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The following master thesis at BI Norwegian Business School is conducted as the final step in our Master of Science in Business, with a major in Supply Chain and Operations Management. The master thesis has investigated transparency within global energy supply chains, and the associated factors that impact transparency. Additionally, the master thesis includes an exploration of how transparency is connected to sustainability. Throughout the research process we have acquired valuable knowledge of the factors that influence transparency within global energy supply chains, and how the concept might enable sustainability.

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We wish you a good reading!

Abstract

Research on transparency in global supply chains has increased in recent years due to enhanced emphasis on sustainability, global dependencies, and supply chain disruptions illustrated through the Covid-19 pandemic and Russia's recent invasion of Ukraine. A sector particularly relevant to illustrate global dependencies and disruptions is the energy sector, which now experiences significant shifts in supply and demand. Characterized by the recent energy crisis, enhanced political demands, and the transition from fossil fuels to renewables, it is evident that the sector is experiencing intensified pressure. Furthermore, as the energy sector is heavily dependent on foreign suppliers, some of them accused of human rights violations and considerably contributes to global greenhouse gas emissions, it becomes evident that the sector would be in favor of practices that facilitate more control and visibility throughout global supply chains. In general, transparency is the tool suggested to better cope with the aforementioned complexities. However, as transparency is currently proven to be relatively poor within this sector, it becomes crucial to identify the factors influencing transparency.

With regards to the previous section, this master thesis identifies factors influencing transparency within global energy supply chains and investigates how transparency might enable sustainability. In literature, researchers have covered the topic of transparency to a great extent, focusing on benefits and opportunities in theory. However, despite transparency being extensively covered in literature, we were intrigued by the insufficient research on how transparency is applied in practice and the concept's corresponding complexities. In addition, few researchers have investigated transparency in connection to the energy sector, an interesting field of investigation due to recent intensified pressure and its characteristics of fierce competition, complex supply chains, and project-based organizing. Consequently, we constructed one overall research question and one sub-question that we attempt to answer to further investigate the research gap: (1) *What are the key factors influencing transparency in global energy supply chains?* and (2) *How does transparency enable sustainability?* We aimed to answer these research questions through a qualitative study with valuable insight acquired from expert interviews to better understand the aforementioned. To answer the first research question, we explored transparency in energy supply chains to better understand the present situation. Further, we investigated *drivers*, showcasing the need for enhanced

transparency, *barriers*, elements that inhibit transparency, and *enablers*, underlying preconditions that enhance transparency in practice. The sub-question was included due to the growing number of organizations that now aim to improve sustainability in their supply chains, making it a relevant subject for investigation. Consequently, we have been investigating whether transparency could simplify the process of accomplishing sustainability in practice.

Our research revealed that globalization and corresponding risk, increased emphasis on sustainability, and the development of new laws and regulations are underlying factors that encourage energy-associated enterprises to ensure transparent supply chains. Through investigating the factors which inhibit information sharing, our study proposes that it is, in fact, the industry characteristics themselves, complexity, fierce competition, and project-based organizing, that impede transparency. Moreover, to ensure transparency in global supply chains, energy-associated corporations are encouraged to invest in information technologies, develop internal culture and allocate new responsibilities, collaborate, and develop common standards across the entire supply chain. Our findings also conclude that transparency can be used as a tool for sustainability, as it is proposed to create increased awareness and monitoring.

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Chapter 1 - Background and motivation of the study

1.1 Motivation of thesis

This master thesis aims to investigate transparency in global supply chains and more specifically, global energy supply chains. The growth of international trade dependencies and increased focus on corporate social responsibilities (CSR) have forced companies to rethink their strategies (Berger-Walliser & Scott, 2018). Initially, globalization was perceived as an opportunity for companies to achieve competitive advantages through low cost of labor, capital subsidies, and reduced logistics costs (Meixell & Gargeya, 2005). These numerous advantages have driven countless businesses to trade globally to some extent. As a result, enterprises are now more than ever involved in complex networks that extend overseas, with an immense number of nodes and entities involved. The magnificent connectivity and vast number of nodes drive complexity, and businesses at the center of the web are most likely unaware of all dependencies present (Mena et al., 2018). This challenge has been particularly visible in the light of recent events, with the Covid-19 pandemic exposing businesses to all associated inter-connectivity vulnerabilities (Chowdhury et al., 2021). Further substantiating the matter, global supply chains were tested again during the conflict between Ukraine and Russia, as enterprises were taken aback by their dependencies on Russian commodities (Kilpatrick, 2022). Furthermore, expectations of social responsibilities for businesses are rapidly changing due to economic development, digitization, connectivity, and increased emphasis on sustainability. Globalization, combined with increased social expectations, has forced corporations to implement sustainability into their strategies and structure. However, limited visibility throughout global supply chains threatens the ability to reduce risk (Zhu et al., 2018).

In recent years, a growing number of corporations have been experiencing the downside of global sourcing through a lack of direct control of upstream supply arrangements, illustrating a modest level of transparency between enterprises and their suppliers (Mena et al., 2018; Egels-Zandén et al., 2015). The energy sector is an industry that particularly faces the drawbacks of global presence. Through the global energy crisis, energy-associated enterprises now encounter supply problems due to rapid human growth (Merchant, 2022). This increases the sector's

complexity through enhanced political demands and a forced shift from fossil fuels to renewables. The global energy crisis was further amplified through the Covid-19 pandemic and Russia's invasion of Ukraine, highlighting interconnectivities, making the energy sector a relevant candidate for further investigation. Similarly, upstream challenges were made apparent through a recent internship at a large Norwegian energy producer conducted by one of the researchers of this study. During the internship, ethical issues at bottom-tier suppliers and poor transparency levels were discovered through a report covering the solar industry (Murphy & Elimä, 2021). The report highlighted how the solar industry is deeply dependent on components and services acquired in the Chinese province of Xinjiang (Murphy & Elimä, 2021). Manufacturers in this area have been popular due to its low production cost, cheap coal, and tax incentives. However, the province has frequently been accused of labor issues, and studies have expressed concerns regarding modern slavery-related human rights abuses in the energy supply chain (Murphy & Elimä, 2021).

In addition to social concerns, the energy industry is a massive contributor to global emissions, accounting for more than 80 percent of total greenhouse gas emissions (Colla et al., 2020). However, ensuring complete visibility across the pipeline has been challenging for the energy sector due to its inherent characteristics, driving complexity and reducing transparency (DHL, 2015). This observation made it evident that the energy industry still struggles to ensure transparency in their global supply chains and how vital transparency becomes to ensure social and environmental responsibility. Another factor motivating transparency is newly established legislation related to transparency in supply chains. As of July 2022, large enterprises resident in Norway (or liable to Norwegian tax) become subject to the Transparency Act. This law encourages the improvement of supply chain visibility and control and strives to “promote enterprises’ respect for fundamental human rights and decent working conditions” (Transparency Act, 2021, §1). This act is a step toward a more transparent global business environment where corporations obtain complete control over their supply chains and sub-entities.

As proven, the once linear supply chain now expands into integrated networks of global upstream and downstream suppliers, which makes maintaining control and visibility vital. This encourages enterprises to enhance transparency in the supply

chain, referring to increased visibility, monitoring, and information sharing, to cope with the consequences of globalization (Bai & Sarkis, 2020; Montecchi et al., 2021). Supply chain transparency is defined as “the practice of disclosing detailed and accurate information about operations and products, such as their origin and sourcing, manufacturing processes, costs, and logistics” (Bai & Sarkis, 2020). Further, it is highlighted in established research how transparency and sharing of information at every step of the global supply chain can be powerful mechanisms for reducing supply chain risk and enhancing social and environmental performance (Bush et al., 2015).

Consequently, our research aims to examine transparency within energy-associated supply chains and better understand the factors that influence transparency. We have chosen the topic of interest as we are intrigued, despite the stated benefits, by how companies relate to transparency in practice. Considering the increased attention to transparent supply chains in theory, we believe a more practical approach focusing on the current situation, drivers, enablers, and barriers will generate valuable insights. We have linked the occurrences identified to energy supply chains, however, we are confident that these challenges are somewhat industry-independent as nearly all actors in modern supply chains are involved in global networks.

1.2 Problem Statement

This thesis explores the factors influencing transparency and finds explanations for the modest level of transparency between enterprises and their suppliers (Egels-Zandén et al., 2015), despite the popularity and benefits highlighted in the literature. Further, we want to investigate how transparency can enable sustainability in supply chains. Transparency is not a new field of research as it was first introduced in the 1980s (Lamming et al., 2001). However, through the theoretical background, it was made evident that limited research exists on the practical aspects of transparency, with restricted emphasis on why information sharing, monitoring, and visibility is insufficient between business and their suppliers. As we found it puzzling that there exist few explanations for why transparency remains poor, this paper aims to tighten the gap by investigating the deeper aspects of the elements that influence transparency in practice in global energy supply chains. The scope covers a subset of sizable Norwegian energy corporations that incur global supply

chains. In an attempt to address this further, we have formulated the following question, which will be our primary emphasis and our overall research question of this thesis:

What are the key factors influencing transparency in global energy supply chains?

The research question will be connected to established theory and research, in which we will investigate key factors influencing transparency in global energy supply chains. This implies investigation of perceived (1) Drivers, showcasing the need for enhanced transparency, (2) Barriers, elements that inhibit transparency, and (3) Enablers, underlying preconditions that enhance transparency in practice. As the research question comprises a variety of potential complex issues and perspectives, we found it pragmatic to limit and concretize the scope of the study. Two measures are imposed to ensure a more narrow scope of research. Firstly, the study will mainly focus on transparency in relation to information sharing concerning sustainability. Sustainability includes social and environmental achievements, exemplified by labor conditions and carbon emissions. As we assess this linkage to be an essential driver for transparent supply chains, it will be used as a primary contextual factor in the thesis. Moreover, due to increased sustainability focus, a growing number of organizations now aim to improve sustainability in their supply chains. As we want to illuminate the possibility of whether transparency could simplify this process, a sub-question that investigates the recursive relationship between sustainability and transparency was formulated to capture this aspect:

How does transparency enable sustainability?

Secondly, to further concretize the thesis, we have chosen to focus on the Norwegian energy sector. The industry is deeply dependent on sourcing in foreign countries and hence significantly affected by globalization (DHL, 2015; Murphy & Elimä, 2021). Recent intensified pressure derived from the global energy crisis, enhanced sustainability pressure, and increased political demands forces energy producing enterprises to rethink their strategies. This implies major changes in the sector in order to cope with rapid human growth and sustainability concerns

(Merchant, 2022), making it particularly interesting to investigate transparency in practice in energy supply chains. To answer the stated questions, we have conducted a qualitative study which will be elaborated on in chapter 2. This master thesis is a continuation of the preliminary thesis report handed in in January 2022 and contains sections derived from the Research Methodology exam handed in on June 22nd, 2021.

1.3 Justification and Contribution to the Research Area

In the development of the study, its objectives, and research questions, we wanted to combine our interest in transparency, sustainability, and globalization challenges with the opportunity to contribute to existing scientific knowledge. We have chosen the topic of interest as it is considered relevant and essential for enterprises to ensure economic, social, and environmental responsibility.

To ensure contribution to existing scientific knowledge, we examined the research's relevance, novelty, contribution, and feasibility. The research question is *relevant* due to the cruciality of transparency in modern supply chains. Researchers have highlighted the importance of transparency as a key to solving complexities related to global supply chains and sustainability concerns (Wadhwa et al., 2010; Saberi et al., 2019; Bø & Baxter, 2020; Friday et al., 2018). This is particularly true for the energy sector as it faces concerns related to sustainability, low levels of supply chain visibility, and is subject to new regulations promoting transparency. Literature highlights that corporations are now required to comply with sustainability expectations in addition to achieving economic objectives. Combined, the three elements of economic, environmental, and social aspects constitute the triple bottom line, argued by literature as crucial to staying competitive in today's global market (Bradley, 2021; Sroufe, 2006; Porter & Kramer, 2006; Porter & Van der Linde, 1995). As developing countries exemplified by China are responsible for an immense amount of the western world's manufacturing, we argue that the issues related to sustainability and dependency are substantial across industries. Reviewing existing papers on the topic, we discovered that our research is characterized as *novel* despite transparency being a popular topic among researchers. What makes our thesis novel is the focus on the practical aspects of transparency as a concept, as we are diving deeper into the current situation, drivers, enablers, and barriers that exist. Hence, we argue that the

study *contributes* to the existing literature by closing the gap between transparency and practical implications in the Norwegian energy sector. To make the study *feasible*, we initiated conversations with a subset of large Norwegian energy-associated enterprises operating within global supply chains. Most of the actors participating are part of a collaborative sustainability forum, in which various issues and opportunities are commonly addressed.

1.4 Limiting the scope of research

As an immense volume of enterprises and industries are involved in global sourcing, it was necessary to somewhat limit our perspective. Accordingly, we have directed our primary focus towards a specific group of organizations. These enterprises are required to manage global supply chains with significant global impact, are relatively experienced, and are perceived as substantial contributors to the sustainability aspect. Hence, experts associated with these corporations are believed to provide valuable insight into global supply chains, supplier relationships, sustainability in a global context, and, most importantly, transparency. Additionally, due to the complex nature of global supply chains, we found it expedient to further narrow the scope of our research. Thus, we constructed an overall research question and a sub-question to approach our objectives as precisely as possible.

In recent decades, corporations have been challenged in sustainability efforts, including environmental and social responsibilities. Moreover, the sustainability aspect has evolved from covering only internal responsibilities to a more holistic picture covering the entire supply chain. Consequently, we believe that this area of investigation deserves more attention, and hence the master thesis mainly covers transparency's linkage to sustainability. Further, the experts included in the study are either directly or indirectly connected to procurement, supplier management, or sustainability, as we believe that employees within these entities possess crucial information, experience, and perspectives about transparency in global supply chains.

1.5 Thesis structure

The structuring of this paper is motivated by the desire to answer the constructed research questions as comprehensively as possible. Chapter 2 elaborates on the methodological aspects of the thesis, and the characteristics of the chosen research design are presented. This section also includes arguments for why qualitative research with expert interviews is chosen in favor of a multiple case study. Following, the theoretical background is showcased through an extensive review of literature in section 3. The chapter is mainly concerned with transparency, including sections about drivers, barriers, enablers, and the importance of supply chain transparency in the energy sector. In chapter 4, an analysis of the study's empirical findings is presented, followed by a discussion of the most essential findings in conjunction with existing literature and our developed research questions in chapter 5. Lastly, in chapter 6, we present the final conclusions of our study and provide suggestions for future research.

Chapter 2 - Research Methodology

2.1 Research Strategy

Methods of research can be defined as either quantitative or qualitative. The methods refer to which strategy the researchers have employed to gather and analyze the information resulting from the study (Bell et al., 2019). Quantitative research emphasizes quantifiable information when collecting and analyzing data. Contrary, the qualitative research strategy chosen has a different epistemological foundation and is expressed through words and images rather than numbers (Bell et al., 2019). As transparency in supply chains is a relatively new topic to most companies involved in global energy supply chains, it becomes difficult to gather quantitative data. Furthermore, as we want to establish an in-depth insight of factors influencing transparency within global energy supply chains and explore the relationship between sustainability and transparency, we argue that a qualitative stance is the most appropriate research method (Bell et al., 2019). The qualitative method allows us to have a close involvement with actors related to our research questions such that we can gain comprehensive insight from their perspectives and thus explain and describe deeper aspects of drivers, barriers, and enablers of transparency.

2.1.1 Scientific Approach

Researchers often distinguish between deductive and inductive approaches to research (Bell et al., 2019). The deductive approach uses what is already known to deduce a hypothesis and then test the theory, while the inductive makes specific observations and contributes to the theory through their findings (Bell et al., 2019). As a combination of both approaches, a third approach is denoted as abductive, which involves going back and forth between theory and data. For our master thesis, we have chosen the latter mixed approach.

Literature associated with our field of interest highlights the importance of transparency within the supply chain to handle multiple challenges and risks that an organization faces in a global environment. However, as there exists limited research on this concept in the energy sector, our study will apply abductive reasoning, also labeled systematic combining, as it eliminates the limitations

associated with deductive and inductive research (Bell et al., 2019, p. 24; Dubois & Gadde, 2014). Abductive reasoning originates from observing a phenomenon and then seeks to develop explanations for them by studying iteratively between theory and data (Bell et al., 2019; Dubois & Gadde, 2014). This allows us to gain a deeper insight into transparency by investigating its impacting factors in the energy sector. By moving back and forth between the theoretical and empirical world, using an iterative rather than a linear approach, we are able to dig deeper into drivers, enablers, and potential barriers that impact transparency and its relationship to sustainability.

Using this approach, we were able to begin with theoretical research, get insight from primary data, and later develop theoretical insights into the factors that influence transparency and how it can benefit energy supply chains. In the initial phase of the thesis development, a tentative theoretical review concerning global supply chains, transparency as a concept, and its connections to sustainability was conducted. As a consequence of inadequate research on the linkage between transparency and the energy sector, we found it helpful to exploit the conducted interviews to review and redefine our theoretical background. Such adjustments to our theoretical foundation were made in parallel throughout the entire primary data collection phase, ensuring that the previous literature and theoretical foundation were aligned with our master thesis progression. In addition, we contributed to existing scientific knowledge by revising our initial conceptual framework by supplementing the model with new insight from our primary findings.

2.2 Research Design

For our research design, we have chosen to conduct a qualitative study focusing on transparency, gaining insights from expert interviews. In the developing phase of the research, we discussed different designs that were potentially appropriate, in which single and multiple case studies were a part of the discussion. This was primarily because of an internship conducted by one of the researchers at one of Norway's largest energy producers, in which our initial interest in the topic was developed. Case studies are in-depth investigations that examine one or multiple *specific* cases, while expert interviews are often conducted to get a broader understanding of a specific topic and are frequently used when difficult to gain access to an area of interest (Bell et al., 2019; Bogner et al., 2009). A multiple-case

study might seem like a suitable design, however, as enterprises within the energy sector are characterized by underdeveloped practices for transparency, it became difficult to acquire sufficient information, documentation, and observation to do an in-depth investigation of multiple enterprises.

Moreover, our desire to explore large enterprises with common challenges made it interesting to converse with several experts within the same sector, and include a broader set of interviewees in order to enlarge our understanding. In this sense, we used expert interviews to illuminate the concept of transparency across enterprises, without taking individual company traits into consideration. These practitioners are designated experts and can provide valuable insights due to their extensive knowledge and experience in their respective fields. In addition, limited timeframes made multiple-case studies challenging to conduct as deeply investigating multiple corporations is time-consuming. On the other hand, expert interviews are argued to shorten the time spent on the information gathering process as the experts provide inside knowledge that can apply to a broader circle of players (Bogner et al., 2009). As a result, a qualitative study with expert interviews seemed like the most suitable design for our study, as opposed to the case design.

2.3 Literature study

Despite the concept of transparency being introduced as early as in the 80s (Lamming et al., 2001), the focus on transparency in the supply chain has experienced growth within research in recent years. In light of this, we have primarily reviewed papers and journals from 2017 to 2020 in our theoretical background. However, we have included some more mature articles to get an overview of how research on the topic has evolved, and hence our timespan ranges from 1987 to 2022. To initiate the theoretical background, we defined several search strings. The most frequently included words were “transparency” and “supply chain.” Articles were primarily found through Google Scholar and Oria, the BI library database. The most frequently used academic databases were Emerald, ScienceDirect, Taylor and Francis, MDPI, and Wiley. To ensure high-quality papers, we nearly exclusively reviewed peer-reviewed articles published in international journals. However, we also decided to include papers from other highly recognized sources, such as Harvard Business School. To capture relevant research and information, we decided not to limit the number of journals included

in the theoretical background. To get a better overview of our collection of data, a summary is included in Figure 1.

