management*. (65)4, 339-46.
- Schneider, T. (2014). Responsibility for private sector adaptation to climate change. *Ecology and Society*, 19(2).
- Schwab, K. (2017). *The Global Competitiveness Report 2017* * 2018. World Economic Forum.
- Sembcorp (2017). Annual Report 2017. Retrieved from <http://www.sembcorp.com/ar/ar2017/index.html>
- Sembcorp (2019). About Sembcorp. A Leading Utilities, Marine and Urban Development Group. Retrieved from <http://www.sembcorp.com/en/about-sembcorp/>
- Sepúlveda, J., & Mendizabal, M. (2011). Business in climate or climate in business?. *Management of Environmental Quality: An International Journal*, 22(5).
- Sorg, G., & Hamelen, E. (2018). The SDGs and how they translate into business. Retrieved from <https://www.sg-associates.eu/the-sdgs-and-how-they-translate-into-business/>
- Steiner, A., & Atterton, J. (2015). Exploring the contribution of rural enterprises to local resilience. *Journal of Rural Studies*, 40, 30-45.
- Surminski, S., Di Mauro, M., Baglee, J. A. R., Connell, R. K., Hankinson, J., Haworth, A. R., ... & Proverbs, D. (2018). Assessing climate risks across different business sectors and industries: an investigation of methodological challenges at national scale for the UK. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 376(2121), 20170307.
- The Danfoss Group (2017). Danfoss Annual Report 2017. Retrieved from <http://files.danfoss.com/download/CorporateCommunication/Financial/Annual-Report-2017.pdf>
- The Danfoss Group (2018). Danfoss Annual Report 2018. Denmark: Danfoss. Retrieved from <https://www.danfoss.com/en/about-danfoss/company/financials/year-in-review/>

- The Economist Intelligence Unit (2019). Democracy Index 2018: Me Too? Political participation, protest and democracy. Retrieved from https://www.eiu.com/public/topical_report.aspx?campaignid=Democracy2018
- The Global Innovation Index (2018). The Global Innovation Index: Energizing the world with innovation. Retrieved from <https://www.globalinnovationindex.org/Home>
- The World Bank (2018). Ease of doing business index. Retrieved from: <https://data.worldbank.org/indicator/ic.bus.ease.xq>
- Tompkins, E. L., & Eakin, H. (2012). Managing private and public adaptation to climate change. *Global environmental change*, 22(1), 3-11.
- Top 30 companies from Singapore's STI. (2019). Retrieved from: <https://aseanup.com/top-30-companies-singapore-sti/>
- UNDP. (2008). Capacity Development; PRACTICE NOTE. United Nations Development Programme. New York.
- UNFCCC (2012). The National adaptation plan Process - A brief overview. United Nations Framework on Climate Change: LDC Expert Group.
- UNFCCC (2015). Adoption of the Paris Agreement, 21st Conference of the Parties. Paris: United Nations, 19.
- United National Global Compact (2018). The Ten Principles of the Un Global Compact. Retrieved from <https://www.unglobalcompact.org/what-is-gc/mission/principles>
- United Nations Development Programme (2018). Human development report 2018: Human Development Indices and Indicators. Human Development Report Office (HDRO).
- United Nations General Assembly (2015). Transforming our world: the 2030 Agenda for Sustainable Development, A/RES/70/1. Retrieved from <https://www.refworld.org/docid/57b6e3e44.html>
- USAID (2011). Business Enabling Environment Measure Plus: Indonesia. Business Growth Initiative. Washington, DC: Weidemann Associates, Inc.
- von Detten, R., & Faber, F. (2013). Organizational decision-making by German state-owned forest companies concerning climate change adaptation measures. *Forest policy and economics*, 35, 57-65.
- Wamsler, C., & Brink, E. (2015). The role of individual adaptive practices for sustainable adaptation. *International Journal of Disaster Resilience in the Built Environment*, 6(1), 6-29.
- Wamsler, C. (2016). From Risk Governance to City–Citizen Collaboration: Capitalizing on individual adaptation to climate change. *Environmental Policy and Governance*, 26(3), 184-204.
- Weber, R. P. (1990). Basic content analysis (No. 49). Sage.

- Wedawatta, G., & Ingirige, B. (2012). Resilience and adaptation of small and medium-sized enterprises to flood risk. *Disaster Prevention and Management: An International Journal*, 21(4), 474-488.
- Whiteman, G., de Vos, D. R., Chapin III, F. S., Yli- Pelkonen, V., Niemelä, J., & Forbes, B. C. (2011). Business strategies and the transition to low- carbon cities. *Business Strategy and the Environment*, 20(4), 251-265.
- Wikipedia contributors (2019a). Singapore. Retrieved 21.02.2019 from <https://en.wikipedia.org/w/index.php?title=Singapore&oldid=884208599>
- Wikipedia contributors (2019b). Denmark. In Wikipedia, The Free Encyclopedia. Retrieved 21.02.2019 from <https://en.wikipedia.org/w/index.php?title=Denmark&oldid=883611182>
- Williams, A. (2015). Singapore jumps to top of Global Dynamism Index. Retrieved from <https://www.straitstimes.com/business/economy/singapore-jumps-to-top-of-global-dynamism-index>
- World Economic Forum (2018). The Global Risks Report. 13th Edition. Insight Report. Geneva. Retrieved from <https://www.weforum.org/reports/the-global-risks-report-2018>
- World Heritage Foundation (2019). 2019 Index of Economic Freedom. Retrieved from <https://www.heritage.org/index/ranking>
- “Population Figures by Country,” (2019). Retrieved from <https://www.nationsonline.org/oneworld/population-by-country.htm>

Annexes

Annex A: Search Strings for Scoping Study

Research Question:

“What is known in the scientific literature about private sector adaptation to climate change?”

Search strings tested for the study:

TITLE-ABS-KEY (("Private sector" OR companies OR enterprises) AND adaptation AND ("climate change" OR "global warming" OR climate OR weather)

- This search string delivers 936 hits and was the one used in the study

TITLE-ABS-KEY ("Private sector" AND adaptation AND "climate change")

- This search string delivers 182 hits

TITLE-ABS-KEY (("Private sector" OR companies OR enterprises) AND adaptation AND ("climate change" OR "global warming"))

- This search string delivers 709 hits

TITLE-ABS-KEY (("Private sector" OR companies OR enterprises) AND (adaptation) AND ("climate change" OR "global warming" OR climate OR weather) AND NOT (mitigation))

- This search string delivers 784 hits

TITLE-ABS-KEY (("Private sector" OR companies OR enterprises) AND ("climate change adaptation") AND (adaptation) AND ("climate change" OR "global warming" OR climate OR weather) AND NOT (mitigation))

- This search string delivers 133 hits

TITLE-ABS-KEY (("Private sector" OR companies OR enterprises) AND ("climate change adaptation") AND (adaptation) AND ("climate change" OR "global warming" OR climate OR weather))

- This search string delivers 163 hits

TITLE-ABS-KEY (("Private sector" OR companies OR enterprises) AND (adaptation) AND ("climate change" OR "global warming" OR climate OR weather) AND (successful OR "business opportunity" OR "business continuity") AND NOT (mitigation))

- This string delivers only 38 hits

TITLE-ABS-KEY (("Private sector" OR companies OR enterprises) AND (adaptation) AND ("climate change" OR "global warming" OR climate OR weather) AND (successful OR "business opportunity" OR "business continuity"))

- This string delivers only 48 hits

Annex B: Scoping Study Literature Results

*Exported from Scopus to Excel 25 January 2019

Article Nr.	Name of Article	Authors	Publishing Year
1	Disclosure of climate risk information by the world's largest companies	Kouloukoui, D., Gomes, S.M.S., Marinho, M.M.O., Torres, E.A., Kiperstok, A., de Jong, P.	2018
2	The role of the private sector and citizens in urban climate change adaptation: Evidence from a global assessment of large cities	Klein, J., Araos, M., Karimo, A., Heikkinen, M., Ylä-Anttila, T., Juhola, S.	2018
3	The Influence of Administrative Traditions and Governance on Private Involvement in Urban Climate Change Adaptation	Klein, J., Juhola, S.	2018
4	Assessing climate risks across different business sectors and industries: An investigation of methodological challenges at national scale for the UK	Surminski, S., Di Mauro, M., Baglee, J.A.R., Connell, R.K., Hankinson, J., Haworth, A.R., Ingirige, B.,	2018
5	Climate Change and Mandatory Carbon Reporting: Impacts on Business Process and Performance	Tang, S., Demeritt, D.	2018
6	The Stimuli-Actions-Effects-Responses (SAER)-framework for exploring perceived relationships between private and public climate change adaptation in agriculture	Mitter, H., Schönhart, M., Larcher, M., Schmid, E.	2018
7	Study on the Climate adaption planning for an industrial company with regional risk of the water supply system-A case in Taiwan	Chen, P.-Y., Huang, S.-J., Yu, C.-Y., Chiang, P.-C., Liu, T.-M., Tung, C.-P	2017
8	Exploring a scale of organizational barriers for enterprises' climate change adaptation strategies	Herrmann, J., Guenther, E.	2017
9	Climate change strategies of multinational enterprises in China	Lei, L., Voss, H., Clegg, L.J., Wu, X.	2017

10	Local authorities and the engagement of private actors in climate change adaptation	Klein, J., Juhola, S., Landauer, M.	2017
11	Organisational uptake of scientific information about climate change by infrastructure managers: the case of adaptation of the French railway company	Dépoues, V.	2017
12	Rethinking business-as-usual: Mackenzie River freight transport in the context of climate change impacts in northern Canada	Zheng, Y., Kim, A.M.	2017
13	Mobilising private adaptation finance: developed country perspectives	Pauw, W.P.	2017
14	Tourism enterprises and climate change: Some research imperatives	Pandy, W.R.	2017
15	A fuzzy linear programming enterprise input–output model for optimal crisis operations in industrial complexes	Tan, R.R., Aviso, K.B., Cayamanda, C.D., Chiu, A.S.F., Promentilla, M.A.B., Ubando, A.T., Yu, K.D.S.	2016
16	The Micro-behavioral Framework for Estimating Total Damage of Global Warming on Natural Resource Enterprises with Full Adaptations	Seo, S.N.	2016
17	Private mainstreaming: Using contracts to promote organizational and institutional adaptation	Keenan, J.M.	2016
18	Private finance for adaptation: do private realities meet public ambitions?	Pauw, W.P., Klein, R.J.T., Vellinga, P., Biermann, F.	2016
19	Adaptation Measures of Energy and Utility Companies to Cope with Water Scarcity Induced by Climate Change	Gasbarro, F., Rizzi, F., Frey, M.	2016
20	Role of microfinance to support agricultural climate change adaptations in Indonesia: Encouraging private sector participation in climate finance	Budiman, I., Takama, T., Pratiwi, L., Soeprastowo, E.	2016
21	Public opinion on public opinion on adaptation of companies to climate change	Tafra-Vlahovic, M., Pletikosic, M.	2015

