

MASTER THESIS

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Managing HSE risks in the Barents Sea offshore projects: approaches of Norwegian regulators and Eni Norge in Goliat operations

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Abstract

The wave of the globalization, new and promising areas for development and new technology brought oil and gas companies to operate all over the world. Today, as some of the major oil companies have turned to the High North, there is a discussion on whether projects in this area can be environmentally and technologically sound.

Norway is widely recognized in the world for both its commitment towards preservation of the Arctic environment, and tough HSE regulations, while Eni's Goliat project is the first installation in the Norwegian part of the Barents Sea.

This said, this report was focused on comparing the main principles and approaches of the Norwegian regulations in the HSE milieu and these of Eni, keeping in mind that the regulations are essentially approaches towards risk management in HSE - this constitutes the first structural part of the thesis. The second part is dedicated to case study and the analysis of the ways the regulations from both sides are being applied in the project. The thesis is using qualitative data analysis for all parts of the analysis.

The study has revealed, that HSE regulations in the mentioned international company and Norway are, first, comparable and, second, similar in many overriding aspects, as the regulations find their roots mainly in a set of international HSE standards. Secondly, the analysis has shown that there are three interdependent realities, influencing the risk management process over a project in the Arctic: *state, company, and location*, while the risk management and, correspondingly, the alignment process between these three realities is built upon a set of fundamental principles, found in both sets of regulations. The mentioned principles directly influence the ten milestone actiones, the final finding of the study, which the company performed in order to guarantee compliance to state regulations and properties of the project's location.

Preface

It is believed, that the interest in the Arctic region is shared by the so called Arctic states - countries which territories (or parts of their territory) are located within the Arctic Circle: Canada, Kingdom of Denmark, Finland, Iceland, Norway, Russian Federation, Sweden, United States of America. China and some other east – asian states are also considered a countries which will play an important role in the Arctic region because of their growing economic powers and population. But the list of the countries with interests in the Arctic region does not stop here. Big countries - members of the Arctic Council dragged the interest of researchers and scientists, while other countries, such as Italy, remained in their shadow.

One might think why a small south Mediterranean country would want to be present and especially to have any particular interest in the Arctic. The facts show, despite all prejudices, Italy's presence in the Arctic has actually a historical background. The story of the Italian presence in the Arctic region has its origin in 1899, when Luigi Amedeo di Savoia, Duke of the Abruzzi, sailed from Archangelsk with ship («Stella Polare» - The Polar Star) to use the Franz Joseph as a stepping stone to reach the North pole on sleds pulled by dogs. This expedition did not reach it's goal. In 1926 the next expedition took place. Umberto Nobile, together with Roald Amundsen and Lincoln Ellsworth (USA) took off from Rome on the *Norge* airship (designed and driven by Nobile) and managed to cross the Arctic Sea and were the first to reach the North Pole, where they dropped the three national flags (Nobile, 1959). Two years later Nobile went on a new Arctic expedition on a new airship called *Italia*. Operating from Kings Bay in Ny-Ålesund, *Italia* flew four times over the North Pole, surveying unexplored areas for scientific purposes. We may consider it the first italian exploration activities in the Arctic. Unfortunately, on its way back the aircraft crashed north of the Svalbard Islands and lost nearly half of its crew. The wreckage was linked to adverse weather, including strong wind blowing from the northern side of the Svalbard Islands to the Franz Joseph Land: this wind stream, that was previously unknown, has been nicknamed after the expedition – *Italia* (Italy in the Arctic. Towards an Italian Strategy for the Arctic, 2015).

Thanks to the work of Nobile, as well as the later establishment of a Svalbard scientific base by the National Research Council and its activities («Dirigibile Italia»); to the Arctic oceanographic cruises by the OGS *Explora* research ship and to the activity of various Italian companies, like Eni and Finmeccanica, it can be said that the Italian record in the Arctic, is not only over a century old, but also that the Italian Arctic footprint has been steadily increasing over time (Italy in the Arctic. Towards an Italian Strategy for the Arctic, 2015). Moreover, in 2013,

Italy has been granted Italy the observer status in the Arctic Council (Arctic Council)¹. Hence, Italy may be considered the most active state in the area among non-Arctic countries.

In the author's opinion, the Italian presence in the Arctic has reached another milestone with the Goliat project, the first platform (FPSO) to start production within the polar circle, and the activities of Eni Norge AS, that developed and implemented this project. Eni Norge is a Norwegian subsidiary of the Italian integrated energy group Eni S.p.A. In round figures, Eni Norge delivered 41 million barrels of oil equivalent in 2014, its proven reserves are 409 million barrels in 2014, and the company is a participant and stakeholder in 60 licences on the NCS, of which we are operator in 18 (Eni Norge)².

I was born in Italy, have graduated from a Russian school in Italy, and am a proud alumni of Università Cattolica del Sacro Cuore in Milan. The double degree Master Program in International Oil and Gas Business between the Moscow State Institute of International Relations (MGIMO) and Nord Universitet in Norway has offered me to both study Energy Management, which I had a great interest in, and to explore a new country for the the author – Norway. During only six months I have stayed in this country, it has provided me with several great opportunities: to study and explore Norway in its fullness, to actively participate in the High North Dialogue conference, to be a summer intern in an Italian company operating in Norway – Eni Norge and be partly involved in the Goliat project, and now the possibility to submit my master thesis both in Norway and in Russia.

I have decided, that the master thesis should encompass all my background and be focused on: Italy, Norway, High North, human – related and environmental aspects of oil and gas activities. This is how this thesis, entitled: «**Managing HSE Risk in offshore projects in the Barents Sea: approaches of Norwegian regulators and Eni Norge in Goliat operations**» was born.

Before anything, my strongest words of appreciation and gratitude go to my supervisor, Elena Zhurova, whose academic and motivational support was of a great importance for writing this thesis; to the Russian and Norwegian branches of Eni – without the advice and mentorship of people working there this work would not have existed; to Anatoli Bourmistrov, head of Handelshøyskolen i Bodø for his consultations, advice, and lectures during my semester in Nord Universitet; and finally to my parents, for their loving advice and support of all my endeavors, and my girlfriend Elizaveta for her care and support.

¹ www.arctic-council.org. Observers

² www.eninorge.com. About Eni Norge.

Lastly, I would like to offer our thanks to the High North Center of of Nord Universitet for coordinating the study program, involving mutual semesters in two universities and countries. Hope, that this program would continue to exist and contribute to the cross-border knowledge base for future developments in the High North and Barents Sea.

Knowledge is universal, youth is the future, and educated youth can turn everything around. What's missing? More collaboration. My wish for the future is that Nord Universitet and Northern Norway become a globally known center for collaboration between talented young people from all over the world to create a future for the arctic region and for all of us. Together.

Moscow, 17 May 2016



Sergey Paramonov



Figure 1. Goliat FPSO (Photo credits: Marus Fiskum. Source: maritime.no)³

³ www.maritime.no. Article “Nå er Goliat i gang” (2016)

Abbreviations & definitions:

AIS: Automatic Identification System

ALARP: As Low As Reasonably Practicable

BAT: Best Available Technology

DNV: Det Norske Veritas

E&P: Exploration and Production (division)

EER: Evacuation, Escape and Rescue

FPSO: Floating Production Storage and Offloading

HQ: Headquarters

HSE MSG: Management Guidelines in Health, Safety, and Environment

HSEQ: Health Safety Environment Quality

IAS: Impact Assessment Study

IOGP/OGP: International Organization of Oil and Gas Producers

IPIECA: The global oil and gas industry association for environmental and social issues

IR: Infra Red

ISO: International Organization for Standardization

MD: Managing Director

MTO: Men, Technology, and Organization

NCA: Norwegian Coastal Administration

NCS: Norwegian Continental Shelf

NEA: Norwegian Environmental Agency

NOFO: Norwegian Clean Seas Association for Operating Companies

NORSOK: Norwegian Offshore Cost Effective Initiative

NPD: Norwegian Petroleum Directorate

ODR: Oil Detection Radar

OHSAS: Occupational Health and Safety Advisory Services

PDO: Plan for Development and Operations

PIO: Plan for Installation and Operation

PPM: Parts Per Million

PSA: Petroleum Safety Authority

PW: Produced Water

QRA: Quantitative Risk Assessment

RAC: Risk Acceptance Criteria

RAC: Risk Acceptance Criteria

ROV: Remotely Operated Vehicle

SCIGR: Internal Control and Risk Management System in Eni

SLAR: The Side-Looking Airborne Radar system

SOA: Service – Oriented (Enterprise) Architecture

TCMS: The Technical Control & Monitoring System

WEA: Norwegian Working Environment Act

ALARP:

1. «ALARP is a general approach or ‘a way of thinking’ regarding all HSE aspects, whereby there is no distinction between ALARP and the more general work performed in order to satisfy the technical and operational requirements concerning HSE aspects given in the regulations» (Vinnem, Witsø, Kristiansen, 2006).

2. «An ALARP review is an exercise performed in a specific and predefined manner, at specific times, using specific methods and/or techniques to reduce risk beyond what is required in order to fulfill the minimum HSE level» (Vinnem, Witsø, Kristiansen, 2006).

Barrier: "all systematic, physical, and administrative forms of protection found in the organization and in the individual workplace intended to prevent, or limit the consequences of, faults and erroneous actions" (PSA). In the 2006 White paper, barriers are defined as “technical, operational and organizational measures which, either individually or together, shall prevent or interrupt the course of specific undesirable incidents. Barriers can reduce both likelihood and consequences”.

Contingency plan: is a course of action designed to help an organization respond effectively to a significant future event or situation that may or may not happen.

FPSO: floating facility, usually based on a (converted) oil tanker hull. It is equipped with hydrocarbon processing equipment for separation and treatment of crude oil, water and gases, arriving on board from sub-sea oil wells via flexible pipelines (Bluewater).

Hazard: Accidents or near-accidents that have or may occur, as well as other factors that can lead to injury or material damage (PSAg, 2014, section 4).

Legislation: Synonym for a law or a set of law, or similar legal manifesto.

Operator: When activities are legislated by the Petroleum Act, the operator is any organization that is operating the day-to-day management on behalf of the licensee. When the activities are not subjected to the Petroleum Act, it is any organization that is operating the day-to-day management on behalf of the owner (PSAa, 2013, section 6)

Pollution: A supply of solids, fluid or gas to air, water or the ground, as well as impact on the temperature with possible negative impact on the local or global environment (PSAf, 2014, section 11).

Regulator: A public institution that is tasked with supervisory authority over safety, emergency preparedness and working environments for hydrocarbon activity in a country or legislation.

Regulation: A topical legal framework, often supplementary to a higher law.

Responsible party: Any organization (including operators) that are conducting or participating in conducting petroleum activity, with the exception of non-operating licensees and owners of onshore facilities (PSAa, 2013, section 6) (PSAf, section 7).

Standard: A document published by a standard developing organization (SDO). They are also known as recommended practices, specifications, bulletins, technical reports and publically available specifications (OGP, 2010).

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1 Chapter 1. Introduction

1.1. Background conditions

Despite the drop in oil prices we see today, total investments in the Norwegian Continental Shelf, according to the Norwegian Petroleum Directorate, are expected to moderately rise after 2017. Additionally, the percentage of new discoveries is expected to almost triple in 2019 compared to 2016 levels (Figure 2). With new projects in the pipeline and new developments in technology, the relevance of HSE will be even greater than it is now, because of slow but steady move of the activities to the northern areas of the NCS – the Barents Sea, and the Eni's Goliat and Statoil's Johan Castberg projects are the clear representation of these processes.

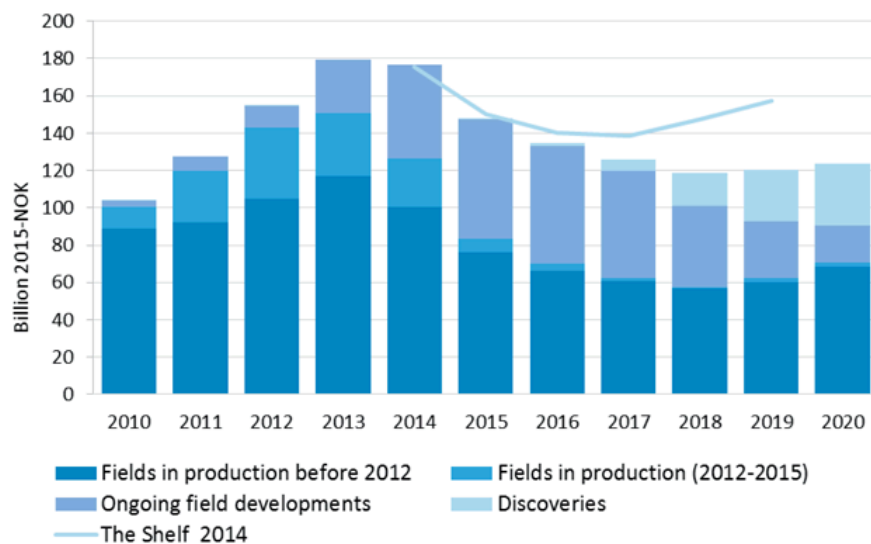


Figure 2. Investments excluding forecast for 2015-2020 (Source: NPD, 2016)⁴

The Barents Sea area is considered an environmentally vulnerable area to oil pollution, while also characterized by difficult and harsh climatic conditions compared to that on the rest of the NCS (DNV Consulting, 2005). A lot of research is being done and even more is coming. There are different opinions whether petroleum activities in the Arctic can be technologically and environmentally sound, and this thesis will try to contribute to this discussion. Nonetheless, according to the NPD, data showed that the majority of undiscovered reserves of gas and condensate lie under the surface of the Barents Sea.

⁴ www.npd.no. Article "The shelf in 2015-Investment and cost forecasts"

According to the analysis done by the The Oxford Institute for Energy Studies (University of Oxford) in the *Outlook for Natural Gas Demand in Europe (2014)*, natural gas will still have a market in Europe, the primary consumer of the Norwegian fossil fuels.

HSE, as mentioned, is the main challenge in the Barents Sea. The focus on influence on humans, e.g. on their safety, on the environment they live in, and their health and well-being is deeply rooted in the oil and gas industry and was distilled in HSE risk management. However, the approached towards HSE management varies greatly from company to company – and from country to country. HSE management is mainly reflected in corresponding regulations. However, legal frameworks in HSE can be highly complex to elaborate on, and the amount of detail in these laws and regulations can be correspondingly very high (Berg, Malikova, 2015). The range of these frameworks can last from just a few pages to several thousands (OGP, 2010), and the potential scope can be huge.

Today, companies have activities and interests all over the world, and international companies from the oil and gas sector are, maybe, the most noticeable examples. Companies investing in projects abroad come across the need to manage HSE risks in an unfamiliar institutional and legal environment. It may result in an emergence of various complications for the company, especially in such issues as risk management; organizational, managerial, and environmental challenges.

This is due to the fact, that HSE as a concept has a lot of different meanings, because of its wide and differentiated scope of application. One these is the oil and gas industry. Concerning the available literature, there is a wide selection of it on HSE in oil and gas, either providing a general outlook, or covering different aspects of it. HSE literature was found to be mainly generic, but some of it is can be more specific to a single country or aspect (i.e. Risk management).

In the author's opinion, the generic approach for studying HSE is not completely right, because this concept is, and should be coutry, company, or case specific.

Secondly, according to the preliminary data collection, there are not many comparative and case-specific studies of HSE. For example, there is a study done by Berg and Malikova (2015) from the University of Nordland on differences between HSE regulations and culture in Norway and in Russia. Another study was done in the University of Stavanger by Hoem (2014), which compared the Norwegian HSE regulations and Shell global HSSE framework in light of several general principles. The particularity of this report is add a *practical component* to the current landscape of works, focused on a comparison of different HSE

regulations.

According to the author's personal experience, the oil and gas industry is focused on reliable practices, rather than on theoretical aspects. Therefore, in the beginning of my work on thesis, there was a general understanding that I should show how different aspects of HSE regulations are actually being implemented in a *real case scenario*. Moreover, it would be interesting for future or current employees of Norwegian companies (and not only oil and gas companies-transportation, logistics companies personnel might also be interested), that are planning their activities in the High North to get insight from a case study, focused on the Goliat project.

Thirdly, the available literature and studies does not prioritize HSE aspects, while in practice in the oil and gas industry there is a clear hierarchy of HSE risks.

This said, this thesis, starting from HSE regulations as the main reference, this study adds a much needed practical component to the research – the case of the operational stage of Goliat project in the Barents Sea. The aim of doing this is not only the conviction that this component is actually missing from the available research, but also an attempt to address the alarmists voices in the science community, calling for a ban of any activity in the High North. Moreover, this thesis is thought to have the figure of a *human* in the center of the analysis. Therefore, in the analysis the concept of HSE will be bound with the concepts of safety and risk.

From the very start of this work, it was also considered necessary to answer the question: Who will be interested in this study? The answer was that it would be interesting for companies newcomers to the NCS, considering the possibilities of the Barents region. The aim is thus to finalize the analysis in a comprehensive *instruction*, based on a real case, of what to expect and what needs to be done on order to obtain a high level of safety combined the the lowest possible level of risks.

1.2. Purpose and problem statement

The purpose of this study is to provide a comprehensive overview of the regulatory regime and main practices in addressing HSE issues in Norway and Eni, and to emphasize the main differences of these. After this comparison will be done, the research is then narrowed down to the case study, which will include environmental and climatic context of the Barents Sea and how these aspects have influenced the Goliat project in terms of regulations in the area of HSE.

Norway has always had international foreign companies operating on the NCS, and, as mentioned earlier, this work should be interesting for companies that are considering the possibilities of potential activities in the Arctic. Moreover, the report could interest regulatory agencies of other Arctic countries, which are thinking of allowing the offshore petroleum activities in their part of the shelf, and therefore searching for the right regulatory policy. It should be noted, that this study becomes even more relevant in light of the ongoing debate regarding the HSE issues of the possible move of oil and gas development further north (in the Barents Sea), and in the LoVe area (the area in Norway around Lofoten, Vesteraalen and Senja).

This study has two main stages. The first stage is a comparative analysis of the health, safety and environmental regulatory regime in Norway and management of HSE issues in Eni. Second – the real life case study of the Barents context and the overview of the Goliat project with a focus on specific regulations and the Eni's organizational and management processes to address the HSE issues.

An international company is always subject to the local regulations, while the concept of HSE is very context – specific. So it's interesting to study the approaches in HSE regulation in both countries and companies; their differences and similarities. Bearing this in mind, it is important to show how a company addresses these differences if there are any, adopts the requirements, and adapts to the regulatory framework and ways of conduct in a specific country, and, most importantly, emphasize and illustrate these processes based on a real project. All this considered, the thesis therefore attempts to analyze HSE on an institutional as well as a company level, which both are then applied to a project.

Thus, the problem is formulated as follows:

«How company has aligned its own regulations and procedures to Norwegian regulations and guidelines in light of the operational stage of Goliat project?»

At first, the problem statement was quite wide, because the initial intent was to analyse all of the stages of this project. Though, based on the feedback received from HSE department employees in Eni's Moscow office, the problem was then narrowed down only to the *operational stage*, which has actually started during the time this thesis was written. Therefore, this thesis will reflect mainly a «pre-operational» stage of the Goliat field development, that refers to *preparations of the offshore installation to the production start-up*.

The problem statement, however, is still quite wide, because the final outcome should be the illustration of the company's activities in light of what is contained in both regulations,

the «usage» of the regulations. So basically, it is the following situation: you have an installation on the NCS and you are preparing to start producing. How would you manage your activities, and what would be your actions as related to the HSE regulations and guidelines in Norway?

1.3 Methodologies and delimitations

This study is unapologetically qualitative. It utilizes only qualitative data in the form of normative acts, the regulations, documents related to the Goliat field development, and descriptive data from the interviews.

The primary data collection has revealed, that the literature covering aspects of petroleum activities from upstream to downstream, HSE, risk management, and project management is vast. Therefore a few focus areas had to be chosen. As it was already mentioned, the concept of HSE is multifaced, therefore the main focus of the report will be on the regulations. However, it is inevitable that management and technical aspects of HSE will also be partly covered. The regulations differ greatly among different countries, organizations, and companies, therefore this topic was narrowed down to one country and one company. Projects can have different stages, and it can take from 5 to 15 years from exploration to development, and 1-7 years from development to production. Of course, it was impossible to cover all project stages, therefore the author considered the installation of the Goliat platform the starting point for the case study.

1.4 Structure

The structure of the study is made accordingly with common requirements for all masters' theses in Nord Universitet. The next chapter will introduce all the relevant theories that can be the foundation for the research questions and the analysis presented in this study. In the third chapter, the author will further elaborate on the thesis's research design and the applicable methods for understanding and presenting the data accordingly. Fourth chapter is the main and most important body of analysis, considering the similarities and differences in the regulations, and both analysis and findings are presented in this chapter. Chapter 5 covers provides the context and represents everything appertaining to the case study, also incorporating discriptive, analytical parts, and the final results of the study. The conclusion, based on analyses presented in Chapters 4 and 5 can be found in Chapter 6. Tables, figures, additional data and references can be found in the appendices.

1.5 Summary

The report has several main goals. First of all, it pursues the aim of creating new knowledge on the application of state and private HSE regulations in the context of the Arctic areas. Secondly, this study pursues a goal to simplify complex subjects, such as HSE and risk management in the Arctic for non-Norwegian and Norwegian *companies*, which are evaluating the option or are interested in producing oil and gas in the Arctic region; *governmental structures* (other than in Norway), that want to structurize, optimize, or improve the regulatory regime for the oil and gas activities in areas, belonging to their continental shelf and located above the Arctic Circle; and *independent parties*, concerned with environmental issues of petroleum activities in the Arctic.

This said, some of the parts of the report may be descriptive in order to present such subjects as regulations and specific aspects of the project Goliat. However, the overall structure, content, and the selected method of analysis and research design of this study will reflect the topic and the research question as much as possible. It should be noted, that there was almost no research on a similar topic and with a comparable research question, so the author had to create a suitable research design from scratch. This process is shown in the methodological part of the study.

All in all, everything in this study serves to the final purpose: to go through complexity to simplicity, and narrow down to the answer to the research question to a simple and brief statement.

2 Chapter 2. Theoretical framework

2.1 Introduction

The aim of the theoretical framework is to provide this study a theoretical base for the further analysis. And while this study is to a large degree rooted in concepts, these may be responsible for different tasks in the landscape of knowledge, and may appear different to the insiders as well as to the outside observer, and their demarcations are neither given nor totally arbitrary (Kringen, 2008). This chapter thus starts off with a discussion of the basic concepts relevant to this study: HSE, risk, and regulation. Secondly, it provides an outline the theory that will provide the framework for understanding the interdisciplinary topic that was selected for this study.

2.2 Concepts of risk, safety, and regulation

First, as the basis for this study, the concepts of *risk*, *safety*, and *regulations* will be described. They have at least one attribute in common: they are all concepts that can be characterized by high level of abstraction. Most of all, they seem to just designate freely defined thematic fields. These concepts, according to Kringen (2008), fit the definition of *hypernyms* – «the linguistic term for super-ordinate concepts that cover a broad range of phenomena, themselves classifying a number of subordinate terms». For the purposes of this study, however, these concepts will be presented in simplified terms, under the lense of relevance for the oil and gas sector. The conceptual philosophical debates goes over and above the purposes of this study.

2.2.1 The concepts of risk and regulations

In simple terms, the concept of risk rests inbetween scientific perceptions of calculable probabilities and cautious perceptions of uncertainty and unpredictability, which are embedded within cultural, social and political environments, including also the normative valuations of the severity of the possible outcomes, against the possible benefits (Royal Society, 1992; Shrader- Frechette, 1991).

There is no universal definition of what is *risk*, so, obviously, there are significant variations in possible explanations. There are several reasons for this flexible nature of the concept of risk. One of the straightforward explanations is that risk management, compared to risk assessment, is a relatively young field that is undergoing a rapid development (Conroy, Murrie). A second explanation for the wide gap in interpretations and definitions has to do with the social constructionist perspective. Risk is considered a humanly constructed concept that is not tied directly to any observable features of the universe, and from a constructionist

point of view, reality is socially constructed and given meaning by people (Easterby-Smith, Thorpe, Jackson, 2012). The actual *existence* of risk is also considered present by people. Considering the observation that *people are different*, it all comes clear.

However, two factors were found to be present in almost every definition of risk: ***probability + consequence***. For the sake of better understanding, let's consider an everyday situation. For example, if you don't brush your teeth you probably might (probability) get caries (consequence). Thus, an event or activity have different outcomes, and one of these outcomes is bad and carries risk. The probability, on its turn, is calculable, and if a harmful event has a high probability – a preventive measure or their combination can be applied to liquidate, or reduce the possibility that this event will happen to minimum levels. Thus, referring again to the mentioned example, brushing your teeth is an act of risk management because it minimizes the risk of caries, while, based on background and knowledge, a person evaluates the possible outcomes. The last can illustrate an act of risk assessment.

A general procedure implemented for analyzing or assessing risks commonly involves three constituent stages: first, identification of the hazard, second, estimation of the level or magnitude of potential harms, and, finally, evaluation of its acceptability (Kringen, 2008).

If we think about risk regulation and risk management, they appear to a large degree synonymous, because both are denoting the mechanisms of “shaping who can take what risks and how” (Royal Society, 1992: 136), pursuing the aim of minimizing the risk. In the business milieu, risk regulation involves a number of actors, ranging from the government, regulators, industrial actors to small independent bodies, each playing different roles in the general effort to manage risks, including the whole process of identification, estimation, and evaluation. It should be noted, that the process of risk management is usually a generalized and iterative effort, so it's impossible to define precisely the stages and elements of the process of risk management (Kringen, 2008).

Today the process of managing risks will involve another criteria – effectiveness. Its presence can be explained by the need of allocating the proper amount of resources in a manner that would reduce risk *effectively* according to the overall valuations of both ‘costs’ and ‘benefits’. Evidently, the task of defining, identifying and measuring risks becomes even more difficult (Kringen, 2008)

This extremely simplified outline provides the understanding of one important fact: anything to do with risks has a strong constructionist component. If we amplify this picture it becomes clear, that risk management has a wide scope of application: actually every economic subject can manage risks, and therefore can interpret risk differently, basing his

considerations on uncountable combinations of historical, economical, political, cultural, environmental, and many other variables. Additionally, this process can be implemented in different areas. For this study, the area of concern will be the HSE.

2.2.2 The concept of safety

The Cambridge dictionary gives the following definition of safety: it is a state in which or a place where you are safe and not in danger or at risk⁵.