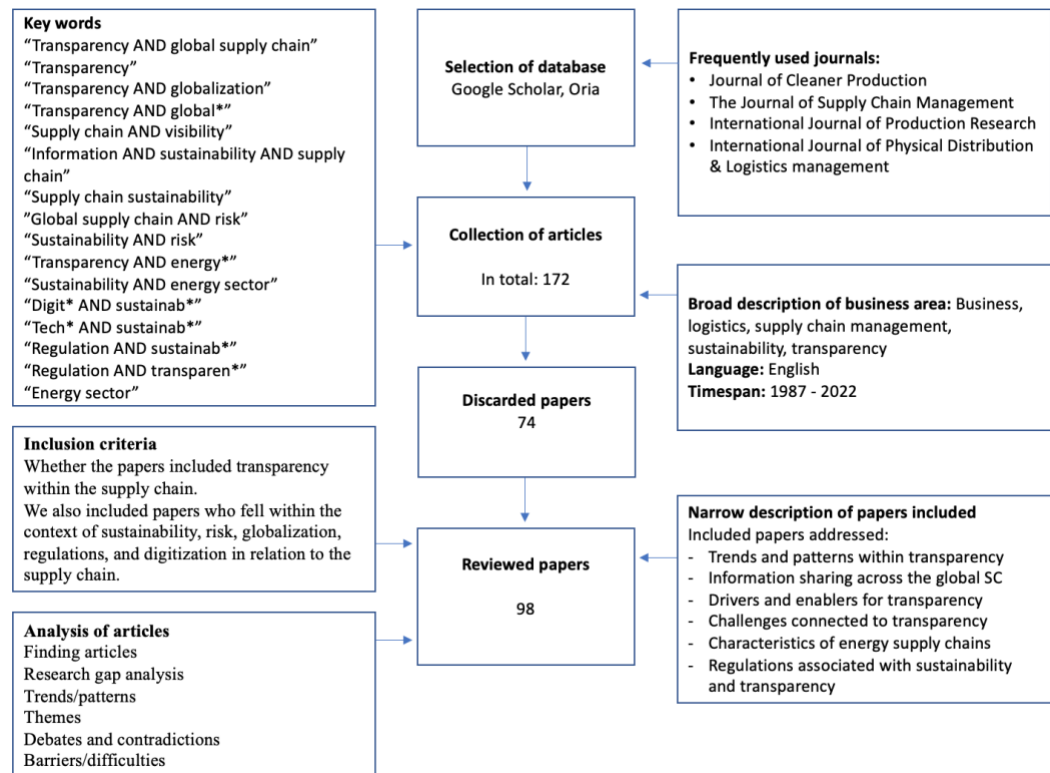


Figure 1 - Review of literature

2.4 Data Collection

Data collection in qualitative research is an essential part of the study, where researchers often conduct interviews or questionnaires as primary data and gather data from external literature and reports as secondary data. Data collection provides the opportunity to acquire first-hand knowledge and insight into the research problem.

2.4.1 Primary data

Information collected for the first time by the researchers and characterized by a degree of originality is denoted as *primary data* (Kothari, 2004). Such data can be exemplified by collecting information through interviews, observations, focus groups, and questionnaires (Kothari, 2004). A self-completion questionnaire is a collection method where respondents complete the questionnaire themselves. This method provides the opportunity to collect large amounts of data from different people, in which one can get insight into opinions, behaviors, and experiences (Bell

et al., 2019). The questionnaire must be easy to follow and answer as respondents might misinterpret the question. Pitfalls of this method include the inability to assist the respondent, the inability to elaborate, and difficulties in collecting additional data (Bell et al., 2019). On the contrary, interviews allow the researcher to gather more information as they can ask follow-up questions to fewer people. This allows the researchers to gather in-depth understanding as opposed to questionnaires, where the questions are more superficial.

As we wanted to gather an in-depth understanding of the factors influencing transparency and its corresponding drivers, barriers, and enablers, we decided to conduct semi-structured interviews that allowed the interviewees to elaborate on the topic of interest. As opposed to questionnaires, semi-structured interviews allow us to set the initial direction of the interview while simultaneously allowing the interviewee to influence the topics discussed. Thus, the structure of the interviews allows greater flexibility as the opportunity to restructure questions is present, a beneficial feature of the iterative approach as it contributes to deriving nuanced findings and perspectives (Kothari, 2004). Additionally, it is easier to control the samples in personal interviews, which minimizes the probability of non-response (Kothari, 2004). However, the method used for primary data collection is also subject to critique. First and foremost, conducting such interviews is severely time-consuming. Secondly, due to time restrictions, only a smaller sample size is eligible for this study. Thirdly, a physical discussion involving the interviewers might bias the findings as the researchers' presence might affect the interview direction.

As both researchers were included in the interview setting, semi-structured interviews were preferable to ensure comparability (Bell et al., 2019). An interview guide was constructed to initiate discussion but was not rigorously followed if the interview object provided additional relevant information. The interview guide used as a starting point included questions regarding perceptions of today's transparency situation, current internal and external information sharing practices, associations with sustainability, drivers, and perceived barriers that inhibit transparent supply chains. The interview guide is included in the appendix, see section 8.1, page 101. Prior to the interviews, we received permission from the interviewees to record the session. There are three advantageous effects of this decision: (1) the focus of the researchers is directed entirely on the interviewee, such that all important points

will be recognized, (2) the interviews can be replayed if necessary, and (3) to ensure reliability. Information from the interviews was partly transcribed during the conversation by the secondary interviewer and finalized shortly after.

As we aimed to investigate the concept of transparency independently of a specific context, interviews were conducted with experts relevant to our topic of interest. Our way of sampling was a non-probability form, known as *purposive sampling*. Bell et al. (2019) argue that purposive sampling is suitable when conducting qualitative research as it places the research question at the core of the sampling considerations. As our study was conducted using a qualitative method, we sampled participants strategically and not randomly. Moreover, as we are conducting a qualitative study with expert interviews, we aimed to include several individuals of interest and selected candidates based on their relevance to the research questions. Bell et al. (2019) argues that there exist different prominent types of purposive sampling, and *snowball sampling* seemed like the most appropriate for our study as we were able to contact relevant individuals with whom we had no previous affiliations.

Our initial starting point in the snowball sampling was the "Leader Sustainable Supply Chain" within a Norwegian energy-producing corporation, an acquaintance made during the internship conducted. Subsequently, the initial interviewee directed us towards additional people of relevance, both internally and externally. Eventually, this method guided us on the path of several Norwegian energy-associated corporations. As it was challenging to know in advance how many interviews were needed to acquire appropriate knowledge, we decided to continue until we perceived saturation. The interviewees were encouraged to provide observations from their current employer and subjective perspectives from previous experiences. Hence, by involving attendees from different companies with dissimilar operational practices, we collected rather varied perspectives of the current situation and issues related to transparency. Hence, we captured a more comprehensive insight into the concept.

Ten interviews with an approximate duration of 45 minutes were conducted, and the primary data collection was finalized at the beginning of April. As owed to the current pandemic situation with Covid-19, all interviews were conducted through

online platforms, mainly at Teams and Zoom. However, with the high performance of today's technological tools, the interviews were conducted with cameras and microphones activated, resulting in valuable discussions that motivated sharing of nuanced perspectives. The interview objects' ID, corresponding company ID, and their associated title are presented below in Table 1.

Identifier code	Company ID	Title	Date
ID-1	C1	Leader Sustainable Supply Chain	10.02.2022
ID-2	C1	Senior Advisor Sustainable Supply Chain	14.02.2022
ID-3	C1	Senior Strategy Advisor	15.02.2022
ID-4	C2	Economy and admin-responsible	11.03.2022
ID-5	C3	SSU-manager Human Rights	16.03.2022
ID-6	C4	Counselor purchasing	30.03.2022
ID-7	C5	Workstream Lead Sustainable Value Delivery	28.03.2022
ID-8	C6	CSR Manager	22.03.2022
ID-9	C6	Supplier Quality & Development Manager	28.03.2022
ID-10	C6	Senior Vice President - Global Supply Chains	04.04.2022

Table 1 - Presentation of experts

2.4.2 Secondary data

As we have chosen an abductive approach, it was essential to include secondary data from other researchers. Archival data was primarily used to gain a foundation for understanding transparency and as a starting point to further investigate the topic of interest. To improve our understanding of the current transparency situation, we analyzed archival data such as annual company reports and sustainability reports from our participating enterprises which highlight important issues related to global energy supply chains. Findings derived from these reports were only gathered to acquire a better overview of the situation in the energy sector and hence not necessarily explicitly included in our findings. In addition, reports highlighting social concerns were also investigated prior to the research study to get a deeper insight into current issues faced (Murphy & Elimä, 2021; Vázquez & Hodgkins, 2021).

As we moved back and forth between theory and data, the theory derived from secondary data was sometimes used to substantiate our primary data and vice versa. Secondary data allowed us to consider other researchers' perspectives, which

contributed to ensuring reliability. Comparing our findings to other records broadened our insight, as external researchers might have chosen a slightly different angle. Secondary data also includes other records from companies and organizations that can be useful for our proposed study (Bell et al., 2019). Secondary data is perceived as beneficial as it permits more time to analyze our primary data, as data collection is time-consuming. As one should never take quality for granted, we were careful of which additional data to include in our research. However, secondary data is often of exceptionally high quality as it is often generated by experienced researchers, providing a more reliable study (Bell et al., 2019).

2.5 Analytical Process

Abductive reasoning has facilitated a continuous interplay between established theory and empirical research (Bell et al., 2019). The initial starting point in the research process and development of our research questions was influenced by a thorough review of current literature related to transparency and sustainability. The development of the interview guide was then guided by the theoretical foundation in combination with previous observations of transparency-related issues within the industry. In parallel to primary data collection, the constant search for relevant literature and reports was continued.

The method of reasoning was also helpful during the empirical data collection. Despite following a constructed interview guide, new fields of interest emerged during several of the interviews conducted. Hence, current issues such as Covid-19s influence on global supply chains were added to the interview guide for the remaining interviews. Additionally, the interview guide was also somewhat personalized and adjusted to make the interview coincide with each interviewee's responsibilities and the service area of the corresponding company.

To capture similarities and differences among the experts, thematic analysis with a color-coding approach was conducted for data sorting (Bell et al., 2019). This implies that each theme is given a specific color used when transcribing the interviews. Theme 1 includes perceived drivers of transparency, whereas a "driver" is explained as a factor that facilitates and encourages transparency between parties in a supply chain. Theme 2 concerns the current practices for information sharing,

transparency, in global energy supply chains, while theme 3 concerns current practices for internal information sharing. Meanwhile, theme 4 concerns “barriers” that inhibit transparency in the global energy supply chain. Lastly, closely related to our second research question, theme 5 includes perceptions about transparency and how it enables sustainability. An illustration of the themes covered in the interview guide in combination with valuable quotes is presented in Table 2 below.

Theme	Relevant quotes
Drivers of transparency	<p>«Compliance drives transparency. Corruption has often been the main-focus, but now the media uncovers other cases and highlights aspects that were not previously relevant»</p> <p>«We have great structures for information sharing, but the new Transparency Act that soon enters into force turns this up a notch»</p> <p>“In 2008/2009, Parliament notification number 10 arrived, stating that companies should conduct monitoring of the supply chain. The new transparency act further enhances this in our company”</p>
Current practices for transparency within the supply chain	<p>“We communicate with our contractor and ask questions about tier-1 suppliers. Our communication with suppliers is often dependent on risk-assessments, and if we evaluate the situation and product to be high-risk, we request information all the way down to tier-5”</p> <p>“It is impossible to gain insight into all components, you have to be selective about what you want information about”</p> <p>“We use triangulation in our conversations with suppliers: Talk to the management, look at documents, and talk to the workers”</p> <p>“Suppliers in our industry often have control in their own company, but little information about their tier-1 suppliers”</p> <p>“There are no systems available to track sub tiers, so we must do it manually. The systems are not perfect for tier-1, and they are most definitely not suitable for sub-tiers.”</p> <p>“With suppliers, we currently have a good level of integration with first tiers. But we typically interact transactionally, manually. Write emails, send drawings. We do not have a digital system for raising questions. ”</p>
Current practices for internal transparency	<p>“Our company has no platform specifically designed for information sharing internally”</p> <p>“We have an open culture of sharing information internally, the threshold for sharing is low. The challenge is that many people know a little about everything, therefore it is not always easy to decide the level of sharing”</p> <p>“Our company has a good understanding of the internal information. We have standard reporting processes each year, with standardized documents to report our current situation regarding sustainability”</p>

Theme	Relevant quotes
Barriers of transparency	“Many nodes and components in the supply chain give an extremely complex picture”
	“As we are project-based, we do not repeat the supply chain. This makes it difficult to regularly share information and achieve close relationships with suppliers”
	“We have no forum, systems, and technology that makes it safe and comfortable to share information”
	“Information sharing is a transaction cost, the more information and evaluation required, thus higher the cost”
	“Common IT-systems that facilitate information sharing is expensive”
	“Regulations in other countries, like China, makes it difficult for our suppliers to go against cultural practices and force them to adjust their operations”
	“There exists hundreds of different ways to show stakeholders that you are transparent and sustainable, it would have been easier if it was standardized for everyone”
	“There is a lot of concerns of sharing information within the energy sector, due competitive advantages and the classified use of technology”
	“We will never be able to disconnect from the price. If our end-product is not profitable, there will be no project. We NEED to have a profitable value chain”
	“Our company is vulnerable to both cyber- and terror attacks, therefore each person should not know more than strictly necessary”
Transparent supply chains' ability to ensure sustainability	“Corporations prefer sharing picture perfect stories, not the things they do poorly. It is a challenge to show corporations' true face, as bad PR is undesirable”
	“Covid-19 has made it challenging to conduct audits and evaluations of sites”
	“In capital letters, transparency becomes the means to achieving sustainability.”
	“As the term 'sustainability' now consists of several elements, UN's sustainability goals have been a helpful specification. Great that a company can be competitive, even if they are not all green at every level”
	“An open dialogue with suppliers is fundamental to fulfill the new transparency act and accomplish a sustainable business”
“Sustainability and openness is essential in the new market”	
“Transparency increases the probability of achieving the UN Sustainable Development Goals and The Paris Agreement”	

Table 2 - Coding scheme

2.6 Scientific Quality

Mason (1996) argued that reliability, validity, and generalizability are important quality measures that need to be fulfilled when conducting research (Bell et al., 2019). However, as validity and reliability are often related to quantitative research, authors have suggested that additional criteria are required to evaluate qualitative research (Lincoln & Guba, 1985; Guba et al., 1994). The suggested criteria are trustworthiness and authenticity, whereas trustworthiness is divided into four sub-categories: (1) credibility, (2) transferability, (3) dependability, and (4) confirmability (Guba et al., 1994). In the following sections, we will focus on criteria suggested by Guba et al. (1994), discussed in combination with corresponding limitations.

Credibility is crucial to ensure that research is carried out according to the principles of good practice. To secure that our research is credible, we focused on respondent validation and triangulation. Through respondent validation, we will submit findings to the experts in the study so that it is possible to confirm that we have interpreted the conversation correctly (Bell et al., 2019). The other technique mentioned by Guba et al. (1994) is triangulation, where the idea is to use several methods or sources of data to study a phenomenon (Bell et al., 2019). In our study, we have collected primary data through interviews with individuals who possess essential knowledge, secondary data through internal documents and reports, and established research. This triangulation improved our understanding of the concept and ensured credibility (Deacon et al., 1998).

Transferability regards whether the findings can be generalized to be applicable in other situations (Bell et al., 2019). Both Williams (2000) and Onwuegbuzie and Leech (2009) highlighted potential problems related to generalization in qualitative research. Naturally, a research study that only contains a relatively small sample size might face doubt regarding the proposed transferability. It is argued that it is almost impossible to know how the findings can be generalized to other settings when conducting interviews that are mainly connected to a few organizations in one sector (Bell et al., 2019). However, the study focuses on corporations involved in long global supply chains and often dependent on foreign trading for products, services, technology, and material. Hence, in correspondence with the development

of new regulations, these characteristics showcase the importance of the topic in several industries, thus improving the relevance to some extent. Lincoln and Guba (1985) were worried about whether findings from qualitative research would apply if the situation or time were to change, as qualitative research often concerns relatively narrow scopes (Bell et al., 2019, p. 365). To enhance the transferability of our study, we accommodate Geertz's (1973) proposal of creating a thorough portrayal of the research context, categorized as a *thick description*, describing the social environment, culture, events, and individual traits. This will be helpful for external researchers to evaluate whether the findings generated can be applied in other contexts. We believe that the study's findings are transferable as the characteristics of the energy sector are not entirely unique, and hence other industries might partly entail several of the same facets. Nevertheless, it is important to remember that our interview objects are not meant to represent the whole population in any precise manner (Bell et al., 2019).

Dependability was presented by Guba et al. (1994) to demonstrate trustworthiness and create a parallel to reliability. Qualitative research is critiqued for its difficulties in establishing what the researchers did and how the findings emerged (Bell et al., 2019). Unclear descriptions of how and why people were chosen for interviews and how researchers chose to analyze the collected data have been condemned by quantitative researchers (Bell et al., 2019). To ensure dependability within our research, we have kept thorough records and data of our research process, including problem formulation, selection of participants, notes, and transcripts, to provide easy access for someone external to review, audit, and critique our process (Bell et al., 2019). This is provided through the extensive methodology chapter, elaborating on every decision made. An alternative is to do an inquiry audit on our study, in which a person with an objective view examines the data collection, analysis, and final results. This person creates dependability by ensuring that our empirical findings correspond with the data collected, which is done through close collaboration with our supervisor. During the master thesis process, all data collected has been stored securely. Documents, transcriptions, and recordings have all been stored separately in secure locations during the project. Additionally, all interviews and corresponding transcriptions and recordings have been given an anonymized identification code and managed according to GDPR.

Confirmability regards the objectivity of the research, which translates to whether the researcher's values and opinions have affected the study's findings (Bell et al., 2019, p. 48). Despite Bell et al. (2019) stating that achieving complete objectivity is impossible, we will reach for objectivity at our utmost effort to ensure confirmability. However, there are some concerns that it can be difficult to get an objective answer to our questions due to previous perceptions and familiarity with the topic. As one of the researchers has a previous affiliation with one participating enterprise, we have attempted to ensure that previous perceptions do not characterize our research. This is done through snowball sampling as we believe that this method will increase confirmability by including individuals with different backgrounds with whom we have no familiarity. To ensure confirmability, we have reflected on the research process through continuous meetings and discussions, digging into our affiliations to the topic, and ensuring that our interview questions are truly objectively constructed.

Authenticity was presented as an optional fifth criterion by Guba et al. (1994), raising issues regarding the social and political impact of research. In this lies the responsibility to represent opposing views of the social setting and create objectivity. To ensure opposing views of the social setting, we included experts from different corporations within energy production. These experts possess experiences and learnings from various business areas within the energy, making it easier to uphold authenticity. As most enterprises that have participated in the study are a part of a common sustainability forum, we acknowledge that the sample might provide bias as many of these corporations are inter-related. However, these potential pitfalls have been kept in mind when analyzing the data, and overall we believe that the inclusion of different expert areas has improved authenticity to a certain extent.

Chapter 3 - Theoretical Background

The following chapter presents the theoretical background of our study. As the thesis investigates transparency within global energy supply chains, theories and literature concerning the topic is included in this section. The theoretical background is presented to provide a foundation for answering our overall research question and sub-question.

To gain deeper insight into transparency, we have divided the theoretical background into four main areas. Section 3.1 encloses information about transparency as an essential contributor to increased visibility and control in the global supply chain. The section discusses how the concept has developed in recent decades and how different authors refer to the concept. Further, as we use sustainability as a contextual factor in our thesis, we elaborate on how transparency is argued to benefit and contribute to sustainability performance. Section 3.2, 3.3, and 3.4 covers three factors influencing transparency's emergence: increased global supply chain risk, focus on sustainability, and new laws and regulations. These elements are all denoted as *drivers* and explain why transparency becomes important to ensure in supply chains. These drivers are discussed in a way that highlights how each element motivates a more transparent supply chain. Section 3.5 covers barriers and explanations for why companies struggle to accomplish transparency. Following, there are some enablers argued by literature that simplifies integration transparency. These are argued to be the utilization of technology and the allocation of responsibilities within enterprises, further elaborated in section 3.6. As we aim to investigate transparency in global energy supply chains, we found it necessary to include section 3.7, which elaborates on the characteristics of the energy sector and why transparency becomes a necessity. Lastly, a summarization of the main findings from the literature study and a conceptual framework is included in section 3.8.