22	Not a panacea: private-sector engagement in adaptation and adaptation finance in developing countries	Pauw, W.P.	2015
23	Observations on the role of the private sector in the UNFCCC's loss and damage of climate change work program	Surminski, S., Eldridge, J.	2015
24	Understanding convergence and divergence in the framing of climate change responses: An analysis of two wine companies	Fleming, A., Rickards, L., Dowd, A.-M.	2015
25	Executives' engagement with climate science and perceived need for business adaptation to climate change	Linnenluecke, M.K., Griffiths, A., Mumby, P.J.	2015
26	Marine tourism in the face of global change: The resilience of enterprises to crises in Thailand and Australia	Biggs, D., Hicks, C.C., Cinner, J.E., Hall, C.M.	2015
27	Exploring the contribution of rural enterprises to local resilience	Steiner, A., Atterton, J.	2015
28	The private sector in climate governance: Opportunities for climate compatible development through multilevel industry-government engagement	Leventon, J., Dyer, J.C., Van Alstine, J.D.	2015
29	Is the private forest sector adapting to climate change? A study of forest managers in north Wales	Lawrence, A., Marzano, M.	2014
30	Mass-cargo-affine industries and climate change: The vulnerability of bulk cargo companies along the River Rhine to low water periods	Scholten, A., Rothstein, B., Baumhauer, R.	2014
31	How Russian Companies Are Coping with a Turbulent Environment: Insights into the Dynamics of Strategic Fit	Saidov, Z.	2014
32	Putting policy initiatives into practice: Adopting an "honest broker" approach to adapting small businesses against flooding	Ingrige, B., Wedawatta, G.	2014
33	Communicating climate change - Learning from business: Challenging values, changing economic thinking, innovating the low carbon economy	Kaesehage, K., Leyshon, M., Caseldine, C.	2014

34	Responsibility for private sector adaptation to climate change	Schneider, T.	2014
35	Adaptation to climate change in the private and the third sector: Case study of governance of the Helsinki Metropolitan region	Juhola, S.	2013
36	Organizational decision-making by German state-owned forest companies concerning climate change adaptation measures	Von Detten, R., Faber, F.	2013
37	Private sector engagement in climate change adaptation in least developed countries: an exploration	Pauw, P., Pegels, A.	2013
38	Climate change adaptation in Australian mining communities: Comparing mining company and local government views and activities	Loechel, B., Hodgkinson, J., Moffat, K.	2013
39	Engaging the private sector in adaptation to climate change in developing countries: Importance, status, and challenges	Biagini, B., Miller, A.	2013
40	Firm and industry adaptation to climate change: A review of climate adaptation studies in the business and management field	Linnenluecke, M.K., Griffiths, A., Winn, M.I.	2013
41	Adaptation to climate change among electricity distribution companies in Norway and Sweden: Lessons from the field	Inderberg, T.H., Løchen, L.A.	2013
42	Mitigating economic risk from climate variability in rain-fed agriculture through enterprise mix diversification	Kandulu, J.M., Bryan, B.A., King, D., Connor, J.D.	2012
43	Economic feasibility of adapting crop enterprises to future climate change: A case study of flexible scheduling and irrigation for representative farms in Flathead Valley, Montana, USA	Qiu, Z., Prato, T.	2012
44	Managing private and public adaptation to climate change	Tompkins, E.L., Eakin, H.	2012
45	Resilience and adaptation of small and medium-sized enterprises to flood risk	Wedawatta, G., Ingirige, B.	2012

46	The influence of climate change litigation on governments and the private sector	Preston, B.J.	2011
47	Business strategies and the transition to low-carbon cities	Whiteman, G., de Vos, D.R., Chapin, F.S., Yli-Pelkonen, V., Niemelä, J., Forbes, B.C.	2011
48	Business in climate or climate in business?	Sepúlveda, J., Mendizabal, M.	2011
49	Sustainable business, sustainable planet a Japanese insurance perspective	Sato, M., Seki, M.	2010
50	Understanding social resilience to climate variability in primary enterprises and industries	Marshall, N.A.	2010
51	Building resilience to climate change in rain-fed agricultural enterprises: An integrated property planning tool	Reid, G.H.	2009

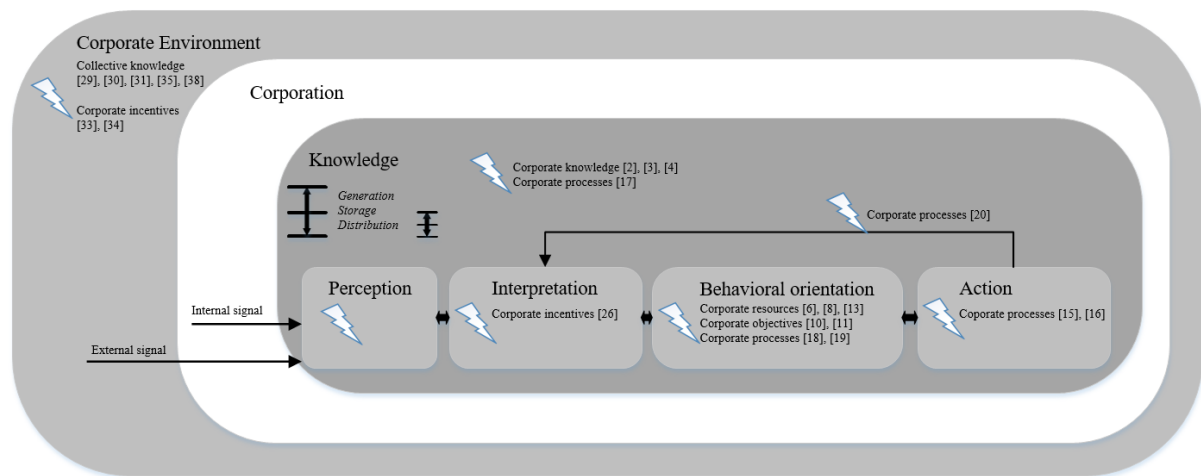
Annex C: Data Charting from scoping study

The table is an example of the content within the entire charting data table that was developed. The example shows the data from article number 44 from the research results list. As including the entire table would be too page consuming, only this one example is included. However, upon request, the entire table can be provided.

Thematics for article analysis															
ID	Title	Authors	Risk perceptions/involvement in CCA	Opportunities	Governmental incentives / incentives for adaptation	public-private partnerships	Top-down public sector approaches vs. bottom up private initiatives	Challenges for adapting	Confusing mitigation with adaptation	Need for high level leadership within the company	Strategies	Sense of responsibility	Changes in addressing the problem throughout these last 10 years.	Definitions	Tools
44	Managing private and public adaptation to climate change	Tompkins, E.L., Eakin, H.	This article looks at the provision of private adaptation public goods. Where private actors are engaging in adaptation measures that have a public good outcome -does not focus exclusively on private enterprises but more on the private individual. However the private individuals that they address often run small businesses - f.x. farmers	There are some opportunities here to engage the private actors - but no business opportunities discussed. Opportunity for co-production of knowledge that can benefit everyone and also engage and educate more actors about climate change	Incentives include tapping into specific motivations behind the measures. Economic transactions, subsidiaries, creating a market for public good	This is considered necessary for this type of adaptation. That the government will need to compensate or incentivize private action	The article mentions that sometimes top down incentives are not really necessary but adaptation for public good happens by accident - someone does something that benefits others as well.	Challenges include: lack of knowledge, lack of certainty, lack of benefits to the private actor	-	-	Examples of strategies given that have facilitated this private adaptation of public goods. Municipalities compensating farmers for increasing their flood risk to minimize the risk to urban settlements down stream Public-private partnerships used as a strategy	This is highlighted in the article in the sense that who bears the responsibility? Should private action be incentivized so that the individual is responsible for adaptation measures or should the government bear the responsibility of climate proofing areas? Discuss the complexity of climate actions and adaptation measures since there is a fine line between what is under your control and what is the city responsible for.	-	Yes defines adaptation loosely - Climate change adaptations are the processes and actions that enable people to cope better with increasingly challenging weather and climatic conditions. Adaptations may involve the development or adoption of a technology, or it can involve building capacity such as improved risk management or knowledge enhancement (West and Gawith, 2005).	-

Annex D: Organizational Barrier Statements

From; Herrmann & Guenther, 2017



Barrier framework and assigned barrier scale. Each number in brackets, refers to a statement from interviewed companies that relate to the organizational barrier (Herrmann and Guenther, 2017)

[1]	The impacts of climate change are not financially noticeable in the enterprise
[2]	Information about climate change is not available for the enterprise
[3]	Information about the impacts of climate change is not available for the enterprise
[4]	Information about adaptation measures is not available in the enterprise
[5]	The enterprise does not record figures and indicators related to climate change (e.g. CO2 emissions, energy use, and water use)
[6]	The enterprise does not possess available funds for adaptation measures
[7]	Public funding opportunities for adaptation measures are not available for the enterprise
[8]	The possibility of private financing (e.g. loans) is not available for the enterprise
[9]	The employees of the enterprise do not have the know-how to adapt the enterprise to the effects of climate change
[10]	The intended adaptation measures have a negative effect on climate protection considerations
[11]	The intended adaptation measures have a negative effect on safety-related aspects
[12]	Other operating risks (e.g. sales issues) are higher priority than the risks resulting from climate change
[13]	Time for searching and evaluating different adaptation measures is not available
[14]	The costs of adaptation measures exceed the expected costs of damage
[15]	The employees of the enterprise do not implement adaptation measures
[16]	The employees of the enterprise are not motivated to implement adaptation measures

[17]	The employees of the enterprise are not informed about adaptation measures
[18]	The employees of the enterprise are not included in the determination process of adaptation measures
[19]	The employees of the enterprise are not included in determining the type of implementation of adaptation measures
[20]	Information about operational impacts of climate change is not communicated to each employee
[21]	Climate change plays a minor role for the enterprise's management
[22]	It is difficult to adapt the internal structure of the enterprise to climate change
[23]	The employees of the enterprise do not have a high degree of flexibility in their decision making during unexpected extreme situations
[24]	Climate change is not integrated into the planning process of the enterprise
[25]	The corporate culture (e.g. standards, values) of the enterprise does not include aspects of climate change
[26]	Climate change does not have an influence on the competitive situation of the enterprise
[27]	The realization of adaptation measures does not lead to cost reduction opportunities
[28]	The political focus is on climate protection rather than on climate adaptation
[29]	Politicians do not provide information on climate change
[30]	Politicians do not provide information on impacts of climate change
[31]	Politicians do not provide information on adaptation measures
[32]	Politicians do not support adaptation measures
[33]	Politicians do not set financial incentives for adaptation measures
[34]	Existing legal provisions do not support internal adaptation
[35]	Information about climate change is not available from science, administration, and other institutions
[36]	The occurrence of extreme weather events is uncertain
[37]	The impacts of extreme weather events are not calculable
[38]	Society is not informed about climate change and its effects
[39]	Different stakeholders (e.g. suppliers, customers, public) complicate any adaptation

Annex E: Normalizing Word Count Calculations

Normalized word counts from national adaptation plans of Denmark and Singapore.