Alli (2008) gives the following definition of *occupational safety*: "...is generally defined as the science of the anticipation, recognition, evaluation and control of hazards arising in or from the workplace that could impair the health and well-being of workers, taking into account the possible impact on the surrounding communities and the general environment" (Alli, 2008, p. 7)

The definition given by Alli incorporates all the essential aspects of HSE as a concept, so it is possible to conclude that area of HSE arises from the concept of safety. Additionally, the given definition incorporates all the aspects of risk and risk management process. Clearly, at this point the report is stepping into an interconnected or *interrelated field of knowledge*.

It is now possible make an introduction to the concept of HSE in general terms. Simply put, *HSE management aims to predict and reduce the probability of accidents or hazards with implications to humans and environment, and to minimize the consequences of a hazard in case it has happened, because the necessary measures were elaborated*. However, a certain degree of ambiguity is still present with respect to the application and definition of HSE, since the implications of these aspect vary across countries, governments, institutions, and organizations.

What results from the definition given by Alli (2008), is that the term is viewed as conceptually dualistic in its core (Berg, Malikova, 2015). On one hand, we have a "health and safety" component, that refers to predicting and minimizing the probability of hazards, that in other words means improving *safety* of humans. On the other hand, we have the environment, which can imply to definitions – the working environment for people, and external environment in the sence of the influence to nature and environment by company's operations. Usually for oil and gas companies the environment means natural environment, and safe working environment is included in the aspect of safety.

Following the logical path of the last two paragraphs it can be assumed, the concept of

⁵ <http://dictionary.cambridge.org/it/dizionario/inglese/safety>. Cambridge dictionary - definition of safety.

HSE primarily finds its origins in *safety*, which is inseparable from the human aspect mentioned previously. Being safe is laid in our genes, when prehistoric men and women searched for safe places to stay during the night because of the danger coming from predators. Safety is an activity of prevention from being exposed to hazardous situation. By staying safe the unpredictable consequences of a negative event can be avoided. (Chandrasekaran, 2016). The term safety is therefore always associated with *risk*. When the risks or one of the possible risks becomes too high, the situation can be considered unsafe or unstable. Therefore, when risks are assessed and eliminated, or minimized (e.g. regulated or managed) - safety gains its own ground and an activity can take place (Ibid).

The focus of this study is *management of HSE risks in oil and gas operations*. Management of risk, as it was mentioned above, involves a number of organizations. Since risk management is an extremely complex issue, in simple terms, these bodies should use a *plan*. In case of the governmental actors, this plan is represented in *regulation and legislation*. The government itself, or other assigned regulatory organs, can be defined as *regulators*, because by means of free elections the citizens delegate a number of responsibilities, including these, to the state. At the same time, private actors *have internal regulations and management systems*, because they are responsible to stakeholders that have given a company the responsibility for their money. The organization, therefore, must have sound measures to guarantee the company's activities are safe and won't result in a loss of their money. It is interesting, how the lack of safety always leads to *losses* of something that is precious, but this should be the topic of a more philosophical study.

The main concern for the petroleum industry in HSE, in author's opinion, includes two main factors: it is the participation, involvement of humans, and influence on them of such activities, and second - their effect on nature, environment, and ecosystems of the region in which oil and gas activities take place. All these are interconnected by the terms *risk, safety, and regulation*.

2.3 HSE

Following the discussion in the previous subchapter, the HSE standards exist because any activity, either industrial, business, societal, political, etc., even everyday routine is associated with risk and therefore should correspond to safety standards. The connection between HSE and risk and safety can be illustrated in common everyday situations. For example, you wash your hands before you eat, because there is the risk to have bacteria on your hands and you *might* get ill; or you brush your teeth before you go to bed, because *might* get dental caries development. Washing your hands or brushing our teeth is one of the

simplest, but at the same time most common HSE standards, pursuing the same goal – to minimize possible risk. HSE standards thus exist in response to the need of risk regulation.

Based on the primary research and study of the available literature on HSE, this concept is clearly abstract, interdimensional and multidisciplinary. However, the clarity comes if we think about HSE risk management. In fact, this study will be generally concentrated on the regulatory aspects of HSE, more precisely *regulations and legislation* on the levels of the government and that of a company.

The author could define a number of the most critical aspects of the HSE regulations, as applied to the *industrial activities*, which are the primary subject of this study: *organizational, managerial, technological, and contextual*. All these aspects are presented in this chapter in relation to the specific properties of the concept of HSE. Schematically, the theoretical framework for this study can be represented in the following Figure:

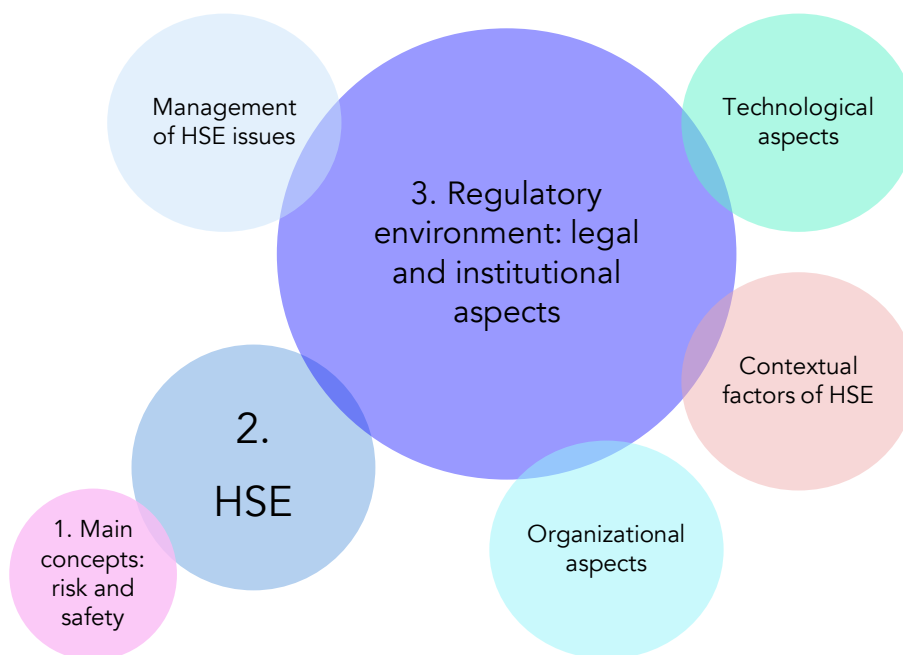


Figure 3. The illustration of the theoretical approach. Fundamental for the further analysis and the thesis in general

The abbreviation **HSE** stands for health, safety, and environment. This concept can be viewed from different angles, because is applicable to many activities, which are not necessarily economic or industrial. However, the area of the application of HSE on which this study will be focused is oil and gas sector, especially on the regulatory aspects of a project.

2.3.1 Regulatory environment: legal and institutional aspects of HSE

This study is specifically concerned with two levels of institutional reality: country level and the level of the companies.

State perspective

Institutionally, the management of HSE issues is, first of all, represented by set of governmental bodies who are responsible for HSE in a given country, and therefore in a variety of industrial activities. Secondly, HSE is regulated by a set of legislative requirements, laws, regulations, guidelines, recommendations and criteria published in one way or another by an authorized institution, responsible organization, or other governmental structures responsible for their issue (Berg, Malikova, 2015). All this forms what can be referred to as an *HSE regulatory environment*.

The main instruments of the regulatory milieu in HSE are *legal documents*, i.e. laws, regulations, guidelines and so on. How these should be applied is subject to law studies, that are over the topic covered in this thesis. However, it is worth to mention, that the HSE regulations usually represent a set specific legislative acts, and these on their turn are extremely country specific, while the importance given to aspects of HSE, the ways of regulating and managing its aspects varies greatly from country to country, in some cases even regions (in countries with federalism). As emphasized by one of the Eni employees in Moscow, sometimes countries can have such low HSE standards, that companies operating there even have to implement their own standards (for example in Africa).

The regulations that in the end can be traced in *international law* are not legally binding, and the available international standards, which are regulatory documents representing attempts of giving the HSE a more standardized approach in regulating the HSE, are also being adopted voluntarily by the countries or companies.

There are international organizations and associations with different sets of participants (countries, companies, independent experts or organizational bodies), that produce internationally applicable standards. These organizations sometimes are supported or, actually, consist of oil companies themselves, that, recognizing the need of homogenization in the sphere of HSE, agreed to contribute. Among these organizations the most notable are: ISO (International Organization for Standardization), International Association of Oil and Gas Producers (IOGP/OGP), IPIECA (“the global oil and gas industry association for environmental and social issues”). There are also several national and regional associations, such as Norwegian Oil and Gas Association, and the U.S. Oil and Gas Association produce

sound standards and sets of criteria, that can be applied to oil and gas activities (Berg, Malikova, 2015).

The mentioned organizations typically pursue the issues that are for the common good for the entire industry. Two of them should be particularly mentioned. First, the ISO, is an independent, non-governmental international organization has published over 19000 International Standards for almost every industry (ISO). The data collection has shown that at least Eni recognizes and incorporates into its corporate management guidelines specific standards, developed for oil and gas industry.

Second organization, the IOGP, is specifically dealing with HSE related matters. The organization has published many scientific reports and, since it is an association of oil and gas companies, those taking part in this organization incorporate the scientific findings, standards, and guidelines the organization presents. For example, Eni's reporting standards are corresponding to the standards set by the IOGP.

Company perspective

From the perspective of economic actors having activities in a specific country, HSE, besides the explanations given above also signifies *compliance* with the regulations in this country. In order to address these challenges, companies have created HSE departments, specifically dealing with compliance and the issues that might arise (Berg, Malikova, 2015).

The primary function of the the HSE departments and corresponding management frameworks today is, however, not only to just securing compliance with the requirements and regulations – they are now becoming the real guardians of the reputation of a company, that is reflected in the involvement of the HSE department in every project of a company. This is particularly important for oil and gas companies, especially after the Deepwater Horizon catastrophe. Actually, these changes are not limited to just oil and gas or other big industrial companies. Today people are becoming more and more aware of the environmental problems, and consequently almost every company has plans regarding sustainability; social, and environmental commitments. Nonetheless, according to the mentioned processes, and a long history of deadly hazards combined with the contributions of oil and gas industry to the climate change, society has started to consider petroleum companies as real threat to humanity, nature and the environment.

On the company level, the understanding of the concept is even more different than that across different countries, because every company or corporation has its own business model, culture, management style, and set of rules. However, as preliminary study of the data

has revealed, each company elaborates its own standards, procedures, and management guidelines regarding HSE, that have proportionally the same power as the laws in a country have, but that are applied and function only within a company, its branches and for its employees.

It should be noted, that HSE a structural component of the organization similar of any other department (Berg, Malikova, 2015), however the structure, management, and administration (and even the name of it) can be very different across companies. The functional aspect of the department is also very different, but in petroleum companies they incorporate legal aspects, technical and design aspects, environmental (nature – related) aspects, social, occupational health and safety aspects.

So it's not rare that oil and gas companies incorporate the country – specific approach to HSE. In the course of communication with industry representatives regarding this study, a representative from Eni has emphasized, that sometimes in case of operations in a country, where the HSE standards are lower than these in the company, they might use their own HSE standards. So what we see here is that there might be different shapes that form the overlay of state HSE – related patterns and those of companies. This is why the universal definition of HSE does not exist and can't exist. Every state, industry, company; every person; even every project or a situation might give different meaning to health, safety, and environment, and these definitions will inevitably be formed by context, knowledge; cultural, historical, political, economical etc. background.

2.3.1.1 Institutional theory

As mentioned above, the HSE standards are represented in legislative documents, issued by the authorized authority. These sets of laws and other legislative documents can also be seen as institutions. Part of this study is the analysis of the regulatory environment of the oil and gas activities in Norway, therefore an introduction to the concept of *institution* is required.

The institutionalization process is well described in Berger & Luckmann (1966) publication entitled «Social Construction of reality». Basing their work on a fundamental philosophical dichotomy *Subjective versus Objective reality*, they declare knowledge, and therefore one's «reality» is relative, thus the external world is experienced differently from person to person. A society, on its turn, is formed by individuals that possess different experiences, background, and knowledge, but when we speak about a country we normally see a common ground and in most cases people actually share views, norms, and opinions.

In their work Berger and Luckmann have assumed that human activity in general combined with this common ground leads to similar behavioural patterns, that can be interpreted as sort of habitualization – i.e. the act of forming a habit. Repeated action makes a pattern, and this pattern becomes a habit. A habit, on its turn, form way of conduct - a socially accepted way to act and behave. This assumption might seem restrictive, but that's what society has invented to introduce order to human actions: instead of being lost in multiplicity of diverse options, a person became able choose the «right» path, although the question «What's right» is still open. The government naturally also seeks to introduce order in the social behavior, that why constitution, laws, and other legislative acts are also an institution.

When habits become an institution? Greif (2005) defines an institution as «system of rules, beliefs, norms and organizations that can jointly generate a regularity of behavior in a social situation». Barley and Tolbert (1997) define an institution as «historical accretions of past practices and understandings that set conditions on actions» (Barley & Tolbert, 1997, p. 98). For rules, norms, and cultural beliefs to become an institution, the activities that produce and reproduce them must be attended to, modified and preserved (Scott, 2001). So all in all, institutions are based on the relationship between historically embedded processes, shared rules, behaviours, and repeated actions which derives from these rules, or expresses conformity to the mentioned common ground. To become an actual institution, these rules and norms must also be accepted, by an authority (Scott, 2001) . Institutions can be characterized as having high levels of resilience, difficult to change and modify, and having tendency to be passed from generation to generation, to be preserved and repeated. Most importantly, they can also operate across multiple levels, from global to local level and to interpersonal relationships (Scott, 2001).

The information given in the previous paragraph should be narrowed up a bit. First of all, it can be concluded, that the external setting in which organizations have to function is an *institutional environment*. This environment can be on one side socially constructed, on the other – it can take its roots from the government. Normally, it is a combination of two. The institutions can be considered rules of the game, while organizations can be considered players in the institutional environment set by these rules. Institutions and organizations are, in fact, in constant interaction, and organizations are the primary subject to institutional change (North, 1990).

Institutions consist of formal rules and informal constrains. Helmke and Levitsky (2004) define the dual nature of institutions as follows: «formal institutions are openly codified, in the sense that they are established and communicated through channels that are widely accepted as official ... informal institutions are socially shared rules, usually

unwritten, that are created, communicated, and enforced outside of officially sanctioned channels». As for this study, only formal institutions will be considered, since the main subject of the study are the condified regulations

2.3.1.2 Principles of regulatory policies

There may be huge differences among different regulatory policies. Sappington (1993) identifies, that the differences can be related to three criteria: a) the objectives and resources of the regulator; b) the institutions of the jurisdiction in which regulation is imposed; and c) the characteristics of the industry for which regulation is contemplated. Each of these factors was found to influence the distinguishing features of regulatory policy to a large degree. Moreover, Mr. Sappington delineates three key dimensions along which the policies may differ. These are *form*, *function*, and *scope*.

The form of regulation defines the procedures employed to design and enforce regulatory rules, the nature the rules, and the locus of the authority in the regulatory sphere. A more subtle aspect of the form regulations take is the extent to which decision-making is delegated. There are two extremes on this dimension *Command-and-control (centralized) and delegatory* regulation. As an example, the author states the case of a water purification and delivery company. With command and control regulations, the authority might «dictate the exact details of the purification process, the rate at which water is purified, the type of pump and conduit used in water delivery, and the exact price at which water is sold to all customers» (Sappington, 1993). In case of the delegation, «the firm will be free to choose the purification process it prefers and the delivery system it finds to be most effective» (Sappington, 1993). However, there are also othe types of the delegatory regulations. *Incentive regulation* implies setting goals or targets is typical of, and the firm is assessed according to how its actual performance compares with the established targets. With *potential regulation* no specific restrictions are placed to the activities, unless the company shows to be unsatisfactory according to a prespecified criteria, for example the satisfaction of customers. All this can be summarized in the following Figure:

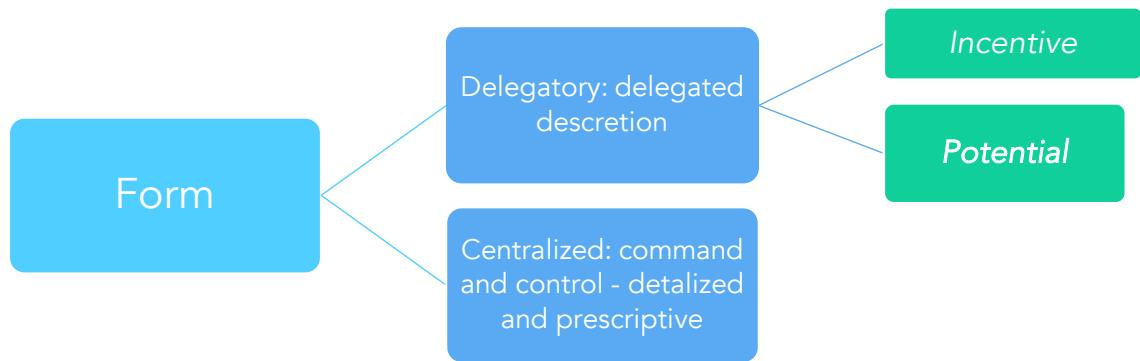


Figure 4. The form of regulations (Sappington, 1993)

The function refers to the main scope of the regulations, what the regulations are there to do. The main aspect of the function is the extent to which regulations serve to inform others about the activity, rather than dictate which activities will be allowed, therefore the regulatory acts can be *informing* or *enforcing* (Sappington, 1993). The key distinction between informing and enforcing regulation what is actually afforded to the final consumers of a product. Informing regulation enables consumers to make their own choices based on the available information (for example, the list of preservatives on the package of a food product, or allergies the food can cause), while enforcing regulation makes choices for consumers (a product should not contain the prespecified preservatives or cause any allergies, but there won't be any information on the package).

The scope represents the extent of the manner of the regulatory supervision and control and the extent to which the regulations encompass the activities of a company (Sappington, 1993). For example, in some industries the authorities can control the prices, limit the earnings, oversee the quality of the products, its major investments and the markets in which the firm is allowed to operate. In other industries the regulation is often more partial, and less comprehensive (Sappington, 1993).

2.3.2 The contemporary context for HSE in offshore installations

Based of the author's experience, knowledge, and the preliminary literature study the relation between the HSE regulations and procedures could be assumingly influenced by *external factors* (such as public opinions, pressure groupes, etc.), as well as internal factors of the industry, such as competition, context, history of the industry, etc. Thus, theoretical consideration on the various aspects of HSE can not be detached from the internal context of oil and gas industry (the external factors are out of the scope and focus of this study). Therefore, it is important to answer a question: *Why such importance is given to this aspect in the activities of petroleum companies?*.

Today, HSE seems to gain greater importance as an academic and professional field than ever. This might be due to several factors: first, the information about accidents is spread much more quickly with social media being the primary source of information for people across the world; second, the living memory of such accidents as Macondo Well or Deepwater horizon; third, the environmentalist movement becoming more and more popular (the green parties getting more votes than ever is a clear indicator of it); fourth, the consumer is becoming more conscious about the environmental and social problems in the world, and wishes not only to buy something, but also make a contribution to resolution of these problems. This subchapter aims to describe why HSE is relevant specifically to the oil and gas industry; its increasing presence as a field; and finally its current role in the oil and gas industry.

2.3.2.1 The role of HSE in offshore oil and gas

Health and safety risks related to the offshore petroleum activities cover an extensive number of areas, both in terms of causes of hazards and in terms of possible outcomes. «Risks include a large variety of factors, such as helicopter transport, fires and explosions (of hydrocarbons or other substances), blow-outs from wells, lifting and crane operations, and falling objects. Outcomes include fatalities as the worst case, in particular within the scenario of major accidents; they include occupational injuries, from cuts and bruises to serious and invalidating accidents, and also occupational illness, often as the result of long term exposures to various hazards (like noise, chemicals, bad ergonomics, etc.)» (Kringen, 2008). Risk indicators are now broadly categorized in terms of major accidents, occupational accidents and occupational health. There has been an increasing focus on the interactions between these broad categories, particularly in relation to the effects that the general working conditions have for operational safety. Such problems as physical and mental stress or fatigue may affect not only the health of individual workers, but also operational safety in the execution of tasks, and therefore safety in general (Kringen, 2008).

The main focus of this study will be on the risk regulations in the Barents Sea, particularly applied to the Goliat field development, that is a project in the Norwegian part of the Barents sea, offshore the Norwegian Coast. In recent years, that major companies in oil and gas sector went totally «*safety first*». HSE assurance has become essential for offshore petroleum industry since they are highly exposed to hazardous situations because of the complexity of the technological equipment being used and the severity of the possible accidents to humans, as well as to the environment. Therefore, there are several good reasons to have sound HSE practices: a) investments in the offshore industry are several times higher

than that in any other production or process, b) offshore are very complex and advanced in design and technology, therefore it is extremely difficult, almost impossible to reconstruct or repair them in case of any damage (Chandrasekaran, 2016).

In the following analysis Chandrasekaran emphasizes the relevance of HSE to the offshore industry should be understood in connection with the issues in petroleum production and processing. Making sure the operations are safe takes identifying, addressing, and reassessing the potential hazards on *every* stage of the project development and, most importantly, of the operations. The assessment includes both qualitative and quantitative methods. The primary objective is to guarantee safety for workers and to people located in the area of operations, and prevent any possible injuries, effects of health, or loss of life. Moreover, pollution and contamination should also include into safety evaluations. One should take into account, that the lack of safety may cause huge losses both in financial terms, and in terms of company's reputation and consequent loss of stakeholders and clients. This said, it can be concluded, that safety may be the single most important aspect for oil and gas operations, since bids are extremely high.

2.3.2.2 Accidents in oil and gas

Unfortunately, oil and gas industry has a long history of *major accidents* (PSA define a major accident as “an acute incident, such as a major discharge/emission or a fire/explosion, which immediately or subsequently causes several serious injuries and/or loss of human life, serious harm to the environment and/or loss of substantial material assets”) linked to health, safety, and environment. Moreover, in the public opinion it is still considered among the other industries to have the greatest potential for similar hazards. This claim is partly supported by the fact, that although one can have an ultra - efficient and sound HSE Risk Management System, the so-called *black swan events* (the unknown incidents impossible to predict) may still happen with technically complex objects (Aven, 2014)

Unfortunately, in case of petroleum activities there is a large probability, that the potential events may be extremely harmful for people and the environment. However, the figures that follow this paragraph show that, in fact, the quantity of accidents has been continuously decreasing over the last years (the last data that was available is due to 2007, so it can be expected that the major accidents are on their minimal historical levels now).

Location	Total No. of Blowouts	Blowouts with Pollution				
		Large	Medium	Small	Unknown	Total
UK	30	0	0	0	0	0
Norway	34	1	0	1	1	3
D/DK/NL	2	0	0	0	0	0
North Sea*	66	1	0	1	1	3
US GoM	273	5	9	40	9	63
Worldwide	498	22	11	56	39	128

Figure 5. Blowouts Resulting in Pollution, by Geographical Area, 1970 – 2007

(Source: OGP, 2011)

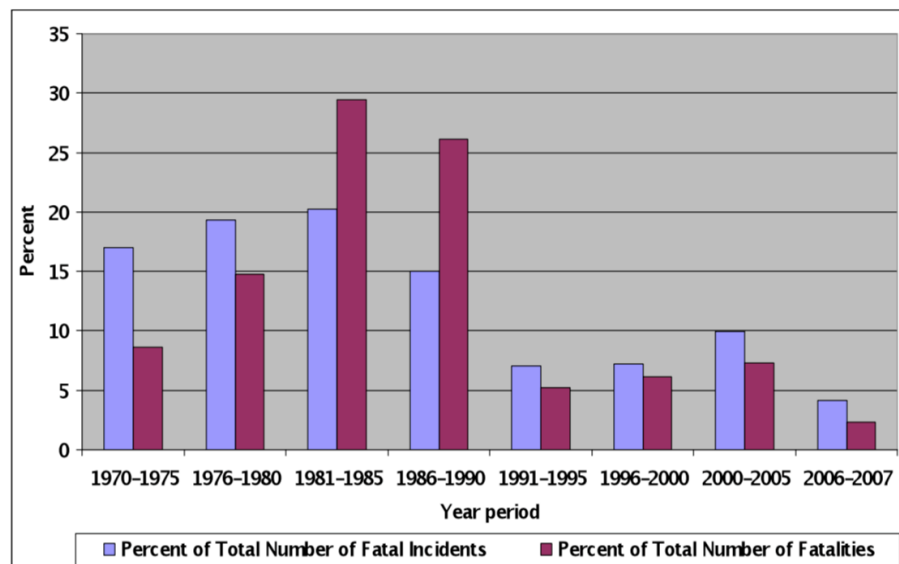


Figure 6. Breakdown of Number of Fatalities and Number of Incidents by Year Period: Worldwide, 1970 – 2007

(Source: OGP, 2011).

Geographical Area	No. of Fatal incidents	% of Total No. of Fatal Incidents	No. of Fatalities	% of Total No. of Fatalities
US GoM	344	62.2	611	28.1
Europe N.S.	88	15.9	574	26.4
Asia + Australia	41	7.4	443	20.4
Other	80	14.5	543	25.0
Totals	553	100.0	2171	100.0

Figure 7. Breakdown of Fatalities by Geographical Area: Worldwide, 1970 – 2007 (Source: OGP, 2011)

The last fatal accident in Norway was dated 2002. Fatal accidents have now reached an extraordinary focus and concern. However, Norway was not exempt from such accidents. «The first fatal accident occurred in 1967. Since then there has been 260 fatalities, including fatalities related to major accidents. The capsizing of the Alexander Kielland flotel in 1980 account for almost half of these, and the majority of fatalities have thus occurred as a result of major accidents (53 percent); and if we include helicopter accidents (17,7 percent of the total), fatalities related to major accidents account for 73 percent of the total number. Occupational accidents account for 23,8 percent, and diving accidents for 5,4 percent. If we only consider figures after 1981, however, occupational accidents account for 64 percent of all fatalities.

During the 1980s, a considerable reduction in the number of fatalities was achieved. Until 1980 there were 88 fatal accidents on the shelf. From 1980 to 1990 (disregarding the Alexander Kielland capsizing) there were only 13 fatalities, in spite of the fact that the level of activity had quadrupled. Seven of these were diving accidents. From 1990 to 2000, there were 7 fatalities related to occupational accidents, and since 2000 there have been only 3» (Kringen, 2008).