3.1 Supply chain transparency

The concept of transparency was first introduced in the 1980s during the development of the lean supply paradigm (Lamming et al., 2001). Since then, there have been many attempts in literature to define the concept. Supply chain transparency can be interpreted as "a state in which information is made apparent

and readily available to certain actors" (Gardner et al., 2019, p. 164) or, more specifically, as "the practice of disclosing detailed and accurate information about operations and products, such as their origin and sourcing, manufacturing processes, costs and logistics" (Bai & Sarkis, 2020, p. 2145). In existing literature, visibility and traceability are concepts often used as synonyms for supply chain transparency (Montecchi et al., 2021). To exemplify, Sodhi and Tang (2019, p. 2946) refer to supply chain visibility as "managers' efforts to gather information about operations upstream and downstream in their supply chain," implying that visibility, traceability, and transparency are intertwined terms.

Mol (2010) assesses transparency towards both a normative and a substantive view. The normative dimension is connected to democracy, participation, and the "right to know," while the substantive dimension is closely linked to the efforts to improve sustainable protection (Mol, 2010). Several authors also connect the term transparency to power and argue that such democratization of information empowers the "powerless" by providing access to and control of information and knowledge (Dingwerth & Eichinger, 2010; Mol, 2010; Egels-Zandén et al., 2015). This argument appears to be supported by the Global Reporting Initiative (GRI), founded in 1997, which set out to drive transparency with a vision to "improve corporate accountability by ensuring that all stakeholders – communities, environmentalists, labor, religious groups, shareholders, investment managers – have access to standardized, comparable, and consistent environmental information" (CERES, 1997, p. 3, as cited in Brown et al., 2009). In this sense, the various stakeholders mentioned by GRI can be classified by Dingwerth and Eichinger (2010), Mol (2010), and Egels-Zandén et al. (2015) as the "powerless."

In this thesis, the substantive view mentioned by Mol (2010) will be the main focus, as we aim to establish a deeper understanding of transparency in relation to sustainability. Transparency has become a popular concept due to increased focus on sustainability. The necessity for change in industry practices and consumption patterns has been in growing focus since the *Brundtland Report* in 1987 (Brundtland & Dahl, 1987). These changes require corporations to have full visibility and control of their entire supply chain, in which there is an emerging agreement among researchers that transparency becomes crucial to ensure environmental and social qualities for products and processes (Fung et al., 2007;

Mol & Oosterveer, 2015; Mol, 2015). Transparency is argued to enhance global security, secure human rights, and hold bureaucrats accountable, working to solve various economic, political, and ethical challenges (Finel & Lord, 2002; Gupta & Mason, 2014). In addition, Egels-Zandén et al. (2015) and Laudal (2010) claim that supply chain transparency can reduce information asymmetry. This is substantiated by the idea that transparency can help actors identify and minimize risks, navigate complexity, improve conditions, and assess progress more easily (Gardner et al., 2019). Consequently, transparency becomes a means to increase control and visibility, which creates the ability to decrease global supply chain risk. Additionally, emergence of new laws and regulations requiring enterprises to increase control of their supply chain can be argued to be a driver for transparency. As recognized, globalization and corresponding risk, growing focus on sustainability, and emergence of regulatory policies increase the need for transparency.

3.2 Global supply chain risk

Globalization emerged as a buzzword in the 1990s and has since then had exponential growth in popularity (Bell, 2003). The once linear supply chain has collapsed into a set of globally integrated networks characterized by continuous information flow across borders. Researchers argue that the emergence of global sourcing is facilitated by economic growth, granting enterprises more varied opportunities for sourcing (Christopher et al., 2011). Contrary, economic growth can also be perceived as a consequence of international trade, a reverse relationship first explained by Adam Smith in 1776. Despite opposing views on how globalization, international trade, and economic development are linked, most researchers agree that globalization imposes both advantages and drawbacks that supply chain managers must contemplate (Den Butter & Linse, 2008; Um & Han, 2020; Baryannis et al., 2019)

The World Trade Organization (WTO) explains international trade to increase living standards and encourage businesses to source in a sustainable manner (WTO, 1994, as mentioned in Rodrik, 2008, p. 213). Exemplified, between 1970 and 2002, international trade increased world gross domestic product (GDP) from 12 to 24 percent (Lacal-Arántegui, 2019). Although the initial focus of this goal is directed towards serving the general public, external researchers also accentuate advantages

that are more directly linked to businesses' success. Scholars highlight cost reduction, reduced cycle times, delivery improvements, increased responsiveness, and easier access to raw materials as drivers for the emergence of global supply chains (Monczka & Trent, 1991; Manuj & Mentzer, 2008). In awe of the underlined perks in literature, global supply chains are suggested as a source of competitive advantage (Manuj & Mentzer, 2008). Despite the perception that global efforts often result in the lowest total cost, companies are encouraged to consider the increased level of risk associated with a global supply chain (Barry, 2004). Lacal-Arántegui (2019) emphasizes several adverse effects of globalization, such as changes in land use, destroyed forests, and delocalization of manufacturing to countries with lower labor costs and less-strict environmental regulations. Furthermore, the literature highlights risk as a bi-product of increased globalization due to long distances between trading partners (Den Butter & Linse, 2008).

Despite multiple suggestions of how to define risk, no universal definition of the term has been accepted (Baryannis et al., 2019). Risk is defined by Ho et al. (2015, p. 5035) as "the likelihood and impact of unexpected macro and/or micro-level events or conditions that adversely influence any part of a supply chain leading to operational, tactical, or strategic level failures or irregularities." Meanwhile, other scholars use the opportunity to emphasize that risk is a concept that needs to be handled, using "the level of exposure to uncertainties that the enterprise must understand and effectively manage as it executes its strategies to achieve its business objectives and create value" as a definition (Deloach, 2000, as cited in Norrman & Jansson, 2004, p. 436). There is an ongoing debate on whether risk involves both positive and negative outcomes in the literature. However, most researchers associate risk with something negative (Baryannis et al., 2019). Global disruptions, uncertainties, and unanticipated consequences have increased the focus on global supply chain risk (Canzaniello et al., 2017; Christopher & Holweg, 2017; Revilla & Saenz, 2017). This has become particularly visible in the light of the Covid-19 pandemic and the recent disturbances in Ukraine, in which global supply chains faced significant logistical challenges and responsibility concerns through ripple effects (Chowdhury et al., 2021; Kilpatrick, 2022). Further, scholars have studied how risk evolves, and Sodhi and Tang (2012) highlight three underlying causes for risk in global supply chains. Firstly, supply chains now include more points of possible disruptions than previously. Secondly, elongated supply chains

reduce visibility which is a factor in slow decision-making and response. Lastly, potential local "fixes" and suboptimization create adverse ripple effects in other parts of the supply chain.

Literature mainly distinguishes between four categories of risk: supply, demand, operational, and security risk (Manuj & Mentzer, 2008; Christopher & Peck, 2004). As our master thesis employs sustainability as a contextual factor, the latter category of security risk is the most relevant, as it concerns outcomes related to human resources and operational integrity (Manuj & Mentzer, 2008). As supply chains have become increasingly globalized, environmentalists argue that pollution has increased (Cruz, 2013). This originates from the argument that international trade and production have moved to countries with a relaxed relationship with environmental regulations (Cruz, 2013). In addition, as corporations are held accountable for compliance failure by non-governmental organizations, governments, and other stakeholders, the enterprise risk increases regardless of whether the violation is directly or indirectly connected to the focal company. Scholars emphasize that inability to operate in line with economic, social, and environmental obligations potentially impacts the organization through reputational damage, credibility loss, boycotts, and sanctions (Goebel et al., 2012; Bankvall et al., 2010). Moreover, Friday et al. (2018) argues that innovations and industry 4.0 increase the complexity and risk within supply chains due to the increased need for interaction. Despite the increased knowledge of how risk might affect businesses, few companies invest in mitigation strategies (Sodhi & Tang, 2012).

Global sourcing increases the distance between trading partners and corresponding risk, hence, the need for transparency rises (Den Butter & Linse, 2008). Tong and Wei (2014) argue that global trading and expansion often promote transparency. Further, when expanding to foreign countries, the authors highlight that corporations must improve transparency to make the enterprise attractive to investors and creditors. Increased knowledge and visibility in the supply chain could reduce the global supply chain risk considerably, as the company is provided with the opportunity to get a better overview and control of the entire pipeline.

3.3 Sustainability in focus

In awe of globalization and corresponding risk, sustainability efforts in the supply chain have emerged as an essential topic. The term sustainability was first introduced in the 18th century (Geissdoerfer et al., 2017), however, it was not before the issuing of the Brundtland Report in 1987 that the popularity of the subject rose (Brundtland & Dahl, 1987). Sustainability is perceived as an umbrella term encompassing multiple concepts frequently used by practitioners and scholars. Depending on the context, closely related terms such as the triple bottom line, 3Ps (people, profit, and planet), ESG (environmental, social, and governance), and Corporate Social Responsibility (CSR) are used as substitutes. Despite various preferences for these expressions, we will hereby primarily apply *sustainability* when referring to these terms, as they are all perceived as interrelated.

The Brundtland Report presents one of the most famous definitions of sustainability, "utilizing resources to meet the needs of the present without compromising future generations' ability to meet their own needs" (Brundtland & Dahl, 1987, p. 42). Despite this definition seemingly accentuating the environmental aspect of sustainability, researchers explain sustainability within corporations as a combination of economic, environmental, and social dimensions (Ahi & Searcy, 2015; Martins & Pato, 2019). Economic sustainability often concerns production and manufacturing costs and is a familiar dimension for most corporations (Gimenez et al., 2012). This ensures that practices contribute to long-term economic growth without compromising social and environmental aspects such as human labor and emissions. Further, Gimenez et al. (2012) argue that environmental sustainability is often associated with waste reduction, pollution reduction, energy efficiency, emissions reduction, and decreased consumption of hazardous and toxic materials. Lastly, social sustainability implies providing equitable opportunities, diversity, promoting connectedness within and outside the community, ensuring life quality, democratic processes, and accountable governance structures (Elkington, 1994, as mentioned in Gimenez et al., 2012). The last dimension is argued as related to reputation, as several corporations are involved in CSR as a way to improve their social status. Sustainability within business is, thus, referred to as "the creation of resilient organizations through

integrated economic, social and environmental systems" (Bansal, 2010, as cited in Ahi & Searcy, 2013, p. 329).

Consequently, Ahi and Searcy (2013), two of the most renowned researchers in the field, argue that it becomes crucial for companies to consider every corner of their business to become more resilient to internal and external shocks. Wittstruck and Teuteberg (2012, p. 142) merge sustainability with supply chain management and employ the definition "An extension to the traditional concept of Supply Chain Management by adding environmental and social/ethical aspects." Broadly, Seuring states that "By merging sustainability with supply chain management, environmental and social aspects along the supply chain have to be taken into account, thereby avoiding related problems, but also looking at more sustainable products and processes" (Seuring, 2008, as cited in Ahi & Searcy, 2013, p. 336).

In discussion of who is responsible for sustainability development, supply chains and corresponding corporations are often mentioned as significant contributors. As a consequence of companies engaging in global marketplaces and employing foreign suppliers, the concept of sustainability is no longer solely concerned with the individual firm but with the entire supply chain (Andersen & Skjoett-Larsen, 2009). Literature indicates that the focus on sustainability in supply chains began in the early 2000s, however, it was first in recent years that the concept became popular within research (Modak et al., 2020). Due to this increase in popularity, companies have begun observing themselves as a piece of a broader economic system and consequently measured their practices by evaluating their environmental and social performance. Furthermore, supply chain managers are in a powerful position to impact environmental and social performance through supplier selection, modal and carrier selection, supplier development, vehicle routing, location decisions, and packaging choices (Carter & Easton, 2011). Carter and Rogers (2008) identify four facets that can improve sustainability within firms: (1) Strategy - identifying initiatives that support the overall sustainability strategy, (2) Risk management - identifying and analyzing upstream and downstream suppliers, (3) Organizational culture - ensuring ethical standards and expectations within and outside the firm, and (4) Transparency - communicating and collaborating with key stakeholders to ensure traceability and visibility across the

pipeline. To achieve a fully sustainable supply chain, all facets mentioned above need to be aligned and co-exist functionally.

Stakeholders have encouraged sustainability reporting, in which transparency is required to enable this initiative. Cini and Ricci (2018) argue that there are several motivations for why companies choose to report on sustainability. Firstly, companies believe that reporting sustainability creates a competitive advantage. Secondly, companies are forced to report sustainability efforts due to increased pressure from stakeholders. Furthermore, several authors discuss that the relationship between a company's sustainability ratings and performance is crucial, as more investors require splendid ratings (Gillian et al., 2021). This is also substantiated by a study developed by Bain & Company, showcasing that 78 percent of investors on a global scale put more emphasis on sustainability now than previously (Yang et al., 2019). Further, to conduct sustainability reporting, corporations need to control and monitor the actors that provide goods and services. Through transparency, identification, assessment, and selection of suppliers, carriers, and locations are simplified. This indicates that the interrelationship between transparency and sustainability is reciprocal. First, increased sustainability focus operates as a driver promoting the need for transparency. As stakeholders demand more information regarding a corporation's sustainability efforts, transparency becomes necessary. Second, transparency drives sustainable operations by providing awareness of sustainability issues and opportunities through increased visibility and information sharing. This yields the possibility to make adjustments, guiding the enterprise in a more sustainable direction.

3.4 Laws and regulations

Regulations are an essential remedy for encouraging corporations to become more transparent (Chatterjee & Chaudhuri, 2021). Additionally, researchers argue that regulatory policies are the most common rationale for why companies pursue sustainability (Darnall et al., 2019). As global supply chains involve multiple firms dispersed geographically, their businesses are affected by norms, customs, and regulations of the country in which operations are located (Chatterjee & Chaudhuri, 2021). In turn, as entities might be located in different political jurisdictions, regulations imposed on one entity might also affect contracting partners' operations

in terms of materials, shipping methods, and supplier selection (Darnall et al., 2019).

There are two different levels of regulations mentioned in the literature, hard law and soft law (Abbott & Snidal, 2000). Hard law can be referred to as legally binding obligations where the authority interprets and implements the law. Abbott and Snidal (2000) argue that the application of hard law can reduce transaction costs, strengthen the credibility of commitments, expand political strategies, and resolve problems of incomplete contracting. As hard law concerns activities and processes required, it is considered adequate as it is expected to impact business processes significantly. However, the author highlights that legislation is often related to costs, restricting actors' behavior, and even sovereignty (Abbott & Snidal, 2000). For hard laws, Darnall et al. (2019) differentiate between two categories of regulations associated with sustainable business strategies: (1) command-and-control regulation and (2) market-based policies. The first mentioned regulations are coercions that aim to reduce the negative sustainability impact by inserting production and usage restrictions. The latter policies are measures that utilize market incentives or charges to affect companies' choices related to sustainability. In the near future, several regulatory policies denoted as command-and-control are expected. To conform to these policies, corporations are forced to gather information regarding their supply chain activities and processes, motivating a transparent supply chain.

On the other hand, soft law is related to areas where legal arrangements are weakened along dimensions of obligation, precision, and delegation (Abbott & Snidal, 2000). Soft laws are not required by law but are expected to be overheld. Soft law offers a lot of the same advantages as hard law, however, it manages to avoid some of the costs and provides independent advantages of its own (Abbott & Snidal, 2000). These independent advantages are related to more effective ways of dealing with uncertainty, mainly as it facilitates the ability to observe agreement's efficiency over time. To exemplify, organizations are expected to work towards the 17 sustainable development goals set by the United Nations (UN) and report their contribution in yearly reports and/or stand-alone sustainability reports. Thus, soft law encourages companies to ensure transparency to fulfill society's expectations.

3.5 Barriers of Transparency

Despite beneficial characteristics related to increased transparency in the supply chain, literature still indicates hesitance towards the concept. As this might seem peculiar, we found it imperative to look deeper into the barriers mentioned by researchers. This section discusses whether supply chain structures are suitable for transparency and further elaborates on why companies might remain reluctant to a fully transparent supply chain.

Fawcett et al. (2008) highlight two barriers that companies often face in regard to transparency: (1) inter-firm rivalry and (2) managerial complexity. *Inter-firm rivalry* includes internal and external turf protection, poor collaboration among supply chain partners, and a lack of trust (Fawcett et al., 2008). These elements are all contributing factors to why companies remain hesitant to share information across entities in a supply chain. *Managerial complexity* is closely connected to information systems and technological incompatibility, inadequate measurement systems, and conflicting organizational structures and culture (Fawcett et al., 2008). These obstacles are significant, as standard systems and procedures are highlighted as preconditions for accomplishing transparency (Gardner et al., 2019; Zhu et al., 2018). Mougayar and Buterin (2016) characterizes the barriers mentioned above as *internal* and argue that the threshold for adopting costly technologies is high. Additionally, *network barriers* are highlighted in the literature, as supply chain partners often use different systems to store and manage information (Saber et al., 2019). Lastly, it can be challenging to accomplish consistency at all sub-tiers in today's extended supply chains. Such challenges can be characterized as *external barriers*, exemplified by limited standard government policies, industry guidelines, and standardized regulations, making it difficult for companies to achieve transparency (Saber et al., 2019).

Gualandris et al. (2021) investigates the association between supply chain structure and transparency, and found significant evidence that certain organizational structures enable or inhibit supply chain transparency. Included in the study were supply chain characteristics such as density, clustering, and geography, which all affect transparency within and across supply chains. Several scholars also recognize that supply chains are not inherently designed to facilitate transparency (Gualandris

et al., 2021; Bateman & Bonanni, 2019). Bateman and Bonanni (2019) highlight the fear of losing competitive advantage, facing criticism, erroneous information, and insufficient return on investment (ROI) as reasons why supply chains are not suitable for transparency. Meanwhile, Gualandris et al. (2021) emphasize cost, complicated processes, and time. Fawcett et al. (2008) highlight the importance of identifying relevant transparency barriers to design and implement bridges to extract the desired benefits. In addition, Egels-Zandén (2015) argues that despite alleged positive outcomes of supply chain transparency, surprisingly few companies carry out the strategy in practice.

3.6 Enablers for accomplishing a transparent global supply chain

Taking a closer look at how corporations can accomplish transparent global supply chains, a section on enablers that can simplify the process is included. Investment in technology and development of the purchasing function's responsibilities have been mentioned in literature to be key enablers to becoming more transparent.

3.6.1 Technology

Technological development has been significant since the progressive computerization in the 1960s and 1970s (Treiblmaier, 2019). Following, utilization of technology has become crucial for supply chains to stay competitive (Treiblmaier, 2019). Authors state that the development of information technologies is an influential reason and necessary precondition for supply chain transparency, as a transparent supply chain relies heavily on information about products and processes (Gardner et al., 2019; Zhu et al., 2018). Information technologies allow firms to collect, store, disseminate, and interpret data, creating opportunities for information exchange (Gardner et al., 2019). Such sharing of relevant, real-time information is argued as a pillar in an enterprise's quest to survive and harvest competitiveness (Baah et al., 2022). Accordingly, Baah et al. (2022, p. 435) refer to information sharing as "the glue that holds supply chains together, especially with supply chain partners." According to the author, the reason for this is that well-functioning information exchange contributes to enhanced relationships with collaborative partners, visibility, agility, and overall improved supply chain performance.

Additionally, Swaminathan and Tayur (2003) discuss three ways the internet has influenced the supply chain. Firstly, it has created advanced planning and optimization opportunities through enterprise resource planning. Secondly, companies can gather real-time information, which enables continuous monitoring of the operations. Lastly, the internet empowers firms' abilities to integrate information and decision-making at both intra- and inter-organizational levels. This implies that enterprises are now more capable of making well-considered decisions than previously regarding traditional operations that concern efficiency, cost, quality, revenue, and sustainability matters concerning environmental aspects and social criteria. Treiblmaier (2019) substantiates this statement as he argues that the advancement of technology supports the effort of economic, environmental, and social goals required in modern supply chains. However, it is commonly known that gathering and assessing information is time-consuming and requires a lot of resources for organizations. Hence, Ordieres-Mete et al. (2020) argue that the combination of the development of digital information systems and the rapid emergence of intelligent technologies creates opportunities for accomplishing sustainability in businesses with less effort.