Denmark				Singapore		
Rank Word	Frequency	Normalized word count	Index	Rank word	Frequency	Index
Climate	237	814.69	100	Singapore	492	60
Change	216	742.5	91	Climate	397	49
Adaptation	156	536.25	66	Change	373	46
Ministry	80	275	34	Energy	257	32
Government	70	240.625	30	Develop	217	27
Denmark	69	237.1875	29	Emission	173	21
Water	68	233.75	29	Water	136	17
Plan	62	213.125	26	Global	128	16
Environment	52	178.75	22	Green	111	14
Danish	48	165	20	National	111	14
Municipality	46	158.125	19	Country	108	13
European	43	147.8125	18	Carbon	102	13
Initiative	41	140.9375	17	Research	101	12
Develop	40	137.5	17	Environment	158	19
Action	40	137.5	17	Sustainable	81	10
Effort	39	134.0625	16	Effort	80	10
Project	38	130.625	16	Reduce	77	9
Ensure	35	120.3125	15	Public	73	9
Management	34	116.875	14	International	70	9
New	32	110	14	Growth	65	8
Cloudburst	30	103.125	13	Solution	64	8
Knowledge	30	103.125	13	Future	61	7
Green	29	99.6875	12	Help	61	7
Solution	29	99.6875	12	Build	60	7
Climate-proof	29	99.6875	12	Manage	58	7

The column “normalized word count” takes account for the Danish document being $110/32 = 3,4375$ times shorter than the Singaporean document, and shows the word counts from the “frequency column”, multiplied by 3,4375.

This results in the word “climate” from the Danish document, being the most frequent word across both documents, thus provided with index 100.

To calculate the remaining indexes, all normalized word counts are divided by the normalized word count for the index 100 word (814,69) and multiplied by 100 to get the ratio.

Fx., to calculate the index for “change” from the Danish document, first the word frequency (216) is normalized by multiplying with 3,4375, equaling to 742,5. Next, 742,5 is divided by the normalized word count of word index 100 ($742,5 / 814,69$) and multiplied by 100, equaling to 91.

Annex F: Full list of keywords for company annual reports

Included in the analysis	Not included in the analysis
Adapt	Adaptation behaviour
Adaptation	Adaptation pathway
Climate	Adaptive capacity
Climate Change Adaptation	Clean
Climate change or global warming	Clean technology
Disaster	Climate (change) impact
Emission	Climate-proof
Energy efficien[..]	Climate vulnerability
Environment[..]	Disaster risk management
Environmental or climate risk	Disaster risk reduction
Green energy	Early Warning System
Hazard	Extreme Weather
Impact assessment	Green infrastructure
Innovat[...]	Green technology
Kyoto Protocol	Integrated assessment
Mitigat[...]	Learning
Paris Agreement	Monitoring and evaluation
Recycl[...]	Nature
Resilien[...]	Vulnerability assessment
Risk assessment	
Risk manage[...]	
Sustainab[...]	
Sustainable development	
Sustainable development goals	

Annex G: List of Companies from Denmark and Singapore at Review

Denmark	Singapore
A. P. Møller – Mærsk A/S	Ascendas Real Estate Investment Trust
Novo Nordisk A/S	CapitaLand Ltd
ISS A/S	City Developments Ltd
Arla Foods a.m.b.a.	ComfortDelGro Corp Ltd
DSV A/S	DBS Group Holdings Ltd
Vestas Wind Systems A/S	Genting Singapore PLC
Danish Crown A.m.b.a.	Global Logistic Properties Ltd
Carlsberg A/S	Golden Agri-Resources Ltd
Ørsted A/S	Hongkong Land Holdings Ltd
Salling Group A/S	Hutchison Port Holdings Ltd
DLG Group A/S	Jardine Cycle & Carriage Ltd
USTC A/S	Keppel Corporation Ltd
Coop Danmark A/S	Oversea-Chinese Banking Corporation Ltd
Danfoss A/S	SATS Ltd
Danske Commodities A/S	Sembcorp Industries Ltd
Lego System A/S	Singapore Airlines Ltd
SAS Group	Singapore Exchange Ltd
Total E&P Danmark A/S	Singapore Press Holdings Ltd
NEAS Energy A/S	Singapore Technologies Engineering Ltd
Danish Agro a.m.b.a.	Singapore Telecommunications Ltd

		Denmark																																									
Words	Index	A.P. Møller-Mærsk (Numerical)		Novo Nordisk (numerical)		ISS (numerical)		Arla Foods (numerical)		DSV (numerical)		Vestas Wind Systems (numerical)		Danish Crown (numerical)		Carlsberg (numerical)		Ørsted (numerical)		Salling Group (numerical)		US/TC		DLG (numerical)		Coop Danmark (numerical)		Danbross (numerical)		Danske Commodities (numerical)		Lego (numerical)		SAS Group (numerical)		Total E&P Danmark (numerical)		NEAS Energy		Danish Agro (numerical)		Index	
		Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index	Index
Adapt	0	0	14	3	0	0	22	4	33	6	52	10	15	3	0	0	0	0	0	0	0	0	0	3	1	33	6	0	0	17	3	0	0	49	9	18	3	0	0	0	0		
Adaptation	0	0	0	0	0	0	0	0	0	0	0	0	5	1	0	0	0	0	0	0	0	0	0	0	0	0	27	5	0	0	0	0	0	4	1	0	0	0	0	0	0		
Climate	35	6	53	10	0	0	16	3	4	1	11	2	34	6	3	1	88	16	0	0	0	0	0	10	2	7	1	43	8	0	0	0	61	11	158	29	0	0	12	2			
Climate Change Adaptation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Climate change or global warming	24	4	11	2	0	0	0	0	0	0	11	2	5	1	0	0	33	6	0	0	0	0	0	0	0	0	0	18	3	0	0	0	4	1	52	10	0	0	0	0			
Disaster	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	0	0	4	1	10	2	0	0	0	0			
Emission	24	4	201	37	0	0	3	1	0	0	7	1	5	1	27	5	114	21	0	0	0	0	0	3	1	0	0	54	10	11	2	0	0	265	49	113	21	0	0	0	0		
Energy efficien[...]	0	0	7	1	0	0	0	0	0	0	0	0	0	0	0	0	7	1	0	0	0	0	0	0	0	0	0	58	11	0	0	0	8	1	48	9	12	2	0	0			
Environment[...]	35	6	389	72	128	24	97	18	143	26	11	2	102	19	55	10	57	11	0	0	0	0	0	26	5	133	24	80	15	22	4	11	2	125	23	331	61	17	3	0	0		
Environmental or climate risk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	2	0	0	0	0			
Green energy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	68	13	0	0	0	0	0	0	0	0	0	7	1	6	1	0	0	0	0	0	0	0	0	0			
Hazard	3	0	7	1	4	1	3	1	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	2	0	0	0	0		
Impact assessment	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	1	0	0	0			
innovat[...]	67	12	177	33	48	9	212	39	53	10	26	5	15	3	36	7	53	10	0	0	0	0	0	22	4	7	1	152	28	45	8	11	2	91	17	71	13	8	2	0	0		
kyoto protocol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0			
Mitigat[...]	45	8	25	5	37	7	62	11	41	8	0	0	10	2	48	9	40	7	0	0	0	0	0	0	0	0	0	43	8	33	6	0	4	1	15	3	0	0	0	0			
Paris Agreement	3	0	4	1	0	0	0	0	0	0	0	0	0	0	3	1	13	2	0	0	0	0	0	0	0	0	0	11	2	6	1	0	0	0	0	1	0	0	0	0			
Recycl[...]	0	0	18	3	0	0	9	2	0	0	0	0	0	0	18	3	24	4	0	0	0	0	0	0	0	0	0	7	1	0	0	0	0	11	2	16	3	0	0	0			
resilien[...]	5	1	0	0	0	0	3	1	4	1	0	0	0	0	3	1	9	2	0	0	0	0	10	2	0	0	0	0	0	0	0	0	27	5	5	1	0	0	0				
Risk assessment	11	2	7	1	4	1	0	0	24	5	0	0	5	1	12	2	22	4	19	4	0	0	10	2	0	0	0	11	2	11	2	0	0	23	4	6	1	0	0	0			
Risk manage[...]	72	13	35	7	88	16	22	4	98	18	4	1	54	10	48	9	88	16	116	21	0	0	42	8	46	9	457	84	240	44	17	3	42	8	70	13	33	6	0	0			
sustainab[...]	147	27	212	39	48	9	50	9	53	10	126	23	312	57	85	16	90	17	0	0	0	0	19	4	60	11	544	100	6	1	0	0	269	49	88	16	12	2	0	0			
Sustainable development	5	1	32	6	7	1	0	0	8	2	11	2	19	4	3	1	9	2	0	0	0	0	0	0	0	0	0	25	5	0	0	0	30	6	31	6	0	0	0				
Sustainable development goals	3	0	14	3	0	0	0	0	0	0	0	0	19	4	3	1	4	1	0	0	0	0	0	0	0	0	11	2	0	0	0	4	1	5	1	0	0	0	0				
Sustainability report	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0			
Length of annual report	159		120		116		136		104		114		87		140		193		22				132		64		117		76		76		112		424		102						
Average numerical word count	20		50		15		21		19		11		25		14		30		6				6		6		13		64		17		2		44		4						
Average index		4		9		3		4		4		2		5		3		6		1			1		1		2		12		3		0		8		8		1				