It should be noted, that the Kielland disaster was a major milestone in the development of the safety regime on the NCS, which is one of the main aspects of this study. The investigation of the Kielland incident, has actually coincided with another deadly accident off Scotland – the Piper Alpha disaster, which took lives of 167 people. All this has left a deep mark on Norway's consciousness, and is among the key events in the development of today's NCS safety regime, in which the main role was played by Magne Ognedal, the PSA's ex - director general. He also played an important role in the investigation of Piper Alpha disaster, and that experience and lessons learned was later reflected in reviewed Norwegian safety regime, adopted in 1985. Under his supervision the regulatory regime was rebuilt, pursuing the reorganisation of government regulatory responsibilities (PSA).

2.3.2.3 Defining the Norwegian context and perspective

With the first oil from the Norwegian Continental Shelf came specific measures aimed at prevent accidents from happening. The regulatory framework as a whole, however, has always «reflected the tradeoffs between providing incentives for the oil companies to engage in, invest, and produce, and at the same time to maximize the values extracted for the public through taxes, levies/royalties, and direct participation» (Kringen, 2008). The consideration on the regulation of health and safety aspects of the petroleum activities, with its upsides and downsides, have been part of these general considerations.

Many contextual and other factors have contributed to the development of the Norwegian regulatory system. It has had several turning points (which are, however, still subject to debate): first safety regulations of the exploration and drilling period from the mid 1960s, the regulation of fixed installations in 1976 ; the introduction of the Working Environment Act in 1977; the introduction of internal control systems during the 1980s; the so-called NORSOK-process during the 1990s; and the new regulatory framework established in 2002 (Kringen, 2008).

The first ever safety framework for the NCS was issued by Royal Decree in 1965, preparing for the first rounds of petroleum explorations. In 1967, the first set of rules was expanded to regulations, containing 130 sections, mainly covering safety issues in a manner

of establishing what is right to do and what is not for an industry carrying out activities. These regulations were to a large degree based on these in the UK, characterized by a heavy reliance on industrial standards and ‘good practice’ in the industry (Kringen, 2008). It should be mentioned, that at that time the political administration had little knowledge and limited resources to handle the emerging complex industry, therefore the industry was invited to cooperate and participate in the development of policies and regulations (Kringen, 2008). However, after a series of accidents, the heavy reliance on «self-regulation» of the industry was replaced with a more critical attitude, but in case of occupational health and safety such considerations were so insignificant, that the existing legislation for occupational health and safety was almost not applied at all, granting “a zone of regulatory exclusion” to the emergent industry (Kringen, 2008).

The second point took place in the middle of 70's, starting from the establishment of the Norwegian Petroleum Directorate (NPD). The new body was given the task of resource management and safety regulation, while major legislative proposals rested with the Government and ministries (Kringen, 2008). Along with these events, the industry was steadily expanding, and the second generation regulations were adopted. They relied even more heavily on the idea of self – regulation of the industry, however, a new concept of «internal control» was first introduced and made part of the safety regulations. According to this principle, the industry, as a separate obligation, should implement a system of identification of the relevant requirements and comply to these, while taking corrective actions if needed. Evidently, these stronger and more prescriptive provisions provided a possibility for authority intervention. For example, these provisions could directly influence the technology and design of platforms: Statfjord B had to be reconstructed according to the new requirement of the NPD not to place living quarter on top of the installation (Ibid). This even has demonstrated the willingness of the authorities to adopt *alternative solutions, if these demonstrate to be sufficiently safe*. Moreover, the companies now had to *report* to the authorities, responsible for offshore safety.

The next turning point, the introduction of the WEA, has «greatly improved conditions for offshore workers, regulating working hours, providing protection against unwarranted dismissals, and facilitating a more efficient involvement in decision making. For several years, a double regulatory track was thus followed, containing somewhat different regulatory philosophies, WEA and the safety regulations. The latter was more managerially oriented in emphasizing management systems and leadership responsibilities, while the former promoted and even presupposed active worker participation» (Ibid).

After the Bravo blow-out in 1977 a discussion has appeared regarding the possible

«administrative and political goal conflicts in the regulatory system. As a result, health and safety issues were separated from the resource management. The NPD was left intact, but safety regulations were transferred to the ministry responsible for the WEA, and the agency was correspondingly split in two divisions, each reporting to *their* ministries» (Kringen, 2008).

During the next years the development of this new concept was taken further along with the general move towards rules that simply state the results to be achieved: the regulations were gradually becoming more risk - and performance-based. As for safety regulations, the first guidelines for «self control» for licensees was issued in 1979, and in 1981 these were developed as guidelines for «internal control», requiring that management systems for safety be developed (Ibid). So now it became up to the industry to supplement the vague requirements set by the authorities adopting more detailed norms internally (Kaasen, 2014). «In 1980, the first guidelines for risk analysis were introduced, including partially quantified risk acceptance criteria (such as for the availability of efficient escape ways). Also, the guidelines introduced a *quantified cut-off threshold* related to *the impairment frequency of types of accidents that could be disregarded in risk evaluations*, the so-called 10^{-4} *criterion*» (Kringen, 2008)

During the 1980s the internal control principles became firmly entrenched within the regulatory system. Goal oriented rules replaced prescriptive rules, and the new regime with *systems audits* and accompanying verifications was established (Ibid). The rules were becoming functional requirements, supported by sophisticated and detailed guidelines and recommendations. These last two legislative documents did not represent legally binding acts, but just inducations on how to fulfill legally binding requirements (Kaasen, 2014). However, «...regulatory interventions also included more direct interferences in designs, technologies, and solutions» (Kringen, 2008)

Towards the end of the 1980s, a significant drop in oil prices reduced profits and increased competition on the NCS. This led to the establishment of the so-called NORSOK program, the main purpose of which was to increase the competitiveness of the Norwegian industry through joint actions of industrial actors and the state in elaboration of cost – effective and technological and organizational solutions (routines, procedures, and standards) (Kringen, 2008). The requirements that define safety goals, risk acceptance criteria, documentation of safety systems became more general and goal – oriented (Ibid). The new risk regulation was more specific in outlining the risk analysis *process* than risk thresholds and methodology (Ibid).

The regulations as we know them today imply a direct connection with the operator by the authorities, since today the requirements are almost totally generalized and the burden of proof and responsibility is on the operator. Additionally, the regulations might call for governmental approval or exemptions; the authorities can also intervene in case of, for example, non-compliance with what is considered by them to represent a safe practice. The dry residue is, however, that the general requirements applied for every company operating on the NCS, today are usually accompanied by case-specific and subject-specific *individual requirements* (Kaasen, 2014). These are much rigid, detalized, specified, and sometimes hard to predict.

2.3.3 Management of HSE issues

The risk management in HSE is, to a large degree, product of the long history of accidents and the gradual recognition of the inportance of this aspect by the industry. Today, companies have elaborated effective and sound HSE management tools. One of the first companies to implement and extensive management system to deal with HSE-related matters was Royal Dutch Shell, when in 1984 the Enhanced Safety Management system was first introduced (Zijlker, 2004). This system is widely considered a milestone towards a more effective HSE management, especially due to the fact that it facilitated an implementation and improvement of HSE culture among the workers of the organization (Ibid). Other oil companies have followed the steps of Shell, and implemented their own systems for managing HSE.

Speaking of the general risk management approach in companies, it can be illustrated in a Figure from the work of Terje Aven (2014) entiteled «Risk, Surprises and Black Swans). The author sees risk management as a fragile «balance» between the costs and benefits and risk assessment and acceptance.

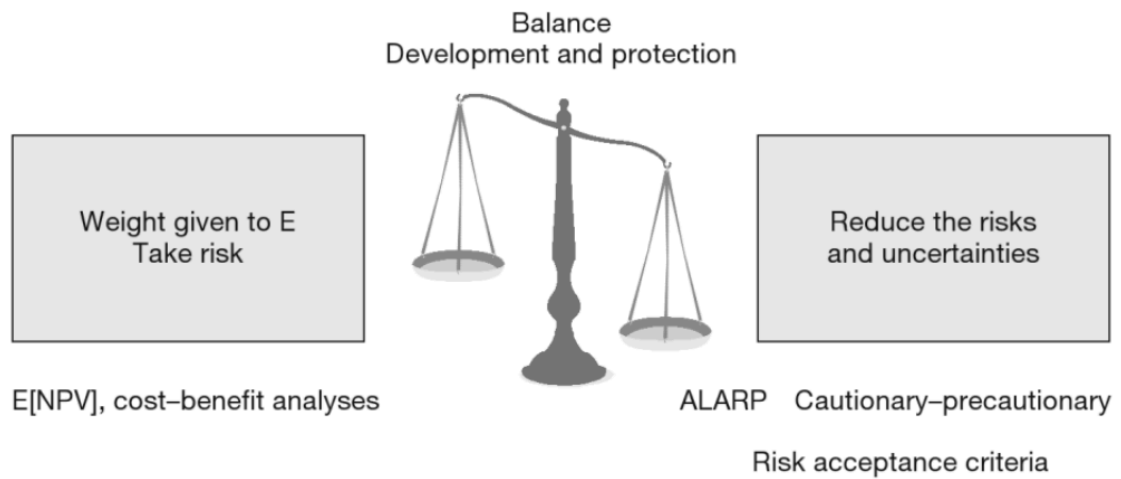


Figure 8. Risk management as an act of balance (Aven, 2014)

Having a widespread good practice and culture of HSE can be considered a common goal for the common good: to make sure the activities are safe and not dangerous for the environment is a good for the oil and gas industry, as well as humanity in general. Understanding their huge responsibility and addressing questions that arise from the public, today companies strive for transparency in HSE - related matter: major international oil companies, especially those that specialise in upstream, e.g. Statoil, ExxonMobil, BP, Chevron & Eni – all have implemented and made publicly available their HSE and Risk Management Systems (Berg, Malikova, 2015).

2.3.4 Technical aspects related to HSE in offshore installations

In the subchapter 2.3.2.1 it was mentioned, offshore installations is a very complex system from a technical point of view. Therefore, any possibility of an hazard should be reduced to minimum possible levels. This subchapter was thought only after the work on the case study – its aim is to provide a brief introduction to several technical properties of the offshore installations. The idea of doing this was triggered by the analysis of the Goliat project design and its plan for development and operations, that revealed a close attention drawn specifically to the following aspects of the design and technical equipment of the installation: barrier management, contingency strategy, water purification and reinjection system.

Barriers

Barriers are a measure to avoid or mitigate the consequences of accidents and have been a common practice in the Norwegian oil and gas activities for a long time. The Norwegian authorities, especially the PSA, have put a strong emphasis on barriers, especially

their technical properties, reliability and functionality (Røssland, 2012).

There is a wide range of the definitions of barriers, however for this report the definition introduced by Snorre Sklet will be used. In his article «Safety barriers: Definition, classification, and performance» (2006) he gives the following definition of barriers: «...physical and/or non physical means planned to prevent, control, or mitigate undesired events or accidents. The means may range from a single technical unit or human actions, to a complex socio – technical system. It is useful to distinguish between barrier functions and barrier systems. Barrier functions describe the purpose of safety barriers or what the safety barriers shall do in order to prevent, control, or mitigate undesired events or accidents. Barrier systems describe how a barrier function is realized and executed. If the barrier system is functioning, the barrier function is performed. If a barrier function is performed successfully, it should have a direct and significant effect on the occurrence and/or consequences of an undesired event or accident». Barriers have three subcategories: organizational, physical, and technical. According to the requirements of the PSA, the Norwegian regulatory authority, «it shall be known what barriers have been established and which function they are intended to fulfill». Therefore, the primary requirement to barriers should be the formalization of their functions in relation to the specific hazards. In reference to the offshore operations, barriers represent one of the contingency measures to prevent the oil compounds to spread.

Contingency plan

The national contingency plan in Norway is standardized and co-ordinated, so in case a spill occurs the national contingency system will work together as a single, integrated response organization; the system is divided into three levels: private (industry), municipal and governmental. Each level is assigned a specific area of responsibility (Nerland, 2001). The requirements are primarily applied to the companies that conduct activities on the NCS: in order for the project to be approved the operator should present a sound contingency plan, that is essentially is *set of measures the company is planning to undertake in case of an acute pollution*. The primary objective of the contingency plan is to recover oil close as close as possible to the source of contamination (ITOPF)⁶. Additionally, since in Norway the responsibility for combatting pollution is subdivided in 32 intermunicipal preparedness areas, the company should hold consultations with the municipalities directly influenced by the field development. The removal of oil includes two two measures: physical removal and supplementary removal with chemical dispersals (Ibid).

Several organizations provide the necessary equipment for oil spill removal: *the NCA*

⁶ www.itopf.com. Documents and Guides. Response Techniques

possesses and maintains the oil spill response depots along the Norwegian Coast. Additionally, it holds on contact several naval defence vessels capable of oil recovery. Vessels from civilian coastal patrol and fishing vessels can also be used, as well as an aircraft equipped with SLAR. *The NOFO* possesses a number of large supply ships, maintains five equipment depots and helicopters put on hold. The industry itself also maintains large stockpiles of equipment (Ibid).

When assessing the oil spill contingency plan, the company should present an integrated, sound and detailed plan, that would have mobilized all the contingency possibilities the country provides.

Water reinjection

First it should be described where the water in offshore activities comes from. Normally the term “produced water” means the mixture of water and oil. Oil and gas reservoirs have a natural water layer that lies under the layer of hydrocarbons, commonly known as formation water. At a certain point in production, the water reaches the production wells and so the water production starts (Atarah, 2011). Normally, the biggest amount of water is contained in the oil reservoirs compared to that in gas reservoirs. Moreover, additional water may be injected in the reservoir water layer to achieve more pressure, and therefore recover more hydrocarbons. As the reservoir becomes more depleted, the amount of produced water simultaneously increases. At the surface, the produced water should be subject to either separated from the oil compounds and then discharged, or reinjected into the wells or the reservoir. The last, however, can only be achieved implementing the newest technology (Elkins, Vanner, Firebrace, 2005).

The properties of produced water and its volumes are different to each field, and therefore require an individual plan for separation from oil compounds and purification. In order to do this, the operator should do an analysis of produced water constituents, primarily concerning oil constituents. The organic and inorganic compounds of produced water has its influence on the selection of chemical additives for oil/water separation process (Atarah, 2015).

Hydrocarbons occur naturally in the produced water. They include organic acids, polycyclic aromatic hydrocarbons (PAHs), phenols and volatiles. These hydrocarbons are considered to contribute the most to produced water toxicity. The available literature suggests, that the components of the PW that represent the most harm are: PAHs – polycyclic aromatic hydrocarbons and alkylphenols (C6-C9 according to Frost (1998), and C4-5 according to Myhre (2004). According to a more recent research by Faksness (2004), 85% of the C4-C5 alkylphenols dissolve in water, but suggests that more than 80% of PAHs reside in the

dispersed oil content (Elkins, Vanner, Firebrace, 2005).

There is still a scientific discussion of whether substances that remain in the PW represent risk to the environment, which is correlated with the perception of *risk* – the concept that will be assessed in the next Chapter. In case there is no evidence that the produced water causes no *harm* to the environment (living species), there will be no reason for the further abatement of the regulations. However, the risk may arise from the *perceptions* that the PW causes harm or might potentially cause harm, whether or not there is an actual science underneath. According to the precautionary principle used in the UK regulations, the unavailability of research does not imply that the substances are not harmful (Elkins, Vanner, Firebrace, 2005). It should be mentioned, that the initial requirement for the goliath field was zero percent discharges to the sea.

2.3.5 Organizational aspects of HSE

2.3.5.1 Organizational theory

The actions and behaviours of an organisation become significantly influenced by the institutional context in which they are located and various components of the institutional environment define what is deemed as appropriate for an organization operating within this environment (Barley & Tolbert, 1997)

There is a wide selection of literature on the organizational behavior. Organizational theory depicts the organizations as agents that respond to certain circumstances and situations (Greenwood, Suddaby, Oliver, & Sahlin, 2008). In the 20th century organizations were viewed as systems responsible for mass production, while in the modern times, organizations are considered to be complex entities with their own culture, beliefs, social structure, and that pursue their own goals. The answer to the question why organizations behave in a certain way lies within internal (people, organizational culture and structure, managerial styles, etc.), as well as external dimension (environment). In fact, according to Hrebiniak and Joyce (1985), organizational acts may have managerial (management teams differ in successfulness of their choices in the same environment) or environmental origins (selection of strategy that works best for a certain environment).

Other studies of organizational behaviour have shown that organizations are always part of a bigger social system, and therefore they seek *legitimacy* within it (Berg, Malikova, 2015). It is expressed in congruence to the norms and values of the environment around them. If the two systems are in line, the organization can be considered legitimate. In case of discrepancies between the two, the organizational legitimacy might be put in jeopardy.

“Legitimacy is a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions” (Suchman, 1995, p. 574). The path towards legitimacy has two optional ways: passive conformity and active conformity.

Institutional behaviours are “observable, recurrent activities and patterns of interaction characteristic of a particular setting” (Barley & Tolbert, 1997, p. 98). By modifying their behaviour to become isomorphic to institutions within their particular environment, organisations enhance *legitimacy*, and therefore their chance to survive.

The behavioural modifications can take two forms. Institutional theory refers to *passive conformity* as in this case organizational legitimacy becomes sort of a side effect of organizational adaptation to particular structures, beliefs and behaviours – institutional environment, while subject to cultural and social pressure enacted from the outside world (Suchman, 1995). So in this case an organizationcc adopts what is considered «normal» in this society in order to comply, and therefore get legitimized.

In contrast, strategic choice can be depicted as sort of *active conformity*, that views legitimacy as an operational resource organisations can extract and adopt, often competitively, from their environment in an attempt to meet their strategic goals (Suchman, 1995). Strategic choice focuses on analysing how characteristics of an organization are influenced by the internal settings and properties, instead of the external environment.

Organizations are primarily formed by individuals, who might interpret the external environment differently. The mentioned interaction between organizations and rules of the game is all about choices. Individuals are the main actors in organizations, and they may make choices based on costs, benefits, basing their views on on subjective perceptions; sometimes (or usually) on imperfect information. All this can result in institutional changes (North, 1990)

Key decision makers and those who possess more power are of particular importance in this context. They evaluate and define their position within the environment, and consequently take over only the necessary, or elaborate new institutional norms, behaviours, which in their opinion is in line with organizational goals and better suits the needs of adaptation and survival. So in the described situation it is not the external environment that is forcing the organization to comply, but key people *in* the organization.

According to Johnston (2013), “Strategic choice suggests that an organisation’s decision makers are able to override the physical environment in which they operate; isomorphism is not inevitable for organisations within an industry sector”.

Nonetheless, in reality, organisations are faced with both strategic operational challenges as well as institutional pressures (Suchman, 1995). Therefore, to effectively analyse the actions and behaviours of an organisation, one must look at the larger picture and incorporate the potential for duality of both these two concepts demonstrated by an organisation.

2.3.5.2 Organizational isomorphism

The contemporary context of internationalization and globalization implies that a considerable amount of companies from all over the world have branches, subsidiaries, and partners in other countries. This means not only homogenization, but at the same time differentiation and further complication of the environment organizations exist in, that therefore patterns of adaptation to it.

In practice this means, that the international companies operating in a certain country become uniform to the organizational and regulatory context they operate in. This problem was examined in a study of *organizational isomorphism* by DiMaggio and Powell (1983). The primary objective of this research was to find common patterns and triggers of this adjustment. This research later has become widely recognized as a milestone of the organizational theory.

The two scientists confronted Max Weber's point of view on why organizations tend to be so similar. He was of the opinion, that organizations, following the aims of rationalization and meeting competition with other organizations on the market, become bureaucratized institutions and that's indeed the bureaucracy that makes them so uniform. The two scientists argue, instead of just being rational, organizations start to resemble each other when they grow bigger, become more structured and establish themselves in a certain field. This process was called isomorphism: this concept, according to the two scientists, has been already introduced in a classic study by Hawley (1968) in reference to the social behavior theory. Isomorphism was defined as a «constraining process, that forces one unit of a population to resemble other units, that face the same set of environmental conditions».

The organizations follow the same path as described by Hawley, called «institutional isomorphism», that means organizations change their features and characteristics to match with the properties of the environment around them. DiMaggio and Powell (1983) found three

main mechanisms of institutional isomorphism: (1) *coercive isomorphism*: organizations become homogenized because of enforcements deriving from political systems they are in; or the need for legitimacy, both in a formal and informal sense, e.g. the laws, norms of a society; (2) *mimetic isomorphism*: organizations become homogenized, because an organization facing uncertainty in the institutionalized environment may copy another, more successful organization or an entity, that has been in this environment for a long time, and in this way methods to address this uncertainty become similar between the economic actors willing to adopt safe and well established practices to mitigate risk of failure; (3) *normative isomorphism*: organizations become homogenized because their participants possess same knowledge, professional characteristics, personal qualities, or points of view because of similar education, background or professional network of professionals alike.

Coercive pressure

The research question for this study is to a certain extent in line with the types of isomorphism introduced by DiMaggio and Powell, however the three main isomorphistic mechanisms require a more thorough description. *Coercive isomorphism* can result in both formal and informal pressures by other organizations, and culture in which they function. These pressures can take different forms, sometimes organizations have to respond directly to the governmental decisions, i.e. adopting new legally binding rules or regulations regarding a specific area of activity. (Ibid) Organizations, on their turn, come to reflect institutionalized and legitimized rules in a particular state, and therefore they acquire similarities that were formed because of the need to conform to a bigger institution (Ibid). Outside the governmental sphere of influence, similar patterns can be seen inside the big international companies, when branches and subsidiaries become subject to standardized management mechanisms, practices, and policies (Ibid). However, Di Maggio and Powell emphasize, that coercive isomorphism may be not so direct as in the stated examples, but rather more flexible and subtle.

Mimetic processes

Another type of isomorphism is referred to as *mimetic*, and the name itself reflects its main characteristic: imitation, because to *mimic* is to copy the behavior of others. *Mimetic pressure* occurs when an organization is trying to copy the behavior of other organizations in their environment to gain success or legitimacy (DiMaggio & Powell, 1983). While the main feature of the coercive pressure is *dependence*, that of the mimetic pressure is *uncertainty*. This characteristic aspect of the environment and objectives leads organizations to identify and adopt the practices of other, seemingly more successful organizations (Ibid). This

uncertainty can be understood as unclear goals and objectives; new technologies are being developed and put to use; the customer preference is unclear, and so on (Ibid).

The concept of «uncertainty» in oil and gas is twofold: first, it is tightly connected with risk, second - with knowledge, understanding (of a certain aspect), or the lack of it, and the flaws in knowledge are in direct correlation the risk. Therefore, in the context of oil and gas, the organization would rather seek to identify and implement the necessary knowledge base and experience of the leading organizations within their own environment, organizational field, and geographical area.

Normative pressure

This mechanism is based on the concept of *normality*, i.e. what is considered to be the correct, right, and what is considered a publicly approved way of behavior. Normative isomorphism is therefore driven by adapting to the practice that is common within the organizational field and is practiced by other employees, which governed by *professionalism* (DiMaggio & Powell, 1983). Professionalism, as was understood by DiMaggio and Powell, is, firstly, the process adapting and cognitive base that is formed by the educational institutions, university specialists or scientists. Secondly, it is an effect of the professional networks, where it is not rare that people, who went to the same universities discuss ideas, their work, their palns, what their companies plan to do etc. All in all, it is a formulation of a collective understanding of the appropriate behavior, set of rules, and, most importantly, knowledge among the professional members of similar organizations (Ibid).

The research question of this study of this study is *how* did Eni align it's regulations to the institutional environment it is in, so it is implicitly presupposed that several, if not all the mechanisms are present in the company. To thoroughly analyse these mechanisms in a specific organization, one should look at the whole history of the company's presence on a certain market, which is way beyond the scope of this study. What is important for this thesis is try to understand which of these types of pressures were manifested in a particular moment of time in the company's history, whether they blended together, or were not present at all. For these reasons, the three mechanisms will be brought back in the Discussion part of this thesis.

2.4 Summary

The Teoretical Framework for this study is quite large and has quite a lot of subchapters, because the concepts of HSE, risk, and safety - are complex and multifaced. Moreover, the context of the offshore oil and gas industry was also emphasized, because it is

directly connected to the fact that HSE risk management is so important. All in all, this chapter includes relevant theory that is related not only to the mentioned concepts, but also relevant for the further analysis of the regulations and for the case study was presented.

3 Chapter 3. Methodology

3.1 Research design and philosophy

Research design as all about making a choice: what will be observed and how. Moreover, a researcher should ask himself or herself what data will be collected, how, and from which sources, what should be primarily reflected in it; how this data will be analyzed and how it can provide answers to the main question(s) of the research or a study (Easterby-Smith, Thorpe, Jackson, 2012).

There is a variety of approaches that exist and are contrary to each other, but it is widely accepted that a research design should create the *best value*, in a sense that it should be able to provide the unique and the most suitable approach towards a specific problem in a way to uncover the maximum from the underlying truth of the matter. This said, this part will be concentrated on finding research philosophy and design that will best suit the whole study, rather than describing the philosophical debate and provide an explanation to every approach.

What will be researched? Conceptually, this thesis encompasses three realities: one external that can also be considered *institutional* (legislative framework), second that is *organizational* (internal regulations), and third is the environmental and regulatory context applied to the *Barents Sea*. The case study will be based on a specific project and the assumption, that these three contexts have influenced the company's actions on a specific stage of a project. There might be also sort of an interaction between these three realities and the company's actions. The goal thus is to find the possible *points of interaction that define the company's actions*.

This assumption is based on the claim, that human constructed concepts such as HSE, risk, safety, and regulation appear to give wide possibilities for interpretations based on the context they are being used, therefore this study have several limitations, mentioned in the Chapter 1. The existence of this «*context*» means the presence of a *hermeneutical component* (a technique historically known for interpreting the Bible writings - Dilthey & Jameson, 1972), which, in fact, will be later described more specifically as applied to the research design .

Starting from the conclusion drawn in the theoretical part, e.g. that the regulations represent the approaches of risk management in HSE, a descriptive/analytical part concerning Norwegian governmental regulations of the oil and gas activities and Eni regulatory framework of risk management in the company and its subsidiaries (Chapter 4), will establish this context for the research problem, while the Hypothesis 1 will be tested and consecutive conclusions will be made. Then it will all be narrowed to a case-study of the operational stage

of Goliat FPSO, which, supported by the information from the interviews and the environmental aspects of the Barents Sea, will illustrate how these three contexts interact and being applied in a real project.