To explain the development of technologies in the 21st century, authors often refer to Industry 4.0 (Piccarozzi et al., 2018). This so-called Fourth Industrial Revolution is explained by Piccarozzi et al. (2018, p. 1) as the age of "cyber-physical systems," which refers to systems that integrates "computation, networking, and physical processes and include a myriad of technologies that span mobile devices, the Internet of Things (IoT), artificial intelligence (AI), robotics, cyber security, and 3D printing." Industry 4.0 is suggested to provide immense opportunities for businesses, and increasing transparency is argued to be one of them (Piccarozzi et al., 2018).

As recognized, there are numerous opportunities rooted in technology. Scholars argue that information security is a required condition to encourage information sharing between actors (Xu et al., 2021). Therefore, a relatively new and popular research field is based on how blockchain applications can ensure both information sharing and security. Blockchain is claimed to be one of the most promising opportunities for extending supply chain visibility and traceability (Wang et al., 2019; Treiblmaier, 2019). Literature also emphasizes AI and big data as up-and-

coming tools for information sharing and transparency (Baryannis et al., 2019; Kaur & Singh, 2018). However, as these technologies are currently in their initial developing phase, only a minor fraction of corporations embrace the potential of emerging information technologies. The cause of this is argued by Baryannis et al. (2019) to be concerns related to data safety and security. However, as these technologies are yet to be fully developed, it is expected that more corporations will invest in these systems in the future to simplify processes and free up time.

3.6.2 Allocation of responsibility

To acquire a transparent supply chain, the responsibility needs to be allocated to the most suitable contributors. The purchasing functions' tasks highlighted in literature are expected to impact transparency significantly (Hsu and Hu, 2009). Purchasing represents up to 80 percent of an organization's cost, demonstrating the immense impact on an organization's value creation (Nicoletti, 2017). Scholars argue that purchasing is essential to supply chain efficiency as the function is responsible for supplier selection and establishment of valuable reciprocal relationships (Joyce, 2006). Additionally, superior purchasing enables decreased cost of manufacturing, enhanced product or service design, and minimization of time to market by close interaction with key providers (Joyce, 2006). Joyce (2006) specifies that management of suppliers is the primary responsibility of purchasers. Further, the author highlights the relevant supplier management tasks as (1) supplier selection, in which the purchaser has to consider attributes like price, quality, and reputation, (2) supplier audits as a means of maintaining suppliers' performance, (3) supplier certification to confirm or refute whether suppliers meet the requirements set, (4) supplier relationship management, deciding length and type of relationship, and (5) partnering, characterized by closer, integrated collaborations that benefit both parties. To successfully fulfill the aforementioned activities and ensure transparency, the purchasing function is required to maintain continuous communication with suppliers.

Walton et al. (1998) argue that the purchasing function should proactively influence the suppliers' processes to become more sustainable. To accomplish this, it requires a deep understanding of the core supplier processes and materials, in addition to associated regulations. Secondly, Hsu and Hu (2009) argue that appropriate consideration of suppliers' ability to fulfill compliance is a crucial responsibility for

the purchasing function, as failure can be risky and potentially affect the company's reputation negatively. Hence, the procurement function is now imposed a far broader set of responsibilities than previously. For the function to be able to make well-considered choices, a rather significant amount of information is needed. Additionally, seen in context with technology as an enabler for transparency in global supply chains, employees in procurement functions must have the competence needed for operating such systems for information sharing. Hence, as the responsibilities of purchasers become more complex, the competence of future employees of this function is expected to experience a shift. Lamming et al. (2001) expect that the employees will be required to manage a broader context than before, creating a necessity for being more attentive to opportunities and threats and utilizing the aforementioned information systems to their full capacities.

3.7 Supply Chain Transparency in the Energy Sector

As generally acknowledged by literature, transparency becomes essential in global supply chains to manage global supply chain risk, sustainability concerns, and new development of laws and regulations. Following, we will dive deeper into the energy sector and explore why transparency becomes particularly vital in energy-associated supply chains.

3.7.1 Characteristics of Energy Producing Companies

One industry significantly affected by globalization, increased sustainability emphasis, and advanced supply chains is the energy sector, which now faces intensified pressure created by a broader set of social responsibilities beyond legal and economic expectations. The energy industry has traditionally been characterized by companies associated with fossil fuels. However, increased focus on climate change and population growth has forced countries to adapt to new energy sources, denoted as renewable energy (RE). RE includes energy that is naturally regenerated either *directly* from the sun (e.g., thermal, photochemical, and photoelectric) or *indirectly* from the sun (e.g., wind, hydropower, and photosynthetic energy stored in biomass) (Cucchiella & D'Adamo, 2013). The past decades have showcased an impressive increase in RE sources, including hydropower, biomass, geothermal, solar, wind, wave, and tidal energy (BloombergNEF, 2021; IRENA, 2021). The RE production capacity has

exponentially increased in the past decade due to policy support, an accelerated market for power purchase agreements, and rapid cost declines in renewable technology (IEA, 2021b). There are four characteristics of the energy sector repeatedly mentioned by literature: complexity, technology intensity, project-based organizing, and a competitive environment (DHL, 2015; Amer & Daim, 2010; Al-Sunaidy & Green, 2006).

A characteristic associated with the energy sector is complexity as a consequence of an extensive global presence. A significant share of the numerous components in energy-producing systems are sourced from foreign suppliers prior to assembly (DHL, 2015). As the energy-producing steps tend to be conducted in remote areas, the distances between clients and suppliers are argued to enhance complexity. Tachizawa and Yew Wong (2014) argue that such distances (e.g., physical, social, or cultural) increase information asymmetry, which implies that the energy sector is severely affected by inaccurate information distribution.

Furthermore, products and processes in the energy sector are particularly associated with the intensive use of technology, which can be argued to further enhance complexity. This development has emerged due to the rapid economic and human growth, which has increased the need for developing tools and systems that can provide efficient energy generation without a negative impact on the environment. This development is shifting the energy sector from fossil fuels like oil and gas to renewables (Papadis & Tsatsaronis, 2020). Consequently, the industry is characterized by a high degree of research and development to increase the efficiency of current and future energy solutions (Amer & Daim, 2010). However, as technologies used in energy manufacturing are considered complex, most technologies are not developed by the energy sector itself. Contrary, the sector relies on enterprises specialized in equipment or innovative fuels such as semiconductors (solar panels), electro-mechanical machinery (gas turbines), agriculture (biofuel feedstocks), and biochemistry (biofuel conversion technology) (Huenteler et al., 2016), further increasing global dependencies. This indicates that components involved in energy production are often a compilation of components used in other industries, which indicates that the leverage might be relatively low.

The energy sector is also characterized by fierce competition and secrecy. In 1991, the Norwegian energy market was deregulated as an attempt to increase consumers' freedom of choice, providing the opportunity to negotiate prices (Al-Sunaidy & Green, 2006). The decision of deregulation was made to enhance economic efficiency and security of supply, however, the decision had a significant positive impact on competitiveness in the market, creating intense competition for both generators and retailers (Al-Sunaidy & Green, 2006). The development of new and improved energy technologies has also been central in the transition towards cleaner and more efficient energy-producing solutions (Sagar & Van Der Zwaan, 2006). As the components used are somewhat unique for each product, corporations within the energy sector are secretive about product details to maintain competitiveness. This is due to the possibility of creating improved services, efficiency, and the ability to respond to environmental concerns (Sagar & Van Der Zwaan, 2006).

Lastly, project-based structures are frequently employed in organizations associated with energy production, as typical tasks often correspond rather well with facets of temporary organizing. There have been numerous attempts at establishing characteristics of projects, however, main elements most frequently mentioned are: (1) clear goal, (2) limited resources, (3) some degree of uniqueness, (4) limited time frame, and (5) teamwork (Turner & Müller, 2003). The energy sector is project-based, determining each project's goal, scope, timeframe, and budget based on customer requests (Brink et al., 2020). Whether it is an oil platform planned or a turbine to be installed, all five characteristics are naturally evident. As tasks in the energy sector are interdependent, often require multiple skill sets, and are rather technology-intensive, Rad et al. (2017) debate that process complexity is added. In correspondence, researchers argue that temporary organizations' ability to integrate diverse and specialized intellectual resources and expertise on short notice is highly beneficial (Brink et al., 2020; Sydow et al., 2004). Consequently, temporary organizing might avoid barriers linked more directly to traditional organizations, a facet that has become more appreciated in modern supply chains (Sydow et al., 2004).

3.7.2 Importance of ensuring transparency in the energy supply chain

Ensuring a transparent supply chain in the energy sector secures better monitoring, visibility, and control over the entire pipeline. On a global basis, the energy sector

accounts for over 80 percent of total greenhouse emissions, including energy production, energy use by industry, services, households, and transportation (Colla et al., 2020). 60 percent of the total energy consumption is covered by fossil fuels such as coal and gas, which are significant contributors to global emissions (Colla et al., 2020). Consequently, the industry is continuously developing and increasing the capacities of renewables (Colla et al., 2020). Additionally, parts of the energy sector have experienced increased risk driven by extended supply chains and social concerns highlighted in developing countries (Murphy & Elimä, 2021; Vázquez & Hodgkins, 2021). Moreover, increased control, monitoring, and visibility through transparency could be essential for becoming more sustainable.

The energy sector is experiencing a shift from a focus solely on deriving value for shareholders to simultaneously considering sustainable responsibility (Pătări et al., 2014). Pătări et al. (2014) argue that the energy industry struggles to execute CSR. This is mainly due to the overall cost, lack of information and awareness, weak cooperation with stakeholders, difficulties with integrating sustainability initiatives into more extensive development plans, and an excessive focus on technical and managerial solutions (Pătări et al., 2014). Accordingly, the energy industry needs to invest time and resources to ensure a more transparent supply chain. This will increase the level of information obtained by all parties and enhance awareness so that contributors in the industry can make improved sustainability decisions.

3.8 Summary of Theoretical Background and Framework

In the theoretical background, we introduced previous literature and research related to our research questions. The theoretical background is developed to better understand different topics related to transparency. The theoretical framework presented at the end of this chapter is based on the theories and research found in the theoretical background and will guide the rest of the research regarding findings and discussion.

To summarize our theoretical findings, it became apparent that some issues exist in modern supply chains that drive the need for transparency. Facilitated by economic growth, corporations have expanded their businesses and supply chains to cover areas across the entire planet (Christopher et al., 2011). Consequently, supply chains become more complex due to the required management of an immense

amount of sub-suppliers located at various geographical locations. The complexity associated with global supply chains has increased the focus on risk as a bi-product of globalization that companies must consider in the future. Additionally, increased awareness among stakeholders forces companies to take responsibility and develop business goals related to sustainability measures. This becomes especially important as each corporation is in a powerful position to impact environmental and social performance (Carter & Easton, 2011). Lastly, laws and regulations are argued to encourage and direct companies toward a more sustainable and transparent supply chain. This is mainly due to the increased focus on sustainability, both imposed by authorities and non-governmental organizations such as the UN.

However, enabling transparency is not as easy as first assessed. Authors mention lack of trust, network barriers, fear of losing competitive advantage, cost, and time as some of the challenges faced (Fawcett et al., 2008; Saberi et al., 2019; Batman & Bonanni, 2019, Gualandris et al., 2021). To overcome these challenges, technological tools are highlighted by scholars. The literature argues that information technology has improved visibility within the supply chain for decades. However, more effective and newly developed tools such as blockchain might be necessary to get a hold of the entire global supply chain. Supplementary, the research argues that allocation of responsibilities within the firm becomes vital to accomplish a transparent supply chain, in which the purchasing function becomes crucial due to the responsibility of supplier-buyer relationships.

As transparency gains ground in literature as a solution to most problems faced by companies through facilitating opportunities for improved control and visibility, transparency proves to be particularly interesting in some specific industries. Transparency becomes particularly important in the energy sector, as the sector is subject to global supply chains, sustainability emphasis, and laws and regulations identified as drivers. Through literature, it also becomes evident that the energy sectors' characteristics drive complexity and increase the necessity for transparent supply chains.

Practical aspects of transparency, drivers, enablers, and barriers to accomplishing transparent global energy supply chains have received inadequate attention within literature. However, we believe that the theoretical background highlights some of

the most important reasons for why the topic becomes essential for companies to consider, what transparency involves, methods for enabling a transparent supply chain, and some of the most important barriers. To answer our research questions in correspondence with topics discussed throughout the theoretical background, we have constructed a conceptual framework to illustrate the most important topics discovered illustrated in Figure 2.

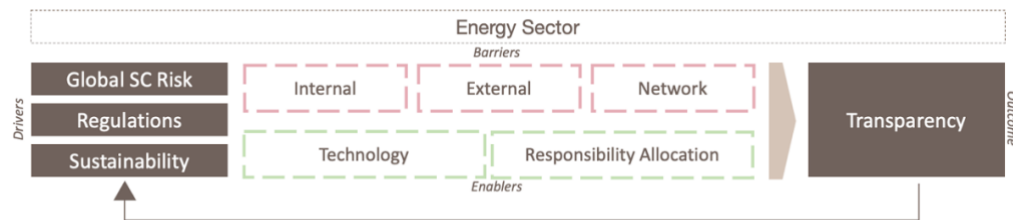


Figure 2 - Conceptual framework

The conceptual framework constructed illustrates our theory subsequent to the theoretical background and can be interpreted from left to right. Our research is directed towards how increased global supply chain risk, sustainability emphasis, and the development of new laws and regulations drive the need for transparency in the supply chain. The beige arrow represents the path to ensuring a fully transparent supply chain, perceived as the outcome. The five boxes surrounded by dashed lines represent facets influencing transparency. As the literature almost exclusively presents transparency as advantageous, while only a small proportion of organizations fully integrate this, it becomes evident that some barriers exist to transparency, illustrated in red. The barriers are thus naturally placed between the drivers and the end product of transparency, as enterprises are often encouraged to become more transparent but face elements that impede this development. Moreover, some underlying conditions are required to achieve transparency in the supply chain. Increased use of digital tools and an allocation of responsibility are argued by literature to be important prerequisites for enterprises to ensure a transparent supply chain, demonstrated in green. As illustrated by the figure, the arrow between the outcome and drivers displays that transparency is expected to have an important role in sustainability. The energy sector is highlighted as the research context.

Chapter 4 - Empirical findings and analysis

The following chapter will present our findings from the primary data collection. The thesis aims to investigate transparency within global energy supply chains and how it can affect sustainability. Our focus on primary data has been centered on current information-sharing practices, drivers for transparency, and the perceived barriers and enablers to achieving a transparent supply chain.

Inspired by the themes that came to the surface through our theoretical background, we have chosen a thematic data analysis with a color-coding approach to structure and analyze the amount of data received from the interviews. The conceptual framework presented in section 3.8 was used as a baseline for our theory, and the findings presented in the following sections are intended to contribute to the development of this framework. The empirical findings are divided into themes, substantiated by relevant quotes from the interviews. Additionally, we have analyzed secondary literature such as consultation statements and published reports concerning energy supply chains to improve our understanding. Section 4.1 provides interviewees' perceptions regarding drivers of transparency in practice. Following, section 4.2 revolves around the current situation for external and internal information sharing in the energy sector. Section 4.3 covers perceptions of barriers and corresponding enablers that influence transparency. Lastly, section 4.4 focuses on perceptions of how transparency can enable sustainability in supply chains.

4.1 Perceptions of drivers of transparency

In this master thesis, a “driver” is explained as a factor that facilitates and encourages transparency between parties in a supply chain. Our findings reveal that energy-associated companies are currently taking a leap toward a transparent supply chain, mainly due to the development of new laws and regulation and focus on sustainability. This section elaborates on the expert's reflections of why obtaining control and monitoring through transparency becomes imperative in practice.

4.1.1 Sustainability pressure from stakeholders

Not surprisingly, pressure from stakeholders was included as an important reason why companies emphasize the accomplishment of a transparent supply chain. As

energy corporations are often partly state-owned (Energifakta Norge, 2019), stakeholders seem to expect a different level of transparency and accountability than fully private enterprises. Ensuring sustainable operations becomes crucial in this sector as two-thirds of global GHG emissions are associated with the production and consumption of energy, making the industry one of the most important contributors to global warming (IEA, 2021a). In addition, the Murphy and Elimä report published in 2021 shed light on problems related to ethical issues in global energy supply chains. The report served as a wake-up call for both businesses and corresponding stakeholders, showcasing that visibility throughout pipelines was poorly integrated. ID-1 explained how the report impacted the company's procedures:

"After the publication of the report [Murphy & Elimä, 2021] highlighting human rights violations in the solar industry, we started to prioritize differently. Now, we investigate our suppliers down to tier 5-6 based on the risk picture in the industry."

Reports highlighting fundamental environmental or social violations often receive massive attention from the media, which in turn creates enhanced awareness in society. To exemplify, there was significant media coverage when a huge methane leakage from an oil field in the North Sea was discovered in late 2020 (Solvang, 2020). ID-4 highlights the importance of increased media coverage: *"Compliance drives transparency. Corruption has often been the main focus, but now the media uncovers other cases and highlights aspects that were not previously relevant."* The increased awareness has pressured companies to report their sustainability efforts in order to reduce the risk of reputational damage and negative stakeholder reactions. However, ID-8 argue that companies often omit areas in which their efforts and achievements are unsatisfactory:

"No company finds it amusing to share information about the things they are bad at, this can be observed in their yearly reports. In the market, there is generally poor transparency regarding companies' struggles. The challenge is to show the true colors of the company, negative publicity is not something we want."

Moreover, ID-8 further argues that "*The current soft and hard laws urge companies to share how they are improving their operations in order to show their stakeholders that they are aware of issues and are currently working on them.*" In the light of increased media coverage, consumers and investors are made aware of the current issues in business and have started pressuring the companies to take responsibility. ID-1 highlights this: "*The customers, investors, and financial institutions value qualifications and that the company is prioritizing sustainability.*"

4.1.2 Laws and regulations

The most frequently referred driver of transparency was newly developed laws and regulations. In particular, experts repeatedly promoted the Transparency Act. The law, announced in 2021 and expected to be enforced from July 2022, intends to reduce human rights violations in the supply chain. To avoid violations, corporations must conduct due diligence assessments within their supply chains (KPMG, 2021). The law covers all companies that are not defined as *small* in the accounting law and sell products and services within or outside Norway. However, it is essential to notice that despite being characterized as small, potential customers that are characterized otherwise might require the information (PwC, 2021). This law promotes transparency within the supply chain as it requires information about how corporations handle actual and potential negative consequences (PwC, 2021). The enforcement of the Transparency Act will be an effective driver for transparency as most businesses are required to gather and assess information about their entire supply chain.

The emergence of this law will significantly affect some of the largest energy-associated companies as they are often of significant size and pose as essential players in the global market. Accordingly, several enterprises associated with energy have provided the government with opinions and suggestions viable for the Transparency Act through consultation drafts to the Ministry of Children and Families. The global presence is highlighted through these consultation drafts: "*We have a worldwide presence with sales to over 160 countries*" (The Ministry of Children and Families, 2019a). Most experts agree that regulations are required for companies to enhance their sustainability and incorporate transparency in their supply chain. ID-6 elaborates on this topic:

“Criteria regarding sustainability has been a recommendation for a long time when purchasing goods and services. However, the development of new regulatory policies forces companies to consider sustainability when purchasing. Common regulations such as the Transparency Act are crucial for improving this area.”

In the consultation statements, several energy-associated enterprises agree that laws and regulations can incentivize companies to address potential adverse effects on human rights (The Ministry of Children and Families, 2019a; The Ministry of Children and Families, 2019b). ID-9 further substantiates this: *“The Transparency Act is pressuring the companies to move from what is expected (soft law) to what is required (hard law).”* When asking how the corporations will ensure that the Transparency Act is overheld, ID-2 argues that *“The purchasing function will become responsible for ensuring that the Transparency Act and supplier conduct principles are overheld.”* This statement highlights the importance of the purchasing function and how essential the department will become for the company to ensure transparent supply chains.

The move from soft to hard law is expected to continue in several countries and unions due to the increased focus on sustainability (Etikkinformasjonsutvalget, 2019). Consequently, corporations within the energy sector will be highly affected by several hard laws due to their presence in various countries and continents, making them vulnerable to local and global regulations. To conduct due diligence that covers human rights, climate change, corruption, money laundering, and economic fraud both in their corporation and the supply chain (KPMG, 2021). The initiative aims to promote “long-term sustainable value creation rather than short-term benefits,” and the final goal is to improve the alignment of shareholders’ interests (European Commission, n.d.). For global supply chains, these new regulations will have an impact as corporations are forced to address the adverse effects of their activities, both in their internal operations and external value chain. This indicates that businesses are forced to acquire more information about their contracting partners and sub-tier suppliers, promoting transparency.