Annex I: Semi-structured Interview Framework

Recipient: Danfoss, Denmark			
Question	Rationale for question		Possible follow-up questions
	Expected answer	Connection to thesis results	
Q1: Being a company within the engineering and manufacturing sector, how do you think that influences Danfoss' possibilities of engaging with climate action?	A lot of changes in the engineering industry taking place, shift to renewables poses many opportunities and challenges	Scoping study: Adaptive capacity depends on various factors such as.... the sector it operates within and the resources it has to utilize (Surminski et al., 2018; Dépoues, 2017).	-
Q2: Are Danfoss' initiatives towards addressing climate change, driven by external or internal factors?	Expected to answer both and possibly highlight company engagement and the global community engagement with SDG's, Paris Agreement, and Global compact principles	Scoping study found that adaptation measures implemented by private companies are often in reaction to an experienced disaster or reacting to changes in policies i.e. driven by external factors	Q1. Which factors (internal or external) do you think affect Danfoss' climate strategy more - have more influence? Q2. Do the highest-ranking employees (CEO/board of directors) exert influence and explicitly address and prioritise climate action? If so, does that make a difference?
Q3: To what extent do you think private companies are responsible for addressing climate change?	Responsibility of both governments and private sector. Shared responsibility of the global community	NAPs: governments highlight the need to include the private sector in climate action. Scoping study: the private sector often wants to do more but struggles with locating entry points	Do you think an engineering company operating in the power sector has more responsibility to address climate change (as a contributor to increased GHG emissions)?
Q4: Are you finding enough available tools and frameworks to support company engagement with climate action, and do you think there is something missing (or that should be changed)? Please also indicate which tools you use for your work with climate action	Answer expected to be 50/50 that they are using some tools but that there could be more. Likely to mention SDGs and Global Compact Principles	NAPs and scoping study indicated that there are tools available for the private sector to utilize. Company AR review highlighted the integration of SDGs into their strategy as a tool to focus action around certain 'entry points'	Q1. Do you think the SDGs are a beneficial tool to develop a company strategy around? Q2. Do you have a way of monitoring and evaluating the use and results of utilizing tools for Danfoss' climate action?
Q5: Do you find that you're able to participate in the dialogue (have a say in framing the problem and developing solutions) of the development of governmental policies and strategies aimed towards climate change and climate action?	Answer expected to be 50/50 - that they are engaging in some dialogues, but that influence is limited	Scoping study: Research has also shown that public authorities generally frame the problem and solutions while the private sector role is mostly in implementing adaptation measures (Klein, et al., 2017; Mees, Driessen & Runhal, 2015; Lund et al., 2012). However, where state-market dualism exists in cities it makes adaptation a very comprehensive strategic plan that is immensely supported by and inclusive of the private sector (Klein & Juhola, 2018).	-
Q6: Are governmental priorities influencing Danfoss' business strategies and/or how Danfoss engages in climate action?	This is thought to highly influence Danfoss. Shift to renewables is a priority for the Danish government and in the world	NAPs: Focus in both country NAPs to shift to more renewables, minimize GHG emissions and become energy efficient	-

Q7: How is Denmark's National adaptation plan affecting the adaptation measures taken by Danfoss?	Might not know what it is	Authors' assumption that the NAPs should affect their adaptation measures	Since the Danish NAP is from 2012 are there any newer initiatives that you know of and have affected Danfoss' measures?
Q8: Are any of your measures complimented with engagement of local government?	Interviewee gives examples of public-private partnerships	Scoping study found that the line between what government and private sector should be responsible for is very and that public and private sector often engage in partnerships - NAP review found that public-private partnerships foster opportunities for economic growth	How do you think such engagements benefit your climate action? Do you wish there was more or less engagement with local government? And why?
Q9: Do you feel you have enough information about climate change and its specific impacts to Danfoss to take appropriate decisions?	Climate change is uncertain and there is a lack of governmental frameworks and policies to guide private sector action	Scoping study found that there is a need for deeper policy making from governments. Especially in socialistic governments such as Denmark, there is more emphasis on public sector action than private sector. - NAP review found that the Danish Government focuses on municipal action more than specific actions needed from private sector	What sort of information would you like to have? Do you have suggestions for initiatives that could help in providing you needed information?
Q10: Do you think that you are responsible for managing risks outside of your company (such as supply chain weaknesses to climate change) or is this a responsibility of the respective governments/partners posed to these climate risks?	Danfoss should consider all risks affecting their operations but finds it to be a joint responsibility of all partners throughout the supply chain	Literature has shown that private company strategies to climate action underestimates broader impacts such as supply chain and societal impacts	-Do you work with certain tools to identify these risks? -Are you finding certain obstacles in working with these types of risks? -How do you, in practice, ensure that you have a joint understanding of risk ownership throughout the supply chain?
Q11: How has Danfoss' engagement with climate change and climate action changed in the past few years?	It has become more holistic	Annual report review found that climate change has gained a more centered position to operations from last year's report to this year's report	What is the primary reason for this change?
Q12: What do you see as challenges (barriers) for adapting to climate change and implementing climate action initiatives?	Economic resource limitations and uncertainty to the impacts of climate change	Denmark has earmarked DDK 122,6 million towards development of technical solutions with CCA potential, but the challenges related to governments providing sufficient policies and frameworks for private sector adaptation, gives the suspicion that private sector businesses may not be aware of this funding option	Do you know that Denmark has earmarked DDK 122,6 million towards development of technical solutions with CC potential?

Q13: Are there initiatives for climate action you wish you could implement, but are finding unfeasible? If yes, which initiatives and what are the reasons for their infeasibility?	Yes, you can always do more, but there are resource limitations (time, economy and legislative support) to doing so.	Scoping study found that there are multiple potential barriers to the adaptive capacity of organizations (both external and internal). Annex D provides a list of barriers as identified by Herrmann and Guenther (2017)	Initiatives could be internally for employees and operations or provide a broader societal impact
Q14: How do you think private enterprises (such as Danfoss) can have a more viable role in climate change adaptation and achieve greater impact (for both economic growth, social responsibility and environmental sustainability)?	More intensive government support - both in terms of frameworks provided and economic funding. More intensive education on climate change (both in terms of impacts and opportunities). More innovative work.	Scoping study found a need for more guiding framework from governments in order for private companies to have a more viable role in CCA Scoping study found that many regard climate change as an uncertain concept Both NAP review and Annual reports review found a great emphasis on innovative work in all four companies as a basis for developing CCA measures	Do you think the responsibility lies with the private company itself or with the government?

Recipient: Novo Nordisk, Denmark			
Question	Rationale for question		Possible follow-up questions
	Expected answer	Connection to thesis results	
Q1: Being a company within the pharmaceutical industry, how do you think that influences Novo Nordisk's possibilities of engaging with climate action?	A lot of changes in the global economy taking place, e.g. shift to renewables and a focus on efficiency.	Scoping study: Adaptive capacity depends on various factors such as.... the sector it operates within and the resources it has to utilize (Surminski et al., 2018; Dépoues, 2017).	-
Q2: Are Novo Nordisk's initiatives towards addressing climate change, driven by external or internal factors?	Expected to answer both and possibly highlight company engagement and the global community engagement with SDG's and Paris Agreement.	Scoping study found that adaptation measures implemented by private companies are often in reaction to an experienced disaster or reacting to changes in policies i.e. driven by external factors	Q1. Which factors (internal or external) do you think affect Novo Nordisk's climate strategy more - have more influence? Q2. Do the highest ranking employees (CEO/board of directors) exert influence and explicitly address and prioritise climate action? If so, does that make a difference?
Q3: To what extent do you think private companies are responsible for addressing climate change?	Responsibility of both governments and private sector. Shared responsibility of the global community	NAPs: governments highlight the need to include the private sector in climate action. Scoping study: the private sector often wants to do more but struggles with locating entry points	-

Q4: Are you finding enough available tools and frameworks to support company engagement with climate action, and do you think there is something missing (or that should be changed)? Please also indicate which tools you use for your work with climate action	Answer expected to be 50/50 that they are using some tools but that there could be more. Likely to mention SDGs.	NAPs and scoping study indicated that there are tools available for the private sector to utilize. Company AR review highlighted the integration of SDGs into their strategy as a tool to focus action around certain 'entry points'	Do you think the SDGs are a beneficial tool to develop a company strategy around? Do you have a way of monitoring and evaluating the use and results of utilizing tools for Novo Nordisk's climate action?
Q5: Do you find that you're able to participate in the dialogue (have a say in framing the problem and developing solutions) of the development of governmental policies and strategies aimed towards climate change and climate action?	Answer expected to be 50/50 - that they are engaging in some dialogues, but that influence is limited	Scoping study: Research has also shown that public authorities generally frame the problem and solutions while the private sector role is mostly in implementing adaptation measures (Klein, et al., 2017; Mees, Driessen & Runhal, 2015; Lund et al., 2012). However, where state-market dualism exists in cities it makes adaptation a very comprehensive strategic plan that is immensely supported by and inclusive of the private sector (Klein & Juhola, 2018).	-
Q6: Are governmental priorities influencing Novo Nordisk's business strategies and/or how Novo Nordisk engages in climate action?	Yes, an emphasis on shared responsibility	NAPs: Shared responsibility of all actors within a country. Partnerships and an overall focus to shift to renewables, minimize GHG emissions and become energy efficient	-
Q7: How is Denmark's National adaptation plan affecting the adaptation measures taken by Novo Nordisk?	Might not know what it is	Authors' assumption that the NAPs should affect their adaptation measures	Since the Danish NAP is from 2012 are there any newer initiatives that you know of and have affected Novo Nordisk's measures?
Q8: Are any of your measures complimented with engagement of local government?	Interviewee gives examples of public-private partnerships	Scoping study found that the line between what government and private sector should be responsible for is very and that public and private sector often engage in partnerships NAP review found that public-private partnerships foster opportunities for economic growth	How do you think such engagements benefit your climate action? Do you wish there was more or less engagement with local government? And why?
Q9: Do you feel you have enough information about climate change and its specific impacts to Novo Nordisk to take appropriate decisions?	Climate change is uncertain and there is a lack of governmental frameworks and policies to guide private sector action	Scoping study found that there is a need for deeper policy making from governments. Especially in socialistic governments such as Denmark, there is more emphasis on public sector action than private sector. NAP review found that the Danish Government focuses on municipal action more than specific actions needed from private sector	What sort of information would you like to have? Do you have suggestions for initiatives that could help in providing you needed information?