The final conclusions are to be made in the *conclusions* to the study. In reference to the research problem it should be noted, that the company's «alignment» to the legislation in the country it operates is expected to be related to specific actions, defined by HSE risk management regulations, since, according to the theory and the Hypothesis 1, they are all different.

This research, in fact, has essentially three sets of data to be assessed: the Norwegian HSE regulations for oil and gas activities, Eni internal regulations of HSE and risk management, Goliat documentation related to communication with the authorities, and interviews of personnel. All sets of data are socially constructed and it might be, in fact, the case when the data itself provides the researcher with the most suitable methodology, while the researcher starts with no presuppositions, and therefore free of bias. Will the presentation of the legislative framework on one hand and regulatory framework on another completely free from bias? One would say probably not, since *a person* presents the information, and this inevitably involves a certain degree of interpretation anyway. It's true, that one should present the information in its integrity, but at the same time one also introduces it according to certain predefined criteria, that correspond to his/hers presuppositions on why the information you are referring to is important. But what is an *interpretation*? And to what degree it can be bias – free? It is hard to answer this question, but it is important to emphasize some considerations.

Primary to the data collection, the author did not suggest there is either a similarity or huge difference between the two regulatory systems. Neither did the author have any previous knowledge on how an international oil company manages its compliance with the legal frameworks of different countries related to HSE issues, or any idea on how these regulations were adjusted to the fragile environment of the Arctic. Moreover, the author of this study had no experience of studying regulations or legal aspects of the company's activities. The author has just inferred from his personal experience, some basic knowledge of the Norwegian context and the problems associated with the oil and gas activities in the Arctic. So it is possible to say, that the author approached this study free from bias.

The first indicator that the study is *constructivist in its nature* is that it has all started with an idea in mind, which was not only based on the available sources, but also on the author's personal interest and experience. This said, it resembles more an educated guess based on a personal, and therefore subjective view of a situation in question. Nonetheless, also

according to the previous knowledge of the author (which is not only his knowledge, but more a general knowledge found in the mass media) there is one *objective fact*: the platform did not start producing as it was scheduled in the project development plan. So all in all, this study will deal with socially constructed realities (institutional level and company level) in a real life context of the operational stage of a project. Thus in the end it is an interaction between subjective reality, and objective reality.

Taking into consideration all the information above, the study should employ a *qualitative methodology in all its parts*. Moreover, the study should be mainly focused on the regulations as a representation of risk management approaches.

The spotlight is thus directed on the combination of internal organizational processes, assumingly influenced by external environment while dealing with objective reality, which in this case take the form of the climate and laws of physics. In other words, all stated in the previous sentence can be described as managing uncertainty, and therefore risk. The approaches of risk management are reflected in the regulations and assumingly in the company's *actions* (on the operational stage of the project), which can provide a much more specific and clear picture, than just the regulations themselves.

What can represent the main data sources for this kind of study? In this regard Mintzberg (1979, p. 586) states: "Measuring in real organizational terms means first of all getting out, into real organizations. Questionnaires often won't do. Nor will laboratory simulations... The qualitative research designs, on the other hand, permit the researcher to get close to the data, to know well all the individuals involved and observe and record what they do and say". Therefore it will only be possible to arrive to the final conclusion with the aid of the documents, illustrating the company's work on the Goliat project and interviews with relevant personnel.

According to several indicators mentioned above, it is also possible to state that the study is assuming an epistemological position resembling the social constructivist paradigm. There is, in fact, no objective truth to uncover, and thus the study is seeking to find knowledge through personal interactions (Easterby - Smith, Thorpe & Jackson, 2012). It will include in-depth interviews with industry representatives and staff from the HSEQ department in Eni Norge, and, accordingly, it would be wrong to assume that everything that will be heard is an objective truth, while it would be right to suggest that the conversations, discussions, or descriptions will involve a certain percent of interpretations, e.g. constructionism. Moreover, the documents that will be analyzed usually have a specific format, layout, structure and, most importantly, the requirements regarding the information that needs to be presented.

Same considerations can be applied to legislation and company's regulations. These represent sound, carefully evaluated and elaborated bodies of text, that include definitions, notions, facts, prescriptions, and principles. Nonetheless, the laws can be applied and treated differently, so it can not be taken for granted that the laws and legislation equals scientific fact. According to Kukla (2000), facts can also be interpreted in a different way.

Another consideration regarding the constructivist nature of this research is reflected in how Rusbult (PhD) defines the *truth as what actually is happening in reality*⁷, or what actually did happen in reality. A humanly constructed theory claims to describe and/or explain reality, to understand reality. «When we make claims based on a theory (by assuming the theory is true, and using "if... then..." logic by thinking "if this theory is true, then ...") we are making truth-claims about the reality of what is happening now, or did happen in the past. Our truth-claims are true if they are correct, if they correspond to the truth of what actually is happening (or did happen) in reality; and our truth-claims are false if they are wrong, if they do not match the truth defined by reality» (Rusbult).

The opinion introduced by Kukla that facts are also being interpreted differently is perfectly in line with the claims of Ken Ham (2003) in the article “Searching for Magic Bullet”⁸. Referring to the creationist versus evolutionist debate, he comes up with a point of view that all scientists are actually dealing with the same amount of data, observations, facts, nonetheless they interpret them differently, and that’s where the debate really is: “Ultimately, the argument (evolution versus creation) is about how you interpret the facts-and this depends upon your belief about history. The real difference is that we have different “histories”..., which we use to interpret the science or the facts about present”. In other words, because of the fact that nobody knows exactly what did happen in reality, scientists have to interpret facts and make reality claims based on these facts, but the interpretations can be very different because simply everyone is different, although facts (or scientific evidence) are the same. These claims explain, why risk management regulations are so different.

But what does risk management regulations represent? What is the purpose? Back to Rusbult, according to the postmodernist theory, the truth is relative and sometimes the perspectives on truth actually blur the line between belief and reality. Rusbult emphasizes that there is an important difference between *humanly-constructed reality and human-independent reality*. «A modern example of humanly constructed reality is the societal agreement, adopted

⁷ <http://www.asa3.org/ASA/education/views/reality.htm>. Article «Reality 101: Basic Concepts of Truth and Postmodernism (truth by correspondence or construction)». The article has no date.

⁸ <https://answersingenesis.org/evidence-for-creation/searching-for-the-magic-bullet/>

by consensus and institutionalized in traffic laws, that we will stop at a red light, and that in America (and in continental Europe but not Britain or Japan) we will drive on the right side of the road» (Rusbult).

«But if there is a collision, due to someone running a red light or driving on the wrong side or making some other mistake, humans do not construct the laws of physics that determine what happens during the collision. Yes, we can minimize the harmful results of a collision by constructing cars with air bags, collapsible bumpers, and other safety features. But we achieve this *humanly-constructed reality* (in which we have safer cars) by acknowledging and understanding a *human-independent reality* (involving the physics of collisions). We can build safer cars by cooperating with reality, by designing cars within the context of the physics that really exists. But we cannot build safer cars by denying this reality, by trying to overcome it through faith in a kinder-and-gentler physics we have constructed; during a collision we would prefer this physics, but we cannot produce it» (Rusbult).

So conceptually, risk management can be viewed as a meeting point of subjective – objective reality. From the previously mentioned theory more questions do arise on how we perceive information about the phenomena: whether it is a testament of an objective truth or socially constructed reality. Generally speaking, the phenomenon studied in this research is HSE risk management on different levels – on a governmental level, and on the company-level. Thus, the main point of the assumption is that this procedure arises from how the objective reality is perceived on different institutional levels, and how it is managed within a specific organization, and how external subjective reality influences these managerial choices.

Nevertheless, the question then remains: why is HSE management not an objective truth? First, phenomena we would normally consider as more solid has in certain circles already been accepted as socially constructed. Especially considering the fact that this concept is not an observable objective fact. Although this notion is not similar to such concepts such as humanity, gender, race, emotions, which modern researchers tend to view as socially constructed (Kukla, 2000), it still can not be observed in nature, and therefore according to positivist methodology, is not an objective fact. Secondly, if HSE management was an objective truth, then more uniformity in definitions and approaches not only on different institutional levels, but in different societies would be observable. Nevertheless, what we see now is that there is, in fact, a great discrepancy between how the legal frameworks are created, formulated and exercised, and controlled – and there are also differences among how the companies choose to interpret the concept itself and HSE management as a procedure.

Berger & Luckmann (1966) study the relativity of reality and knowledge in society and between them, stating that a person's reality and knowledge differs with his or her social setting. This paves the way for another argument, that individually, all people experience different realities and have different knowledge. The same statement can be applied to companies, which differ in their core business, goals and objectives, organizational culture and so on. Companies and governmental bodies consist of people, and some people have the responsibility for adopting a unique definition of, for example HSE and its management, that they consider the most applicable only in this company or country. Considering that this study is primarily concentrated on one company, it can be argued that the perception of reality would be fundamentally different among, lets say, board of directors of this company and any other company, which strengthens the argument that the concept of HSE, as well as several other concepts relevant to this study, are socially constructed.

From the analysis conducted in the previous paragraphs it can be inferred, that this study is adopting a point of view that *everything is constructed*, except for the laws of physics, the external reality independent from people. This study, in fact, balances between the two versions of reality that were described in one of the previous paragraphs. It is a bridge between two realities: one is undoubtedly constructed (the governmental legislative framework, Eni's internal regulatory framework), and the other represents the objectivity of reality of the conditions in the Barents Sea, and the risk that derives from them.

Both constructed realities are introducing *order*: in one case, it's order for operations and activities, that are ultimately related to well being of a nation, in another – order inside a company, which is vital for the company's future and reputation. The common thread is, nonetheless, an interaction that is assumed to be present between the reality that is a given, e.g. it is already there, established, and the reality that has to adapt to what is given. This adaptation and interaction, which is essentially what is going to be studied, is also constructed by humans, and therefore the knowledge that this paper is posing the goal to uncover what is socially constructed, e.g. made by humans. So it can finally be concluded, that a *milder constructionist methodology* might be the best choice for this study, because the the problem does not imply an objective truth to be uncovered, but instead how constructed realities transform under the pressure of the objective facts, or human – independent reality, according to Rusbult.

The problem of this study primarily poses itself a question «how». This implies the existence of an assumption, that is human constructed by its nature. The ideas on of socially constructed knowledge were described by Mannheim, Berger and Luckmann («The social construction of reality», 1967), Lincoln and Guba (The Natualistic inquiry, 1985), and later by

Lincoln and Guba (2000), Shwandt (2000), Neuman (2000), and Crotty (1998) among the others. One assumption is similar in all of these studies, that individuals seek to understand reality around them, in which they live and work, and the conclusions they come to becomes their knowledge, experience, e.g. the basis people recall when it comes to decision making, and what is prior to this – give meanings to situations they find themselves in. In order to gain more knowledge about the world a person might develop subjective, attributed towards certain objects and things meanings of their personal experiences.

Following this logic, and considering the primary building block of any organization are people, they will act in a similar way. This assumption takes the path introduced by North in 1990 further. It actually opposes his point of view: in modern day organizations the role of key decision makers decreases, and key decisions are more and more a collaborative, interactive effort, which not only involves actors whithin the organization, but outside it as well.

The meanings, knowledge, experience – all together they form a kaleidoscope of people's individuality and professionalism. Thus, the researcher cannot afford to narrow down the subject of the study, but instead should analyze it in its complexity. The goal of the researcher would be to rely as much as possible on the participant views of the situation being studied, a view that is a construction, the application of meaning to a situation. Often these subjective meanings are negotiated socially and historically. In other words, they are not simply imprinted on individuals, but they can also be formed through interaction with others (hence social constructivism) and through historical and cultural norms that operate in individuals. Finally, constructivist researchers also focus on the specific contexts in which people live and work in order to understand the historical and cultural context of the participants (Cresswell, 2003).

In light of the above items it can be inferred the author will stick to qualitative methodology with a type of a constructionist research design to be used: case method. Case study according to Yin (2003) should be considered when: (a) the focus of the study is to answer “how” and “why” questions - in such a setting, a case study would be an *explanatory* one (b) you cannot manipulate the behaviour of those involved in the study; (c) you want to cover contextual conditions because you believe they are relevant to the phenomenon under study; or (d) the boundaries are not clear between the phenomenon and context (Baxter, Jack, 2008).

Again, according to Yin (2003a, p.2) "the distinctive need for case studies arises out of the desire to understand complex social phenomena" because "the case study method allows

investigators to retain the holistic and meaningful characteristics of real-life events," such as organizational and managerial processes (Kohlbacher, 2006). As it was already mentioned, case studies appear to be the preferred strategy not only when "how or "why" questions are being posed, but also when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context (Yin, 1981, p.59, 2003a, pages 2, 5-10).

The author believes that the study corresponds to most of the criteria defined by Yin. Consequently, the type of the case study should be selected, based on the overall purpose of the study. Yin (2003) and Stake (1995) describe the variety of the types of case studies existing. Yin categorizes case studies as *explanatory, exploratory, or descriptive*. He also differentiates between single, holistic case studies and multiple-case studies. Stake identifies case studies as intrinsic, instrumental, or collective. After a thorough assessment, *a descriptive single case study* looks like the approach that fits best the purpose of this study. This type of case study is used to describe an intervention or phenomenon and the real-life context in which it occurred (Yin, 2003). Clearly, the context of this study is the operational stage of the Goliat project, and the phenomenon to be studied is the alignment of Eni's internal regulations and the company's actions in the described above reality and environment.

3.2. Data collection

The data collected for this study is essentially qualitative. Firstly, because the basics and the context for this study are the Norwegian legislation for oil and gas activities and Eni's internal regulations concerning HSE risk management in the first place - the nature of these data sources is qualitative. Secondly, the research question («How») does not require any quantitative data to be evaluated since, as it was previously said, the zeitgeist of this study and the concepts in question is strongly constructivist. Moreover it's hard to say how the quantitative data will help to make the right conclusions and represent any value. Finally, the ethical concerns, such as asking a company for numbers should also be taken into consideration.

The Norwegian legislative framework in HSE was taken mostly from the PSA webpage, the other sources can be found in the reference list. It might seem that the Chapter 4 is quite descriptive, but approach that the author chose for this section was to imagine a situation when a new company considers to start activities on the NCS and seeks a brief and simple introduction to the Norwegian legislative system for this kind of activities, which is quite different from that in other oil exporting countries (i.e. Russia) (Berg, Malikova, 2015). For this part, only the English translation was examined. The Eni internal HSE risk

management rules and guidelines were available partly in Italian, partly in English, so relevant parts were translated from Italian.

The data collection regarding the case - Goliat project and its operational stage is twofold: on one side the author will use the disclosed documentation on the FPSO and other materials in public access that were provided by Eni Norge, on the other side will be in-depth, semi-structured interviews with HSE staff from Eni Norge, directly involved in Goliat project. The prior knowledge acquired through analysis of the Norwegian legislative regulations and their principles, as well as Eni regulations and information on the development of the Goliat project will serve as a foundation for the interview guides with the informants, who were available for an interview.

The semi-structured interviews were considered the most viable option for this study because of several reasons. Easterby-Smith, Thorpe, and Jackson (2012) consider both semi-structured and unstructured interviews appropriate in three conditions: when it is necessary to understand the specific constructs, such as language, professional terminology etc., in our case this would be related to HSE. At the same time, according to the same authors, the objective of the researcher in case of an in-depth interview is to develop an understanding of the respondents's views in their integrity in order to obtain the «whole picture» of a particular situation, to understand the unclear logic of a specific situation, or the interviewee might be much more open about the mentioned situation confidentially in a one-to-one conversation. All the mentioned pre-requisites were found applicable to this study. As it was already mentioned, at a certain point the data flow will be narrowed down to the case study, where personal views, experiences, and stories might be essential to uncover the information that can provide an answer to the research question of this work. The case being studied is very specific, and the aim is to uncover some practical issues, so the interviews are, actually, the keys for the research question answer. At the same time HSE management, especially for a project that is currently in the spotlight in the oil and gas world, a project that will define the image of the company, might be a sensitive topic for it. This is the case to where a less-structured interviews, where people can open up more and feel more relaxed and personal, might be of a well use.

3.2.1 Setting and participants

All interviews took place in Eni Norge's office in Stavanger, in a room which is usually used for Goliat project team meetings. The interviews were thought to take place in a relaxed atmosphere, but in practice they were not. The fact that the interview took place in the company's office during the working hours didn't positively influenced the mood of the

interviewees, thus providing some limitations to the research. However, feedback from the conversations with other Eni employees from Moscow, as well as excerpts from primary communication with HSE personnel in Eni Norge will also be used in the study.

3.3 Data processing and analysis

Following the initial mindset of allowing the ideas and hypotheses to be sort of a continuation of the analysis being done, an overarching research design was born during the elaboration of the methodology for this research. The methods that will be applied in this study are hermeneutics and content analysis. Nonetheless, the methods of data processing will be slightly differ relatively to the stages of the study. The next chapters will cover how the data will be gathered and assessed, following the approaches of content analysis and hermeneutics; why they provide a suitable strategy for the analysis for each stage of the study.

3.3.1 Content analysis with traces of grounded theory for qualitative data analysis

Content analysis is considered as a flexible method for analyzing text data by researchers (White, Marsh, 2006). It is subdivided in a family of analytic approaches ranging from impressionistic, intuitive, interpretive analyses to systematic and strict analyses of the text (Rosengren, 1981). In fact, the intuitive analysis might be a good approach for this study. The specific type of content analysis approach chosen by a researcher varies with the theoretical and substantive interests of the researcher and the problem being studied (Weber, 1990). Although this flexibility has made content analysis useful for a variety of researchers, the procedures to be applied in content analysis are not defined precisely, which has limited the application of content analysis (Tesch, 1990).

The main part of the study starts with the descriptive analysis of the two regulatory systems, that are allocated on different institutional levels: one is on governmental level, another is applied only in one company. But the actual evaluation and framing of this data applying existing methods might represent quite a challenge.

Content analysis starts its long journey in 18th century in Scandinavia (Rosengren, 1981). Initially researchers used content analysis as either qualitative or quantitative method, but now it has all gone to long established controversy quantitative versus qualitative. The strong support for quantitative content analysis was recognized after Harold Lasswell's publication "Power and Personality" where it was first introduced. Bernard Berelson (1952) took Lasswell's approach further and in his work "Content Analysis in Communication Research" proposed a definition of content analysis which, from this point of view, is

emblematic: «a research technique for the objective, systematic and quantitative description of the manifest content of communication». After Berelson, qualitative content analysis gained strong support and popularity as a primary tool for content analysis, with text data coded into specific categories and then described using statistical tools (Hsieh, Shannon, 2005). Nonetheless, now both qualitative and quantitative tools for content analysis are becoming purpose – centered: quantitative tools are increasingly being used for analysing social trends and opinions in mass media, social networks, big data, while qualitative methods are used in social and humanistic studies.

This has happened because of several fundamental differences in these two methods. Zhang and Wildemuth (2009) emphasize several of them: quantitative methods usually imply deductive reasoning , while qualitative content analysis usually takes to the inductive reasoning, allowing the inferences and assumptions emerge from the raw data after careful assessment; data sampling in quantitative content analysis should not be carefully picked as in its qualitative counterpart; and finally, as perviously mentioned, the output of quantitative content analysis is usually statistical or at least has something to do with statistics, while after the qualitative assessment a researcher will hardly get any numerical output (Ibid).

Easterby-Smith, Thorpe, and Jackson (2012) state, that a researcher can make use of the content analysis approach in case of a data interrogation for constructs and ideas that were previously defined. Simply put, this approach, partially influenced by quantitative methodology, (Easterby-Smith, Thorpe, Jackson, 2012) intend creation a matrix or a scheme that can be used to give sense to a text and capture constructs that can lead to a main idea, the meaning of a text or other set of data. Nevertheless, this matrix can only come into being from a starting hypothesis or assumption. This is true for this work, but not completely. Grounded analysis on its own turn is closely linked to the concept of grounded theory and provides an opportunity for a more open approach towards data interpretation and analysis.

This corresponds to the approach that was initially taken for this study: before the data collection even started, it was almost clear that the initial assumption will not be the only one, and the initial (contextual) sets of data will provide the ground for new hypotheses, especially considering the fact that the data was completely new for the author. This is in line with considerations made by Easterby-Smith, Thorpe, and Jackson (2012), who emphasize that although these two approaches are considered competing, it is more a continuum between these two than «one or another». This being said, a *mixed approach* can be implemented for this study. Moreover, the hypotheses that might arise, combined with the information from the mentioned two sets of data can constitute context in which the conclusions from the content

analysis of the interviews can be consequently placed. Or conversely, they can provide the matrix for the content analysis itself. Finally, it can be a combination of these two considerations. Schematically the selected «mental map» for the data processing is illustrated in the following Figure:

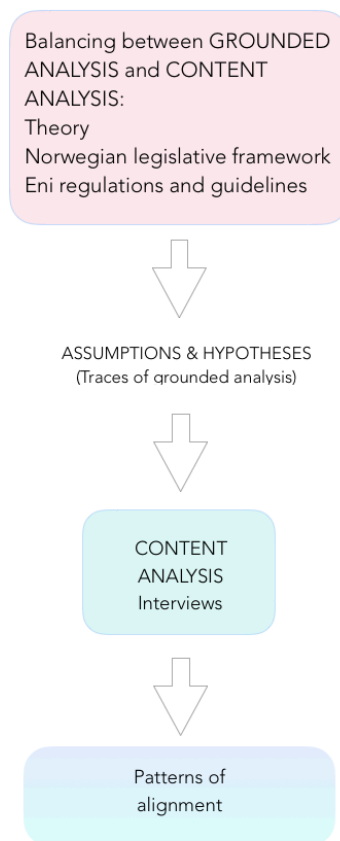


Figure 9. The «skeleton» of the research design

Seven steps are usually used in all approaches to qualitative content analysis. All of them imply a similar analytical process, including formulating the research questions, selecting the sample to be assessed, defining the categories to be applied, outlining the coding process and the coder training, implementing the coding process, determining trustworthiness, and analyzing the results of the coding process (Kaid, 1989).

Coding is essential for the success of a content analysis, its usage is necessary in all variations of content analysis, both qualitative and quantitative. The basic coding process in content analysis is to organize large blocks of text into few content categories (Weber, 1990).

The coding strategy stands for assigning a special code or label to language construction inductively from raw qualitative data a researcher was able to get (Strauss & Corbin, 1998). This method can take two forms: one (the most basic) is referred to as *open*

coding, that is defining the word or a construction that represents value for a researcher, or carries information the researcher is looking for; second is called axial coding, which is structuring a group of codes on a higher level (Ibid). This type of coding can involve hierarchical (sortable) and non-hierarchical (non-sortable) coding while grouping codes into categories (Ibid). Hierarchical axial coding allows to add other layers, utilizing sub-codes within certain categories. The approach to coding that is commonly used is to code the complete text, and look for relationships and determine the axial codes afterwards.

The method of coding will be used in the Chapter 4 of this study, to extract the *core feature and characteristics* in the regulations of the two companies. However, this will not be the same process as described in the last paragraphs. As for the extraction of language constructions, the process will be similar to that described by Strauss and Corbin (1998), and the method that will be used is *open coding*. But the codes in this case will represent the unique features of the regulations, and sometimes there might be a necessity to infer them. Nevertheless, this approach will be minimized to an extent less possible in order to exclude any bias.

According to Hsieh and Shannon (2005), qualitative content analysis has three more specific approaches: conventional, directed and summative content analyses. These approaches differ mainly in ways of coding the data. *Conventional content analysis* is considered appropriate when there is not much existing theory or literature on a phenomenon that is being studied available. Researchers avoid using preconceived categories (Kondracki & Wellman, 2002), instead allowing the categories and names for categories to flow from the data. Researchers immerse themselves in the data to allow new insights to emerge (Ibid), also described as inductive category development (Mayring, 2000). Many qualitative methods share this initial approach to study design and analysis. So when this approach is being used, open codes and axial codes (categories) are being extracted from the text directly, letting the text (usually interviews) determine the categories (Hsieh & Shannon, 2005).

Directed content analysis is mainly used when there is a prior research, theory, or knowledge on a specific topic, and a new research is usually seeking the goal to extend or validate the existing information (Ibid). This said, the researcher will therefore rely on the previously developed categories. They will be consecutively used in the coding scheme, that is commonly represented by the research findings of the previous works. The researcher then continues to search for information or constructions that fits the pre - defined categories (Ibid). Existing theory or research can help shaping the research question. It can also help assuming the main variables or the possible relationships between. All this can help to

determine the initial coding scheme or relationships between codes (Mayring, 2000). The strength of this approach is that you know what you are searching for.

Finally, a *summative content analysis* is rooted the quantitative approaches. It implies representing certain words or content in text with numbers. The purpose of doing this is understanding the contextual use of the words or content, counting the linguistic constructions and comparing them (Ibid) After this quantification is done, the more subjective search for meaning commences, but this research is not centered specifically on meaning, but rather on the exploration of usage (Ibid). The presence of a particular word or content in textual data is also referred to as manifest content analysis (Potter & Levine-Donnerstein, 1999).

The order in which these approaches are presented reflects a scale from more deductive reasoning (content analysis) going down to inductive reasoning (summative analysis) (Hsieh & Shannon, 2005). As it was already mentioned, the primary approach for this study was kind of a *tabula rasa* meaning not the full absence of any primary research or theory in a similar field, but rather an aspiration for an «exploratory», bias-free mode. Nonetheless it's necessary to admit, that a bias of conclusions made by existing theory and the initial data represented by the regulations from both sides had an influence on the research, for example the fact that the concept of *risk* can be different depending on the circumstances. Since the essence of this study is expected to be derived from the interviews, the most suitable approach will be a conventional content analysis.

The elaboration of the suitable methodology has significantly altered the already mentioned «mental map» with which this study was initially approached (Figure 9). At the same time, this map took form of a schematic representation of the research design. One might think this research lacks a structured approach and he might be even right, but the author not only intentionally allows the hypotheses and assumptions to pop up, emerge from the analysis and the data, but also the ideas for research design and methodology as well. This is an attempt to interact, to communicate with the information, interpreting it and giving a voice to the plain data and theory all at the same time. But how this attempt match any theoretical or phylosophical methodology?