4.2 Current transparency practices in the energy sector

Information sharing between direct contracting parties has been present within the energy sector through transactions and contracts. This type of information sharing has been crucial in energy projects due to customized specifications and technology for each project. However, transparency across the entire supply chain is a relatively new concept within business. Organizations are confronted with the challenge of improving transparency in order to meet regulatory requirements, optimize operations, guarantee quality outputs, and ensure sustainability (Montecchi et al., 2021). As the energy-associated supply chains are characterized by the rapid use of numerous suppliers across significant geographical distances, the challenge of accomplishing a transparent supply chain is intensified (DHL, 2015; Murphy & Elimä, 2021). To better understand the current transparency situation in energy-related companies and hence gaining an understanding of challenges faced and improvement potential, we asked the interviewees about their current external and internal perceptions and practices.

4.2.1 Current practices for information sharing within the supply chain

To improve our understanding of the current transparency situation within the supply chain, we included questions regarding the communicating parties, the content of the information shared, and how communication was conducted in the energy sector. From the conducted interviews, our findings showcased that current practices result in generally low transparency within global energy supply chains.

Traditionally, energy-associated companies are often project-based resulting in communication mainly with tier-1 suppliers through contracts. These contracts are often time-restricted and temporary, indicating that new supplier relationships are developed continuously based on the project's characteristics and needs. However, the focus on closer monitoring and visibility across the pipeline has put transparency on the agenda for most participating companies. Our findings prove that the nature of the information shared across global pipelines is now changing. Moving from somewhat established practices for information sharing regarding health, safety, and environment (HSE), and direct emissions, companies are now emphasizing sharing more in-depth insights that concern indirect social and environmental aspects. This indicates a shift for companies within this sector, which

implies the need for closer relationships with their suppliers. The interviews displayed that in-depth information is generally shared through utilizing simple yet secure platforms such as Sharepoint. However, the interviewees highlight the limited availability of platforms that facilitate information sharing past tier-1 suppliers. To simplify information gathering, most participants state that they use external third parties to collect information about suppliers' operations, products, and services. The interviews highlighted that corporations often used a risk-based approach when deciding when to conduct an audit, however, during the Covid-19 pandemic this routine was inhibited.

Supply chain parties involved in information sharing

Through the interviews, it became clear that numerous nodes are often included in energy-associated supply chains. Our findings showcase that it might be as many as 4000 tiers in the supply chain for some business areas within energy. A complex supply chain might hinder well-functioning communication in the industry, a facet required for accomplishing a transparent supply chain. This is highlighted by ID-1:

“All of our contracts are time-limited, and consequently, the opportunity for dialogue may also be limited. New contracts are granted all the time, and therefore we struggle to have a long-term dialogue with these suppliers. The industry is gradually moving further away. Previously, production took place nearby, but now more entities are located overseas.”

The abovementioned quote illustrates how the selection of communicating partners becomes crucial. However, it also highlights how time restrictions and complex supply chains complicate the environment of energy-associated actors. As the energy sector is proven to be project-based, it indicates difficulties in communication with the entire pipeline due to rapid replacements of contract suppliers. Moreover, the main share of interviewees argues that the focus on transparency in the supply chain is new to their agenda. Hence, they state that communication with suppliers is more frequent with direct contracting partners than with suppliers further upstream. ID-7 explained;

“In general, we only have tier-1 communication. However, in some cases, we know the identity of tier-2, but we do not audit or request information

from these suppliers. Ensuring sustainability in the supply chain is entirely new for us, so we have not used any resources to ensure transparency further upstream in the supply chain.”

This statement indicates low control over sub-suppliers upstream, an area of which several participants are required to improve due to global supply chain risk, increased focus on sustainability, and new regulations. The fragmentation of supply chains increases the risk of being associated with human rights violations through business connections (Etikkinformasjonsutvalget, 2019). Moreover, communication and knowledge about the supply chain operations are limited, and ID-10 emphasizes that: *“To accomplish a transparent supply chain, our tier-1 suppliers need to be responsible for their tiers. They are contractually liable, not us.”* The interviewee continues, *“If we start to manage our sub-tiers, we also become responsible.”* This showcases some degree of disclaimer, shifting the responsibility to contracting partners. Hence, this might indicate the need for collaborative efforts across the supply chain to enhance the visibility.

As observed, most companies mainly focus on tier-1 information sharing. However, interviewees argue that in some specific cases, information regarding operations, products, services, and processes might still be requested further upstream in the supply chain. Specifically, it was evident that the business area affects the communication practices and parties. As wind and hydropower are more established power sources in the energy industry, uncertainty is lower, and communication is conducted correspondingly. For solar power supply chains, however, a less mature market characterized by continuous improvement, rapid technological development, and high risk, a different method of communication is required to obtain responsible supply chains. ID-1 elaborates on how the business area affects the communication and monitoring in supply chains:

“We mainly communicate with our contract partners, and our contracting party is usually local in the country we operate. Then, we ask about subcontractors if we find it necessary. This has been our situation until now. However, looking at solar panels, we request information upstream to levels 5-6. This is a risk-based approach employed due to solar panels’ relation to forced labor in the supply chain.”

This statement sparked interest in how communicating parties are elected, in which interviewees reveal that the decision is often made on a risk-based approach. As immense technological expertise, access to raw materials, and low-cost production are required in energy production, components needed in the Norwegian energy sector are often produced in various countries providing these facets. Consequently, globalized pipelines and the corresponding risk increase the complexity of collecting information. Hence, ID-10 disclosed that *“As the company needs to relate to thousands of different suppliers, handling sub-suppliers becomes challenging. Therefore, in the future, we might only gather information on a risk-based approach.”* Interviewees elaborated on the topic and informed that the risk level is usually decided based on reports, country of origin, and industry. ID-10 argues that *“We often have a risk-based approach based on the industry; when buying technology from China such as solar-panel components, we might be more aware of the risk than buying from suppliers within minerals, a business area that is more developed.”*

Nature of the information shared

The interview guide included questions regarding what type of information the companies usually shared. Not surprisingly, as the main share of operations in the energy sector is project-based, several interviewees mentioned the iron triangle representing time, cost, and quality. ID-1 emphasizes that:

“Time, cost, and quality (the iron triangle) are often included in our contracts. In addition, we now expect our suppliers to share sustainability information. Sustainability creates a new dimension where we need to ensure that we encompass a sustainable supply chain [...]. There are approximately 52.000 components in a wind turbine, and therefore it becomes important for the suppliers to share information regarding the products’ origin.”

The iron triangle is the most commonly used criteria for project success, however, it has been criticized for excluding other important criteria, such as principles related to sustainability (Ebbesen & Hope, 2013). To further investigate this aspect, we asked the participants what information was shared with suppliers regarding

sustainability. ID-3 describes the development within the industry: *“Previously it was only large corporations that had HSE reporting, however, now small actors have joined the journey too.”* Most interviewees mention that there has been a shift from asking mainly about HSE to more in-depth questions about social and environmental aspects in recent years. ID-9 indicates that the HSE reporting has been taken to the next level and that supplier evaluation now often includes *“CSR related topics (environment, human rights, anti-bribery, product sustainability, recycling, CO2 footprints), quality standards (ISO-certificates), and basic information about the company.”* This is substantiated by ID-2, stating that *“Previously, we only held meetings dedicated to HSE. However, now we are building a program for environmental and social impact.”* The abovementioned quotes prove that the nature of the information shared has shifted from more simple information about labor conditions and emissions to more in-depth insights that concern indirect emissions, products’ total impacts on the environment, and social/ethical concerns.

To simplify the process of gathering information about suppliers’ operations, their products, and services, ID-7 explains that the company *“Creates our own set of questionnaires that includes questions regarding suppliers’ processes and use of material.”* As the expectations from stakeholders are ever-increasing and companies are not yet able to act sustainably on all levels, such self-constructed questionnaires provide information about the facets the enterprise finds most important. Hence, businesses need to be somewhat selective when constructing these self-completion questionnaires, as they would provide an immense amount of data if constructed otherwise. The experts elaborated on the type of information usually shared and that gathering information could differ based on the supplier characteristics. ID-2 explains:

“The type of information we get and share with our supplier differs depending on the supplier characteristics. Previously, we solely requested information about the iron triangle, however, we now include more questions to ensure that sustainability criteria are fulfilled [...]. If the suppliers are willing to answer our questions, it is easier to create a strong relationship, however, if their response is negative, it might become more difficult. For instance, in the solar industry in which we are a small

customer, actors are sometimes more hesitant to share information than hydro and wind, where they feel obligated since we are a large customer.”

This illustrates that the level of transparency is based on suppliers' willingness and that it can be challenging for the company to ensure complete transparency. Despite requesting certain types of information, it might not always be provided due to power differences and imbalance in the relationship.

Methods of information sharing

Furthermore, the interviews included questions regarding methods of communication, as we found it intriguing to get insight into tools that facilitate information sharing. Some of the interviewees emphasized that most communication with tier-1 was conducted through simple platforms such as by mail, phone, and physical meetings if required. ID-2 explained how they "*use collaboration tools such as SharePoint in our projects.*" Cloud computing intranet technologies services such as Sharepoint can contribute to increased and simplified communication between members in the supply chain. Several of the participants explain that they use external companies to simplify the process of information collection. EcoVadis is used by the companies ID-1 and ID-7 are employed in, here explained by ID-7:

"We use a company called EcoVadis to gather information for us. We have a due diligence process, which is a set of questionnaires used for our suppliers, where we ask for ISO certificates and request self-assessments. We might demand documentation of the questions answered [...], but we do not go into more detail than this."

Meanwhile, ID-10 explains how they use a similar platform: "*We use IntegrityNext, a platform where suppliers share information regarding their business. As a customer, we can collect the information we need, and the supplier only has to insert information once. This is not customized to the type of industry, but general questions that apply to all industries.*"

However, despite this simplification of communication, some interviewees state that physical meetings are still popular. ID-2 stated that "*Contract meetings are*

conducted once a month during the project" and continued to explain that additionally, *"Physical meetings related to different topics are sometimes held if necessary."* During the interviews, it became evident that such continuous meetings become crucial for project-based organizations, as it is important to document and monitor each project's progress. A report written by Greenhouse Gas Protocol (2004, p. 71) substantiates the need for physical meetings, stating that *"Verifiers may need to visit a number of sites to enable them to obtain sufficient, appropriate evidence over the completeness, accuracy, and reliability of reported information. The sites visited should be representative of the organization as a whole."* Such audits are also argued by participants in this study to be beneficial. ID-8 elaborates:

"We have color-coded the world map using a country index built on corruption, environment, and social aspects. Norway and Australia are typical green countries, while China is red. We use this mapping as a starting point when conducting a risk evaluation, and we must make sure that the red countries are monitored more thoroughly. If we do not get the answers we are seeking through our requests, we travel to the supplier and conduct audits. Typically the project leader or I are sent out to observe the site."

Through the interviews, however, it became clear that the frequency of such physical encounters has been reduced as a result of the ongoing Covid-19 pandemic, limiting the opportunities for travel and physical contact. As ID-1 explained, *"Covid-19 has made it challenging to conduct audits, evaluation of sites, and quality assessment of documentation."* On the other hand, ID-6 reports that in their company, *"Covid-19 has been a kick-start for sharing information, as we were made aware of how global our supply chain really is."*

Well-established sub-supplier communication is seldom reported during interviews. ID-10 stated that *"The level of integration and communication with tier-1 in the company is satisfactory. However, we have no IT systems for interacting with sub-tiers, and therefore we usually interact transactionally and manually by writing emails."* This showcases that there are limited methods, tools, and procedures available for information sharing with other parties than tier-1. On the other hand, it was discovered that a small share of companies included had

developed their own solutions for information sharing with their supply chain partners. This is explained by ID-9:

"We have developed an online platform where suppliers can share information, so it becomes easier to be transparent. We have regular meetings with our suppliers to get more information about how they are approaching their sustainability goals. By doing so, we are able to highlight the importance of sustainability and, at the same time, educate them on the topic. We do this as we want to include them in the journey and explain what transparency and sustainability are really about."

In summary, the interviews showed that there are few effective methods for communication below the tier-1 level, despite some participants highlighting developed systems. This displays a need for equipment and tools for communication to effectively gather and assess the immense amount of information.

4.2.2 Current practices for internal information sharing

As we aim to investigate transparency in global energy supply chains, we believe that investigating a company's internal processes, perceptions, and culture is beneficial. From an early stage, the empirical findings demonstrated how internal culture for information sharing contributes to how, how much, and which information is shared externally. As a result of the abductive approach, we included questions regarding internal practices for information sharing as we found it intriguing to investigate how internal culture influences external information sharing, a topic inadequately discussed in literature. Several experts stated that internal information sharing is often done through digital communication flows, face-to-face meetings, and processes and procedures. However, the interviews illustrated that the information shared within companies varies significantly.

In the most technology-intensive corporations, internal information sharing is low due to classified information regarding processes and products, and the information flow is maintained at this level to reduce risk. Consequently, these companies have decided to exclude internal information sharing in their business strategy. ID-8 explains why this is the case:

"We want to reduce the risk of product- and technology information leakage. We are afraid to share information internally because we want to have less vulnerable points if something were to happen."

Further, the interviewee explains that this results from the corporation's processes being *"Vulnerable to both cyber-attacks and terror attacks, and hence, each employee should not know more than strictly necessary."* Additionally, the same participant explained that in cases where internal information needs to be shared, it is required to use platforms that are considered *safe*. To exemplify, information about product technology that could increase efficiency, competitiveness, and profit is not allowed to be shared on unsecured platforms such as e-mail. Hence, this is considered a safety measure to avoid information leakage and reduce the corresponding risk.

Other interviewees report that the willingness to share information is present, however, some elements make internal information sharing difficult. ID-3 substantiates this willingness but stresses the lack of digital tools that facilitate open information sharing in the company across departments:

"Norway has a trust-based culture, making it easier to be transparent. On a general note, I experience the employees' willingness to share information. However, our company has no platform specifically designed for information sharing internally, which makes it difficult."

Such obstacles to internal information sharing are also highlighted by ID-2, seen in correlation with the recent pandemic: *"We have no platforms for internal information sharing. During Covid-19, each entity has been more isolated. This showcases that we seldom work cross-functionally with other teams, and the information shared across departments and corresponding learning is thus limited."* Consequently, the pandemic has been a setback for information sharing across departments, inhibiting knowledge sharing.

Nevertheless, most interviewees state that their affiliated company obtains a culture and system for internal information sharing. The willingness to share information

internally is emphasized by ID-1, "*We have an open culture of sharing information internally. Hence the threshold for sharing is low. However, the challenge in this company is that many people know something about everything. Therefore it is not always easy to decide the level of sharing.*" Participants argue that the different competence levels across departments inhibit information sharing and that frequent information flow is crucial in developing competence within the industry. This can be exemplified by the fact that more people are experienced with the importance of sustainable supplier selection in the purchasing function than in the technology department. Hence, for the company to ensure sustainable operations at all levels, it becomes crucial to educate all departments on topics related to sustainability and transparency.

Generally, most participants stated that employees display a positive attitude towards internal information sharing. ID-6 highlights that "*It is a good culture for information sharing across departments.*" It is further argued that cross-functional information sharing is essential in energy-associated enterprises, as the nature of operations is project-based. Such internal information flows across departments might reduce the risk of sub-optimization, as all entities' goals are aligned, and every employee is equally updated on projects' progress, potential disruptions, and corresponding risks.

4.3 Perceptions of factors influencing transparency

Scholars argue that transparency can be beneficial for increased control, visibility, and sustainability capabilities (Rajeev et al., 2017; Mol, 2015). During the review of literature, we were superficially introduced to some of the factors influencing transparency in general. However, to gain a better understanding of the factors influencing energy-associated corporations' willingness and ability to accomplish transparency, we asked the interviewees what they perceived to be *barriers* and *enablers* for transparency in practice.

There has been an increased focus on the advantages of a transparent supply chain in literature. However, there has been inadequate investigation of why companies struggle to ensure transparency in practice. Consequently, we devoted an entire section of the interview guide to this topic. When asking the interviewees about what they perceived as the most prominent barriers for achieving a transparent

supply chain, the respondents gave unexpectedly similar replies, despite being employed at different companies. Surprisingly, the barriers most frequently mentioned are related to the energy sector's characteristics, such as high level of competition, complex supply chains, technology intensity, and project-based organizing. This gave an indication that energy-associated supply chains are, as mentioned by scholars, not inherently constructed in a way that facilitates transparency (Gualandris et al., 2021; Bateman & Bonanni, 2019). In addition, and probably a more general observation across industries, experts mention that lack of standardizations and insufficient information technology systems are barriers for transparency. Correspondingly, when integrating measures to overcome these barriers, they are characterized as enablers.

4.3.1 Fierce competition

The technological composition of components used in energy production is a substantial element that determines the competitive advantage for corporations within energy. Several interviewees reflected on how competition influences energy-associated supply chains' transparency both positively and negatively. On one hand, competitive markets can positively influence transparency and sustainability, as transparent attitudes towards sustainability contribute to differentiation from competitors. ID-6 illustrates the ease of close relationships as mentioned in the literature but continues to discuss how competition stimulates sustainability:

“The easiest thing in the world is to relate to the same supplier, this is time saving and effective. However, this is not possible as we are often project-based. If there exists no competition, the market will not become as effective as it could have been. If you only have one supplier, the incentives for ensuring sustainability and transparency might be lower than in an environment where competition is fierce.”

On the other hand, the fear of sharing sensitive content that compromises competitiveness, as previously mentioned, is also the most frequently displayed barrier related to transparency. This is highlighted by expert ID-1, stating that *“There are a lot of concerns related to information sharing within the energy sector, due to competitive advantage and classified use of technology.”* The interview

sessions provided us with valuable information regarding the competitive landscape in the energy sector. Most companies within this industry are concerned with sharing advanced technological specifications and are hesitant to transparency. The statement provided by ID-4 is a perfect illustration of why competition in the technology-intensive energy industry is a barrier to transparency, emphasizing the fear of information leakage concerning technological development:

“If someone were to develop a turbine that is only one per mille more efficient than the component used by the competitors, it will result in several million NOK during the turbine’s lifetime of approximately 50 years.”

Further, we were intrigued by whether this worry about information sharing concerned all types of information. During the interviews, it became evident that most energy-associated corporations are willing to share sustainability information, however, detailed information about products’ origin and production processes is often omitted in the communication due to the fear of losing competitive advantage. Interview ID-8 elaborated on the type of information eligible for exposure:

“Our company handles a lot of sensitive information, to get access to this type of information, we need to evaluate the situation. We do not wish to share information externally that is unsuitable for exposure. This applies to both technology and products, and technology can also, in fact, pose as a product. However, we can share sustainability information if it does not involve details about our products.”

As the participating companies are hesitant to share product specifications and origin information due to competitiveness, information concerning bottom-tier suppliers is often omitted from the information being shared. This is a challenge inhibiting sustainability enhancement, as recent reports highlight that the main share of social and environmental violations occur in the bottom tiers (Murphy & Elimä, 2021).

Our findings also prove that, due to different competitive levels, transparency differs across business areas. In solar-related supply chains, bottom-tier suppliers are almost exclusively located in China, which provides few alternatives for

sourcing elsewhere (Murphy & Elimä, 2021). Hence, the suppliers are in no need of transparency and sustainable operations, as they know that players further downstream are dependent on their products and services. However, in other business areas like wind and hydropower, interviewees argue that the market is more competitive, with numerous suppliers providing substitutes. This makes suppliers required to commit to more sustainable operations and communicate such efforts to potential purchasers. ID-5 displays power imbalances on a general basis:

“If you only have one supplier, you are dependent on this supplier no matter what sustainability measures they take. This indicates that the supplier is not pressured to change, however, if the market offers competition, companies can demand a certain sustainability level, hence competition drives sustainability.”