<p>Q10: Do you think that you are responsible for managing risks outside of your company (such as supply chain weaknesses to climate change) or is this a responsibility of the respective governments/partners posed to these climate risks?</p>	<p>Novo Nordisk considers all risks affecting and affected by their operations</p>	<p>Literature has shown that private company strategies to climate action underestimates broader impacts such as supply chain and societal impacts</p>	<p>Do you work with certain tools to identify these risks?</p> <p>Are you finding certain obstacles in working with these types of risks?</p> <p>How do you, in practice, ensure that you have a joint understanding of risk ownership throughout the supply chain?</p>
<p>Q11: How has Novo Nordisk's engagement with climate change and climate action changed in the past few years?</p>	<p>It has become more holistic</p>	<p>Annual report review found that climate change has gained a more centered position to operations from last year's report to this year's report</p>	<p>What is the primary reason for this change?</p>
<p>Q12: What do you see as challenges (barriers) for adapting to climate change and implementing climate action initiatives?</p>	<p>Economic resource limitations and uncertainty to the impacts of climate change</p>	<p>Scoping study found that various factors both internally in the organization as well as externally, influence the degree to which companies are able to adapt to climate change.</p>	<p>Barriers could relate to:</p> <ul style="list-style-type: none"> - Corporate knowledge - Corporate resources - Corporate objectives - Corporate processes - Collective knowledge - Corporate incentives - Corporate culture
<p>Q13: Are there initiatives for climate action you wish you could implement, but are finding unfeasible? If yes, which initiatives and what are the reasons for their infeasibility?</p>	<p>Yes, you can always do more, but there are resource limitations (time, economy and legislative support) to doing so.</p>	<p>Scoping study found that there are multiple potential barriers to the adaptive capacity of organizations (both external and internal). Annex D provides a list of barriers as identified by Herrmann and Guenther (2017)</p>	<p>Initiatives could be internally for employees and operations or provide a broader societal impact</p>
<p>Q14: How do you think private enterprises (such as Novo Nordisk) can have a more viable role in climate change adaptation and achieve greater impact (for both economic growth, social responsibility and environmental sustainability)?</p>	<p>More intensive government support - both in terms of frameworks provided and economic funding</p> <p>More intensive education on climate change (both in terms of impacts and opportunities)</p> <p>More innovative work.</p>	<p>Scoping study found a need for more guiding framework from governments in order for private companies to have a more viable role i CCA</p> <p>Scoping study found that many regard climate change as an uncertain concept</p> <p>Both NAP review and Annual reports review found a great emphasis on innovative work in all four companies as a basis for developing CCA measures</p>	<p>Do you think the responsibility lies with the private company itself or with the government?</p>

Annex J: Transcript of Danfoss Interview

- Christina: Question three. To what extent do you think private companies are responsible for addressing climate change?
- Julia Panzer: Well, I mean we are part of the global system. We are corporate citizens and we have a lot of people working for us. So, we definitely have a, a task to show what is possible from a technology side because, in the end it will come down to regulation and to politicians and setting the course forward because climate change is still very abstract. We have of course young people protesting and demonstrating as one part of the constituents. And then there's the part of where you can say, well, I'm an engineer and I know that it's technologically possible. And I think that's always the interesting part when I talk to my engineering colleagues because they can tell me what we can do today. And so, it's also our task to go out and say, well, this is possible what we can do. So therefore, as a politician or a government, you can actually set high targets because we know we can achieve them. So that's our part of the equation, which is also why we worked a lot with colleagues on the Paris climate agreement to say, well, you know, let's push the boundaries on these parameters, stay on energy efficiency targets in there, on buildings, on transport, something we very strongly support.
- Christina: Great. Good answer. All right, and so question four, are you finding enough available tools and frameworks to support this company engagement with climate action? And do you think there something perhaps missing or that should be changed with these available tools that you have?
- Julia Panzer: I think overall, I think we have too many tools by now. There's tons of initiatives and awareness raising campaigns, and everybody wants to right now work with cities. That's very sexy. So, you know, we're kind of constantly drawn into, oh, here is a, is an initiative you should take part in. Can't you sponsor this? Can you do that? And I think we've been talking a lot, over the past years. And what's important is action. So, I very much support the initiatives and projects where you do both capacity building, awareness raising, but then also create a project pipeline because in the end, if we're not changing the way we build our buildings, how we drive and so on nothing will happen. I mean we can have as many pledges and declarations and so on. What do we have to have these projects, and then there's also thing whenever you have a new government, they would initiate new projects or new initiatives because they want to do their own thing. And we need to overcome that. We need to have some continuity here and use the initiatives that we know are already working and then accelerate those.
- Christina: And so, these are very much internal initiatives that Danfoss is coming up with, are you also finding that society and governmental structures are providing you frameworks and tools that will guide you in your work?
- Julia Panzer: Yeah, and it's not so much that we come up with this internally, but it's really external work that we're doing. Today, for instance, well, the UN Global Compact is definitely a good example of moving companies along. There is something called sustainable energy for all where we

work for instance with the UN Environment Program on district energy projects globally to kind of inform but also help the globe to roll that technology out because it's complex, it's not easy. And the same goes for buildings, building codes, what is the state of the art and but also something like the SDGs for instance, that is definitely a framework that companies understand because it's about KPIs and we can feed into this process. So that's very useful. And at the same time, of course, whenever it comes to when we signed up to energy productivity 100 where they put companies together to rattle for better energy productivity internally. Or something like RE100 where companies should also green their carbon footprint in terms of energy use. So, that's definitely tools, but there's a lot of things out there. and I don't think we should do more of that, but more like really use the ones we have and roll that out and then also go beyond the risk because now we're a good company and when you mentioned Novo or Danfoss, you know, we're definitely in the lead, but what about all the other companies to smaller ones that are kind of more difficult to use that?

Christina: So, you don't find that there's necessarily something missing in the tools? Just that they should be used more?

Julia Panzer: We should implement. I think the time is now for implementation. And that's what we should focus on.

Christina: Question five. Do you find that you're able to participate in the dialogue? Have a say in the framing of the problem and developing solutions with governmental policy. So have a dialogue with the development of governmental policies and strategies.

Julia Panzer: Yes. I think that, I mean, especially in the Danish context, I think there's this acknowledgement that we have to have public private collaborations to solve these challenges. They won't be one or the other. And I look across the globe that, that understanding is kind of like going through, but it's still sometimes that the private sector with the solutions doesn't have a voice at the table. And that's something, I mean, we cannot come up with solutions if we don't know what's already possible. And so there needs to be that collaboration, I think for good policy making you need to have an understanding of what you have already in technology and can be possible. So that's why we are engaged. And I think once private sector gets engaged and really shows that goodwill it works as well. I mean, there is trust that needs to be built.

Christina: So, once you do engage with climate action, you feel like this, your voice is also being heard?

Julia Panzer: Yes, absolutely. And appreciated also because there's, I mean, policy makers and no climate action. People would normally hear about the problems and then when it's about offering solutions as well to move forward and implement. Because I mean, we know what to do. It's a matter of doing it

Christina: Right. Alright, so I'm getting onto question six. Are governmental priorities influencing Danfoss' business strategies and or how does Danfoss engage in climate action? So, I guess this ties a little bit back to the question about external factors. I suppose we have actually already kind of touched upon this question. So maybe for the sake of the time limit we should just move on to the next one.

Julia Panzer: But I think I can get that in just one sentence. Governmental priorities are very important, and they influence our strategy. There's one thing, companies, private sector is planning. They like to have like long time planning horizons in order to know what to invest in. So, if we have a very strong position from government on energy, for instance, energy efficiency, renewables that helps us to navigate the business into that direction.

Christina: And how is Denmark's national adaptation plan affecting the adaptation measures that Danfoss is taking? Are you even aware actually that we have adaptation plan in Denmark?

Julia Panzer: I have not read the Danish national adaptation plan, I have to say. But probably our environmental health and safety director has, or I would expect him to, to have read that. We do have internally a list of risks and climate adaptation is one of these risks. I mean we are in globally and in India where you have a lot of water scarcity. We are in a lot of different areas of the world where you have problems. I think in Denmark there will be probably more flooding and, then so we have that on our index list and now our guys are going through that. But I personally have not read the Danish adaptation plan.

Christina: Fair enough. So, question Eight. Are any of your measures complimented with engagement of local government? I suppose this also kind of ties quite back to being under the influence of external factors. But is there anything that comes to mind that you would like more support?

Julia Panzer: Yes, I mean, just to give an example, in Sønderborg, the area where we are headquartered, we work very closely together to decarbonize the city because that of course our production is a big part of decarbonizing that area here and the action happens in the local communities. So that's why we also work closely with the cities and communities to make that happen and to see what's our part, but also how we can help with the solutions again, because in our case, it's both our own production that we need to decarbonize, but our products help to reduce energy use. So, it goes to kind of both ways. So, they're a key player.

Christina: Yeah, and do you feel that you have enough information about climate change in the specific impacts to Danfoss in order to take appropriate decisions or do you feel like you're lacking information about the issue?

Julia Panzer: No. I think we have definitely, I mean, the recent IPCC report has definitely sparked quite some interest. Also, again, with policy, with our leaders, with our decision makers, CEO or C-level and in our C-suite would also participate normally in the World Economic Forum in Davos and the other participate in the COP. So, we get a lot of information there in terms of what's happening. And then on a local level we have real councils and we are part of governmental think tanks and so on. So, there's a lot of information that comes our way and also through the Global Compact that we are engaged with.

Christina: And are you experiencing that this information is being pushed to you or that it's more a pull scenario where you have to get the information and look it up?

Julia Panzer: No, I think because we are so many members or members of so many different initiatives and so on, we get a lot of information sent our way.

So, we're definitely well informed, I think. But we also focus on it and we have a sustainability director, we have a big employee health and safety kind of network. And just today, our CEO actually gave a Webinar to our internal colleagues on how we work with sustainability. So, what we have achieved over the past years and what we want to do now going forward, we definitely have to step up also.

Christina: So clearly also being one of the largest companies in Denmark would influence your ability to be part of all these forums. Do you think, um, do you think if you're a smaller private company and perhaps not part of being all, uh, being a part of all these different forums that you have a larger challenge with, uh, getting the information about climate action?

Julia Panzer: Absolutely. I think for smaller companies it's definitely a challenge because they don't have these functions. I mean we work with public affairs and sustainability and, um, and this is the sole purpose of our little department and to screen this information and to give it back to the, to the business and to act basically on our behalf. So, if you're a smaller company, you don't have that. Um, so, but you might, I think there again like through global compact are similar kinds of bodies to go get your information. So in Europe normally you are also a part at least of one or two trade associations that can prepare you for that.

Christina: Okay.

Julia Panzer: But definitely, I mean if it were making a survey most likely, I mean the smaller ones, SMEs and so on, they don't, might not have even heard about the SDGs. That's why it's so important to do the outreach and awareness raising.

Christina: Okay. So, it's actually 4:30 now and I want to respect your time and your weekend. Um, we have five questions left. I don't know if you would mind maybe having them sent to you or if your, um, if you are out the door right now or would be able to take 5 more minutes.

Julia Panzer: Yeah, if it can take five more minutes and just go a bit quicker through those so it would be faster.

Christina: Okay. Well let's do so. Okay. So, question 10. Do you think that you're responsible for managing risks outside of your company or is this a responsibility of the respective governments or partners that the climate risks are posed too? So, this isn't of your supply chain management, whether you think that you're responsible for also managing risks outside of the company.

Julia Panzer: I mean our approach has always been that we also have quite an impact under the, the local communities around our supply chains, around our production. And if they're not healthy, if they're not secure, you know, we don't have the workforce that we need. I think that's also, it's of course a, uh, a company kind of interest again to have that healthy environment and people around. Cause otherwise, again, no, customers, but also nobody that produces your goods and hence no business. Um, therefore we had this, I think, you know, back in the days before CSR was invented in, we were founded in the thirty's and our founder actually started to build a social housing around the production sites to make sure that the workers are happy and have a good home and um, and, and come to work in a, in a good mood. And I think that's the whole kind of perspective. It's not just about, it's life work balance. And I think that's something we

have had in our DNA for a while, and hence we also engage in lots of, when it comes to these local things on it, I think we have a couple of, uh, initiatives, especially again, especially in India where we know that there's, for instance, in a local village, water scarcity, then we do something around that, um, provide them with, uh, solutions or we have a new project in, in our eastern European facilities, um, that now kind of phased out plastic bottles and something we want to roll out across. It's a little bit away from the climate change part, but in that sense, having these initiatives also across outside of just the pure business.