3.3.2 Hermeneutics

Both for theoretical comparison and the case study it mst be useless and unnecessary to try to apply existing concepts or create coding categories, since it is is not a research in the sphere of legislation and law, nor an institutional study. Likewise, there is no point in comparing the two sets of rules and regulations word by word. Thus, another methodological

philosophy should be applied for the legislative comparison. As it was mentioned, the goal of presenting the two regulatory systems was to establish the context for further digging for answers to the main research question. *Hermeneutics* philosophy might be in line with this perspective.

The term hermeneutics (from the Greek *hermēneutikós*) originates from mythological character of Hermes, the messenger god of the ancient Greeks. In order to deliver the messages from the gods, Hermes had to be familiar with their language as well as with that of the mortals for whom the messages were destined. Thus, Hermes had first to understand and interpret these messages for himself in order to know what the gods wanted to communicate before he could translate, articulate, and explain this to mortals (Mueller-Vollmer, 1986). After the twentieth century hermeneutics has been established as a methodology organized around the problem of interpretation, both linguistical and philosophical, making interpretation and language a point of departure for this new promise in philosophy (Garagalza, 2013).

The main contributors to this new movement were Martin Heidegger and his student Hans – Georg Gadamer, who revived the problem of interpretation, making it a necessity, characteristic for all human beings (Ibid). Following the already mentioned property of hermeneutics, «the interpretation appears in connection with language and is presented as a universal problem, affecting our experience as a whole, our awareness of the world, and our self - knowledge and relation to the other. This problem may, therefore, provide us with a guiding thread to the universe of human discourse in its totality and as a guide for our reflections on the human and its world. It could be said that the human cultural universe is a fabric of words, models, concepts, theories, hypotheses, and so on, that is to say, of interpretations, mediating between human beings and reality - interpretations, within which both (humans and reality) acquire their specific configuration and determination. Hermeneutics studies, precisely, this interpretative relation between the human and the real, and it treats this relation as a starting point for the rethinking of philosophy as a whole» (Garagalza, 2013). Based on the information introduced, using hermeneutics for this study will presumably allow to understand the context around the research problem, at the same time allowing the context help the author to formulate the hypotheses and assumptions, based on which the next part of the study will be concentrated.

There are nonetheless several properties of hermeneutics that should still be considered: hermeneutic circle, the whole and the part, and language. *The whole and the part* refers to one of the core ideas of hermeneutics, resulting from the practice of interpreting ancient texts. The approach derives from the assumption that certain concepts of a text cannot be represented in

its entirety, unless the full meaning of a text is delivered (Dobrosavljev, 2002). Thus the part is inseparable from the whole, and the terms and concepts can be called “the part”, and the full text “the whole”. However, the essential part of this consideration is the meaning, or understanding of a full text. It can not be fully understood without any knowledge of the context it was written in. This claim can find its confirmation in the literature classes: introducing a new piece, the teacher also provides the author's autobiography and the historical context it was written in, so the perception of the part becomes more understandable and meaningful based on the understanding of the whole. The point of view of the described situation, the context that can be a continuation of the whole and part relationship, the context becoming the whole, and the text itself – a part. Therefore, the perceived meaning of the part or of the whole can both change with respect to examining the one or another, or all together. The last option is, of course, preferable. This interdependence between the whole and the part can be considered universal, and is the foundation for the cognitive understanding (Ibid).

Hermeneutic circle, according, again, to Dobrosavljev (2002) is «the basic structure of cognition in general», that it simply the cycle of «understanding» (Figure 11). This circle is free from the strict logic, allowing a «flow of time and meaning» (Ibid). It develops the concepts in a flexible and changeable outline. These possible changes in understanding mean the awareness of the limitations deriving from the preconceptions. They do not imply personal limitations, character or biased approach: according to Gadamer, preconceptions are not more than prejudices, that does not influence the whole (Ibid). The last claim is extremely important for this study since the preconceptions were present and were assumed to cause bias. Now it becomes clear that they are not, and the study is free from bias.

Considering the information above, it is possible to assume that the hermeneutic circle ties all the precepts, assumptions and ideas together. Figure 11 describes the basic relationship between the whole and the part, and how their interdependence influences the whole understanding of a certain source of information. The circle also constitutes the basis for Figure 12, which further elaborates, following the steps of Berg and Malikova (2015), on the relationship between the researcher and the participant – in case of this study, the author of a text or the interviewee in an interview, continuing and reflecting the interplay between the whole and the part.

«The continuous whole/part idea is operationalized on both participants. Both circles represent the basic hermeneutic circle: and within each circle; within each person, lies a set of prejudices that will be broken down. So the interesting phase of the process is the one that is marked in red, in the mutual area of the circles. In this area, there is a melting of understanding,

i.e. the understanding is mutual between the interviewer and interviewee. They will exit from the circle at the exit point, where they have reached the end of their mutual understanding. In the event that it is possible, it is important that both parties verify and accept the understanding that has emerged» (Berg, Malikova, 2015).

In the aftermath of the information provided in this Chapter, it becomes clear that the last two notions turn up to be a common thread for the research design and methodology of this study. Referring to this, the two Figures are to be done in order to represent crucial parts of the research design.

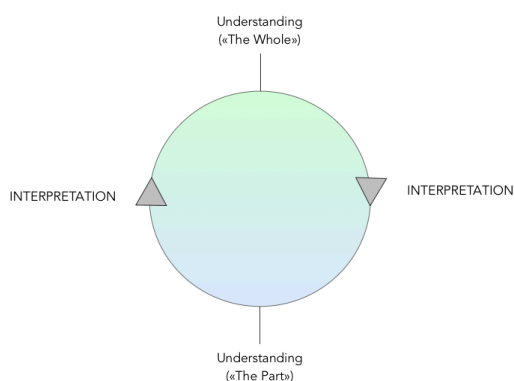


Figure 10. Basic hermeneutic circle

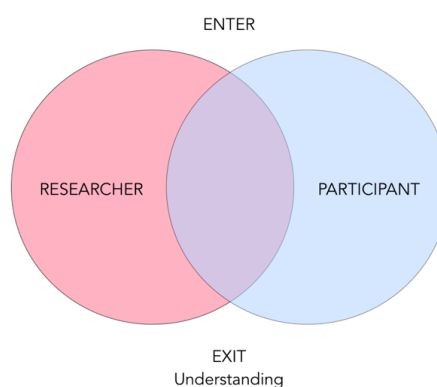


Figure 11. Hermeneutic circle with two participants

Based on the previous considerations and the attributes of hermeneutics, the overall research design is represented in next Figure, and will be further assessed in the next few chapters.

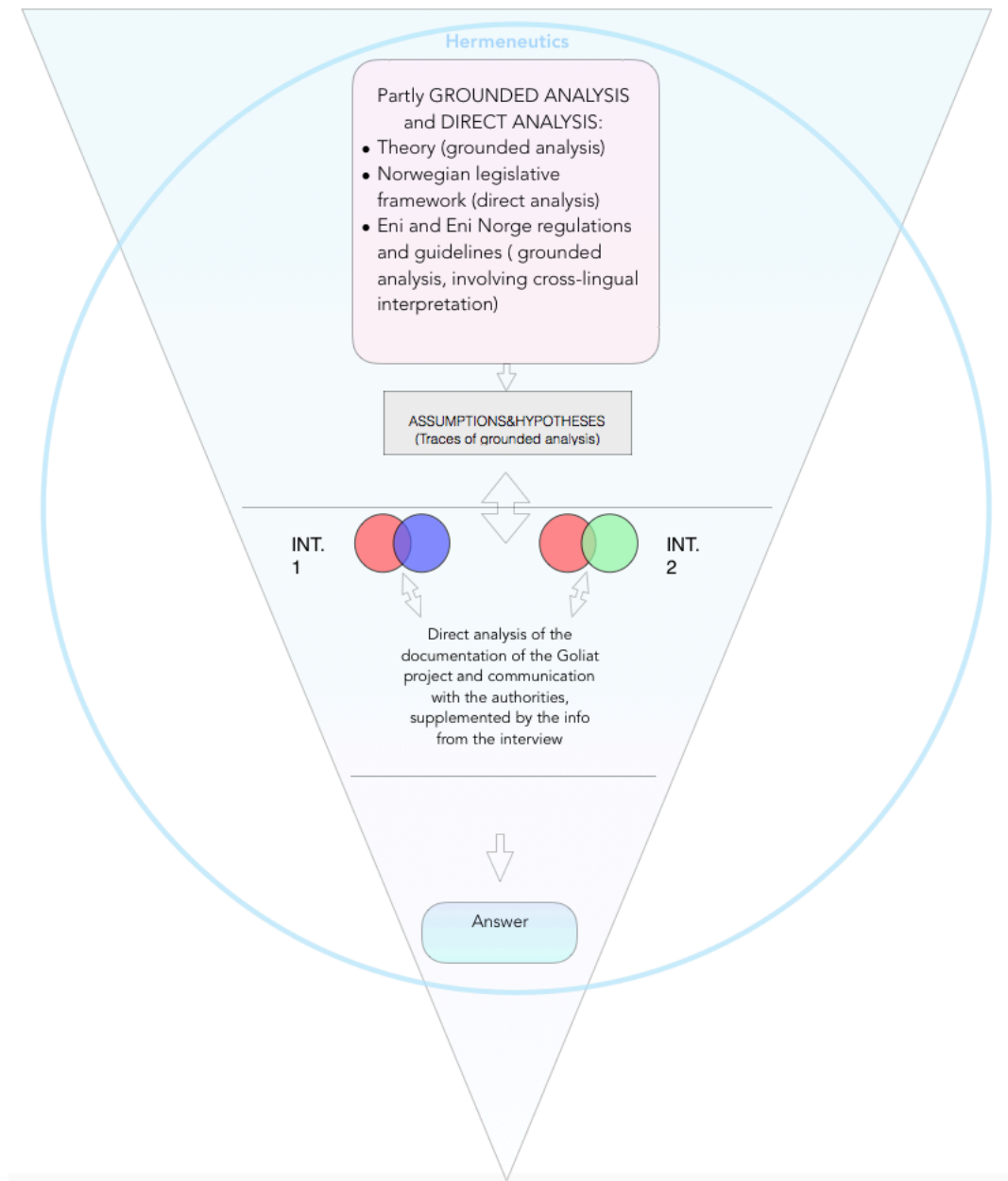


Figure 12. *The research design.*

3.3.3 Hermeneutics with content analysis as a research design

The considerations from the previous parts permitted to elaborate the final research design represented in the Figure 13. It should be noted, that the previous research was almost absent in a similar field and with a similar approach, focused on the practical relevance of the study and simplification of complex matters, so the research design was elaborated from scratch, uniquely based on the author's view. Hermeneutical understanding is the red thread of this study and will be applied in every stage of the research. The main tool for the data analysis will be different methods of content analysis, based on their suitability for each specific data source. The design looks like an inverted pyramid, because the whole research

goes «from general to specific and from complex to simple». The following subchapters will elaborate more on what should be done on each stage of the analysis.

3.3.4 First stage: understanding the regulatory frameworks

In order to be able to compare the two regulatory framework, the specific criteria should be defined. The understanding of the regulations will be based on two levels of analysis: first, the analysis of the policy design theory, second – that of the main features of the regulations, based on the content analysis and the context, in which the regulations were elaborated, how, and what is actually being regulated. Then, the features of the regulations will be assigned a label, based on the author's method, illustrated in the Figure 5.

The research question starts with the word «HOW», and this gives the primary indication, that «HOW» is not reflected in the PRESENCE of certain concepts in the regulatory frameworks, but instead is the reflected in the main REGULATORY PRINCIPLES and features, established in the mentioned documents.

The whole process, which finds its roots in content analysis aided by the hermeneutical philosophy and methodology, will look as follows:

1. Presentation of the Norwegian legislative framework (introduction, risk concept, main governing bodies etc.)

2. 1 level of analysis: policy design principles

3. 2 level of analysis: main features and aspects of the regulations (by direct content analysis+accessible literature)

4. Summary and conclusions

1. Presentation of Eni regulations

2. 1 level of analysis: policy design principles

3. 2 level of analysis: conventional content analysis of the regulations+cross lingual interpretation where needed

4. Summary and conclusions

1. Comparison of the two regulatory frameworks: merging the main principles between the regulations and defining the points in common if any of them will be found.

2. Conclusion and findings

3.3.5 Second stage: case study

Maintaining the overall research design, interviews and documents provided by Eni Norge become a «part» of the whole, which is the oil and gas activity in a specific context. In fact, previously this part is thought to provide a proof or denial of the assumptions made in the previous stages of the study, but after a thorough analysis this part is actually thought to provide additional information to the summary of the two regulations and make a final contribution to the answer to the research question. For these purposes a combination of conventional content analysis and direct analysis (the last one is aimed at defining the principles of the regulations, explicitly or implicitly reflected in the documents, which illustrate the activity of the company), was considered the best tool.

The thesis is layered on two stages for several purposes. First, it's a ladder for the «whole» to the «part», from general to specific, and the research design reflects this. Secondly, it is an elaboration of data aiming at a conclusion which will make sense, going from general to the specific.

The institutional level of HSE (the sum of the legal frameworks) is the most rigid level, and can almost be accepted as a constant. The company-level management of HSE is flexible, and is also the level that requires adaptation so long as compliance remains the imperative for the company. Therefore, one precedes the other: the thesis is not about how the legislations will change to meet the practices of the companies: it is about how the companies adapt to meet the requirements of the legislations and what practices are implemented in the Norwegian context. This adaptation is assumingly reflected in specific activities and procedures implemented by the company, and defining these with a high level of probability is the final destination for the research.

3.3.6 Third stage: discussions and definition of practices adopted by the company to meet the requirements

The final third stage of the study is aimed at providing a comprehensive, simple answer on the research question, based on all the analysis done. Most importantly, the specific solutions and actions of the company should be defined. This part will also define the fundamental principles, according to which the Goliat project was developed.

3.4 Validity and reliability

Newton (2009) in «Reflexivity, Validity and Roses» elaborated on what does «validity» mean. She emphasizes, that validity is often said to represent the differences in

epistemology amongst researchers, because everyone has an individual understanding of what is a valid research. She comes to a conclusion that a researcher, regardless of whether it is a qualitative or quantitative research, makes a contribution to the construction of the meaning of its own research. Therefore, one should be self-reflexive enough on his/her findings, regardless of whether it is a «social construction» or not.

Validity of the qualitative studies, according to Sandberg (2005) can be elaborated according to three criteria: *communicative, transgressive, and pragmatic validity*. Communicative validity involves a continuous dialogue between the researcher and the subject that is being studied. For example, in case of an interview the researcher should ask open-ended questions, be open for a discussion and collaborate with the interviewee on certain subjects or aspects – all this can ensure communicative validity (Ibid). Certainly, it may be the case for this study, because during the time this thesis was written the author continuously collaborated and spoke to people involved in HSE in Eni and Eni Norge and a lot of information, especially particular details, gathered from this communication was later included in the final version of this thesis.

Secondly, pragmatic validity, according to Sandberg (2005), involves testing the knowledge in action. This is achievable by testing the knowledge/statements/interpretations of a particular subject in the interview (Ibid). This technique was also employed for this report and the interviews were structured accordingly. Many questions in the interview guide (see Appendix 3) were designed to see how a particular statement (in the regulations, for example) has worked in practice, or to check whether an assumption/own statement on the subject in question was right or wrong.

Finally, transgressive validity means to examine validity from various standpoints of whether the conclusions reflects the «indeterminate fulfillment» (Ibid). One of the ways to examine transgressive validity is to check for «differences and contradictions in a lived experience» (Ibid). Sticking to this method, the author deliberately checked for similar conclusions or methods used for other works – no similarities were found.

3.4.1 Relevance of the theory

The theoretical framework of this study should support the research question and findings. Accordingly, all the information presented in the theoretical part was elaborated according to the aims of this research, the problem, and the key concepts (risk, safety, regulation). The theory that was presented is an overview of the relevant scientific that are related to the research question, and at the same time information relevant specifically for this

study in light of its general method, because, as it was already mentioned, many aspects of it were elaborated by the author specifically for this report.

3.4.2 Ethical considerations

Before starting this research, the author has committed himself to several ethical considerations. First of all, any real names of the personnel from Eni and Eni Norge will not be disclosed. Moreover, during the interview the source was against the usage of the recording equipment, therefore only the author's notes were used in the case study. Most the company's documents used in the analysis are public, and a permission was given by the informants to use the internal documents as well.

4 Chapter 4. Comparison of HSE regulations in Norway and in Eni.

4.1 Introduction

This chapter is the main body of information in this assessment. To start it off one might need remember the problem/research question: «How Eni has aligned its own regulations and procedures to Norwegian regulations and guidelines?». The problem lies within the intersection of two regulatory environments: that of the state and that of the company. The assumption to be tested in this part is to understand, whether the regulations are different or similar in their general principles of policy design. Therefore, this Chapter will represent the first stage of this study, which, according to the elaborated methodology, is aimed to explore and describe these in Norway and Eni. However, the author will approach this chapter with view, that the *state is the regulator, and the company is subject to its regulations*.

The primary subject to the state regulations is Eni's Goliat project, so it will be interesting to see how the two regulations influenced the process of the project development, especially if there were some differences. The project will be analysed *only from the point of view of the regulations in HSE*. Moreover, the case should provide an a comprehensive overview and illustration of how the Norwegian regulations are being applied in a real case scenario.

This chapter will be structure in the following way: first, a brief introduction to the Norwegian legislative context will be given, second, these will be analysed in relation to the *three principles of policy design*: form, function, and scope. The third stage will dig deeper into the regulations to extract the key *aspects or criteria* stated in the regulatory framework regarding the HSE risk management. This last part of the presentation of the legislation will also take into account the primary analysis of the main regulations and literature regarding the regulatory regime in Norway.

The same process will then be repeated for Eni HSE management regulations. The key features in HSE of these regulations will also be emphasized. However, the basis for this analysis will be the main principles of the Norwegian regulations, because, in case of the company operating in a certain country – the country's legislation comes first, it is explicit. This whole process is aimed at finding differences and similarities between the two sets of regulatory documents, because the main focus is to understand the process of alignment in case the regulations were different, and the interactions between the state and the company. The main features of the regulations will then be assessed in light of the Goliat project

development, that will supposedly provide an insight of how they work in a real case scenario and whether there were additional requirements to this project.

4.2 Norwegian regulations and guidelines in HSE and their main features

4.2.1 Risk concept and risk management approach

In the theoretical framework it was concluded, that before one can analyse the legislative framework related to managing risk in HSE, it is necessary to start with the basics: the understanding of risk and safety. It is important, because the definitions to these basic concepts differ greatly, so one should look at the definition in each specific case. In Norway, HSE risk comprises the threat of accidents, personal injuries, occupational illness and environmental damage. The regulations require that risk analyses are conducted to identify possible hazards during operational stage, and the consequences these may have of human, environmental and economic character (The Management regulations, Section 17, 18, 19).

According to Petroleum Safety Authority, the main organ, responsible for overseeing compliance with the regulations, and maintenance of high standards of HSE on the NCS, **risk can be defined as «the consequences of an activity with the associated uncertainty»** (PSA, 2016). The Authority introduced this new definition of risk, in order to avoid important decisions to be taken without adequate knowledge. While it is quite hard to compare the components of this definition to standard components of what can be defined as risk, which opens wide space for interpretations, this definition is fundamental for the risk assessment and the risk management processes for the oil and gas activities in Norway.

The Section 11 of the Framework regulations gives the following instruction to risk management: «In reducing the risk, the responsible party shall choose the technical, operational or organisational solutions that, according to an individual and overall evaluation of the potential harm and present and future use, offer the best results, provided the costs are not significantly disproportionate to the risk reduction achieved» (PSA, 2014).

«If there is insufficient knowledge concerning the effects that the use of technical, operational or organisational solutions can have on health, safety or the environment, solutions that will reduce this uncertainty, shall be chosen» (PSA, 2014).

The term *uncertainty* in the definition is related to the potential consequences of the activities. The guidelines to Sect. 11 of the Framework regulations say «the uncertainty relates to which incidents can occur, how often they will occur and which detriment of or loss of

human life and health, environment and material assets the various incidents can lead to. As regards the external environment, the uncertainty also relates to which environmental harm the operational discharges can result in» (PSA, 2014).

The Management regulations require the operator to implement their own risk acceptance criteria for major accident risk and environmental risk. The Management Regulations Guidance defines the need for the operator to determine whether risk criteria are met. The terminology of Risk Acceptance Criteria (RAC) is also used in NORSOK Z-013, but a value is not given and the standard just gives further guidance. Values are given for the maximum tolerable impairment frequency of critical safety equipment (NORSOK Z-013, Appendix A.1.2).

In the Norwegian regulatory environment, the ISO: 31000 represents the basis for the risk management process (Principles of Barrier Management in the Petroleum Industry - PSA, 2013).

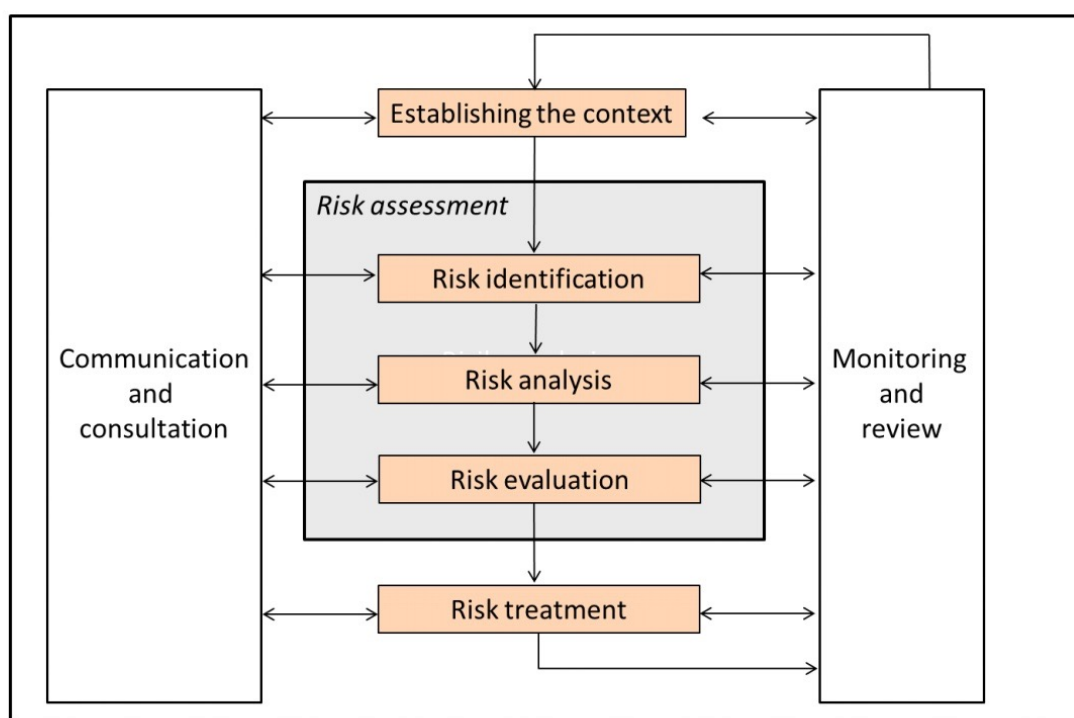


Figure 13. Risk management process (Source: ISO 31000)

According to the Framework regulations, the risk acceptance criteria should be set up for the evaluation of risk analysis. The Management regulations specify that the risk analyses and therefore the derived risk acceptance criteria (maximum allowed level of risk) shall be set for (Section 9 of the Management Regulations):

1. Risk to personnel as a whole offshore as well as offshore and to personnel groups exposed to specific risks
2. The loss of main safety functions as mentioned in the Section 7 of the Facilities regulations
3. Acute pollution or pollution from the facility
4. Damage to a third party

HSE Framework Regulations (Sect. 9), provides the following measures to reduce risk: «In effectuating risk reduction the party responsible shall choose the technical, operational or organisational solutions which according to an individual as well as an overall evaluation of the potential harm and present and future use offer the best results, provided the associated costs are not significantly disproportionate to the risk reduction achieved» (PSA). This definition gives a definition almost equal to what is understood by the concept of ALARP. Additionally, according to the Paragraph 9 of the regulations, this principle should include a qualitative, as well as quantitative component. Therefore the second interpretation (see Abbreviations & Definitions) of the ALARP principle corresponds to the dominant view on risk reduction in Norway, that is also defined in the regulations.

However, the main particularity of the Norwegian regulations is that the regulations in Norway *does not include any statements on lower tolerable limit or negligible risk*, and therefore no lower limits that would show when further risk reduction is not required. (Vinnem, Witsø, Kristensen, 2006).

Another difference in the Norwegian regulations is that there are *no explicit requirements on the ALARP evaluations*. These differences on the levels of risk show, that the companies also have to form their own range of processes, evaluations, documentation, criteria, and guidelines, which might be different from interpretations and assessments of the PSA. The operating companies are thus relatively free in choosing the best possible solution, but at the same time they must provide proof that a specific solution in treating risk is the most viable option.

4.2.2 Structure and main governmental bodies

The petroleum companies operating on the Norwegian Continental are subject to an extensive number of regulations and laws. Speaking of petroleum activities, the fundamental legal framework consists of:

1. Act of 29 November 1996 №72 pertaining to petroleum activities (Petroleum Act)
2. Regulations to the Petroleum Act, laid down by Royal Decree 27 June 1997

(Petroleum Regulations)

3. Technical Regulations

4. Other safety (HSE) Acts/regulations/guidelines/white papers

The exclusive property and resource management rights to the oil and gas deposits belongs to the Norwegian State. The management of these resources is executed by the King in accordance with the provisions of the Petroleum Act and the decisions made by *Stortinget* (the Norwegian Parliament).

The regulatory regime for the petroleum activities in Norway is *license-based*. The licenses to explore and produce oil and gas on the Norwegian Continental Shelf are time-limited and are granted under the Petroleum Act by the King in Council as the highest representative of the Norwegian State. The major development projects that are considered matter of public importance must be approved by the Parliament. The government holds executive power over petroleum policy and is responsible to the *Storting*. Several ministries, supported by the subordinate agencies and directorates, are responsible for applying the policy (Figure 14).

The safety *management* consists of two main elements: the prescription of safety norms (directly or indirectly affecting safety levels), and the activities designed to check whether the norms are complied with. The strong interaction exists between the two. The third element is the means to enforce compliance to the safety norms. (Aven, Vinnem, 2007). In the author's opinion, the same could be applied to health, safety, and environmental norms all together.