This indicates that it becomes difficult to force change in a supplier-buyer relationship in which one part is dependent on another. Instead of forcing a change on suppliers, several participants report that they rather encourage supply chain partners to make a difference. ID-2 illustrates how the level of competition in different business areas impacts transparency:

“In the production of solar power and battery components, we are a small contributor in a demanding and elongated supply chain. Hence, we have no leverage, and a best-effort approach for communication is employed. Additionally, we might encounter more immature suppliers in these markets, making it challenging to demand information. However, in hydropower in which we are a significant player, it becomes easier as the supply chains are shorter and the projects considerably larger.”

As uncovered through our interviews, several experts hope that more sustainability aspects will soon be the main arguments for getting involved in contracts, creating a need for transparency. However, experts disclose that price is still the main factor when choosing suppliers in the energy sector. ID-5 argued that *“We will never be able to disconnect from the price. If the end-product is not profitable, there will be no project.”* This indicates that despite the increased focus and pressure from stakeholders on sustainability and hence transparency, the price will always be the

most emphasized factor when getting involved in project contracts, which reduces the priority of becoming transparent. This is also discussed by ID-5, stating that *“Competitiveness and capitalism is a barrier towards sustainability and transparency. As a small player, one does not afford to employ sustainable efforts if no one else bothers to care.”*

4.3.2 Complex supply chains

Not surprisingly, the largest corporations participating in the interviews mentioned that their supply chains are complex. ID-5 declares that *“Many nodes and components in the supply chain creates an extremely complex picture.”* As previously illustrated by the complexity of wind turbines and its numerous components, the number of contributors involved in energy production is immense. This implies that the barrier of complex supply chains is highly relevant for corporations involved in energy. ID-5, employed in one of the largest participating organizations, stated that *“We have over 9000 direct suppliers that we need to control.”* The immense amount of direct suppliers constitutes only a fraction of the external supply chain network. Hence, the complex external network complicates the process of transparency, mainly as the network is distributed across continents. ID-9 substantiates this:

“When you only have five suppliers, it becomes effortless to follow up sub-suppliers. However, when you have 4000 direct suppliers as we do, it becomes too complicated to cover them all. You can probably double the amount of tier-2 suppliers. You have to be selective on which business areas you want to focus on sub-suppliers, e.g., conflict minerals.”

This highlights the stated difficulties of accomplishing sustainability in the supply chain, as this requires companies’ ability to receive and analyze information from thousands of suppliers in their network. Furthermore, ID-1 explained:

“It is not possible to map out the entire supply chain because the chain is so complex. It is difficult to get insight into all components, so we have to be selective of what we choose to get insight into.”

As the highlighted quotes illustrate, companies are both directly and indirectly, related to multiple supplier levels in different supply chains. Hence, it becomes evident that the complexity of the supply chain makes it challenging to create a transparent supply chain within energy. Furthermore, with its presence in various countries globally, Covid-19 has made it challenging to monitor each entity. When the Covid-19 pandemic occurred in March 2019, it became evident that maintaining audits at production sites across the world became challenging, hence creating difficulties of ensuring that compliance was overhauled. Interviewee ID-8 substantiates this by stating that “*Corona has made it difficult for us to maintain audits and check the terrain.*” As complexity is a central trait of energy-associated supply chains, the risk increases due to global operations. Elongated supply chains increase the risk of disturbances and require businesses to find new ways to ensure compliance and evaluate the supplier structure.

Additionally, we asked the participants whether elongated supply chains across continents had any impact on the type of information shared. ID-6 elaborated on this matter, emphasizing challenges related to information sharing regarding emissions across the supply chain: “*Naturally, we have been reporting Scope 1 and 2, which covers our internal emissions, however, we understand that Scope 3 is where we need to improve.*” The interviewee refers to commonly used measuring methods of GHG emissions first developed by the Greenhouse Gas Protocol, where Scope 1 and 2 are associated with emissions directly related to the enterprise, while Scope 3 is connected to the supply chain (Greenhouse Gas Protocol, 2004). Substantiating the statement made by ID-6, a report written by FairSupply (n.d) highlights:

“Measuring scope 3 is difficult. The situation is exacerbated by lagging carbon accounting systems, designed around last century concerns and limited to Scope 1 and Scope 2 considerations.”

The difficulty can be explained by the fact that Scope 3 data lies in the supply chain rather than the company observation, this indicates that upstream and downstream emissions occur in millions of supply chains (FairSupply, n.d.). Further, it is stated by FairSupply that in order for companies to measure Scope 3, “*Supply chain visibility is crucial. Scope 3 emissions may represent the bulk of an entity’s GHG*

emissions. As such, they offer a significant opportunity for emissions reduction, if the right means of engagement between buyers and suppliers are employed". Due to the complexity of energy-associated supply chains, it can be challenging to report on Scope 3 emissions.

4.3.3 Project-based organizations

Another barrier discovered in the interviews is the projects-based approach often employed in energy-associated organizations. Accomplishing a transparent supply chain might be difficult in these corporations, as the choice of suppliers of products and materials are often dependent on the project characteristics. ID-1 declares: *"Our company is project-based, and we do not repeat our supply chain. Consequently, information sharing and transparency become challenging. However, despite this challenge, we try to learn from each project and bring competence to the next."*

It is commonly known that close relationships with suppliers facilitate open information sharing and collaborative advantages. However, fostering close relationships between players in a supply chain does not come without charge. As projects are often time-limited, this cost of maintaining close relationships must be seen in accordance with the benefits provided. ID-3 discusses the cost-benefit evaluation needed for close supplier relationships and transaction costs in temporary relationships:

"Our company is project-based which affects the relationship with our suppliers. The cost of transparency would account for a disproportionately high share of total transaction cost if you only have one transaction with a supplier."

Accordingly, for a large share of energy-associated companies, encouraging transparency is challenging due to rapid changes in supply chains. What amplifies this difficulty in energy supply chains is the uncertainty present when signing the contract, ID-1 display this:

"Often, hydro-power suppliers have not yet decided which suppliers they will use when the contract is awarded. The suppliers are chosen based on the specific product that is tailor-made specifically for us. In some cases,

you can estimate approximately which sub-suppliers will be used, but not entirely accurately. This is easier to do in our solar projects as these components are often more standardized.”

Moreover, in many cases, it can be demanding to acquire all the information needed to make the best decisions, as most aspects are not decided when the contract is awarded. ID-5 explains how the different phases of a tendering process affect suppliers' willingness to employ sustainability efforts: *“The willingness to impose sustainability measures is always higher the day prior to contract signing. The day after, this willingness is significantly lower.”* The expert continues to explain how suppliers involved in tenders are remarkably eager to promote their initiatives prior to the contract award but that promises are often not in correspondence with later actions. Hence, this displays that the temporary organization of projects can impose realistic communication concerning sustainability.

4.3.4 Lack of standardizations

In addition to the three barriers mentioned above, the experts made it apparent that one of the most substantial challenges that needed to be surpassed was the lack of standardization. The problem is highlighted by ID-3, who claims that *“Everyone reports differently on unequal foundations but labels it identically.”* This statement was repeatedly mentioned as an inhibitor of the goal towards a transparent supply chain, as tiers across borders have different perceptions of what sustainability and transparency include. As several of the companies in the study purchase from suppliers in underdeveloped countries, ID-5 explains that *“One of the most demanding barriers are cultural differences.”* Further, ID-4 highlights how *“foreign suppliers might not have the same opinion of what is important to share.”* Thus, it becomes clear that culture, norms, and traditions might affect the type of information shared and the frequency of communication. Correspondingly, several interviewees requested the establishment of standardized processes, definitions, and evaluation methods, as *“Today's practices make it challenging to decide what to share and know what is compared,”* as explained by ID-1. This is supported by ID-3, stating that *“Standardized processes and common ground rules would reduce the transaction cost.”* These reductions in transaction costs are owed to enhanced clarity in frameworks, guidelines, and processes, reducing the time spent on

gathering and assessing information. Such standardizations are mainly considered beneficial in global settings, as emphasized by ID-5:

“In Norway, we are all subject to the same laws and regulations. However, it becomes challenging to accomplish transparency and verify sustainable operations globally, as the frameworks are so different. Hence, without common standards, there is a risk of creating a race towards the bottom line, which might compromise the workers’ wellness. Therefore, leveling the playing field is crucial.”

ID-1 substantiates the statement above by highlighting the variation of hard laws in different countries and how these affect transparency: *“Using the solar industry as an example, Chinese suppliers are subject to laws and regulations that decide what type of information they are allowed to share. This makes it difficult for us to require information.”* Further, ID-5 explains that:

“If you have deliveries from China, you are subject to regulations that decide what you can require information about, this is called the blocking law. This law inhibits the possibility of going to China and requesting to know whether human rights are overheld, however, you can ask how the supply chain is organized and get verifications. Whether you will get it, that is another case.”

Hence, it becomes evident that the lack of country-independent standardization through certifications, frameworks, laws, and regulations poses a barrier to transparency across global supply chains. Consequently, we expect that there needs to be developed common standards across industries and countries to enable transparency.

4.3.5 Poor IT systems

During the interviews, it became evident that today's IT systems are insufficient to ensure transparency across the supply chain. ID-4 states, *“We need technology that can automate and simplify the process, as becoming completely transparent is time-consuming and resource-demanding without advanced technology.”* As the energy sector is often characterized by temporary relationships with suppliers, conducting

a cost-benefit analysis of the investment in IT systems becomes even more essential. ID-3 substantiates this: "*Common IT systems are expensive to implement. It might be a beneficial investment if your business is concerned with long-term relationships. However, for short-term relationships, the cost will exceed the benefits.*" This barrier becomes particularly substantial in the energy sector, as the investment cost of sufficiently advanced IT systems is high compared to the size and value provided by the relationship and contract. However, finding the correct IT provider can be challenging as mentioned by interviewee ID-7: "*The number of companies providing such IT systems grows by the hour, and it is difficult to navigate the market and find the most optimal one.*" According to the expert, this is due to limited technological expertise in the entity responsible for the purchase of the system. In turn, this provides insufficient foundation for making decisions regarding functionalities and efficiency needed. Hence, the fear of making a significant investment that does not provide the benefits intended emerges.

As seen through the interviews, most enterprises involved in renewables have a significant improvement potential for implementing systems that facilitate transparency and open communication. However, it became apparent that corporations that have been subject to sustainability concerns for several years, such as more established enterprises involved in oil and gas, have more advanced solutions. ID-5 argues that they have developed systems that simplifies tier-1 communication:

“For the suppliers that deliver products or services associated with our core business, we have insight into their sub-suppliers, sometimes to tier-3 level. I feel that we have a good system for this, the structure and requirements are present - but of course, there is always improvement potential. We have definitely been working more towards supply chain visibility after the Transparency Act was announced.”

Further, ID-9 stresses the importance of having systems that uncomplicates the process of information sharing, and elaborates on how their associated company have created a platform that stimulates transparency:

"It becomes crucial to find technology that makes information sharing effortless. Most companies might have a platform for information sharing for tier-1, but not necessarily for upstream suppliers. Therefore, we have created a free online platform where suppliers can share the information required."

In general, most participating companies in our study are under the impression that the current information sharing systems are insufficient, and that more advanced IT systems must be integrated in their enterprises in order to enable transparency. However, some interviewees report that they employ well-functioning systems that provide adequate communication with tier-1 and their respective sub-supplier, but that they lack tools for information sharing past tier-1 suppliers.

4.4 Perceptions of how transparency enables sustainability

What sparked our interest in the field of transparency were the benefits allegedly provided by the concept, whereas enhanced sustainability was highlighted as the main advantage of information sharing between actors in the supply chain (Rajeev et al., 2017; Mol, 2015). To answer our sub-question, we decided to include questions of how experts perceived transparency's opportunity to enable sustainability. Our empirical findings immediately uncovered that for businesses in the energy sector, sustainability was the main objective for enhancing transparency in the supply chain. As the energy industry is a vast contributor to global warming, emitting 31.5Gt of CO₂ in 2021, and has faced numerous allegations of human rights violations, it is evident that the energy sector has a considerable improvement potential in regards to sustainability (IEA, 2021a; Vázquez & Hodgkins, 2021). An energy-associated enterprise participating in the Transparency Act consultation argued that: *"We are present in some of the most demanding places in the world, both at land and sea. We conduct businesses within several countries with different security and human rights approaches. Therefore, responsible operations are crucial for maintaining trust"* (Ministry of Children and Families, 2019a). The consultation statements showcase how important transparent supply chains become in ensuring sustainability. Hence, it is natural to assume that transparency, a sustainability facilitator, should be put on energy-associated enterprises' agendas to a far greater extent. As we wanted to investigate transparency's advantages, we

included questions linking transparency to sustainability in the interview guide to let the experts discuss this topic.

There is a common agreement that transparency is the key to ensuring a sustainability in supply chain among the interviewees. ID-2 agrees with literature, highlighting that *"In capital letters, transparency becomes the means to achieving sustainability."* Further, ID-1 explains this by stating that *"Increased transparency makes it easier to make sustainable choices."* This is because having all information about suppliers' operations, services, and products, provides the opportunity to make more well-considered sustainable decisions. ID-7 elaborates on the topic of transparency in relation to sustainability:

"I think transparency is an important contributor to accomplishing our sustainability goals. I believe that whether you choose to invest in transparency is somewhat dependent on the company's characteristics and organizing. However, in any case, the risk and impact on sustainability are huge in your supply chain. If you focus on greenhouse emissions, 80% of the footprint is in your supply chain. Additionally, if you look at human rights, the number of people working in your supplier base is far larger than people working in your own company. Hence, the impact of your supply chain is immense, and you need to know what is going on and where the risks are located to address them."

Accordingly, the main impact of operational choices is seen in the supply chain. This is particularly evident in the energy sector, as supply chains are often elongated across borders. Consequently, there was a common agreement between interviewees that to ensure sustainability in supply chains, enhanced visibility is required.

Experts emphasize the connection between transparency and the UN's Sustainable Development Goals (SDG). ID-4 argues that the SDGs have been essential contributors to the development of the term sustainability: *"The term 'sustainability' has gradually improved, in which the concept now includes the UN's Sustainable Development Goals. This is advantageous, as the term includes more than just the environmental perspective."* To accomplish these SDGs, interview ID-8 argues that

transparency is an important facilitator for sustainable operations: "*Transparency increases the energy sector's probability of achieving the UN Sustainable Development Goals and The Paris Agreement.*" ID-10 substantiates this statement: "*The goals of sustainability, which now includes ESG performance and reducing carbon footprint, can not be achieved without transparency.*" However, accomplishing a transparent supply chain alone is demanding, and consequently, collaborative efforts are mentioned as advantageous as explained by ID-8: "*A common goal is much more beneficial than if all parties should work towards that goal in isolation, therefore, it becomes important to collaborate to accomplish the sustainability level we desire.*" Therefore, a united effort among supply chain partners could be viewed as a means to accomplish a fully transparent supply chain that facilitates sustainability.

As proven, a transparent supply chain can contribute to enhancing sustainability performance. Sustainability performance is argued by the experts to become an important competitive advantage in the future. ID-1 mentioned: "*Being sustainable becomes an important parameter in future competition. The clients appreciate full transparency, and hence qualifications and sustainable operations become important for investors and other financial institutions. In the future, I believe that sustainability will become a 'knock-out' criteria.*" This statement was further emphasized by ID-5, explaining how transparency regarding sustainability efforts impacts the tendering process: "*The suppliers that we know have the best labor conditions and are best at following the human rights standards have an advantage in the tendering process.*" In summary, accomplishing sustainability in the supply chain is almost impossible without information sharing.

Chapter 5 – Discussion

The following chapter will discuss the empirical findings in light of existing literature. Our empirical findings derived from conducted interviews and the extensive review of literature elucidate many interesting perspectives on transparency. However, we have decided to focus on the aspects that contribute the most to answering our first research question; *What are the key factors influencing transparency in global energy supply chains?* To do so, we will combine the structure of our empirical findings and theoretical background, covering current drivers, barriers, and enablers for transparency in sections 5.1-5.3. Meanwhile, section 5.4 is mainly concerned with our sub question; *How does transparency enable sustainability?* To answer the stated question, we discuss the importance of sustainability in the energy sector and how transparency can be perceived as a tool to accomplish sustainability in supply chains. Lastly, section 5.5 summarizes the discussed matters and presents an altered framework seen in Figure 3, page 81.

5.1 Drivers of supply chain transparency

This chapter discusses the circumstances which explain why transparency emerges as an important topic for businesses to consider. In short, transparency had a far lower significance prior to the emergence of globalization when value chains were centered more locally. However, today's elongated supply chains that extend across borders, enhanced emphasis on sustainability, and related regulatory policies drive the necessity of enhanced monitoring and control. The following sections discuss how globalization, sustainability, and regulations drive increased transparency in energy supply chains.

5.1.1 Global supply chain risk

One of the most apparent drivers for transparency is the increased global supply chain risk, as proved by the theoretical foundation (Den Butter & Linse, 2008; Tong & Wei, 2014). The literature argues that ensuring a transparent supply chain would provide corporations with a better overview and visibility, increasing supply chain control (Tong & Wei, 2014). On the other hand, increased global supply chain risk was rarely mentioned directly as a driver for transparency in our empirical findings. However, the context was frequently used to describe the desire for more control.

Established literature argues that corporations often neglect the drawbacks of globalization (Barry, 2004). Due to global dependencies and recent supply chain disruptions illustrated by Covid-19 and the Ukrainian war, businesses have been affected and gained new perspectives on global supply chains (Chowdury et al., 2021; Kilpatrick, 2022). In our empirical findings, the most frequently mentioned side-effects of globalization were social and environmental concerns in the supply chain, as illustrated in the Murphy and Elimä report (2021). The report displayed how energy-associated enterprises possess inadequate control and visibility towards bottom-tier suppliers in the business area of solar power. Furthermore, our findings showcase how other business areas are also subject to similar challenges and reveal how traditional tier-1 monitoring is insufficient to maintain control and reduce risk in energy-associated supply chains. The reason for this, we argue, is that the suppliers further upstream are just as prone to disruptions as the closest tiers. Hence, keeping track of tier-1 suppliers becomes superfluous if lower tiers are not included in the information flow. Literature further argues that enhanced risk is rooted in the inter-relationship between nodes and that increased control of the supply chain network becomes crucial to prevent unexpected impacts derived from upstream suppliers (Tong & Wei, 2014; Sodhi & Tang, 2012). Despite our empirical findings rarely mentioning global supply chain risk as a driver for transparency, the complexity of globalized energy supply chains is highlighted by the experts interviewed and referred to as "impossible to map out." Therefore, we argue that a key lesson is that the inability to get an overview of the supply chain increases the risk of compliance failure and other disruptions as enterprises are not sufficiently informed about disruption points, making transparency vital.

Our study uncovered that the energy industry is greatly dependent on international contribution and subject to great disruption and corresponding risk. As a result, current practices require adjustments that facilitate open information sharing and communication across value chains to accomplish two essential objectives: (1) reducing the dependency risk and (2) obtaining greater control and visibility across the entire value chain in order to avoid disruptions. Based on our findings, it would be reasonable to believe that the risk-related challenges entailed by globalization is likely to drive enterprises' desire to establish supply chains closer to home. However, there was a concurrence between the Murphy and Elimä report (2021) and the experts regarding the unattainability of an entirely local energy supply

chain. This is mainly due to the dependencies on foreign components, technology, and material expertise. At most, we might expect to see some tendencies towards more local providers, as corporations have been encouraged to reduce the global supply chain risk. As the most optimal situation has proved to be unrealistic at the moment, we argue that increasing the transparency is the second-best option. We believe that improving the visibility of each node would contribute to displaying inter-relationships and dependencies that were previously concealed. Hence, businesses might become more aware of which nodes are prone to disruptions through enhanced transparency. By facilitating the opportunity to make operational adjustments to avoid significant impact, enterprises are encouraged to increase transparency to reduce global supply chain risk.

5.1.2 Sustainability pressure from stakeholders

The empirical findings and the theoretical background demonstrate that Norwegian energy-associated enterprises are held accountable for a significant share of their corresponding value chain and encouraged to develop sustainability practices due to stakeholder expectations (Andersen & Skjoett-Larsen, 2009). The literature argues that this accountability is imposed by customers, financial institutions, and other remaining shareholders (Cini & Ricci, 2018). Our empirical findings display that due to governmental ownership, the state is often held accountable or associated with activities conducted by energy enterprises and hence affected by both positive and negative reactions that these activities might entail. Consequently, any potential violation is of rather significant importance, as essential stakeholders might face substantial backlash. Thus, with the government as one of the principal shareholders, it becomes crucial to keep its interest in mind when creating an operational strategy, which preferably includes sustainability measures.