Christina: Okay.

Julia Panzer: So, it is also the responsibility for us.

Christina: Yeah. Right. Okay. So, question 11, how has Danfoss' engagement with climate change and climate action changed in the past few years?

Julia Panzer: I think it has moved from something that this is nice to do and, or we have to do to something that we want to do. Um, and then it's also very, very much on the, on the agenda of the top level. That has definitely changed a lot for us over the past. Yeah. Maybe even five years that I have been part. So, um, the, the whole SDG discussion and the Paris Agreement and now the IPCC report, I would say these are the three key moments where, um, where decision makers of companies that were maybe not so engaged, um, also kind of came on the board of the training and they're moving into the same direction. There was definitely that. There's increasing momentum, which is very positive. Um,

Christina: For sure. Absolutely. Yeah. Yeah. Okay. And so, question 12, um, what do you see as challenges for adapting to climate change and implementing climate action initiatives? If any?

Julia Panzer: The challenges... Um, well, I mean there's still something about how we do. Um, how do, how we do capex investments. So, there's no life cycle approach to products and investments and so we can see that, um, the general business decision would still be an upfront cost, um, and that goes across that is happening in cities and it happens with business partners and so on. So, basically that's something that we need to overcome, um, on a global level. And, the majority of businesses has realized that there's no way back or around, um, but again, now it's about action and there's still a lot of talk. Um, so instead of kind of having to get another initiative, we should just actually follow through with the ones that we're already engaged in and do that. I think that's a part of the challenge is the talking with versus action challenge, um, of businesses. Um, yeah. And the government's giving them the um, yeah, the kind of, Not Trust, like trust. Well, trust in that we can do it and they can set high ambitions.

Christina: all right. Um, so question 13, the second last question, um, are there initiatives for climate action that you wish you could implement but that you're finding unfeasible. And if so, which?

Julia Panzer: I mean, you know, um, I would love to do a "let's renovate all office buildings or all like public buildings", because with that we would already go like a very, very long way. But even the European Parliament, and I have a colleague that works with led lamps and he says the European Parliament, will be the last building to be renovated and have actually energy efficient technology. And because it's just so complex

and nobody knows who's going to take that position. And that's sometimes where I'm thinking from a business perspective. Things go very fast on a public level. It's, it's, it's just slower and we need to pick up in speed. So, I'm like, just do the right thing instead of discussing and we, I think we should overcome this. Like, why are we doing it and go to the how? That's where the businesses are good because that's how the business works. It's about doing it. Um, so if we could accelerate, uh, the, the initiatives that we are having, like the district energy in cities, I would love to go into every city with that initiative for instance and roll that out. Yeah. Like faster with this.

Christina: Okay, so last question. Um, how do you think that private enterprises can have a more viable role in climate change adaptation and thus achieve greater impact? Um, both for economic growth for the company and social responsibility and environmental sustainability. So, the question was how...

Julia Panzer: when you say adaptation? So not mitigation.

Christina: Well, I mean it's, it's a, it's a bit of a mismatch sometimes between adaptation and mitigation and you know, whether its adaptation for mitigation or the other way around. Um, so I guess in a way, both of them really.

Julia Panzer: Okay. So, how could we have a big... I think actually we moved the needle already quite a bit. Um, uh, but then again, I mean bolder targets, uh, if we can like now in Denmark also with the, the, the new government or what happens after the election basically is, um, there needs to be some kind of bolder targets and really visionary politicians in that sense. And we make, we make the best to kind of show without partners, uh, what's possible. So, if I would wish for like one thing is that we go beyond business as usual in, for instance, energy efficiency measures. Like you can see on the European level, we have a target that would be achieved if we just, you know, everyone once in a while replaces their fridge or their car. So that means that the stuff, gets more efficient already. Um, just find a normal kind of use rate. Um, so this goal that we're having right now basically is be below that business as usual. That's not very ambitious. Um, so we would like to see that more ambitious and really go across and not say, well, um, one or the other. And I think that's what companies also have to acknowledge. I mean, it's not one or the other solutions there are many solution that will have to be implemented and instead of fighting, um, if it's this technology or that technology, we should all be saying, well, let's overcome this because, and for business and for people and for our financial performance, we should move into the same direction and once we have made this decision and it should go actually rather fast.

Christina: So, have more ambitious goals and go beyond business as usual.

Julia Panzer: Yeah. Yeah. That would be the summary. Yeah.

Christina: The summary of, yeah. Okay. Great. Well, um, Julia, this is all of the questions that we had for you.

Talk outside interview scope.

Annex K: Transcript of Novo Nordisk Interview

- Talk outside interview scope.
- Ásdís: Should we just get started?
- Kaitlin: Yes, I am ready.
- Ásdís: Okay, great. Just so you know, is it okay that we record this so we can transcribe it?
- Kaitlin: Yes.
- Ásdís: Okay, good. Thank you. We have 14 questions with possibility of some follow ups in total. I'll just start with the first question. Being a company within the pharmaceutical industry, how do you think that influences Novo Nordisk's possibilities of engaging with climate action?
- Kaitlin: So, I think in general, pharmaceutical companies do consume quite a lot of natural resources and also energy consumption. So, I think as an industry as a whole, we have a lot of opportunities for making big changes. And also, with Novo Nordisk, I believe we're one of the top, like in terms of number, top employers in Scandinavia. So, we have over 40,000 employees globally. And we have production, across the world. So we really have a chance to make changes not only in Denmark but across the globe. Then I guess the third thing is that I think at Novo Nordisk we see that they're links between climate and health and that's something that we are exploring further, but I think there are a lot of interesting synergies between the movement of people potentially due to climate change. We see a lot more people moving to cities, and then having lifestyle changes, where for example, you're buying a lot more fast food and maybe not exercising as much and working at a desk a lot more. So, they're kind of a lot of synergies between climate change and health that we see where we could make an impact ourselves.
- Ásdís: And do you think Novo Nordisk's initiatives towards addressing climate change are driven by external or internal factors?
- Kaitlin: I think it goes both ways. I think at Novo Nordisk were incredibly lucky. I don't know how much you guys to read about Novo Nordisk, but we have something called the triple bottom line at Novo Nordisk and this is that all decision making is judged based on not only the economic side of things, but also the environmental and social side of things. And so, the kind of TBL mentality, this is something that's actually integrated into the articles of association at Novo Nordisk. So, this is kind of the founding document of what our company is. I think we have this kind of document that we can hold up always saying that we believe in the triple bottom line mentality and is this causing harm to the environment? Or is this causing harm to society? So, we kind of have this mandate which we're really lucky to have.
- Kaitlin: And then I also think we're very lucky that we have engagement from our executive management in terms of climate change. In 2018, we actually spent most of the year developing a new environmental strategy towards 2030. And then in August the executive management approved this new environmental strategy. So, I think we also were incredibly lucky as a company that our CEO was very engaged on the climate agenda and also the rest of his executive management group. So, we're very lucky at Novo Nordisk that this is something we've worked with for a long time. But I also think it's very important that external factors are also driving this. I don't think Novo Nordisk and industry as a whole can't solve the problem by themselves. It needs to be a joint effort

between governments, between non-profits, between industry. I think everyone has a large role to play and we know that businesses also have a huge role to play in it.

Ásdís: Thank you. You answered my follow-up questions there as well. So that was great. And touching up on that, which you just talked about, to what extent do you think private companies are responsible for addressing climate change?

Kaitlin: I think private companies have a huge role to play. I think you need to take responsibility not only for your own personal kind of footprint, so your own operations, but also up your supply chain and down your supply chain to see how do you create your products? How are your products being used? And then also once products are finished being used, how are they disposed of? And I think in the past, Novo Nordisk has primarily focused on our own production sites. And with this new environmental strategy I mentioned, we're really focusing on broadening, so that we're not just focusing on our own footprint, but also the footprint of all of our suppliers and also the footprint of our products, once customers have finished using them. So, we're really kind of examining the entire value chain of our company now.

Ásdís: Yeah. I saw you've had this zero-waste strategy and circular approach.

Kaitlin: Yeah. So, the new strategy is called circular for zero and, and one of the things is that we want zero waste to landfill by 2030, but that's only one of the kind of many different targets we have in place by 2030.

Ásdís: Yes, right. Question four, do you find that you're find thing enough available tools and frameworks to support company engagement with climate action? Or do you think there's something missing or could be changed? So, if you could please indicate which tools you work with.

Kaitlin: As you guys know, because you've looked at our annual report, we use integrated reporting and I think this helps us hugely at Novo Nordisk because it really adds validity and transparency to our environmental reporting and also adds this trustworthiness because it's validated by auditor's. So, we go through a huge audit process to ensure that the data is accurate. And so, I think that something that could be interesting is seeing if integrated reporting could be made a little bit more available on a broader scale to companies. There aren't that many companies that do it right now. Another framework that we use is the ISO 14,001 standards for energy management across our sites. So, all of our production sites are certified based on this ISO verification. And I think that's helped us hugely having standardisation across our different production facilities. We've also found CDP to be very, very helpful in reporting. We report to CDP for both climate and for water. And I think this is very helpful because it allows for comparison between different companies. I think there's so many different metrics that you can use in terms of the environments that it sometimes can be hard to figure out where you stand. And so, CDP has a very comprehensive way of ranking companies on their environmental performance. And then, I don't know if you guys familiar with the new TCFD recommendations?

Ásdís: Yeah. A little bit.

Kaitlin: I think this is something that Novo Nordisk is also looking into and I think it's a great initiative and I'm quite excited to see how it develops over the coming years, but I think there's still a lot of uncertainty in how should companies report according to the TCFD recommendations, what does it actually look like once it's complete in an annual report? So, this is something that we're kind of taking a step wise approach to doing and looking into where do we have gaps within

the TCFD framework and where can we improve in the coming years. And I think one of the things that the TCFD really brings to the table is that suddenly it gets investors interested in the environment. So, they're really trying to show what risks and opportunities climate change poses to different companies. And I think for Novo Nordisk, this has been something that we've been considering for decades. What sort of risks can climate change have on our company? So, having investors actually realize this is something we take very seriously and are working on as a company I think brings a huge validity to environmental data and metrics.

Ásdís: Yeah, definitely. And do you find that these tools offer a way of monitoring and evaluating the use and results of these tools, for example towards your investors and reporting to them.

Kaitlin: I think that that kind of has yet to be seen on how investors, will use the TCFD recommendations because there isn't any sort of requirement right now. It's all based on voluntary disclosure for the TCFD recommendations. And it seems like people are reporting in many different ways to the TCFD recommendations, which is understandable since it's so new. But it would be nice to have a little bit, I guess, more coordination across industry on how should the actual final report look and exactly what metrics should we be disclosing with these TCFD recommendations. So, I think a little bit more standardisation with these could be very helpful.