All in all, the state *regulation* of the oil and gas activities in Norway has two pillars: it represents governmental entities responsible for administrating, regulating, controlling, and supervising the activities offshore as well as onshore (e.g. relevant Ministries, NPD, PSA, NEA and others), on the other – the body of legislative framework for the petroleum activities in Norway. This framework was created and is kept updated by the Parliament under the King's approval. The Parliament passes legislation, adopts propositions, and discusses and responds to white papers related to petroleum activities.

As for companies who have decided to go for a project on the Norwegian Continental Shelf, two main documents must be submitted to the Norwegian Authorities: The Plan for Development and Operations (PDO), and Impact Assessment Study (IAS), according to Section 4.2 and Section 20 of the Regulations relating to the Petroleum Act. Guidelines for the content of these documents are published by the NPD in the year 2000 (PDO for Goliat).

Matters related to HSE in petroleum activities are delegated a number of governing institutions: three particularly relevant Government bodies, and several less important but also relevant for HSE regulation. The most important governmental institutions are Ministry of Petroleum and Energy, Ministry of Labor and Social Inclusion, and Ministry of Climate and Environment. But they do not directly participate in controlling the offshore activities on the continental shelf. As it was already mentioned, they are supported by several governmental entities: The Norwegian Petroleum Directorate (NPD), the Petroleum Safety Authority (PSA), and the Norwegian Environmental Agency (NEA) (Figure 15) (Berg, Malikova, 2015). It should be noted that they do not depend on government or the ministries; they are completely independent organizations that insures their work is properly done and transparent.

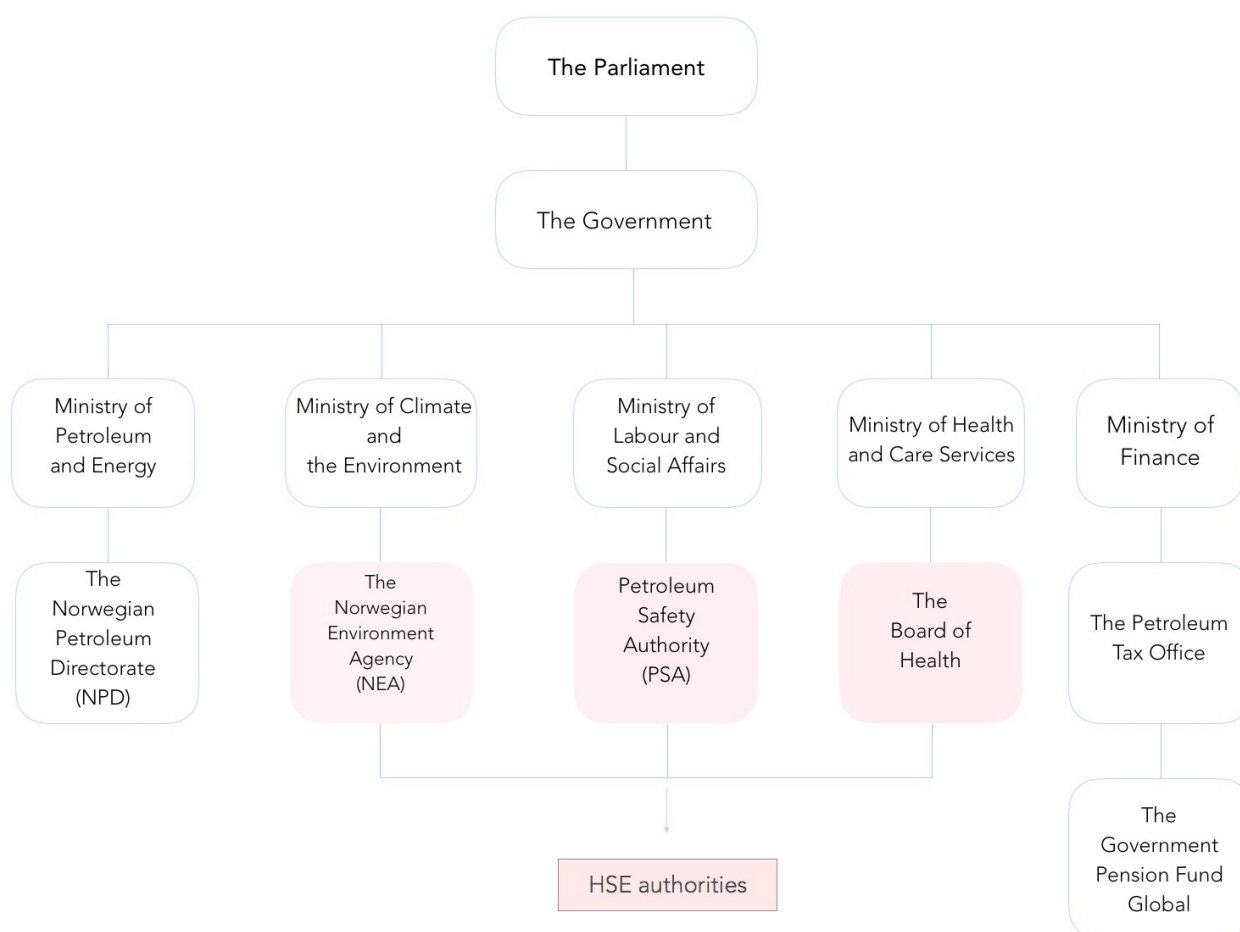


Figure 14. The Norwegian HSE authorities and governmental bodies responsible for the Norwegian petroleum sector

In reference to the Norwegian governmental structure it is important to mention, that it is not characterized by hierarchical structures and sometimes it may not be exactly right to define an Agency as “subordinate” to a ministry, since the Agencies are in many cases independent bodies with flat organizational structure. Probably the most accurate definition will be, that they are “controlled” or under Ministry’s “supervision”, but in this report the author will still use the word “subordinate” for better understanding of the overall structure.

When it comes to the approved projects, companies must share their interest in the project with:

1. Petoro AS, a state owned company that manages the Norwegian state’s direct financial interest
2. Statoil ASA, in which the state has 67% ownership stake through the MPE
3. Gassco AS, an independent company-operator of the integrated system for transporting natural gas from the NCS to Europe, also owned by state

The overriding legislative Acts in the Norwegian HSE for petroleum activities are:

The Norwegian Petroleum Act of 29 November 1996 (“The Petroleum Act”) and several Regulations relating to this Act

The Petroleum Regulations 1997 June 27 (last amended in July 2012)

Act 21 December 1990 № 72 relating to tax on discharge of CO₂ in the petroleum activities on the continental shelf (last amended in 2008)

Additional Acts:

Working Environment Act (Not suitable for offshore floating installations. Instead, the 2007 Ship Safety and Security Act and the 1977 Seamen’s Act may take care of safety aspects on board) (Vinnem, page 112)

Act of 13 March 1981 No.6 Concerning Protection Against Pollution and Concerning Waste (Pollution Control Act)

The Petroleum Act, which is the basic and essential legislative document for any petroleum activity in Norway, covers overall requirements for the award of licenses, exploration, field development and infrastructure, joint activity and unitization of fields, decommissioning and cessation of activities. The general principle of the petroleum activities

on the NCS under the Petroleum Act is that oil and gas operations must be conducted in compliance with a reasonable standard of care, taking into consideration the safety of employees, the environment and the economic values represented by installations and vessels. Moreover, according to the Act, a high level of safety must be maintained on all stages of a project, while the best and latest available technology must be implemented.

These regulations have been issued by competent directorates and agencies. Each of these regulations covers a different aspects and issues of HSE. It should be noted, that all Acts and regulations have corresponding guidelines and interpretations regarding their application. The legislative regulatory environment in Norway can be presented in the following figure:

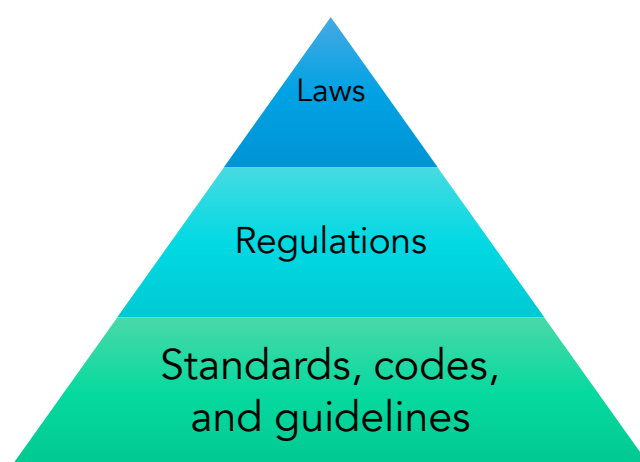


Figure 15. The Norwegian regulatory system (Source: Svein Erikssen, PSA)

The regulations prescribe specific goals and requirements regarding a wide range of technical design factors and management processes and require a significant number of strategies, records of activities and management plans to be prepared and submitted and mainly audited by the PSA. Moreover, they require the Operator to establish risk level for each of its activity and to manage its activities accordingly. The general principle of the regulations is that they do not provide the specific solutions, instead, they delegate the responsibility to select the best one to the company (Svein Erikssen, PSA)

Pursuing the goal of safety for the oil and gas activities, *the guidelines* define a set of international and national standards as recognized norms, so the authorities expect the Operator to use. The use of these standards is considered equal to compliance. The standards may imply certain solutions, however, the PSA regulations allow other solutions in case their safety level is comparable to that set by standards. In case the Operator provided a solution

different to the standard, it is are therefore expected to provide sound proof of effectiveness of the option (Svein Erikssen, PSA).

The *international standards* can be considered keys to the doors of the Norwegian regulations. The 66% of the PSA guidelines are based on international standards such as NORSOK and ISO/IEC (44 and 38 standards correspondingly) (Svein Erikssen, PSA). These standards should give a maybe less experienced company a hint of what is expected from an Operator on the NCS.

In order to facilitate the following analysis, the main regulatory organizations in Norway overlooking HSE and risk management on the NCS should now be introduced.

The Norwegian Petroleum Directorate.

The final beneficiary of the oil and gas activities in Norway is the Norwegian Society. The responsibility for petroleum activities under the Norwegian jurisdiction and promotion the value of the industry for the benefit of the society as a whole is allocated to the NPD. Therefore, the primary objective of the Directorate is to contribute to creating the greatest possible value for society from the oil and gas activities. The second main function of the NPD follows from the previous statement: keeping a wise resource management based upon safety, emergency preparedness and safeguarding of the external environment. The third main function of the Norwegian Petroleum Directorate is the overall evaluation of PDO's and awarding licenses for companies to conduct the activities on the shelf. At the same time, it makes sure the activities are safe and comply with the Norwegian environmental standards and requirements.

There are three offshore - related Acts that fall within the jurisdiction of the NPD:

- The Petroleum Activities Act 1998 No 104 amended to 2009 is principally concerned with the fiscal arrangements associated with licenses although it also includes the premise that petroleum activities should only be carried out with pragmatic regard for operational safety and the environment
- The CO2 discharge Act, which is also a fiscal measure to limit the discharge of natural gas and the flaring of petroleum products offshore through the imposition of a tax on quantities discharged
- The Scientific Research Act, which applies to scientific research of the seabed and the exploration for subsea natural resources (Morgan, Hook, Budgen, 2010)

In addition to these three, the NPD has also published guidelines to the PDO's and PIO's, where, for example, there is a detailed description of the content regarding technical

aspects that should be assessed in IAS's. It can be concluded that the role of the NPD is primarily *fiscal* and the supervision over the HSE compliance of the projects is rather a pragmatic general assessment. Today, almost all responsibilities regarding the HSE compliance on all stages of a project are taken over by PSA. Health and Safety regulations under the Petroleum Activities Act also fall under the supervision of PSA.

This said, it now boils down to three main governmental organs that carry out all the activities related to the HSE: Petroleum Safety Authority, the Norwegian Environmental Agency, and the Board of Health.

The Petroleum Safety Authority

The PSA was created as a separate, independent petroleum specific legislative regulator in 2004 and, although it is under supervision of the Ministry of Labour and Social Affairs, the PSA has total regulatory responsibility for safety, emergency preparedness and the working environment in the Norwegian oil and gas industry. The published remit of the PSA includes its coordination and cooperation with other regulatory organs with independent authority in the HSE. With regard to offshore activities these include the Norwegian Environmental Agency (formerly known as SFT and the Norwegian Climate and Pollution Agency), The Norwegian Board of Health and the Norwegian Radiation Protection Authority, which is subordinate to the Norwegian Ministry of Health and Care Services.

As emphasized by a representative of Eni Norge, the Norwegian Petroleum Safety Authority is the main regulatory organ of oil and gas activities in Norway. It manages the everyday safety activities, guarantees overall Occupational Health and Safety of the petroleum activities, as well as general compliance of offshore installations to the HSE regulations and guidelines. The control and supervision is carried out by audits, verifications, investigations, consents, meetings with industry representatives and surveys.

The regulation of the Norwegian petroleum industry falls within a number of Acts, Regulations, and Guidelines to them. The regulations and guidelines are providing further details on regulations and basic Acts and the modalities of how the requirements are to be used and applied. The regulations and guidelines must be applied together. The following table is representing the structure of the regulations that fall under the responsibilities of the PSA (Berg, Malikova, 2015):

Regulations	Source	Guidelines	Source
The Framework Regulations	PSAa	Guidelines to the Framework Regulations	PSAh
The Management Regulations	PSAb	Guidelines to the Management Regulations	PSAi
The Facilities regulations	PSAc	Guidelines to the Facilities Regulations	PSAj
The Activities Regulations	PSAd	Guidelines to the Activities regulations	PSAk
Technical and Operational Regulations (only onshore facilities)	PSAe	Guidelines to the Technical and Operational Regulations	PSAl
Working Environment Regulations	PSAf	?	PSAm
The Information Duty Regulations	PSAg	Drilling Reporting Guidelines (DDRS), Corrosion and Damage Reporting Guidelines (CODAM), Guidelines for application for Acknowledgment of Compliance (AoC), Guidelines for plan for development and operation of a petroleum deposit (PDO) and plan for installation and operation of facilities for transport and utilisation of petroleum (PIO)	PSAn

Table 1. The representation of the main regulations

The Framework HSE Regulations (NHSE) amended to 2009, concerned with health, the environment and personal safety. This document is fundamental for HSE management of any oil and gas activities in Norway. The regulation delineates the main principles of the application of the requirements and several important specifications. The compliance with the Framework regulations is assessed by the PSA (Morgan, Hook, Budgen, 2010).

The Framework regulations provide a framework for HSE regulation and all the oil and gas activities. It delineates the common scope of application of all regulations, their common purpose and definitions, who is responsible for complying with all the regulations, and the main principles for health, safety, and environment that must be shared by the companies in case they conduct petroleum activities in Norway (including the overall HSE culture in actors responsible). In light of the Framework regulations, the other regulations only provide further details of what is required in each specific area of HSE – related matters.

The Management Regulations (NMR) amended to 2004, which describe the requirement for the management of petroleum activities. The regulations prescribe specific requirements regarding a wide range of technical design factors and management processes (brings in light four main areas relevant for managing offshore facilities: barrier management; objectives, internal requirements and decision-making process; analysis; notification of relevant authorities and applications for consent. The regulations require a significant number of strategies, records of activities, and management plans to be prepared and submitted and

audited by the PSA, while also controlled and supervised by Norwegian Environment Agency (NEA) and the Health Authorities (Morgan, Hook, Budgen, 2010).

The Activities Regulations (NAR) amended to 2010, emphasize the right way to conduct different activities that involve offshore petroleum installations. The compliance with the regulations is also controlled by the PSA, NEA, and Health Authorities (Morgan, Hook, Budgen, 2010).

The Facilities Regulations (NFR) amended to 2009 is a technical set of regulations which are to be applied which stipulate requirements relating to the design and outfitting of facilities. Issued and controlled by PSA, NEA, and the Board of Health. To the mentioned risk – based approach in HSE management two specifications are added: the various risk thresholds and the risk monitoring (Morgan, Hook, Budgen, 2010).

The Information Duty Regulations (NIDR) amended to 2010, which identify the information requirements that have to be met by the managers of a petroleum installation and by the managers of services, suppliers of equipment, and third parties are being provided to such an installation. Moreover, the communication with the authorities, fishermen and local communities also fall down to these Regulations (Morgan, Hook, Budgen, 2010).

This communication with the PSA mainly undergoes through *audits*, however there are other means mentioned above. The audits represent a systematic examination of management and control systems the operator of a specific oil field has implemented. These audits are considered essential for safe oil and gas operations and are supported by all types of measurement – based verifications, tests, inspections, checks – all these are done to ensure that the actual circumstances conform with the regulatory and management system requirements.

The party responsible, e.g. the operator, shall decide on the extent of controls, the method to be used in, and the degree of independence of the assessment, in order to record that the requirements and standards of health, safety, and environment were met. Such verifications shall be carried out according to an overall and unambiguous verification programme and verification basis. The operator shall establish the verification basis for the total petroleum activities after having determined the scope, method and the degree of independence of the verification. The operator shall also carry out an overall evaluation of the results of verifications that have been carried out. The Petroleum Safety Authority may order the operator to have verifications carried out, or otherwise carry out verifications by itself.

The audits must have several important characteristics, according to the Ministry to which PSA is subordinate: the audits must be *risk – based* and *system oriented*, they should not replace the *internal control* by the industry representatives, and finally it must strike a balance between its role as a high risk and technology regulator and a labour inspection authority, at the same time contributing and collaborating with companies and unions represent a crucial requirement for and principle in the PSA’s activities.

The regulations require the risk assessment to be undertaken by the Operator. As it was already mentioned, the responsible party must communicate with the regulator, providing them not only all the information that is required by law, but also data the agency might specifically ask for.

The Authority also execute the general development of the risk level in the offshore petroleum industry in Norway, which is analyzed and presented on an annual basis. The scope of this assessment covers all aspects of HSE within the authority's jurisdiction (Vinnem, 2010). The methods used to collect and evaluate data and the risks were developed in «Risk Level Project» (RNNP). Since the first report the Project and the methods that are being used for evaluation, were in constant development and updated in cooperation with different industry players, groups, and external parties (PSA, 2012b)

The RNNP is outlined using statistical, engineering, and social science methods, and provides a broad illustration of risk levels, including risks that derive from major hazards, incidents that may represent challenges for emergency preparedness, as well as risk perception and cultural factors. Moreover, the reports also include information and data from databases (i.e. Environment Web Databases) (Vinnem, 2010).

The PSA makes their assessment using the following indicators (Trends in Risk Level in the Petroleum Activity, 2012):

- Indicators for events related to major accident risk
- Indicator for barriers related to major accident risk
- Indicators for serious occupational risk and diving accidents
- Indicators of events related to transportation accidents (helicopter)
- Indicators for working environment factors
- Indicators for events with consequences of lesser extent and significance for preparedness

The evaluation also includes:

- Experience of risk
- HSE climate
- Qualitative evaluations related to the issues

In case of a hazard, the main tool used by the PSA to investigate more thoroughly into detail and perform an extensive analysis of the causes that can lead up to an event is the MTO-analysis. The MTO stands for Man, Technology, and Organization, and this method is based on the claim that both human, organizational, and technical factors should be considered as the factors that could potentially lead or cause hazards. «The MTO-analysis involves the use of an ‘event - and cause - diagram’, a ‘change analysis’ and a ‘barrier analysis’. The event-cause diagram provides a linear account of the event sequence in a block diagram, and includes the attribution of ‘technical and human’ causes in the sequence. The change analysis describes how the series of events have deviated from earlier events, a normal situation, or from common practice. The barrier analysis identifies human, technological, or organizational barriers that have failed or are missing in the course of events» (Kringen, 1993). The analysis is done in order to identify how the flow of events could have been broken, and what the organization have done in the past in order to prevent the accident.

The Norwegian Environmental Agency

The Norwegian Environmental Agency is responsible for evaluating the environmental impact of oil and gas activities on the NCS in general, as well as in specific cases and project. The aim of the agency is to guarantee that quality of the water in marine areas, in order to preserve the species and ecosystems. Moreover, it aims to make sure the human health and well being is not influenced in any circumstances by the oil and gas activities and the amount of greenhouse gases is on a level that does not harm the climate system and the atmosphere (NEA).

The documentation assessed in the case study provided additional information on the authority: the Agency is also involved in the assessment of PDO's, IAS's and various applications for permissions regarding activities, that may involve pollution, emissions, influence to the marine areas and ecosystems. Moreover, it evaluates, conducts consultations and issues decisions on the proposed solutions regarding emissions, pollution, discharges, usage of chemicals, waste management, and contingency measures. Finally, the NEA also executes audits and inspections to secure compliance with requirements, prescriptions, and recommendations are being followed and maintained by the Operator.

4.2.3 The policy design

Several sets of information were considered for this subchapter: the theoretical base on policy design, the history and the context for the Norwegian regulations, and the main regulations themselves (Table 1), implementing the method of content analysis. Going into details on policy design does not belong to the scope of this study, so this chapter will provide only general considerations.

As for the *form*, the regulations are clearly *delegatory*. Starting from the self – regulation approach in the 70s, when the petroleum industry in Norway was in its infancy, the responsibility of regulation of HSE aspects of the operations was delegated to the companies operating on the shelf. Since then, the regulations have developed drastically, but today a lot is up to the companies, while the regulations specify *what* is to be achieved, and not *how* (PSA). The text of the main regulatory documents clearly proves this claim, and, actually, this approach was found in almost every Section of the Regulations and Guidelines. The regulations, therefore, set specific goals, and the Operator should present its solutions and suggestions. This last consideration is perfectly in line with the definition of a variation of the delegatory approach – the incentive regulation. Therefore, in relation to the form of the policy design of the Norwegian regulations in HSE it is possible to claim, that they are ***delegatory and incentive - based***.

The main *functions* of the regulations can be narrowed down to the essentials: to maintain high standards of safety and keep in the minimal level of risks in the operations. But it is quite complicated to define whether the regulations are informing or enforcing. In this situation, one can think about the final beneficiary of oil and gas activities on the NCS – the Norwegian society. As we know, in the developed democracies the society can execute pressure on the industry if they consider, and there is evidence, that its activities can be potentially harmful for them. What provides them evidence of that? The information. So just as in the example with food in the study of the theory, the information is the key component to understand whether the regulations are informing or enforcing. In our case the regulations are ***informing***, because the preliminary data collection has revealed, that a lot of documents, information, the results of audits and so on available in the Internet and thus accessible to every one. Additionally, transparency of operations is one of the main objectives of PSA.

Before the case study it is, however, hard to emphasize the scope of the regulations, because for now it is not possible to trace how the regulations are being applied in reality.

This analysis has revealed, that the Norwegian regulations are characterized by incentives and goals. This said, the next part of the study should emphasize, what are these incentives and goals, which will be represented in light of the *features* of the regulations.

4.2.4 Main features of the regulations

The main regulatory principles can be summarized according to the history of the Norwegian regulations, the content of the main regulations, study of the additional literature and publications, and other information publicly available, i.e presentation of a PSA employee. Moreover, the policy design analysis conducted in the previous chapter has revealed, that the Norwegian regulations rely very much on incentives and specific *goals*. Now it is time to uncover what are these goals. For the purposes of better understanding of the analysis, these specific points reflecting what is expected from a company – Operator will be hereafter called *features*.

The Norwegian regulatory system today to a large degree is founded on the assumption of the fundamental wrongness of the prescriptive – inspection based approach. This system is considered reactive at its core, incapable to inspire *continuous improvement* – the fundamental element of any sound HSE management approach. Obviously, the red thread of the Norwegian regulatory approach is the principle of the *minimization of risk* in oil and gas activities in Norway. The regulations are therefore *risk – based* (this means that audits or verifications are planned in terms of an overall assessment of where the risk is highest - PSA), that is expressed in Section 11 of the Framework Regulations throughout the regulations. It is the overriding principle for all petroleum activities.

An underlying notion to the principle of the minimization of risk is “prudence”, meaning that any activity under the Norwegian legislation must be sound and carefully assessed to reduce risks – both with regard to overall, as well as detailed assessment of all relevant factors that might influence the activities. Each assessment is separate, and considerations must be given to specific conditions of the factor (PSAa, 2013, section 10). It is implicitly understood that risks represent harm or danger to people, environment or material assets, and the risk level to these must be as low as possible.

The common scope of application for regulations is generally explained in the Sect. 1-4 of the Petroleum Act, with adjustments resultant from the parallel provisions in othe acts upon which the Decree is based. The Petroleum Act covers all aspects of activities that can be reasonably considered to be related to offshore petroleum activities and relevant HSE issues in these activities, including activities in or related to special facilities onshore (Vinnem, 2010).

Every company conducting activities in Norway must adhere to the fundamental Acts, regulating the petroleum activities in this country. After a company starts conducting any petroleum activity in the country and on the NCS, it becomes considered the operator of these activities, or *the responsible party*.

The Framework regulations contain the definition of a responsible party. The regulation states «the operator and others participating in the activities are responsible pursuant to these regulations» (Section 7, paragraph 1). The operator is subject to the law, and the notion «others» means both companies and individuals. This implies that company engaged in the petroleum activities has to guarantee the compliance with the Petroleum Act and the regulations by other actors involved, and guarantee, that these activities represent a minimum risk to health, safety, and the environment. Besides this, the operator carries a responsibility to make sure that anyone who carries out work on his behalf, either personally, through employees, contractors or subcontractors, must comply with the HSE requirements. By this, the operator is expected to assume a central role, and therefore main responsibility. This is the second main principle of the regulations – all actors involved in the petroleum activities must meet the requirements, and main responsibility for this is allocated to the operator.

As mentioned above, the primary objective of the Petroleum and the regulations is to set a high standard for safety, achieve a «systematic implementation of measures» (by the responsible party) to fulfil the HSE requirements and objectives, and, secondly, to «further develop and improve the standards». While the first and the last of these objectives aim directly at the fundamental goal of any HSE – related legislation, the second objective brings a slightly different direction: in order to systematically implement the necessary measures and ensure *continuous improvement* (Section 17 of the Framework Regulations) to comply with the regulations, the party responsible has to establish an administrative and organizational structure for this purpose. This objective therefore constitutes the incentive for establishing a system of *internal control* (Vinnem). This principle should be applied by “adopting administrative management tools which allow the company to check its own operations in a systematic manner” (PSA). Therefore, it’s the internal control system that is expected to make the legislation effective (Vinnem).

In other words, the responsible party is responsible to make the legislation work, while the legislation itself implies the adoption of *best possible solutions*. Making sure the solution is the best available, on its turn, is also a responsibility of the operator and depends on its *collaboration* with the relevant authorities. If, however, a company decides to implement

another approach or specification than what is described in the Guidelines - it is acceptable, but the company must then generate sound evidence that the selected alternative method is not worse than that described in the guidelines.