Our empirical findings prove that the media is another vital stakeholder for energy-associated corporations. Interviewees accentuate how media coverage has been a wake-up call for many organizations, highlighting their operations' previously unknown adverse environmental and social effects. From the experts' statements, it became evident that enterprises devote more time and resources to sustainability as soon as they have been subject to or made aware of violations. This was made apparent through the publication of the Murphy and Elimä report (2021), subsequent reactions from society, and following adjustments to energy-associated

enterprises' current business practices; "*After the publication of the report [...] we started to prioritize differently.*" As the media plays a vital role in encouraging sustainability performance, our empirical findings demonstrate that reputational damage is an undesirable result. To avoid such destructive situations, it becomes crucial to consider every aspect of the business, and hence transparency emerges as a necessity (Fung et al., 2007; Mol & Oosterveer, 2015).

As a consequence of governmental and societal pressure, sustainability reporting has emerged to show how enterprises are evolving and working towards sustainability. To succeed with sustainability reporting, enterprises need to disclose and communicate sustainability goals and corresponding efforts to reach them, whereas transparency becomes an essential facet that simplifies this process. Literature highlights several motivations for why enterprises focus on sustainability reporting: competitive advantage, pressure from stakeholders, and desire for increased sustainability ratings and performance (Cini & Ricci, 2018). Our empirical findings showcased well-functioning structures for corporations' sustainability reporting, however, it became evident that most enterprises still struggle to report on their supply chains' impact due to low visibility.

Recent stakeholder pressure on sustainability has increased the focus on environmental and social aspects, an advancement of the traditional HSE and corruption-focus. The research uncovered that most enterprises had insufficient control and information beyond tier-1 suppliers. As global presence expands the concept of sustainability to cover the entire supply chain and not solely the enterprise itself, it becomes evident that corporations are required to develop their current practices for information sharing (Andersen & Skjoett-Larsen, 2009; Ahi & Searcy, 2013). We argue that this becomes particularly essential for energy-associated corporations as the probability of social and environmental violations increases in line with the number of nodes and countries included in the supply chain network. Therefore, a key lesson is that stakeholder pressure is a vital driver for transparency as enterprises are dependent on stakeholders' support to remain competitive and ensure a good reputation. Moreover, we debate that transparency increases the company's knowledge about sustainability-related impact and possibilities in the supply chain, which provides the opportunity to serve essential stakeholders with the information requested.

5.1.3 Laws and regulations

Literature frequently connects transparency, sustainability, and the introduction of regulatory policies (Chatterjee & Chaudhuri, 2021; Darnall et al., 2019). Both hard and soft law is argued to impact business processes significantly and contribute to a more transparent business environment (Darnall et al., 2019; Abbott & Snidal, 2000). The interviewees' highlight that transparency has previously been encouraged through soft laws. However, the energy sector has recently faced a transition towards hard law. Regulations that emerge regarding transparency are mainly in awe of the increased emphasis on sustainability and the desire to minimize adverse effects on environmental and social aspects. The shift towards hard law thus implies that in the coming years, energy-associated enterprises are not only implementing voluntary sustainability efforts to acquire goodwill, but they also do so as required by law to avoid sanctions.

Established literature argues that hard law is the most effective method to force change (Abbott & Snidal, 2000). This was evident in our empirical findings, revealing how some enterprises have neglected their sustainability responsibilities until the announcement of the Transparency Act. Unarguably, The Transparency Act, developed by the Norwegian government to secure human rights in the supply chain, proved to be the most frequently promoted law in our empirical findings. The law is expected to significantly impact Norwegian energy-associated enterprises and their corresponding supply chains; Established enterprises that have well-monitored tier-1 operations must develop their current practices as they are now forced to expand their horizon to sub-entities and suppliers in need of monitoring. On the other hand, less mature players in the energy sector will perceive this imposition as an upheaval of current business practices. We argue that even small corporations that are not directly subject to the Transparency Act will notably be affected by the enforcement, as certain corresponding downstream entities are larger enterprises directly subject to the law (PwC, 2021). More interesting, however, are the smaller corporations that are not directly affected by the law but might utilize the enforcement as a guideline towards future injunctions that will apply directly to them. Hence, as a result, hard law that applies to certain actors may also apply as soft law for remaining actors excluded from the enforcement.

Thus, the empirical findings display that the announcement of the law initiated a long-overdue preparation.

Despite established literature presenting regulatory policies as beneficial factors that encourage transparency, our general perception is that entirely open information sharing is challenging for businesses to achieve. The empirical findings showcased that enterprises are generally favorable to the new laws and regulations covering transparency, however, a common concern regards how to ensure compliance in a complex global environment. Our theoretical background and empirical findings showcase that energy-associated enterprises are characterized by elongated supply chains, complex compositions of products and services with numerous inter-dependent components, and intensive competition. As a result of "*4000 direct suppliers [...] and double the amount of tier-2 suppliers*" in need of control, we argue that Norwegian energy enterprises might face difficulties accommodating the Transparency law. This indicates a need for collaborative efforts across the supply chain to manage and control information flows in a way that satisfies the regulations set.

As a contributing factor towards regulatory compliance, standards and common ground rules across borders are highlighted through our empirical findings. Moreover, as the energy-associated supply chains are highly globalized, we argue that Norwegian energy-producing companies and supply chain partners will be affected by laws and regulations that apply in other operating countries as well. We argue that compliance with the Transparency Act is simplified by the development and coexistence of similar laws that apply directly to foreign sub-suppliers. This is exemplified by recent transparency laws discussed by the EU that legislate all entities located within Europe, in which a potential development could assist Norwegian energy-producing companies to demand information (European Commission, n.d.). As a key lesson, energy-associated enterprises should utilize the emergence of new regulations as an encouragement to invest time and resources in transparency.

5.2 Enablers for supply chain transparency

The thesis addresses two enablers discovered in the theoretical background, technology and allocation of responsibility. However, as an *enabler* can be referred

to as a prerequisite for an unspecified event to happen, we argue that solutions for certain barriers mentioned in the empirical findings can be categorized as enablers as well. This section will discuss enablers mentioned in theory and debate how overcoming certain barriers uncovered in our empirical findings might enable more transparent global supply chains.

A review of articles showcased that technology is the utmost mentioned enabler for transparent supply chains. However, our findings made it evident that existing technologies utilized in the energy sector are not ideal for information sharing below tier-1. This implies that the main share of enterprises involved in energy production lacks sufficiently advanced systems for effortless information sharing. In literature, information technologies are argued to be preconditions for information sharing across supply chains, as the aim of transparency is to gather information about products and processes (Gardner et al., 2019; Zhu et al., 2018). Such technologies allow organizations to enhance relationships with collaborative partners, gain visibility, become agile, reduce transaction costs, and improve supply chain performance (Baah et al., 2022, p. 435). Similarly, the empirical findings agreed with the literature: technology is a necessity to effectivize the processes of information collection, review, and sharing, as becoming transparent is time-consuming and resource-demanding if such activities are conducted manually. Based on theoretical and empirical findings, a key lesson is that digitization of gathering and analysis of information becomes crucial for energy-associated enterprises to simplify the process of ensuring a transparent supply chain.

Internal development of culture, communication, and practices could also enable increased transparency. The literature discusses how the allocation of responsibility becomes vital to ensure transparency, emphasizing the development of the purchasing function (Hsu & Hu, 2009). This function is argued to be responsible for several crucial activities to ensure transparency in the supply chain, such as supplier selection, supplier audits, supplier certification, supplier relationship management, and partnering (Joyce, 2006). Similarly, our empirical findings demonstrate that the purchasing function has an important role in ensuring compliance is upheld. Accordingly, we argue that developing the current competencies and practices within the department is essential to managing the complexities associated with transparency in global energy supply chains.

Therefore, a key lesson is that it may be necessary to employ and create positions where the primary responsibility is to ensure transparency and hence sustainability. The development of internal culture is also argued as a facilitator for increased transparency by the empirical findings. Cultural development is insufficiently discussed in the literature as an enabler, however, internal culture is mentioned in the theoretical foundation as a barrier that inhibits transparency, implying a need for advancement (Fawcett et al., 2018). In correspondence, our findings showcase that information shared internally in departments and cross-functionally varies significantly due to great differences in internal culture for information sharing. On a general note, we debate that there is room for improvement as the average level of information shared is relatively low. We argue that internal information sharing in enterprises can be denoted as a facilitator for increased transparency across supply chains, as it fosters supplementary dissemination of information and stimulates learning.

Another enabler discovered in our empirical findings, however, not mentioned directly as an enabler in the theoretical foundation, is the need for standardizations. Our findings reveal that the lack of standardizations across businesses, countries, and industries is argued to be a barrier to transparency. Expert statements uncover that it becomes demanding to ensure transparency due to variations in priorities and a lack of common frameworks and guidelines. This can be connected to the previous discussion about laws and regulations, as it becomes difficult to align goals across the supply chain when different countries have dissimilar regulatory policies regarding transparency. Consequently, we argue that to accomplish a transparent supply chain, it becomes crucial to create common standards and frameworks, hence denoted as enablers. Thus, a key lesson is that it becomes vital to align perceptions regarding what transparency involves in practice, the prerequisites needed for implementation, expectations of barriers one might face, and common ground rules. As an intended result, it will become effortless to implement and ensure transparent supply chains, as roadmaps explaining what, how, and why are distributed globally. However, we acknowledge that differences in culture and regulatory policies can make it challenging to align the interests of all supply chain entities. Despite common regulations, culture, and perceptions being developed in western countries, we still argue that expecting similar approaches from underdeveloped countries might be challenging. We still debate that international

organizations will play an essential role in aligning entities' interests, and we expect that the EU and other international federations will be important contributors in developing such standardizations in the future.

By combining the aforementioned findings of barriers and enablers, a last enabler came to surface. Previous discussion indicates the need for collaborative efforts among supply chain partners to enhance transparency. Collaboration was not necessarily mentioned directly in our findings as a means to a transparent supply chain, but rather existed as an obvious factor necessary for accomplishment. We argue that technological systems, previously mentioned to simplify the process of information sharing, would not provide any advantages if there is absence of suppliers utilizing the same platforms. Furthermore, as our findings displayed a certain degree of responsibility disclaimer, common standards and frameworks can only be developed if suppliers cooperate and agree to comply, further substantiating the need for collaboration. Hence, as transparency refers to information sharing, visibility, and monitoring across the supply chain, we argue that any effort that aims to enhance transparency will not be rewarding unless other parties are willing to cooperate.

5.3 Barriers for supply chain transparency

In this chapter, we will discuss the barriers that inhibit complete transparency in current global energy-associated supply chains. The section is focused on the barriers identified in our empirical findings, seen in combination with the barriers found through our theoretical background. Previous literature on barriers for transparency has been focused mainly on a superficial level, and the categorization of such broad barriers. Combined with the primary findings of our study, we believe that this section provides a more complete picture of the barriers that impede transparency in practice. In summary, our empirical findings showcased some inconsistency in the barriers highlighted, however, there was significant consensus among our experts that the facets characterizing the energy-sector, competition, complexity, and project-based organizing, are the main factors that inhibit transparency.

5.3.1 Fierce competition

In competitive industries, intellectual property is seen as a significant aspect important to maintain in order to gain an advantage over competitors (Bateman & Bonnani, 2019). Therefore, enterprises are secretive about information regarding products, components, and processes, as a compilation of these is somewhat unique for each project. As information regarding optimal solutions is highly coveted, it becomes evident in our empirical findings that enterprises are highly attentive to how and to whom this information is disclosed. Consequently, the fear of losing competitive advantage is the most distinct barrier in today's energy-associated supply chains.

Particularly in the energy sector, characterized by technology intensity, employees are highly secretive about information that might provide advantages related to effectiveness of solutions (Bateman & Bonanni, 2019). As illustrated in our findings, this is due to the immense impact such minor improvements have on profitability; *“a turbine that is only one per mille more efficient [...] will result in several million NOK”*. The fear of sharing sensitive content that compromises competitiveness, highlighted by Fawcett et al. (2008) as “inter-firm rivalry,” is substantiated by our empirical findings. Findings showcase that energy-associated companies are reluctant to supply chain transparency due to fear of information leakage concerning technological development. Thus, component- or process-specific information is often omitted in communication between supply chain partners. Sustainability-related information at a superficial level, on the other hand, is argued by the experts as acceptable to share. As most challenges encountered in the supply chain are located at bottom-tier levels (component level), and detailed information concerning operations at these lower tiers is often omitted due to competition, we argue that it becomes difficult to gather and evaluate information in the supply chain. Therefore, a key lesson is that enterprises in global energy supply chains often avoid sharing detailed information concerning products and processes by being excessively focused on intellectual property, thereby inhibiting transparency.

5.3.2 Complexity

According to literature, globalized supply chains impose significant complexity and thus risk, increasing the need for transparency (Tong & Wei, 2014). Moreover, literature also argues that complexity is a collective concept covering several aspects that make achieving transparency intricate, posing a barrier (Saberli et al., 2019; Fawcett et al., 2008).

The energy sector is argued to be inherently complex due to its composition. First and foremost, each downstream enterprise needs to deal with numerous upstream suppliers due to the immense number of components in energy-producing systems; *“There are approximately 52,000 components in a wind-turbine.”* Secondly, due to elongated supply chains extending across borders, including numerous nodes, significant differences in culture, laws, traditions, technological systems, and perceptions are among the facets mentioned in our empirical findings that increase complexity. The technological nature of energy-producing solutions imposes additional complexity, as competence is not necessarily easily available in-house. Furthermore, literature highlights how technological incompatibility, inadequate measurement systems, and conflicting organizational structures increase the managerial complexity, thus inhibiting information sharing (Fawcett et al., 2008). Consequently, we debate that the level of complexity in energy supply chains is one of the main reasons it becomes challenging to ensure complete transparency.

Several barriers identified in our research correspond rather well with established literature. However, one barrier identified in our empirical findings distinguished from previous research was how differences in maturity levels affect complexity and thus transparency. A key lesson from our findings is how enterprises, based on business area, experienced differences in maturity levels regarding transparency and sustainability. Empirical findings show that enterprises associated with well-established business areas, such as wind and hydro, seldom perceive maturity as a barrier to transparency. However, enterprises associated with solar power report how such under-developed industries limit both the willingness and opportunity to become transparent. This finding emerged somewhat unexpectedly, as our initial intuition was that transparency was more country-specific than based on business area. We argue that ensuring transparency becomes more challenging in industries

connected to an immense number of suppliers, as it becomes nearly impossible to keep track of all sub-tiers. Additionally, it becomes particularly challenging to obtain sufficient visibility in areas where suppliers are immature, as immaturity adds to complexity through ignorance and lower levels of competence regarding risks faced.

5.3.3 Project-based organizing

Comparing our theoretical background and empirical findings, we discovered somewhat conflicting views on how organizing structures impact transparency. Close relationships built on mutual trust that facilitate reciprocal information sharing and collaborative advantages are highlighted in previous literature as beneficial for ensuring transparency (Joyce, 2006). Contrary, our findings proved that most energy-associated enterprises employ project-based structures that entail arm's-length relationships. As explained by researchers, the reason for this is the agility and flexibility entailed by projects, facilitating the opportunity to withdraw from contracts that do not fulfill requirements set (Naderpajouh et al., 2020). Another advantage of short-term relationships highlighted in our empirical findings is that project-based structures stimulate sustainability efforts. According to our interviewees, the reason for this is that sustainability incentives are enhanced prior to a tendering process, and through more frequent tenders, sustainability measures must be continuously considered and evaluated.

However, our empirical findings prove that the project-based organizing of the energy sector is not only advantageous viewed from a transparency-related perspective. The experts demonstrated how temporary organizing counteracts close relationships and thus also the opportunity for transparency. Primarily, project-based structures impede transparency in the energy sector due to transaction costs. Through expert interviews, it became evident that the time and effort needed to gather information regarding sustainability rapidly accumulated when new suppliers were employed for each project. The reason is that formal and legal conditions, documents, and contracts must be correct prior to project initiation. As each project is time-limited and requires a unique supply chain, establishing well-functioning procedures for information sharing becomes redundant compared to the time and value created. As a key lesson, if the goal of transparency is to accomplish a certain level of sustainability, project-based structures do not seem to be the most

optimal. This is mainly due to temporary organizing's characteristic of limited time frames that inhibit close collaboration and poor inter-organizational relationships (Sydow & Braun, 2018). We argue that these limited time frames make it challenging to create aligned practices, procedures, and perceptions with contracting parties, as it requires investments that might seem excessive compared to the value derived. Hence, it might become problematic to align short-term goals with the corporate strategy through temporary organizing.

5.4 The role of transparency for enabling sustainability

In the following sections, a discussion of transparency as a means for accomplishing more sustainable supply chains will take place, as sustainability emerges as a primary objective for future businesses. Hence, this is our attempt to answer our second research question; "*How does transparency enable sustainability?*" Following, there will be a discussion regarding transparency's importance in the energy sector, a necessity to consider as it is proved how the energy sector has an immense impact on social and environmental aspects, and hence excellent improvement potential.

5.4.1 The importance of sustainability in energy supply chains

Our findings emphasize that ensuring sustainable practices in the energy sector is crucial due to its significant impact on the environment and social facets. Interviewees argue that sustainability practices and operations within the supply chain are crucial to ensure responsible business. As previously discussed, energy-associated enterprises are often partly state-owned (Energifakta Norge, 2019), creating an intensified pressure on organizations to amplify corporate social responsibility due to their associations with governments. These findings are substantiated by previous literature, in which it is argued that sustainability in supply chains has become essential in corporations' agendas due to intensified expectations (Cini & Ricci, 2018). As this enhanced emphasis on sustainability continues, there is a common agreement between interviewees and literature that excellent sustainability performance will increase the company's attractiveness (Cini & Ricci, 2018).

There has been an insignificant focus on the importance of sustainability in the energy sector in previous literature, however, it is thoroughly discussed industry independent (Lacal-Arántegui, 2019). Literature commonly argues that global presence makes it challenging to ensure sustainability performance (Andersen & Skjoett-Larsen, 2009). In consensus with the literature, our empirical findings highlight changes in land use, emissions, destruction of nature, and poor labor conditions as bi-effects of such globalized operations (Lacal-Arántegui, 2019). Experts argue that sustainability performance becomes particularly essential in the energy sector, as social and environmental concerns were exemplified by the recent allegations of forced labor in Xinjiang, experienced in the solar industry (Murphy & Elimä, 2021). Experts further substantiate the immense corporate social responsibility: "*The number of people working in your supplier base is far larger than people working in your own company.*" Correspondingly, experts state that their indirect supply chains account for the largest contribution of CO₂ emissions, which highlights the importance of ensuring a sustainable supply chain. However, our empirical findings made it apparent that few corporations measure scope 3, referring to emissions derived from indirect supply chains, and have limited control over upstream suppliers, illustrating the urgency of enhanced visibility.

As a result, recent events highlight the poor conditions present in current global energy supply chains and how disclosure of sustainability violations becomes pivotal. The energy sector's global presence entails immense disruption points, highlighting the need to integrate responsibility throughout the entire value chain (Ahi & Searcy, 2013). As a key lesson, sustainability should be a top priority because energy supply chains have a significant impact on the environment and employ millions of people across the globe. As a result of reinforced sustainability emphasis, we debate that sustainability will become a knock-out criterion in future tenders and investment decisions.

5.4.2 Transparency as a tool for sustainability in the energy sector

Today, transparency practices in energy supply chains are predominantly concerned with direct contracting parties. Our findings show that most energy-associated corporations solely have information-sharing procedures with tier-1 suppliers, indicating low supply chain transparency. Moreover, our empirical findings, combined with the theoretical background, prove that the characteristics of a sector

can affect the transparency level in an enterprise (Gualandris et al., 2021). As proved in the previous section, the energy sector is in a powerful position to impact sustainability performance in supply chains. Regarding this argument, global energy supply chains are optimal candidates for utilizing transparency to enhance sustainability. In turn, information concerning components, materials, origin, and processes is required.