Christina: Can I just jump in with a quick question, Ásdís?

Ásdís: Of course.

Christina: Because I was paying quite a lot of attention to the stuff you said about integrated reporting and how not a lot of companies do this now. And so obviously the way that a lot of other companies do report, is by having a separate sustainability report. Do you want to add a few comments about why you think integrated reporting is a better way of going about it than doing separate reports?

Kaitlin: Yes, definitely. It's something that we've considered a lot at Novo Nordisk. What is the best way to report on our environmental data and I think the thing about integrated reporting is that you have this audit program that you go through where you actually have an audit company come in and dig into all of your environmental metrics. And if they see anything a little strange, they immediately ask about it and you have to prove kind of that all of your data is correct. And then they actually go to all of the different sites and also examine there and reporting to ensure that the data is valid. And when you have a separate sustainability report, usually this doesn't undergo any sort of audit process. So, there's no kind of verification standard attached to it. So, for us it's very important that we can prove that everything is verified within our annual report. And that's why we've decided not to have kind of a separate document just on environmental data.

Christina: Thank you.

Ásdís: Moving on to question five, do you find that you're able to participate in the dialogue of the development of governmental policies and strategies and towards climate change and climate action?

Kaitlin: I think to some extent. But I think this is something that we could also work on more as a company. It's not really something that we've engaged with on that wide of a scale. But I will say, for example, when we announced, I believe it was in 2014, that we were joining RE100 and had a plan of using 100% renewable power within our production sites by 2020. And in certain places of

the world, we knew that there wasn't a solution to having renewable power in those areas. So, it involved engagement from a government affairs level, where it was our company actually kind of working with the government to figure out if we could offer any sort of solution in these different regions. And now with the new environmental strategy for 2030, we've extended it so it's not just power, but also all fuel, all steam also all transportation. And we know this is actually going to involve a lot more advocacy, for example, with electric cars. In a lot of places in the world, they just don't have the infrastructure. So, it could be that we maybe advocate for better infrastructure for electric or hybrid cars and then also right now it's just quite expensive to buy hybrid and electric cars. So also pushing the manufacturing companies potentially so that they have more low-priced opportunities for hybrid or electric cars. So those are just some ideas for the future of how we could engage with governments and governmental agencies going forward.

Ásdís: So maybe some suggestions of incentives.

Kaitlin: Yeah, it could be.

Ásdís: And do you think, touching up on this again, that the governmental priorities, do you think that they are influencing Novo Nordisk's business strategies and how Novo Nordisk engages in climate action?

Kaitlin: I think that government actions have a huge impact on our environmental strategy. And I do think we're very lucky that we're located in Denmark because Denmark as you know, has a pretty robust environmental agenda and it is kind of one of the top concerns right now in Danish society and also in Danish government. So, I think it kind of goes hand in hand that that's also one of the areas that we engage a lot with. I do think yeah, we're very lucky we're in Denmark and have that kind of synergy. So, I guess I would say yes. Government's policies do have a huge impact in how we engage with climate action.

Ásdís: Do you think that they're supportive of your engagement?

Kaitlin: I think, uh, in Denmark, um, in certain ways, yes. And in other ways, no. Um, and then I think if you look in the US, it's a very different story. So, I think it very much depends on which government is in power at the time. Um, and which location you're looking at.

Ásdís: Question seven. How is Denmark's national adaptation plan affecting the adaptation measures taken by Novo Nordisk? Do you know that there exists an adaptation plan for Denmark?

Kaitlin: Yes. Yeah. So, I guess

Kaitlin: I don't, I wouldn't, I don't know how it exactly impacts us on a, on a day to day, um, Eh, level. But I think that kind of the Nova Nordisk climate strategy and the Danish national adaptation plan complement each other very well. Um, I know it's something that we consider within all of our production sites, these, uh, kind of a different climate scenarios about what we can expect in Denmark in the future. And in the national adaptation plan, they're very clear about increasing levels of, of rain and also cloudburst events. So, this is something that we take into consideration at all of our production sites. Um, so that we know how we can handle these cloudburst events so that we can, yeah, we won't have any sort of interruption within our production. Um, so it's definitely something that is also considered within it, I would guess. I think the national plan is kind of an umbrella and our small little Nova Nordisk plan fits well into what everything that they're using for the adaptation plan.

Ásdís: This kind of relates to question eight. So, you think that some of your measures are complimented with the engagement of local government?

Kaitlin: Yeah, I think there's so much work we need to do with local government, and we can't do it by ourselves having, I mean it would be a disaster if Novo Nordisk kind of came up with their own plan without, um, talking with the surrounding areas. It needs to be something that's coordinated in the area. Um, Novo Nordisk we don't exist kind of in a bubble. So, we need to ensure that we have a coordination with the local municipality. And I guess some examples I've heard of, um, is like when we have increasing cloudburst events, um, one of the things we thought about at Novo Nordisk is if we can, um, have some sort of water pathways, um, potentially a road. If there's a ton of rain, that road might shut down and become a water pathway to get the water out safely. Um, so obviously that would be something that we would coordinate with local authorities if we were considering doing that. Um, and then I think one of the, one of the kind of highlights of us collaborating with the local government is something called the Kalundborg symbiosis project. Have you guys heard of that?

Christina: No.

Kaitlin: It's in Kalundborg where we have our largest production site and it's an area where there's a lot of other industry. Um, and it was decided many, many years ago that they wanted to start a symbiosis project where the waste from one company was then used as a resource in another company. So, there are at least eight different stakeholders that use waste as resources from one company to another. And it includes both industry but also the kind of local municipality. Um, so that's something that we kind of hold as the gold standard at Novo Nordisk for how we want to work with the local municipalities where we have production.

Ásdís: So, you will be happier with more engagement with the local government.

Kaitlin: Yeah. We have to have engagement with the local government. Yes.

Ásdís: And these partnerships like with the other companies at this Kalundborg projects or more partnerships with those private, other private companies and local government is something you would wish to do more of?

Kaitlin: Yes.

Ásdís: And moving on to question nine, do you feel that you have enough information about climate change and its specific impacts to Novo Nordisk, to take appropriate decisions?

Kaitlin: I think yes. We've been working with environmental issues for many decades now. Um, and we have a, a quite integrated network of environmental coordinators and energy stewards that are across all of our production sites. So, I think we have a pretty good handle on climate change impacts. Um, but I will say right now there's a lot of uncertainty about, um, kind of where's the world going to go? Are we going to be headed to a two-degree world or are we headed to a 5+ degree world? And um, right now that could have, yeah. It waits to be seen. Um, so I think we're taking the steps to ensure right now that we can survive in both the, the two-degree world and also the five-degree world. Um, but I think there is a lot of uncertainty still about where we'll end up in the future.

Ásdís: Do you have any suggestions for initiatives that could help you in relieving the uncertainty and providing more information?

Kaitlin: I mean, I think that having all this is from a, this is from a personal perspective, not a Novo Nordisk perspective, but I think having, um, countries all agreeing to the Paris Agreement and agreeing to work for a two degree scenario change

would be a big step in the right direction. Um, I think having, yeah, countries pull out of the Paris agreement, will really hurt, um, a global solution to climate change.

Ásdís: Right. Moving on to question 10, do you think that you're responsible for managing risks outside of your company? Like supply chain weaknesses to climate change, or is this the responsibility of respective governments or partners that are close to these climate risks?

Kaitlin: Uh, so at least at Novo Nordisk, we think that it's our responsibility to understand where we have kind of risks within our supply chain related to climate change. Uh, and we do a lot to engage with our supply chain in relation to climate change. Um, so this past year we engaged with over 30 suppliers on the climate agenda. And this is because we know that over 90% of our carbon footprint comes from our upstream supply chain. Um, so kind of us dealing with the 10% of emissions within our, our entire value chain is a very, very small portion. So, if we want to make a difference, we really need to engage our supply chain. And I also think that again, we've been working with the, the climate agenda for so long that we have a lot of learnings that we can share and are happy to share with our suppliers about how can you do energy savings and actually have it be a good business case. Um, so we, at, Novo Nordisk really are working on engaging our supply chain.

Ásdís: Great. Are you finding that there are certain obstacles in working with these supply chain risks?

Kaitlin: I think it's getting our, our supply chain to understand, uh, the environmental and financial and I guess social benefits, um, to the climate agenda. Um, and I think at first a lot of suppliers maybe see that it's very expensive and don't see the other benefits to engaging on the climate change initiatives. Um, but it's something we're working on and we have seen a lot of positive feedback from suppliers. So, we are hopeful that it will develop further in the coming years.

Ásdís: So, related to this, for question 11, how has Novo Nordisk's engagement with climate change and climate action changed in the past few years?

Kaitlin: Um, so I think this is also related to the question you just asked about our suppliers because, uh, in the past we've been working on accomplishing our, RE100 goal of having a hundred percent renewable power within production. Um, and so it's really been a focus on our own production sites. Um, and with our new environmental strategy towards 2030, we've realized that, while it's very important that we accomplish RE100, we really need to expand the scope of our environmental strategy. So, it's not just dealing with kind of these 10% of emissions in our value chain. Um, but also looking at our upstream suppliers and then also looking at how our products are used, how are our products developed and how our products disposed of. Because right now, um, consumers use our products and then they end up in incineration or in landfill. So, is there a better way that we can deal with our products after use? And that's not something that we've engaged with before.

Ásdís: Great. So, for question 12, coming back to obstacles. What do you see as the main challenges for adapting to climate change and then implementing your climate action initiatives?

Kaitlin: I think, uh, one thing that I mentioned earlier was the suppliers. So, getting our suppliers on board, and joining of our zero-carbon program at Novo Nordisk. And then I think another big one is regarding transportation. Um, we have, also as part of our new environmental strategy, a goal of having zero carbon

emissions from operations and transportation. And all of a sudden that means all of our product distribution. We want to be carbon neutral. All of our, our emissions from company cars needs to reach zero. And then we also need to have zero emissions from business flights. So right now, it's a very hard nut to crack because there's no way you can fly, um, and not emit. Um, so we're looking into, do we need to do offsetting or how can we reduce our flight emissions to a point where we can ensure that all flights are necessary for business, uh, and then offset the rest? And then also with electric and hybrid cars, there are certain places like in Denmark, um, where we do have opportunities and infrastructure, uh, to transitioning to using electric and hybrid cars. But in a lot of areas of the globe, that's not an option. The infrastructure just isn't there. Um, so I think that's going to be one thing that we're going to be working on a lot over the next many years, is figuring out how we can globally transition to using electric and hybrid cars.

Ásdís: Yup. Well next question. It really relates to this and something about this lack in infrastructure that is maybe prohibiting certain actions being implemented. Are there any other initiatives in climate action that you would like to implement but that may be difficult or you are finding unfeasible perhaps on a larger scale?