The principle of collaboration mentioned above is actually deeply rooted in the history of petroleum development in Norway and this story is worth to be mentioned. When the activities on the NCS have just started, the Norwegian government had lack of knowledge in regulating this kind of activities and in this industry in general. So the companies (mainly foreign companies) were given a big degree of responsibility to come up with their own rules and decide what's best.

Another principle is that the requirements are *performance based and functional*, in sense that they set a particular level for aspects, characteristics or qualities of products, processes or services, that the government considers able guarantee the high level of safety and minimization of risk to the environment and health of people involved in the activities, and the Norwegian society in general. However, they do not set specific technical or design solutions that the Operator should use. The requirements are fulfilled by the companies by presenting a solution that is both the best possible and best available in each specific case.

The guidelines accompanying the regulations are not legally binding, but the regulations and the guidelines have to be regarded and applied together, in order to get the best possible interpretations of the provisions and how they are to be met. If, however, a company decides to implement another approach or specification than what is described in the Guidelines it is acceptable, but the company must then generate evidence that the selected alternative method is not worse than that described in the guidelines.

The last principle of regulations is the the requirements, contained in the documents are *generalized*. This means, that all the requirements in the regulations must be implemented for all stages and for all operator's activities, depending on the applicability and the stage of the project themselves.

It should be noted, that developing and improving the HSE standards has another separate objective. This element of regulations has a dynamic meaning applied to it, because societal and governmental views on acceptable HSE are actually changing over time. Therefore, the regulations should emphasize the required HSE criteria are not static.

The regulations also require that specific quantitative risk analysis is carried out to provide evidence and justifications of the management of hazards. It is stipulated that such analyses address major accident risk, emergency preparedness and environmental risk and

specifically address the intended working environments and thus contribute to improving the health, well being and security of the employees, and preventing personal injury, deaths and work related disease.

All in all it is possible to state, that there are *no preferred or prescriptive solutions* for the petroleum activities in Norway. Instead, the operators are expected to evaluate and identify the best suitable solutions for every aspect or issue arised.

4.2.5 Summary

All in all, the Norwegian regulatory regime reflects the complex nature of the concept of HSE itself. Moreover, an attempt was made to establish a regime that will fit this complexity in a best possible way. It is mainly reflected in the flexibility of the regulations, and their non – prescriptive and goal – oriented targets. The main pressure and responsibility is delegated to the operator, while compliance is verified through audits. However, under new safety – management model there are the minimum standards for structural and operational integrity for such issues, as well control, prevention of fires and explosions, and worker safety (Svein Erikssen, PSA, 2014).

The Norwegian regulatory system is also associated with duality. The *State – company* dichotomy in the Norwegian context evolves in what can be called *flexibility for state agents – flexibility for company* dichotomy. The Norwegian regulatory regime can be briefly described as *incentive based with self - regulation* as a dominant principle. In this context the main regulatory player is provided with the freedom of authority to answer the question “What is best or good enough?” while the responsible party is given the freedom of responsibility to answer the same question, and propose its suggestions to the authority. In this way, a constant cooperation and collaboration between the two parties is established. Norway has a long-standing tradition of a more collaborative approach: the so-called *threepartite communication* between state, companies, and third independent parties.

The regulations are generally wel received by companies. Since it involves international standards, for a company it is easier to understand the level of quality and performance of, say, technical assests, while the regulations are always interpreted in a similar way, so it reduces the possibility of inconsistencies or misinterpretations. However, it also sets very high level of requirements for smaller companies, with less competence and experience.

Since he regulatory regime is goal oriented and in many cases might not have clear requirements and the general approach towards safeguarding this regime is highly participative and collaborative, this might lead to differences in interpratations from both

sides. However, it triggers a more co-operative attitude from oil companies, since, in the end, safe petroleum activities are a good for all.

4.3 Illustrating the main characteristics of the Norwegian regulations

It should be remembered, that the following approach repeats the author’s method of studying HSE regulations, emphasized and illustrated in the Figure 3. The following figures are presented based on the analysis conducted in the Chapters 4.1 – 4.2 and are essentially a brief, simple, and comprehensive overview of the main features and characteristics of the regulations - just in line with the main approach for this study “from complexity to simplicity”. In the end of this chapter, the Norwegian regulations will be compared to the regulations of Eni, summarized exactly in the same manner.

Risk	«The consequences of an activity with the associated uncertainty»
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Regulatory policy design:	<ul style="list-style-type: none"> • Delegatory and incentive – based • Informing • ...
----------------------------------	--



ASPECT	MAIN FEATURES	WHERE
General	Goal oriented and non prescriptive	Characteristic of all regulations
General	Requirements are generalized (regulations and guidelines should be applied altogether)	Characteristic of all regulations
Management	Risk - based	Section 11 of the Framework Regulations, other regulations

Management, technology	Continuous improvement	Core principle in all regulations
Organization, management	Communication and consultations	The Information Duty Regulations, also an overriding principle
Organization, management	Internal control + Audits as a controlling measure	The Framework regulations
Organization, management, technology	Delegation of responsibility to the Operator (responsible party)	The Management Regulations, the Framework regulations
Technology	Functional and performance – based (best practices and best available technology)	Guidelines to the regulations
Management, technology	Quantitative and qualitative aspects	The Management Regulations
Management, technology	Precautionary principle	Inferred principle related to risk management from the set of regulations studied
Organizational, management	Compliance to the regulations is mandatory	Core principle (Sanctions – Management Regulations)
Technology, management	Implementing good solutions without running into substantial costs	Principles of Barrier Management in the Petroleum Industry (PSA, 2013)

Table 2. The main principles and characteristics of the Norwegian regulatory framework

If we look back on the aspects of HSE legislation emphasized by the author, and assign these in form of labels to the overriding features and characteristics of the Norwegian regulations, the most of the labels will be **management and technology**. Keeping in mind the basic concepts of risk and safety, the essence of the Norwegian regulatory regime, in the authors opinion, is that:

- *Best technology is the final product of good management of safety and risks, and, on its turn, it is the main warrant that the activities are safe, with minimal risks to people's health and to the environment.* This claim represents a ***hypothesis*** to be tested in the case study.

4.4 HSE regulations and guidelines in Eni

4.4.1 Introduction and availability

A representative of Eni in Moscow provided the author the company's regulations related to HSE. The protection of health, safety, environment, and public safety is a priority objective for the company. The company operates in accordance with principles, procedures and behaviours oriented towards standards of excellence (Eni HSE MSG).

The method of the analysis of the Eni regulations was different from that implemented for the Norwegian regulations. Since there was no primary knowledge of the regulations and no literature that could help with the assessment, the method of the content analysis was partly direct, partly grounded: the regulations were allowed to speak for themselves on their policy design, but as for their main aspect and features, the research was based on the features of the Norwegian regulations.

4.4.2 Eni Regulatory System: structure and main actors

Commitment to excellence in HSE in Eni takes its roots from the Global Compact initiative, launched by the UN Secretary General Kofi Annan. The initiative aimed at creating a pact between the UN and world business covering human rights, labour, and environmental protection, to which Eni has adhered.

The Eni's regulatory system is codified in a substantial body of guidelines, instructions, and other documents that represent a consistent and reliable *framework*. It also includes By-laws, Code of Ethics, Corporate Governance Code, Model 231 Principles, SOA Principles and the CoSo report. Each component of the Regulatory System is reflected and integrated in the Company's Code of Ethics that identifies the fundamental values of the company.

Eni's regulatory system is standing on *10 policies*, same for the company and all its branches and subsidiaries. (Figure 17). Generally speaking, the 10 policies constitute the integral principles, based on which the company functions. Compliance with these policies is guaranteed by 40 *Management System Guidelines* (hereafter also referred to as MSGs). The main MSG is the MSG of Regulatory System that guarantees the proper management process

of the Regulatory System, while all guidelines are considered fundamental for all company's operation and activities with compliance on all levels.

The whole regulatory system has two intergral levels: *the management level* (10 policies and 40 MSGs), that guarantees the overall management of all activities and processes within these activities; and *operational level*, that guarantees proper procedures, operational methods, definition of functions, and execution of company's operations on the level of everyday activities.

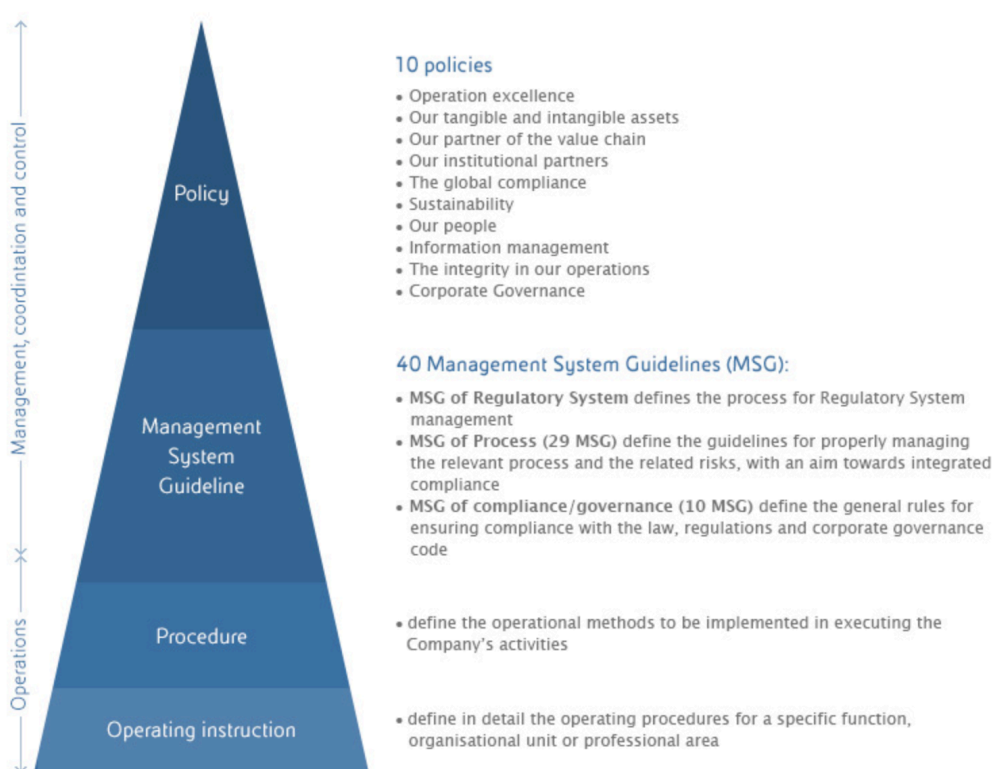


Figure 16. The main regulatory policies and documents in ENI (Source: Eni corporate website)

4.4.3 Risk concept

As in the previous case, before presenting the HSE regulations, the case – specific definition of risk should be presented. In the Eni HSE Risk Management and Reporting Instruction the following definition of risk can be found: «**a combination of the likelihood of an occurrence of a hazardous event or exposure(s) and the severity of injury or ill health that can be caused by the event or exposure(s)**». Reference is being made to OHSAS 18001:2007 standard. Key points of this definition are *likelihood (probability) + hazard or exposure + severity (consequence)*.

Risk categories are also defined in the instruction, that refer to potential areas of impact: «P» - people, «E» - Environment, «A» - Assets, «R» - reputation.

According to HSE MSG, all Eni subsidiaries are allocated to risk clusters, based on the specific activities they perform (Eni Norge, for example, belongs to «elevated» HSE risk cluster due to exploration and production activities). Eni Spa and all its subsidiaries manage their risks through implementation of integrated HSE risk management systems, according to modalities issued in «Clusterization criteria based on HSE risk».

Those companies that belong to «elevated» risk cluster can address, coordinate, and control HSE-related issues themselves. Nonetheless, the management, control of HSE risks and fulfillment of requirements issued by the headquarters is an obligation of all of the Eni subsidiaries, just each of them acts independently in different external institutional environment and performs different activities, therefore risk levels may vary.

It can be concluded that risk management in the company is decentralized, the detection, assessment, and elaboration of relevant risk management measures and control is assigned to subsidiaries, while high level of the company's management is responsible for overlooking, coordinating, and keeping the regulations updated.

It should be noted, that in any case any risk associated with *fatality* for a person or a group of people is under unacceptable in any circumstances.

4.4.4 Regulation of HSE

The commitment towards the protection of health, safety, and environment has resulted in an internal system of risk control and regulation, which is, according to the words of Eni representative in Moscow, a «cascade» - type system (which also can be defined as inclusive gerarchy). The system keeps under centralized control all the risks spread on different levels of company's operations, while guaranteeing compliance with internal regulatory system on all levels (Corporate Management – Business areas, i.e. *upstream* – Entities, e.g. Eni SpA and subsidiaries – Processes). This system is entitled **Internal Control and Risk Management System** (hereafter also referred to as «SCIGR»). «Eni has integrated this system into general organizational and company policy structures and has defined the SCIGR in line with *main frameworks and relevant national and international best practices*» (Eni corporate website). The main set of risks overlooked by the System is: strategic, operational, compliance, and reporting.

The Board has approved management guidelines (Management System Guidelines, hereafter referred to MSG) and instructions (or operating procedures) to these guidelines to

ensure the implementation of the same procedures and operational methods of Risk Management System, and their compliance with the 10 basic principles of the Regulatory System for the company's activities.

It is represented «by all the tools, organizational structures and internal regulations aimed at allowing healthy and correct business practices in line with the company objectives» (Eni corporate website). The system primary means are «an adequate process of identifying, measuring, managing and monitoring major risks, as well as by means of suitable structuring of information flows aimed at guaranteeing the dissemination of information» (Eni corporate website). Based on a combination of top down and down up approach, SCIGR makes use of reporting tools and flows in a way that allows information generated by the personnel of the company to get all the way up to the Company's top management.

The Internal Control System has several institutional levels: *Corporate level (highest)* (Board of Directors, Board of Statutory Auditors, Control and Risk Committee; Compliance Committee, Risk Committee – oversees the risks in general), *first level of control* (risk owners, usually line managers), *second level of control* (has two additional internal levels: one ensures Compliance Objectives are met, the other that Strategic, Operating and Reporting objectives are met; consists of two process owners, one risk specialist, and several relevant departments to which determined by the risk management model special functions are being assigned), and *third level of control* (done through internal audits, that can also be outsourced). The essential principle of functioning of these levels is that they must be separate and independent from each other and from actors outside of the company (SCIGR).

The basic principles around which the process of SCIGR is built up are *information* and *communication*. The process is and should be *customizable* for the specific nature of the individual company or process, applicable regulatory framework, dimension and organizational structure, skills and number of people involved, e.g. each subsidiary develops its own procedures, which nonetheless are integrated and in compliance with SCIGR framework. The process involves *all bodies and resources* on all organizational levels (from the Board of Directors to personnel on all levels). Finally, the Internal Risk Management System is established to promote the achievement of the company's objectives, and is *company specific*, that means it is ultimately based on the company's characteristics (business model, strategy, activities, geographic presence and structure of the company) (Eni corporate website).

The process can be described briefly as a combination of measures (risk management) - audit/evaluation - reporting. Although SCIGR process can more formally be described as

following:

1. Definition and implementation of the Internal environment;
2. Identification, assessment and treatment of risks;
3. Definition and implementation of Control activities;
4. Monitoring,
5. Review and evaluation of the entire system and Information and communication

As emphasized by a manager in Eni Moscow, that the additional instruments of risk control are: Anti – Corruption Compliance Program, Ethical Code, Model 231, Financial Reporting, Whistleblowing Reports (if an employee notices lack of compliance or suspicious activities – he/she can report to the risk owner), Market Abuse, Related Parties, and Antitrust Code.

The main goal of this integrated system is to provide an «organic and comprehensive view of the Company's main risks, greater consistency among internally – developed methodologies and tools to manage risks and strengthening of the organization awareness, at any level, that suitable risk evaluation and mitigation may influence the delivery of corporate targets and value» (Eni corporate website).

4.4.5 HSE risk management and main approaches

Following the principles of the UN initiative, Eni has created an implemented an Integrated HSE Management System, where “Eni SpA and the operating companies/divisions are assigned different roles. Eni SpA is responsible for defining and updating Group guidelines, ensuring the coordination of HSE system planning and auditing at company sites, promoting the dissemination of information and best practices, while also consolidating HSE performance indicators” (Eni HSE Report, 2011)⁹. According to the same Report (2011), divisions and companies are responsible for planning, executing, and controlling the operations, while pursuing the objective of *continuous improvement*.

In Eni the HSE is recognized as a fundamental aspect of the company's business because of several reasons. First, it is highly important aspect in the definition of the business strategy, because it guarantees sustainability; second, it is a complex issue because of national and international regulatory framework, technical and other regulatory aspects; third, because of peculiarities of the legislative systems in the countries in which Eni is conducting activities;

⁹ https://www.eni.com/it_IT/attachments/sostenibilita/cop-ita-web.pdf. HSE Report «Eni for 2011». Available only in Italian

and finally because of its strong transversality and impact on all operational and management activities, that influence other processes in the company.

Commitments to managing HSE issues are therefore an integral part of planning and controlling of industrial and commercial activities. Moreover, divisions and companies should operate in compliance with the latest international standards in HSE and *current best practices*. The main documents addressing the HSE Management issues in Eni Spa and its subsidiaries are: *Eni HSE Management System Guideline* (hereafter referred to HSE MSG), and a corresponding *Professional Operating Instruction: Risk Management and Reporting*.

The responsibility towards HSE management is distributed among three main actors: the first level of responsibility is allocated to so – called “datori di lavoro” (“work givers” in Italian), e.g. those who are in power of a production unit or organizational structure, simply put those who operate and act near the fonts of actual risks, and thus better understand them and are able to address and mitigate them most effectively. According to the HSE MSG, they are also empowered to *autonomously* organize their production units, and identify those employees with necessary HSE competence (HSE MSG).

The second level of responsibility is allocated to top management of the business units. They must address, coordinate, and control the general path of HSE management in their company’s business units, which have the duty to address, coordinating and controlling the overall performance of HSE management in their own sphere of competence and on security policy supervision, health, environment and public safety of the company. The top management of the business units identified as part of Eni SpA are, in particular, invested with the role of proxies under Italian law or otherwise provided with adequate powers of attorney. In carrying out these activities, the senior management of the business units makes use of specific organizational structures, specializing in HSE issues (HSE MSG).

At the third level of HSE responsibilities attribution is Eni SpA itself, which is entrusted with the tasks of guidance, coordination, support, and control over the general performance of HSE management in the business units. To this end, the “function HSE”, carries out the activities of direction, support, inspection into the business units, and also in order to ensure the conduct of these activities, develops, implements and maintains an adequate regulatory system HSE, in accordance to what is described in the MSG (HSE MSG).

This said, it could be assumed that the HSE management is also based on a *system of responsibilities and delegation of authority*.

The overall process in management of HSE issues stated in HSE MSG is based on the

principle of guaranteeing the *continuous improvement* of the activities and the company's performance. Therefore the general process of risk assessment include several stages: planning, implementation and operation, monitoring and corrective actions, management review.

Additionally, Eni SpA and all its subsidiaries manage the HSE risk through the implementation of integrated HSE management systems, according to the procedures contained in "Criteria for clusterization based on the HSE risk" (Eni HSE MSG). This implies that the company has a system of risk clusters, based on which Eni subsidiaries are grouped according to their activities.

According to Eni's HSE Risk Management and Reporting Instructions, that are in addition to the HSE MSG, «management of HSE risks is an integral part of the management of the business and requires the total concerted effort of the organization, focused on the objective of protecting people, the environment, assets, the business and earnings from potential losses». Clearly, it can be concluded that safety for people, assets; protecting people's health; environmental protection are the primarily goals of company's activities. Moreover, it is emphasized that HSE management is fundamental for the business, growth, and earnings of the company. It is understandable, because any failure in this area will bring irreparable damage to the reputation, and therefore to the company's revenues, especially in a climate of growing public scrutiny and concern for oil and gas companies, since they are widely considered the main contributors to climate change and potential culprits of such catastrophic events as Deepwater Horizon.

The risk management process and risk tolerability criteria are referred to the following areas: people (health protection and promotion), Critical Equipment Protecting Personnel (damage or loss), Environment (damage), Assets and Operations (damage to the environment deriving from operational activities or from incidents), Reputation (damage to business, to «License to Operate», or the overall damage to the value of the Company deriving from HSE risks), Social context (society in general) (damage to external stakeholders). It is mentioned, that any activity that carry some degree of risk – entail risk for more that one of the above areas. Although it is difficult to define to which area more importance should be given, it is generally accepted that damage to people's health is given the priority (Eni HSE Risk Management and Reporting).

Risk, according to Risk Managenet Instruction, is a peculiar event associated with a specific, discrete scenario (helicopter crash, oil spill, etc.), and is usually assessed qualitatively – through what has been called Full Qualitative Approach (Figure 2), as well as

quantitatively – through Semi – Quantitative approach for each area of risks (Figure 3). Risk Matrix is a tool inspired by the ISO 17776 standard, which is used for setting risk tolerability criteria. The matrix axes reflect the definition of risk: the vertical axis represents potential *consequences*, and the horizontal axis reflects the measure of *likelihood/probability/frequency* of the occurrence of a hazardous event.

B – Risk Matrix - B1. Basic Risk Screening Matrix (Full Qualitative Approach)

Consequence					Increasing Annual Frequency					
Severity	People	Environ.	Assets	Reputation	0	A	B	C	D	E
					Practically non-credible occurrence	Rare occurrence	Unlikely occurrence	Credible occurrence	Probable occurrence	Likely/Frequent occurrence
					Could happen in E&P industry	Reported for E&P industry	Has occurred at least once in Company	Has occurred several times in Company	Happens several times/y in Company	Happens several times/y in one location
1	Slight health effect /	Slight effect	Slight damage	Slight impact	Continuous Improvement					
2	Minor health effect / injury	Minor effect	Minor damage	Minor impact						
3	Major health effect /	Local effect	Local damage	Local impact	High Risk					
4	PTD or 1 fatality	Major effect	Major damage	National impact						
5	Multiple fatalities	Extensive effect	Extensive damage	International impact						

Figure 17. «Full Qualitative Approach» (Eni HSE Risk Management and Reporting)

B3. Risk to People (Operations) Assessment Matrix

Severity	People (Operations Risk) (usually in the open)	0	A	B	C	D	E
		<10-6 occ /y (1)	10-6 to 10-4 occ/y (1)	10-4 to 10-3 occ/y (1)	10-3 to 10-1 occ/y (1)	10-1 to 1 occ/y (1)	>1 occ/y (1)
		Could happen in E&P industry	Reported for E&P industry	Has occurred at least once in Company	Has occurred several times in Company	Happens several times/y in Company	Happens several times/y in one location
1	Slight health effect / injury	Continuous Improvement					
2	Minor health effect / injury				Risk Reduction Measures		
3	Major health effect / injury	Compulsory reduction measures					
4	Permanent Total Disability or 1 fatality (small exposed population)			High for 3 rd parties onshore			
5	Multiple fatalities (exposed groups)			High Risk			

(1) frequency expressed in occurrences per year

Figure 18. Example of «Semi-Quantitative Approach» (Eni HSE Risk Management and Reporting)

The risk management process is built up in several stages, that *are continuous and iterative* (Figure 19).

The first stage of the process of managing risks in HSE is establishing the context (analysis of *internal* as well as *external factors* that must be considered in the management process). Internal factors include corporate risk management standard, internal organization and delegation of responsibilities, capabilities of people who operate, maintain, and manage activities at the facilities); external factors are *applicable legislations*, codes and standards, and key stakeholders (also partners, regulators, local communities, NGO's, major contractors and suppliers) (Eni Professional Instruction).

The next stage is communication and consultation, that includes identification and involvement of key local figures outside the company to ensure a consultation with them is set up in the process of risk assessment (Eni Professional Instruction).

The third stage is the risk assessment itself. It consists of risk identification, risk analysis (frequency evaluation + consequence evaluation), and risk evaluation (assessment of tolerability of risk to people, environment, assets and reputation by comparing risk level with the relevant tolerability criteria). In order to interpret HSE risk means of measurement of risk

are required, such as: fatalities/occupational illness per year, spills per transfer operation, financial losses per year (risk to assets) (Eni Professional Instruction).

The fourth stage is risk treatment (identification if effective risk reduction measures needed to reduce the likelihood/probability/frequency, therefore to prevent, and/or control incidents – limiting the extent and the duration of a hazardous event, or to mitigate the consequence of an accident) (Eni Professional Instruction).

The final stage of the process of risk management is monitoring and review (a measure to guarantee the entire process continues to be effective, and verify whether the barriers continue to be effective). This stage is particularly important whenever a significant change in the installation occurs, which can potentially affect its integrity (Eni Professional Instruction).