Literature, in combination with empirical findings, made it evident that transparency can be classified as a "tool" or "facilitator" for sustainability (Fung et al., 2017; Mol & Oosterveer, 2009). Transparency can reduce information asymmetry between supply chain entities through enhanced monitoring and verification of environmental and social fulfillment in global supply chains (Egels-Zandén et al., 2015; Laudal, 2010). Hence, confirmed through our findings, transparency facilitates more well-informed and thus sustainable decisions.

Furthermore, a key lesson from our study is that open information sharing will contribute to creating an awareness within the supply chain, which provides the opportunity to discuss sustainable complexities in a collaborative way that will benefit all entities. We believe that by debating sustainability-related issues in plenum, supply chain partners' previous experiences and knowledge might contribute to deriving awareness and hence optimal solutions that foster environmentally friendly and socially responsible operations. Literature confirms this assumption, highlighting that collaboration might enhance sustainability within firms (Carter & Rogers, 2008; Baah et al., 2022; Joyce, 2006). Such collaborative efforts were displayed as advantageous in the empirical findings as well, in which it was made evident that achieving common goals regarding enhanced sustainability is simplified through collaboration. Additionally, we argue that collaboration will equalize the variations in maturity levels previously mentioned and assist the development of transparency as a tool for sustainability.

As a result, both literature and empirical findings highlight that transparency can be characterized as a tool for enhancing sustainability in global energy supply chains. However, experts argue that it becomes difficult to ensure transparency at all levels due to its immense supply chain network, which forces enterprises to prioritize. This became apparent in our empirical findings, in which the complexity of wind

turbines was used as an example, highlighting the immense quantity of components used and the corresponding amount of contributors involved in production. Moreover, we argue that despite the difficulties of ensuring transparency at all levels, increased transparency could enhance the awareness of the parts of the supply chain that require amplified monitoring. As the current transparency within the energy supply chain is severely poor, we argue that any improvement can benefit the sector by decreasing information asymmetry, displaying potential disruption points, and reducing sustainability-related risks. However, despite recent emphasis on sustainability in supply chains and energy-associated enterprises' perceived desire to act more responsibly in terms of environmental and social aspects, experts still argue that profit trumps all other facets of operations. Hence, regardless of our aspiration that transparency will be employed as a tool for accomplishing more sustainable operations, the citation of ID-5 keeps us grounded and realistic: "*We will never be able to disconnect from the price. If the end-product is not profitable, there will be no project.*"

5.5 Concluding reflections of factors influencing transparency and how transparency enables sustainability

Based on the discussion of empirical findings and previous literature, we have developed a revised framework presented in Figure 3. It is important to display our acquired insight in a figure to give an overview of the influencing factors and practical aspects of transparency. The dashed boxes in the middle still represent factors influencing transparency, however, interrelationships, stated barriers, current practices, and enablers have been altered due to new insight.

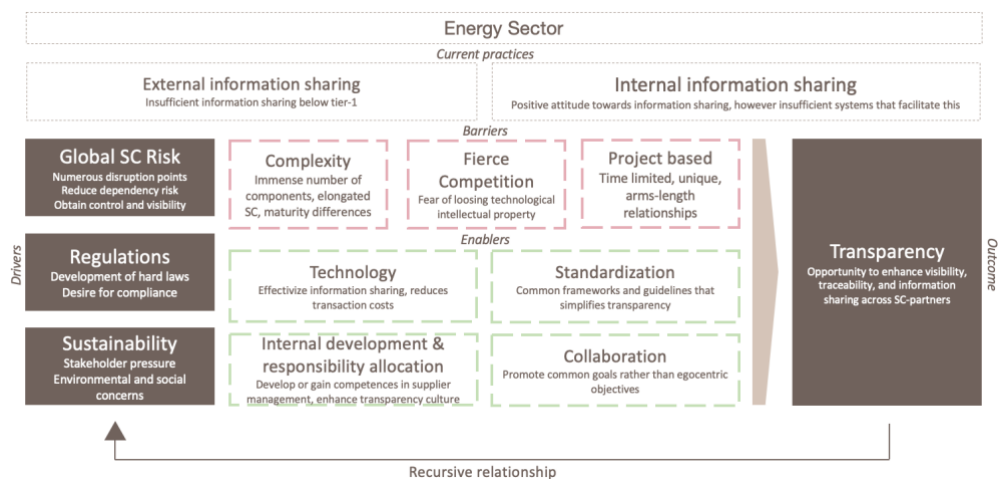


Figure 3 - Revised framework

Investigating the current practices for information sharing, it was made evident that information sharing between businesses and suppliers are insufficient below tier-1. Internally, we discovered that most employees have a positive attitude towards information sharing, however, businesses fail to develop a beneficial culture for transparency as a consequence of insufficient systems. In summary of our empirical findings and theoretical background, we argue that global supply chain risk, sustainability, and emerging regulations are three factors that drive the development of transparency. Global supply chain risk and sustainability were made evident through our theoretical background, while regulations appeared as a driver in the expert interviews and were later added to the theoretical foundation as a part of the abductive approach. Through investigating the elements which inhibit transparency, we discovered that it was the industry characteristics themselves, illustrated in red, that impede transparency. Moreover, as illustrated in green, improvement of information technologies, internal cultural development and allocation of new responsibilities, standardizations, and collaboration are suggested as underlying preconditions that enhance transparency. In conclusion, the barriers and enablers are the main factors influencing the transparency level in energy supply chains. Moreover, the solid line drawn from transparency to drivers represents a reciprocal relationship where increased emphasis on sustainability drives the need for transparency and transparency enables enterprises to enhance sustainability.

6.0 Conclusion and implications

This chapter will denote a summary and a conclusion of the master thesis based on our two research questions. Section 6.1 will derive the study's theoretical implications, which will elaborate on our first research question focusing on drivers, barriers, and enablers of transparency, in addition to answering our second research question. Further, section 6.2 will discuss the practical implications of transparency in energy supply chains. Finally, the thesis' limitations and opportunities for further research will be discussed in section 6.3.

This thesis aimed to explore the concept of transparency in energy supply chains. The interest in the topic evolved as a consequence of previous work experiences highlighting moderate transparency levels, as well as the energy crisis, further amplified by Covid-19 and the Ukrainian war, illustrating the need for a greater understanding of global dependencies. Exploring transparency included investigating the factors that influence transparency in global energy supply chains. Accordingly, our first research question was developed: "***What are the key factors influencing transparency in global energy supply chains?***" To answer the stated question, we decided to investigate drivers, barriers, and enablers. Secondly, we added a second research question to be answered, "***How does transparency enable sustainability?***" as we found it intriguing to explore the potential recursive relationship of whether transparency can contribute to ensuring sustainability.

This thesis executes qualitative research with expert interviews to understand the research topic and the current situation in the energy sector. Consequently, we interviewed ten key experts from the industry, which provided valuable insights and prior experiences from their respective enterprises, which broadened our perspectives on the matter. Between conducting interviews, we moved back to the theoretical foundation to adjust the research direction and supplement the previous framework in accordance with our abductive approach. Post interviewing and analysis, our findings were discussed considering established literature promoted in the theoretical background.

6.1 Theoretical implications

Our findings and theoretical background reveal that transparency is essential to ensure control and visibility of global supply chains (Fung et al., 2007; Mol & Oosterveer, 2015; Mol, 2015). Through recently disclosed violations of human rights and environmental responsibility in global energy supply chains, we discovered that the current transparency is far too low (Murphy & Elimä, 2021). This intrigued us to investigate why there is a difference between how literature displays transparency, and how the concept is realistically applied in practice. This turned out to be our main contribution to existing literature, as established literature insufficiently has focused on the practical aspects of the concept. As we wanted to further investigate why transparency is moderate, we decided to investigate three main elements that turned out to be important impacting factors: (1) Drivers, showcasing the need for enhanced transparency, (2) Barriers, elements that inhibit transparency, and (3) Enablers, underlying preconditions that enhance transparency.

The drivers mentioned in the literature and those argued by our empirical findings were appealingly similar. The two most prominent drivers, both promoted by literature and in our empirical findings, were global supply chain risk and sustainability. Global disruptions and increased focus on sustainability in supply chains have amplified the need to create visibility and control of the supply chain network, which drives the need for transparency. Initially, when reviewing literature, we would argue that increased emphasis on sustainable operations was the most effective driver of transparency. However, through this study, it seems like this statement is not necessarily true as our findings showcase that companies are still mainly concerned with price and profit. Moreover, what became particularly visible through the interviews is that despite enhanced sustainability emphasis and global risk, transparency will not be enterprises' main priority until regulatory policies are imposed. This clearly shows that few enterprises initially perceive transparency as a necessity and illustrates how energy-associated supply chains only increase information shared when forced to do so.

However, low transparency in energy supply chains affirms that there exist certain barriers to overcome. Established literature mainly concerns the superficial

characterization of barriers to transparency, similar to most enterprises (Fawcett et al., 2008; Mougayar & Buterin, 2016; Saberi et al., 2019). Barriers mentioned in literature and empirical findings can be argued to be somewhat similar, however, additional and more specific barriers were discovered during the interviews. The empirical findings promoted fierce competition, complexity, project-based organizing, lack of standardization, and poor IT systems as elements that keep enterprises reluctant towards open information sharing. Hence, one of the most interesting findings derived and contribution to existing literature was how the characteristics of the energy sector inhibit transparency. In summary, this indicated that energy-associated global supply chains are, as also argued by scholars (Gualandris et al., 2021; Bateman & Bonanni, 2019), not inherently constructed in a way that facilitates transparency. However, despite experts promoting the impossibility of achieving a fully transparent supply chain, we believe that even the slightest improvements could benefit enterprises.

As denoted, achieving a fully transparent supply chain is complex for energy-associated corporations due to the sector's characteristics. Moreover, the literature and our empirical findings have highlighted several underlying preconditions to simplify the process of becoming transparent. The thesis showcases a certain degree of concurrence between our empirical findings and theoretical foundation in terms of transparency enablers. Advanced information technology, currently obtained by very few energy-associated enterprises, is argued both by literature and empirical findings as a necessity for transparency. The activities required to ensure transparency across the energy supply chains are time and resource-intensive, highlighting the need for effectivization. The literature agrees with the aforementioned and promotes technology as the most essential enabler (Gardner et al., 2019; Zhu et al., 2018). Additionally, literature tends to discuss the purchasing function in relation to transparency, as the function is usually responsible for supply chain relationships (Joyce, 2006). This is mentioned implicitly in the empirical findings. Our findings and discussion are also characterized by other necessities that appear in relation to the identified barriers, hence, solutions that contribute to overcoming these barriers are characterized as enablers. What was frequently mentioned by interviewees, but inadequately emphasized in the literature, was the need for common standards and the development of internal culture to facilitate transparency, two important findings. In summary, it became evident that the most

prominent enabler is the development of technologies that facilitate transparency by simplifying the process of information sharing with suppliers past tier-1.

In regards to our second research question, in which we wanted to investigate the recursive relationship between sustainability and transparency, the study disclosed perfect compliance between our empirical findings and the theoretical background, stating that a transparent supply chain can facilitate improved sustainability performance. The literature argues that to ensure sustainability, corporations must increase the visibility and traceability of the supply chain (Carter & Rogers, 2008). Similarly, empirical findings imply that transparency is believed to be a vital contributor to accomplishing sustainability goals. However, as previously argued, accomplishing a fully transparent supply chain might prove difficult due to energy supply chains' characteristics, and consequently, collaborative efforts are brought forward as an enabler.

In the sections above, we have summarized our main findings to answer our two research questions. As illustrated in our adjusted theoretical framework, we conclude that several factors influence transparency in the energy supply chain. There are three main drivers that encourage transparent supply chains; increased global supply chain risk, focus on sustainability, and development of new laws and regulations. These elements do not necessarily affect the level of information shared directly but instead promote transparency's cruciality. Additionally, we argue that several barriers exist that negatively affect transparency. One of our main findings is that the most prominent barriers that seem to inhibit energy-associated corporations from ensuring transparent supply chains are the inherent characteristics of the energy sector itself. Lastly, information technology, development of internal culture and allocation of responsibility, standardizations, and collaboration are essential preconditions that stimulate enhanced transparency. Summarized, both barriers and enablers, as now identified, need consideration in order for energy-associated enterprises to improve their transparency. In conclusion, in the second research question, we argue that increased transparency can improve sustainability performance in global energy supply chains. Enhanced visibility, monitoring, and traceability of the supply chain are proclaimed to enhance control, facilitating improved, well-informed, and hence more sustainable decisions.

6.2 Practical implications

Our research uncovers that globalized supply chains face numerous challenges, illustrated through the energy sector. Not only are the supply chains affected by global events such as Covid-19 and the war in Ukraine, but global supply chains are also impacted by minor disruptions like the disclosed violations of human rights in Xinjiang. The moderate levels of transparency currently obtained by global energy supply chains have showcased how enterprises are now encouraged to further develop current strategies and mindsets to become more robust and resilient towards such occurrences.

To achieve transparent supply chains and the corresponding advantages of improved control, monitoring, and well-informed decision-making, the ability to map out and assess the entire supply chain is crucial. To do so, our study reveals that it becomes essential for businesses to consider several measures. First and foremost, enterprises that desire increased transparency need to improve the internal culture for transparency. This implies ensuring that concerns, knowledge, and experiences are communicated across departments without facing judgment. We also believe that ensuring an internal culture for information sharing could stimulate and encourage more external information sharing. Secondly, the study revealed the importance of investing in advanced information technologies that make information sharing across entities effortless and less time-consuming. We debate that such advanced systems become essential to handle the immense amount of information generated by global supply chains. Thirdly, we argue that the complexities of global supply chains are practically impossible to handle through current practices and that the development and allocation of responsibilities are necessary to ensure a transparent supply chain. Hence, to increase control over supply chains that extend across borders, enterprises are encouraged to develop their current competencies or employ resources that obtain advanced expertise. In summary, we conclude that enterprises need to cooperate across entities in the supply chain rather than operate in isolation to overcome the aforementioned. Through joined forces that promote common goals rather than egocentric objectives concerning profit, we argue that the threshold for information sharing might be lowered. Gathering information upstream and mapping sub-suppliers is difficult

without information from sub-tiers, and consequently, collaboration becomes crucial to identify potential disruptions and corresponding risks.

Throughout this study, we have conducted expert interviews with employees of rather large and established energy-associated enterprises. Such businesses might be excessively concerned with current operational processes and conduct "business as usual" without critically reviewing current procedures. In light of the research conducted, we encourage enterprises to stay proactive in terms of transparency to remain prepared for potential disruptions and risks. Businesses that are not involved in global trade to the same extent might not necessarily face the challenges identified to the same degree, however, we urge all businesses to become more prepared for future requirements. Smaller or less mature enterprises that are not yet subject to requirements that concern transparency are encouraged to use recent events and announced regulations as guidelines for optimally carrying out operations.

This study revolves around the energy sector, however, we argue that our findings are likely to be relevant for other actors as well. Although different industries are somewhat uniquely constructed, we argue that many sectors are designed in a way that entails either of the characteristics discussed in accordance with the energy sector. We argue that highlighting practical barriers and perspectives on transparency within the group of organizations included in the study is convenient for various industries, as the drivers, barriers, and enablers identified are relevant for other actors as well. Most enterprises today are characterized by elongated global supply chains, and hence, many corporations are faced with similar elements that stimulate transparency. Consequently, we imply that transparency becomes essential in all sectors to enhance control, visibility, reduce risk, and enhance sustainability. In summary, we conclude that the study's findings are not necessarily generalizable due to the specific characteristics of the energy sector, however, we believe that the study is still relevant for other industries.

6.3 Limitations and future research

Limitations of the study are essential elements to consider when conducting research, as also proven in section 2.6. In combination with suggestions for future

research, this section will acknowledge some of the most critical limitations of the study.

First and foremost, and as previously discussed, there is limited literature concerning the practical aspects of transparency in energy-associated supply chains. However, the topic of transparency is well covered by researchers in general and often discussed in the context of global supply chains. Consequently, we have been forced to combine and compare general findings from literature with disclosed information from the interviews to tighten this gap. Another related challenge experienced was our limited competence in the energy supply chain and its composition prior to the research. Despite the abductive approach employed, this restricted knowledge might have compromised the quality of the questions asked, hence there is a possibility that relevant insight might be missing due to our choice of direction during the interviews. In addition, questions directly connected to enablers of transparency were not explicitly included in the interview guide but instead implicitly discussed through the barriers. In aftermath, we acknowledge that this might have excluded valuable information, as experts might have disclosed different perceptions of enablers if asked directly.

Secondly, the research design is subject to limitations. Investigating multiple industries and collecting different perspectives on the same challenges might be beneficial to establish the most accurate overview of transparency as a concept. Drivers, enablers, and practical barriers that affect the transparency would have been interesting to observe across industries to improve transferability and generalizability. However, as time and resources were limited, we decided to solely conduct interviews with several companies within one sector. As mentioned previously, the research is still considered relevant because the sector's characteristics are not entirely unique.

Based on the highlighted limitations, we have suggested three areas eligible for future research. Firstly, exploring the extent of which transparency varies across different business areas within the energy sector can be interesting. Through our expert interviews, we uncovered significant differences in maturity levels and perceptions of the necessity of transparency. Therefore, we argue that studying these differences across solar, wind, hydro, and geothermal might be interesting.

For instance, we argue that looking into how the different supply chains are constructed and getting a deeper insight into which concerns and disruptions each area has experienced could be intriguing. Furthermore, for future continuation of research on the energy sector, we would recommend including enterprises with state-of-the-art transparency levels to illustrate best practices.

Secondly, we argue that our findings are somewhat relevant despite the focus on the energy sector. Moreover, we debate that the findings are also applicable in other industries. Hence, we believe that it would have been beneficial to conduct a similar study in other sectors as well, to further investigate the effect a sector's characteristics might have on transparency. For instance, the engineering and construction industry might be natural continuations of the investigation, as they are somewhat similarly constructed.

Thirdly, we are under the perception that the drivers mentioned, global supply chain risk, sustainability focus, and regulations, all promote the establishment of more local value chains. As we in section 5.1.1 promote transparency as a second-best option that aims to substitute the need for more local energy supply chains, we argue that a thorough exploration of the two options would have been fascinating. This includes evaluating the possibility of a more local energy-associated supply chain as an attempt to reduce the dependencies previously discussed in the thesis and simplify information sharing.

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8.0 Appendix

8.1 Appendix 1: Interview Guide

Topic	Aim	Question
1. Basic information	Get to know the interviewee, understand their role in the company and which perspectives they might have on the problem statement	<ol style="list-style-type: none"> 1. What is your position in the company? Department? 2. How long have you been employed? 3. What are your responsibilities/work-tasks?
2. Perception of today's transparency situation	Identify the interviewee's superficial perception of today's situation	<ol style="list-style-type: none"> 1. Do you have any previous affiliation with supply chain transparency? 2. In your opinion, on what level does the company utilize transparency today? 3. How would you describe the information flow internally and externally? 4. How does having a global supply chain affect the amount of information shared between you and your suppliers? 5. How much information about collaborative partners (e.g., suppliers, sub-suppliers, clients) does your company receive? 6. How would you describe the method of communication among parties the company is involved in? (e.g., calls, e-mails, meetings, etc.) 7. What decides the frequency of contact with different suppliers? 8. How do you see transparency as an advantage in your company? 9. How important do you consider a transparent supply chain? 10. In your perspective, how is transparency linked to sustainability? 11. Have there been any specific happenings that has contributed to increased focus/need for on transparency/sustainability? 12. Which activities are you aware of that encourage transparency today? 13. In your opinion, where is there potential for improvement of the transparency situation? What do you believe will happen in this area in the future?
3. Barriers for transparency	Uncover potential barriers for transparency, and investigate how they can be eliminated	<ol style="list-style-type: none"> 1. What is the general perception among employees regarding information sharing? 2. How would you describe the culture of information sharing internally in the company? Externally? 3. Which disadvantages do you connect to transparency? 4. Which factors do you believe impede transparency in your company? 5. How does the infrastructure in the company affect the ability to share information both internally? Externally? 6. In your opinion, how could the company best facilitate for information sharing?
4. Other		<ol style="list-style-type: none"> 7. To further investigate this topic, who would you recommend that we talk to? 8. Other remarks or topics that we should explore?