Kaitlin: I think one of the things, uh, also is that right now there are a lot of solutions in place for having renewable power. Um, it's pretty, I mean it's not easy but, but there's wind power and solar power that is relatively widely available globally for having renewable power, but it's a lot harder to find solutions for replacing steam and fuel with greener sources. Um, so that's also something that we're finding to be a, a barrier right now to reaching zero CO₂, from operations. So that's something we'll be engaging quite a bit with the local governments globally to find solutions for, uh, within the next 10 years.

Ásdís: Hmm. So, onto the last question, question number 14, how do you think private enterprises can have a more viable role in climate change adaptation and achieve greater impact? For example, these three pillars of sustainability; economic growth, social responsibility and environmental sustainability.

Kaitlin: Okay. Yes, that's a good question. Again, I think we're, we're very lucky that at Novo Nordisk we have this triple bottom line as a part of our company. But I think it can still be hard to ensure that all kinds of three pillars have the same weight, um, so that it's not just economic decisions that are being made, but that also environmental and social considerations have the same weight. So, I think figuring out a way where environmental impacts can also be quantified in a better way could help. I also think, um, with the TCFD recommendations, suddenly having investors asking about environmental data and asking for environmental metrics, that could have a huge implication across the industry in increasing their focus on, on climate change risks and opportunities. So, I think, it still needs to develop more, but I think the potential for really changing industry through TCFD recommendations, I think it's there.

Christina: Okay. Great. That's the end of our interview, our formal questions.

Kaitlin: Yes. Great.

Ásdís: Is there anything that you would like to highlight or add to what we have been discussing?

Kaitlin: Uh, I don't think I have anything else to add. Um, but I also know if, if you guys are interested in any other companies, I know Carlsberg is also doing fantastic work and also Ikea if you need any more, kind of Nordic companies that are working with the sustainability agenda. Those are kind of two front runners also.

Ásdís: Yeah. Thank you.
Talk outside interview scope.

Kaitlin: And then I'm the lead for, we have six different tracks for the environmental strategy. So, um, I work with the track for zero CO2 emissions from operations and transportation and then I'm also in charge of all of our environmental reporting. So, I do all of the annual reporting, our CDP reporting, and then I'm also doing all of our TCFD reporting too.

Christina: All right, great. Thanks for that.

Ásdís: Can I ask you, do you think that you will reach your goal 2030, for zero emissions?

Kaitlin: Zero emissions from operations and transportation. And yes, if we want it to reach the goal tomorrow, we could by buying offsets, but we don't believe that's the way to do it. Um, so we really want to work on finding meaningful solutions instead of just buying offset projects, uh, for all of this. So, we're engaging in a lot of things from China to Brazil to the US to find ways to have better solutions, especially for our fuel use. But I do believe we will accomplish it and we have 10 years, so that's a decent amount of time.

Christina: It's a very ambitious goal. It's great.

Kaitlin: It is, but we're very hopeful because our CEO is the one who signed off on it and once you have the CEO signing off, I think that does a lot to motivate managers and employees across the company
Talk outside interview scope.

Annex L: Summary of Interview Answers

Comparison and summary of answers to interview questions

Company	Q1	Q2	Q3	Q4	Q5	Q6	Q7
	Being a company within the your sector, how do you think that influences your possibilities of engaging with climate action?	Are your initiatives towards addressing climate change, driven by external or internal factors?	To what extent do you think private companies are responsible for addressing climate change?	Are you finding enough available tools and frameworks to support company engagement with climate action and do you think there is something missing (or that should be changed)? Please also indicate which tools you use for your work with climate action?	Do you find that you're able to participate in the dialogue (have a say in framing the problem and developing solutions) of the development of governmental policies and	Are governmental priorities influencing your business strategies and/or how you engage in climate action?	How is Denmark's National Adaptation Plan affecting the adaptation measures taken by Danfoss/Novo Nordisk?
Danfoss	Big impact on climate change - the core of our technologies is energy efficiency and we therefore have a responsibility to show the way forward, both internally in our own operations, but also externally in projects.	As we are still a family owned company, with the founder spirit very present in our DNA, sustainability is something we have always done. It is part of our DNA to have the longer view. And as I personally like to say, if by 2050, we do not have a healthy planet, we will not have healthy customers or maybe customers at all that would be able to purchase our products. Hence this is where our internal motivation comes from. Externally, there are two important factors: our customers' demand regarding environmental regulation and energy efficiency standards, to name a few, but also and very importantly the regulatory framework conditions. This is why it is so important that we have for instance the climate agreement, that the EU sets high targets on energy efficiency, renewables and CO2 emissions until 2020, 2030 and so on, and ultimately the national strategies and plans that need to show the pathway forward and which drive investment decisions.	Private companies are corporate citizens, part of the global system. Danfoss, being an engineering company, should be explicit about their expertise in technological solutions and what targets are achievable to inform policy makers.	There are enough tools that are very useful. There just needs to be continuity and use of the initiatives that we know are already working and accelerate those. Tools we use: - UN Global Compact - RE100 - SDGs	There needs to be public-private collaborations with information sharing, so that both policy makers know whats being done and what is possible (technology wise), and private companies know what needs to be done. Danfoss feels like they have a seat at the table and that is why they are engaged in the dialogue. They want to contribute the information.	The private sector is generally interested in long-term planning for investment decisions and business continuity. Governmental priority incentivizes the private companies towards moving their business in certain directions. For Danfoss, this is especially within energy efficiency, as this is set as a governmental priority.	Not familiar with the NAP. However, flooding is addressed as a risk for Danfoss, but not for the sake of integration with the NAP.
Novo Nordisk	Being one of the largest companies in Scandinavia, Novo Nordisk consumes a lot of natural resources, and is therefore a contributor to climate change. Moreover, being a pharmaceutical company, Novo Nordisk has great opportunities in delivering products to adress secondary risks from climate change such as health risks	Everyone has a role to play and dealing with climate change needs to be a joint effort between all players in the society. Highlights the internal factors that affect their strategy which are driven by the core values of the company which is to be sustainable financially, environmentally and socially. Top level influence is also high within Novo Nordisk where the company's environmental strategy is prioritized.	Private companies should take responsibility for the whole lifecycle of products - from supply chains to production to disposal. Novo Nordisk has a circular zero for waste goal by 2030 in which zero waste should go to landfill by this year. Holistic approach.	Novo Nordisk uses integrated reporting to add validity and transparency to their environmental reporting. Intergated reporting should be applied on a broader scale, Novo Nordisk is also certified according to the ISO14001 for energy management and reports based on the CDP and TCFD recommendations and is a part of RE100. There is however a need for furthering the understanding of how companies should report according to the TCFD recommendations as there is a lot of uncertainty in regards to this - more coordination across industry in terms of how the report should look and how investors will use the information. At this point, environmental disclosure is voluntary with no requirements	Not specifically engaged in the dialogue at the moment but have thoughts and ideas on how they could. Especially towards advocating for incentives that will help with moving certain initiatives forward. Such as incentivizing going electric in transportation.	It depends on the context you're looking at. For Denmark, the government has a very robust environmental agenda, which hugely impacts the environmental strategy of Novo Nordisk	Not really influencing Novo Nordisk but compliments their actions. Both Novo and the NAP consider increased precipitation as a risk and Novo Nordisk has implemented measures to increase their resilience to these events at their production sites.

Comparison and summary of answers to interview questions

Company	Q8	Q9	Q10	Q11	Q12	Q13	Q14
	Are any of your measures complimented with engagement of local government?	Do you feel you have enough information about climate change and its specific impacts to Danfoss/Novo Nordisk to take appropriate decisions?	Do you think that you are responsible for managing risks outside of your company (such as supply chain weaknesses to climate change) or is this a responsibility of the	How has the company's engagement with climate change and climate action changed in the past few years?	What do you see as challenges (barriers) for adapting to climate change and implementing climate action initiatives?	Are there initiatives for climate action you wish you could implement, but are finding unfeasible? If yes, which initiatives and what are the reasons for their infeasibility?	How do you think private enterprises can have a more viable role in climate change adaptation and achieve greater impact (for both economic growth, social responsibility and
Danfoss	In Sønderborg, where the company is headquartered, Danfoss is working with the local government to decarbonize the city. This is because Danfoss is both a contributor but also has solutions for solving the problem. Action happens locally and you need partnerships with local governments.	Being such a large company, allows for Danfoss to engage with many different initiatives, where information is given. Actively seek out information from different sources: World Economic Forum, Governmental think tanks, COP and Global Compact. Moreover, Danfoss has a Sustainability Director and a Safety and Health Network. Smaller companies have a potential obstacle, in that they do not have the necessary resources to seek out this information.	Julia does not address risk management for supply chain management directly but highlights that Danfoss is focused on a healthy work environment for their employees throughout the entire supply chain.	There has been a shift from what is "nice to do and something that should be done", to something that Danfoss "wants to do". Now it is also a part of top-level priority which has been facilitated by the development of the SDGs, Paris Agreement and IPCC reports	Part of the challenge is overcoming "business as usual" and going from just "talk" to actual "action" and following through with initiatives. Governments need to trust the private sector in what they can bring to the table for more ambitious target 'setting'.	Julia mentions that she would like to make Danfoss's office buildings more energy efficient and overall be quicker in implementing and scaling up initiatives.	It is imperative to have ambitious goals and go beyond business as usual and have visionary politicians that set high targets. It's not about one solution over the other - many different solutions have to be implemented
Novo Nordisk	There needs to be coordination with local government, authorities and other companies in the area. An example is the Kalundborg symbiosis project which is facilitated by the local municipality. The project reuses waste from one company as a resource in another company.	There is great uncertainty about the ultimate severity of climate change so Novo Nordisk is preparing for different scenarios of global warming	Novo Nordisk is engaging their suppliers due to the fact that 90% of their emissions comes from their up-stream supply chain. Trying to inform their suppliers that these changes have a positive effect on the environmental and financial wellbeing of their company. (Not only looking at the up-front cost)	The scope of the environmental strategy has been broadened to go beyond own production sites, and engage the entire upstream supply chain, in order to reach the RE100 goal of having 100% renewable power within production by 2030	Challenges to reaching a carbon neutral goal relates to both getting suppliers on board as well as achieving zero emissions from transportation, especially flights (since this is not possible at this point). Novo Nordisk is therefore looking into how they can reach carbon neutrality with flights through offset projects and help transition into using electric and hybrid cars globally while also considering challenges relating to infrastructure for these measures.	Being able to reach zero emissions while working within different global contexts where the possibility of using renewable energy is not as easily accessible everywhere. Working closer with governments to achieve this. Difficult to replace steam and fuel with greener sources	Figuring out a way of quantifying environmental impacts so all three pillars have the same weight and the pull from investors to be presented environmental metrics can be met