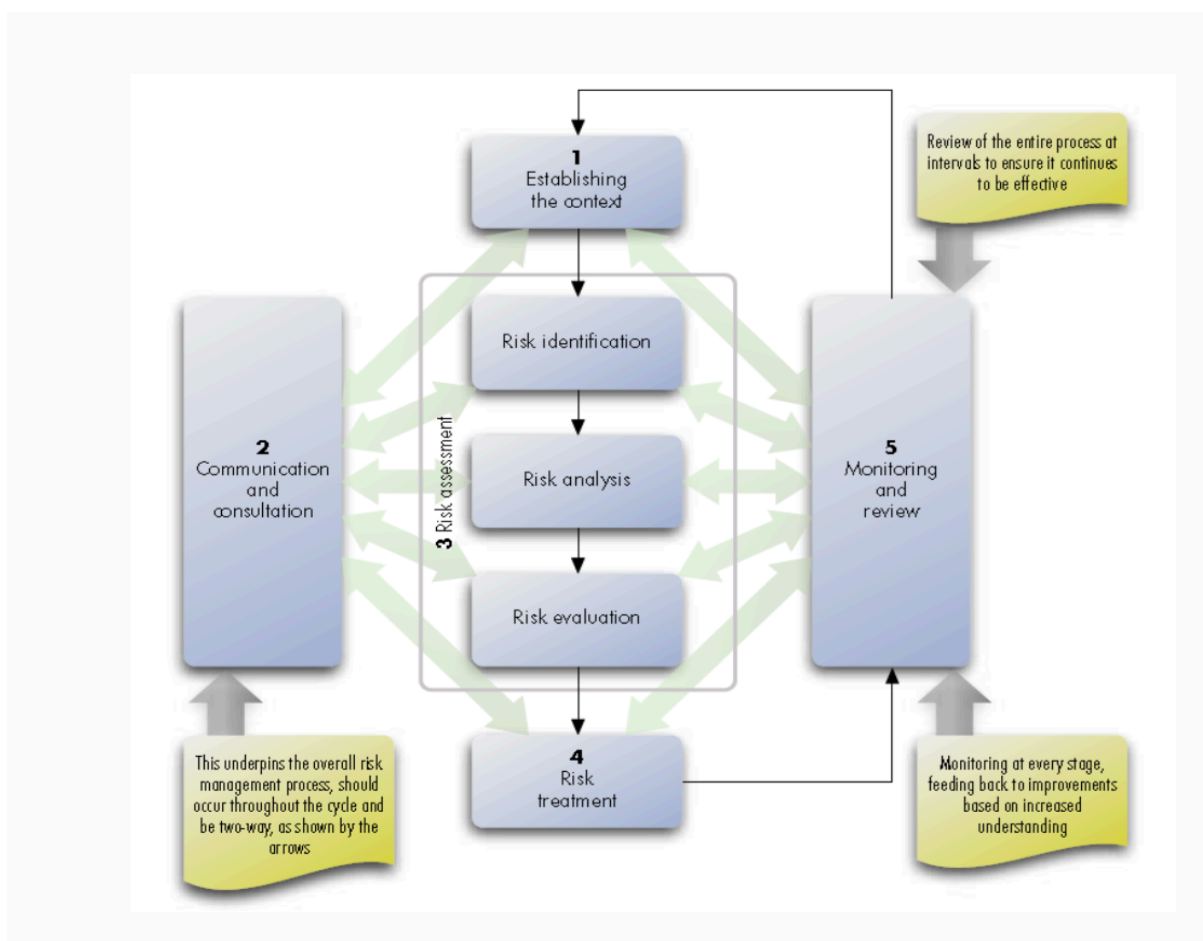


Figure 19. Risk Management Process in Eni (Professional Operating Instruction: Risk Management and Reporting)

For every possible risk in activities found to be present in the process of the risk assessment, the main areas of HSE associated with these risks in all operating units/projects (exploration/development/operation), including normal and temporary activities (e.g.

operation plant, warehouse, marine base, headquarter, guesthouse, drilling activity, seismic), should be recorded in the Risk Register (Eni Professional Instruction).

The Risk Register should demonstrate that:

- all hazards, effects and threats have been identified
- the likelihood / probability / frequency and consequences of a hazardous event have been assessed
- controls to manage potential causes (threatened barriers) are in place
- recovery preparedness measures to mitigate potential consequences have been taken.

The Register should include the most significant hazards (together with their consequences and the probability of occurrence, which, in case they happen, can have an adverse affect on the Company, with consequent negative influence on its HSE performance and reputation. The Risk register is a live document, that shall be updated minimum once a year. The document can be replaced by a tool requested by the local authority, but the Register should be kept updated for reports to the HQ and internal usage (Eni Professional Instruction).

The HSE risk should be reported to company's E&P Division in order to them to be aware and keep track of the main HSE risks associated with their operations, and be informed about the progress in reduction of those risks classified as medium, high – medium, and high. All the risks should be stated in the Risk Report (sent to Eni E&P by end of June each year) (Eni Professional Instruction).

For the high risks identified in the process of Risk Management and Action Plan should be developed and also sent to Eni E&P division.

For any risk identified there are four basic management approaches:

1. *Take/Accept*: the risk is tolerated in its basic state with no active controls being applied;
2. *Terminate*: the factors which create the risk are eliminated (e.g. replacement of dangerous chemicals)
3. *Treat/Manage*: apply controls in the form of hardware, software, procedures with the effect of reducing the frequency or consequences of the event
4. *Transfer*: Insure (only in case of risk for assets).

QRA (Quantitative Risk Assessment) should be implemented to indentify the risk reduction measures, based on the following process:

1. Identify hazardous events, considering techniques such as Event Trees;
2. Consider the accidental loads (e.g. radiation from fires) and, hence, the damage/harm deriving from the hazardous event to: an employee, a man of the public (risk to people), a plant section (asset risk) etc;
3. Sum up frequencies of all hazardous events of the same nature (all gas releases, all fires, all explosions etc.) with same consequences (harm to an employee, a man of the public, a group of people, an area with a given occupancy);
4. Enter the suitable risk matrix and verify tolerability;
5. If unacceptable, assess what controls are viable;
6. Determine if the risk, which is residual after controls, will be manageable;
7. If still unacceptable, consider further mitigating factors (reduction of % of manning, chance of sheltered escape, favorable wind directions, extra controls etc.) to re-conduct the event in the acceptable area;
8. If still unacceptable, consider the “zero option” (“terminate” the risk).

The remedial measures needed to measure and control each of the high risks, and should be based on safe and well established working practices and procedures in order to reduce the residual risks to a level which is practicable. If the identified remedial measures are not suitable to move into the *high – medium* region, a detailed QRA, when applicable, shall be performed in order to substantiate the final risk level (Eni Professional Instruction).

Risk reduction measures should include preventive actions (reduction of likelihood/probability/frequency) and mitigating measures (reduction of severity of consequences). Risk mitigation measures include steps to prevent escalation of the development of the abnormal situation and to lessen adverse effects on HSE. In this regard, *barrier management* can be considered a classic example of risk mitigation. Risk reduction also include such measures as recovery preparedness. An approach widely used is to evaluate the effort and cost involved in a number of different risk-reducing measures and to estimate the risk-reducing effect of each and then select the best option available (Eni Professional Instruction).

Evaluation of risk reduction should always be based on sound engineering principles and common sense. Local conditions and circumstances, the state of scientific and technical knowledge as referred to a particular situation, and the *estimated costs and benefits* (Eni Professional Instruction).

The following “hierarchical” principle shall be adopted when it comes to risk reduction, with the following priority list:

- 1) Avoid the risk
- 2) Replace hazardous devices/operations with less hazardous ones
- 3) Prefer collective safety measures to individual ones
- 4) Adopt alternative design/operations
- 5) Increase No./effectiveness of controls, supported by the best available practices (HSE MSG) and technologies.

The process stops when efforts to introduce further reduction measures become unreasonably disproportionate to the additional risk reduction that will be obtained.

Hierarchies of risk management emphasize the *risk - based approach* implemented by the company, in a sense that the risk that can involve the biggest impact should be addressed first.

4.4.6 Policy design of Eni regulations

As for the *form*, the regulations are *delegatory*. The principle of delegation of the responsibility is applied to the company’s branches and subsidiaries and the responsibilities in managing the HSE issues and risks. The text of the main regulatory documents clearly proves this claim, and this approach was found all the documents analysed. At the same time some regulations set goals, procedures and ways of conduct (SCIGR and HSE MSG), while the subsidiaries are pretty much autonomous in selecting the ways to comply with these. But the other regulatory documents, such as Professional Instructions are more specific and prescriptive in many aspects of HSE risk management. This may be due to the fact, that the regulatory system in Eni is as cascade – type system, so the set of regulations are more goal – oriented at the management level, but when it comes to the instructions that are applied to the subsidiaries and its personnel, the regulations become more specific to ensure the compliance in the parts of the company that are small and spread all around the world, and therefore harder to control directly from the headquarters.

The main *functions* of the regulations can be narrowed down to the essentials: to maintain high standards of safety and keep in the minimal level of risks in the company and in the activities of all its subsidiaries around the world. This is why the company has also implemented the risk clusterization model. To determine whether the regulations are

informing or enforcing, we should look at the final beneficiaries of the company’s activities. In this case, the beneficiaries might be: The Italian government (Eni pays a certain amount of taxes there), and therefore the Italian society, the stakeholders, and consumers of its downstream products. So as in the previous case we look and the information regarding HSE the company makes publicly available, a series of documents can be found on the company’s website under the sections of Governance and Sustainability. However, in this case the regulations are *enforcing*, because the information available on the company’s website is general, while no information regarding the HSE risk management and no information on the main approaches of the company in assessing and managing risk and safety was found. The annual meeting with stakeholders also does not provide any information on these aspects of the company’s activities, only general data that is relevant for the company’s investors.

According to the documentation studied, the scope of the application of the regulations is very large, because it encompasses the company, its subsidiaries, and literally every employee. This illustrates the importance given to HSE and risk management in the company.

4.5 Illustrating the main characteristics of Eni regulations of HSE

The analysis presented in the chapter 4.3.1 - 4.3.5 takes us to a summary similar to that in the previous part, concerning the Norwegian regulatory environment. In this case, the overriding principles were inferred for the analysis of three documents, which regulate the HSE issues in the company – SCIGR, HSE MSG, and HSE Risk Management and Reporting Instructions. After a brief summary, these principles are going to be compared to these in Norway and a conclusion will be derived, based on the results of this comparison.

Risk	«A combination of the likelihood of an occurrence of a hazardous event or exposure(s) and the severity of injury or ill health that can be caused by the event or exposure(s)»
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Regulatory policy design:	<ul style="list-style-type: none"> • Delegatory and incentive based/Detalized command and control • Enforcing • Scope is large
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Aspects of HSE	PRINCIPLES	REGULATIONS
General	Requirements are generalized	SCIGR, HSE MSG, and Instructions should be applied together
General	Partly goal oriented and non prescriptive/partly detalized and prescriptive	Characteristic of all regulations
Management, organization	Hierarchies of risk, risk minimization also a general target	HSE Risk Management and Reporting Instructions
Management, organization	Continuous improvement through iterations	HSE Risk Management and Reporting Instructions, Eni HSE Report (2011)
Management, organization	Communication and information (internal) + communication and consulatation (external)	One the the core principles in SCIGR and other regulations; risk management process
Management, organization	Internal control system + Audits and reporting to the headquarters	Integrated Internal control System and audits for the headquarters
Management, organization	Delegation of responsibility (3 levels) + almost automomous subsidiaries	Risk Management and Reporting Instructions, but an overriding principle as well
Management, technology	Functional and performance – based (best practices and best available technology)	SCIGR, Eni HSE Report (2011)
Management, organization	Quantitative and qualitative aspects	HSE Risk Management and Reporting Instructions

Management, organization, technology	Precautionary principle	Inferred principle related to risk management from the set of regulations studied
Management, organization	Compliance is mandatory	SCIGR
Management, organization	Costs and benefits evaluation	HSE Risk Management and Reporting Instructions

Table 3. The main principles and characteristics of the regulatory framework in Eni

4.6 Comparison of the two regulatory frameworks. Analysis and summary of findings

Norway	Eni
«The consequences of an activity with the associated uncertainty»	«A combination of the likelihood of an occurrence of a hazardous event or exposure(s) and the severity of injury or ill health that can be caused by the event or exposure(s)»
<ul style="list-style-type: none"> • Delegatory and incentive – based • Informing • Scope supposedly large 	<ul style="list-style-type: none"> • Delegatory and incentive based/Detalized command and control • Enforcing • Scope is large
Main aspects: technology and management	Main aspects: management and organization

Key features	
Goal oriented and non prescriptive	Goal oriented and non prescriptive, but detalized and prescriptive on the employee

	level
Risk - based	Hierarchies of risk, risk minimization also a general target
Continuous improvement of regulations, processes, technology, risk and safety level	Continuous organizational and process's improvement through iterations
Communication and consultations	Communication and information (internal) + communication and consultation (external)
Internal control + Audits as a controlling measure	Internal control system + Audits and reporting to the headquarters
Delegation of responsibility to the Operator (responsible party)	Delegation of responsibility (3 levels) + almost autonomous subsidiaries
Requirements are generalized	Requirements are generalized
Functional and performance – based (best practices and best available technology)	Functional and performance – based (industry best practices)
Quantitative and qualitative aspects	Quantitative and qualitative risk assessment
Precautionary principle	Precautionary principle
Compliance to the regulations mandatory	Compliance is mandatory
Implementing good solutions without running into substantial costs	Costs and benefits evaluation
Compliance with the regulations is mandatory	Compliance with the state legislation is mandatory

Table 4. Comparison of the HSE risk regulations in Norway and Eni

As this table shows, Norwegian regulatory framework in HSE and Eni HSE management regulations are very similar in governing principles of management aspect of HSE. Additionally, if we look at the Figures illustrating the risk management processes adopted in Norway and Eni – it becomes clear that these are *identical*.

These conclusions might have three points of reference: first, the international standards that drove the regulatory authorities in Norway and the Board of Directors of Eni were the same (in case of risk management it was the ISO: 31000); second, because of the complexity of the concept of HSE depicted in the theoretical part of the study, so countries and companies are adopting the same standards and approaches since they have shown to be reliable, safe, and clearly, represent operational best practices. The third reason for this similarity might be the organizational isomorphism studied by Di Maggio and Powell, more specifically - coercive isomorphism. Looking back at the theoretical part of the study, the two scientists have emphasized that in an established field organizations tend to resemble each other in many aspects, and thus the regulation of HSE issues can be one of these aspects. It is worth noting, that albeit the principles of the regulations are so similar, the *definition of risk is different*.

The Eni regulations on the local level of subsidiaries/employees, however, appear to be more detailed and prescriptive, and this might be dictated by the need to ensure compliance locally, which can be very difficult with goal-oriented requirements, since the company is operating in various parts of the world, employing locals, that might belong to different cultural, historical, and organizational environment than that of the employees who are accustomed to incentive regulations.

This is also a manifestation of coercive and partly normative isomorphism, but on the *level of personnel*. This might be an interesting finding, because in the work of Di Maggio and Powell only deals with organizational isomorphism. In this case, the pressure of the organizational regulations applies directly to a person, making him/her to adjust to the company's regulatory environment and procedures.

This said, the answer to the main research question obtains a basis: in some cases, due to a number of factors, state regulations and company's regulations of a certain area of activity in a certain field can have points in common. This is contrary to the Hypothesis 1 mentioned in the Theoretical assessment, that Eni has aligned its regulations to the state regulations in Norway, because these are different. Additionally, as emphasized by an employee of Eni Norge and other company representatives, according to the company's Management procedures it should *in principle* comply with the regulations of the state they are working in. But what about the internal regulations? According to the findings introduced above, these regulate company's internal procedures and activities, as well as *relations* with external environment, but compliance to these is also required.



Figure 20. Hypothetical representation of the state – company interaction over a project

Norwegian legislation states, that any company conducting activities on the Norwegian Continental Shelf must in principle comply with the regulations of this country – quite typical claim, since it's obvious a local or foreign organizational body must follow the law. At the same time, according to Eni regulations, all the company's branches and subsidiaries must in principle comply with the norms and regulations of the country they operate in. Same for this – it's obvious, no company in the world wants to disobey the laws in the markets they are working in. Moreover, several people from Eni and Eni Norge have emphasized that the state requirements are a priority for the company. Therefore, in light of the Norwegian legislative context it is possible to say, that one of the main objectives on all stages of the project was to make sure any activity of the company is in line with the main Norwegian regulations, as well as company's internal regulations.

Additionally, full compliance implies not only compliance to the regulations themselves, but also to the governing principles. It is crucial for two reasons: first, the Norwegian regulations are goal – oriented, so one won't be able to find specific prerequisites for oil and gas activities - and that's where one should look at the governing principles to understand *how* to work in this context; the second reason will be addressed further, however, it should be noted that it is impossible to provide, say, a PDO or IAS – the basic documents for any project on the NCS, without the incorporation of the basic principles. Back to the Goliat project, this view on *compliance* with the regulations will be further taken for granted.

A look over the two regulations has revealed the main principles established in each regulations and it was already mentioned that a number of principles was found to be common. Consequently, they can provide the basis for answering the main research question, because it is possible to assume that in our case there was already a sort of an institutional common ground for state – company communication. The Goliat field had different stages: exploration, surveys, exploration drilling, appraisal drilling, development, and production. On every stage the company has followed the principles from the Table 4, so these are also expected to be present in the relevant documents regarding the operational stage of the project.

In the Methodology for this study a lot has been said about *interaction*. Now, in the fashion of what has been said in the last paragraphs it becomes clear, that the state – company alignment process can be illustrated in the Figure 20. This gives us food for thought and further analysis: the main goal of the case study is to find out about the additional requirements set to the Goliat project by the authorities in light of the illustrated process. Moreover, one should look at what were the points, topics, or project aspects, around which this interaction took place and to understand the potential reasons of why they have appeared.

According the analysis of the Norwegian regulations, the main concerns for the governmental watchdogs are *management and technology*, while according to the assessment of the company regulations, the Operator provides an *organizational component*, as shown in the table summarizing the main aspects of the Eni regulations (the regulations mainly are mainly concerned with *management and organization*). The organizational component is ways the work is being done and the project is executed. Is this consideration true? This can be the *final hypothesis*, which will be tested in the case study.

The findings emphasized in this chapter provide a hint to this research: they implicate that the state – company's alignment is an interdependent *process*, strained along the project timeline and stages. The main focus of this study is the operational stage, so it is assumed that study of the data related to the case study will provide insights to this process and to maybe apply a time – frame to it, in case it will result possible.

5 Chapter 5. The Goliat project case study

5.1 Establishing a context for the case study

The analysis of the two regulations and the summary from the last chapter can be considered the basis for the case study. The research question for this work is «*How company has aligned its own regulations and procedures to Norwegian regulations and guidelines in case of Goliat operations?*». The research question was based on the assumption, that as far as the regulations refer to two different realities thus the regulations should be different. Nonetheless, *the analysis of the regulatory frameworks has revealed, that they are to a large degree based on the same principles*. Moreover, it is a priority for a company to comply with the state regulations in Norway. As it was also emphasized by a source in Eno Norge, the company has performed GAP analysis between the two regulations to identify discrepancies and effectively address them. This affirmation can simplify the task of the case study, since now it is necessary to define: a) the main criticalities around which the process of the Figure 21 appears; b) how did the company manage additional requirements set by the authorities (field-specific requirements); c) securing which aspects of the management/technology the company put most emphasis on; d) the scope of the Norwegian regulations.

Risk management and regulatory roles might be best elucidated in concrete events and cases. The regulatory responses can materialize in the documents, that can illustrate in a more comprehensive way the process described in the Figure 20.

However, it is possible to state in advance that the mentioned additional aspects should complete the puzzle of the answer to the research question.

5.2 Contextual aspects of the oil and gas activities in the Barents Sea

The analysis of the concept of HSE has revealed that the regulations can be to a large degree influenced by different contexts: it can be country-specific, company-specific, or specific to certain (environmental) conditions or project in terms of complexity. In other words, HSE is inseparable from the contexts it is being applied. At the same time, an industrial project also can not be separated from the context in which it was thought, matured, developed, and came into reality. The background for the Goliat project, in the author's opinion, is twofold: one is the mentioned interdependent process of the state and the company interactions concerning the issues of HSE and regulations; while the other is the unique climatic and environmental properties of the Barents Sea. One should therefore introduce the

environmental context in which the two regulations focalized together in a specific project, because as it was already highlighted, the regulations can not be detached from the context. Referring to the claim in the methodological part of this study, we achieve *humanly-constructed reality* by acknowledging and understanding a *human-independent reality*.

There is an ongoing debate on whether the Barents Sea possess critical factors, that imply difficulties for oil and gas operations. Moreover, according to some experts, the petroleum activities in the Barents Sea should be to a large degree limited or even prohibited. The aim of this subchapter is to provide a comprehensive (but, of course, simplified) overview of the climatic and environmental context of the Barents Sea, and to investigate, how these characteristics might influence a field development the project.

To start off, the proposed oil and gas development projects in the Barents Sea, and consequent maritime tanker traffic due to the activities in the High North emphasize the need for HSE standards adjusted to additional challenges of the arctic conditions: ice, icing, long distances for infrastructure, darkness etc (Barents 2020). According to the same report, existing regulations and technical standards does not include specific measures for addressing HSE challenges of the arctic, therefore today's technical and design standardards should be updated (Ibid). Only together with significantly increased reliance on project specific functional requirements by individual operators and down the supply chain, recognised international technical standards are applicable in this type of climate (Ibid).

The preliminary risk study shows that the risks increase when moving the operations into cold areas and areas with ice, due to the increase in severeness of consequences of a potential accident. The risk increases for all accident categories in the Barents Sea, so the project needs to focus on possible measures to reduce the probability of an accident as well as the consequence (Barents 2020).

Indeed, the cold climate is associated by many scientists with more risk and difficulties to oil and gas operations than in other areas. It is highly important that any offshore activities in the Barents Sea need to take into account all the challenges that Arctic climate introduces. The Barents 2020 report done by DNV has identified several challenges of the Arctic region that add risks to the existing safety, health, and environemtnal risk picture in the North Sea. If oil and gas activities offshore NCS in the Barents Sea ought to be conducted with the same safety level as in the North Sea, several factors must be accounted for evaluation and implementation of specific technical solutions and operational best practices.

First, significant variations in the climate conditions of the Barents Sea were found: according to the recent analyses of the climate of the Barents Sea, the overall conditions were

found to be less harsh, than it is considered by the public opinion (Oljevern)¹⁰. The western part is in many aspects similar to the North Sea in environmental conditions, while additional Arctic challenges increase further east: low temperatures, ice, icing, darkness, remoteness and vulnerable environment (Barents 2020).

Moreover, two particular environmental phenomena were found present in the western part of the Barents Sea, and these events might imply serious complications for the petroleum activities in this area, compared to those in the North Sea. These phenomena are icing and polar lows. These opinions of the researchers are also supported by conclusions made by Statoil and Eni Norge on their joint information Internet portal - Oljevern.

Barents Sea is considered an environmentally vulnerable area. More than 300 species of micro algae are registered in the Barents Sea, about 150 fish species (the most important commercial fish is cod, capelin and herring), and different types of top-predators such as seal, whale and ice bear are also important species in the Barents Sea (Bellona)¹¹. This said, prior to any activity a thorough analysis of the impact of oil and gas activities environment and species that are living in the area of the field development must take place. Obviously, this should be done on every stage of the project.

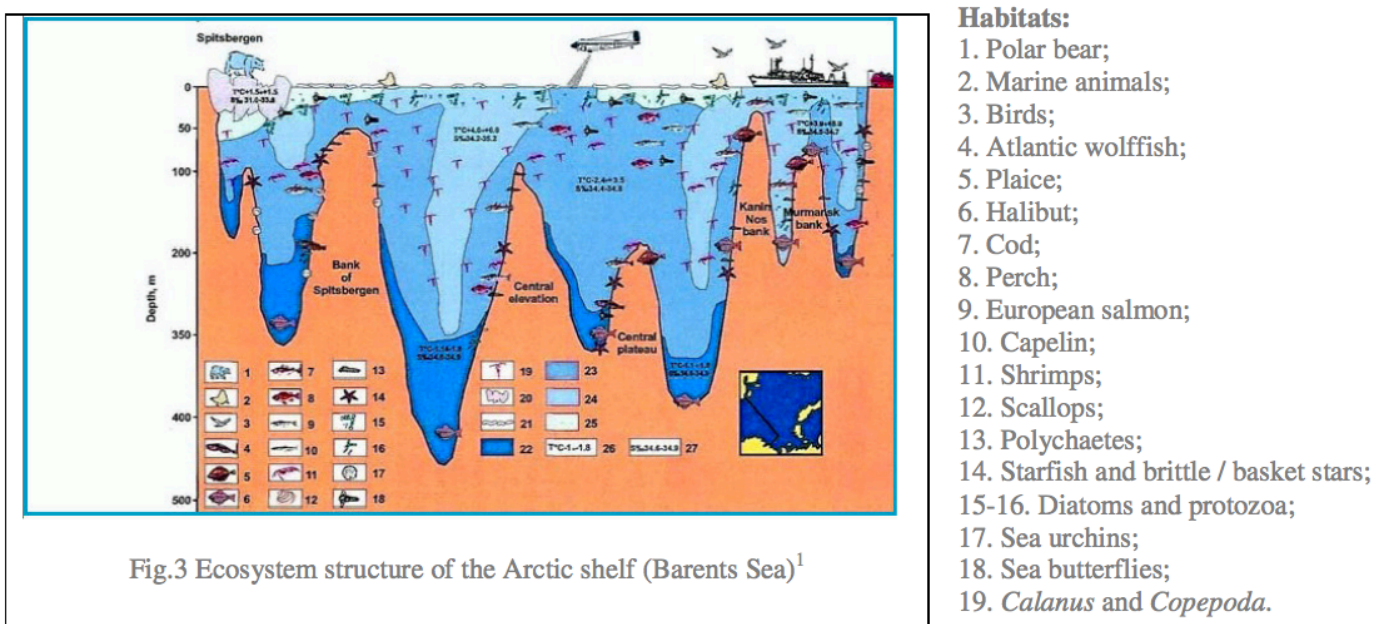


Figure 21. The ecosystem of the Barents Sea (Source: Bellona)¹²

Additionally, nobody can be one totally protected from the so-called Black swan events that are «a highly improbable events with three principal characteristics: unpredictable;

¹⁰ <http://www.oljevern.no/no/Articles>.

¹¹ http://bellona.no/assets/fil_Chapter_5_Environmental_impact_of_oil_and_gas_activity_in_the_Arctic.pdf

¹² http://bellona.no/assets/fil_Chapter_5_Environmental_impact_of_oil_and_gas_activity_in_the_Arctic.pdf

they carry a massive impact; and, after the fact, we concoct an explanation that makes them appear less random, and more predictable, than they were» (Taleb, 2007). These events, however, are extremely rare.

According to the Barents 2020 report, the severeness of the possible hazards might increase due to a number of Arctic – specific factors: remoteness, huge distances, and lack of infrastructure that make emergency response more complicated; darkness, which also complicates the response; extreme temperatures and weather; unique and vulnerable marine and coastal environment; potentially long down-time of operations after accidents, because of seasonal inaccessibility for repair; high public scrutiny to activities in the Barents Sea, low public tolerance for accidents with potential serious damage to reputation for all parties involved (Barents 2020). This said, these factors should not only be included, but to become starting points in the overall risk identification and management process. Moreover, in light of the possibility of hazards in the High North, the focus on contingency plan should be very high.

Due to the mentioned properties of the natural conditions in the Arctic, the main risk for the operations in this area is that the consequences of a possible accident might be much more severe and/or increase in their extent than in the North Sea. The consequences that are considered severe include loss of lives, environmental damage, and consequently serious economical loss. It should be noted, that there is lack of data regarding the possible effect of a hazard offshore for the ecosystem of the area in general. This said, one should not forget, that a certain degree of risk is always present, therefore any discharges resulting in water pollution are going to be prohibited in the Norwegian part of the Barents Sea.

All above implies, that specific solutions must be implemented in order to get people working in these conditions more prepared, because safety for people is considered the first to come when considering a project in any area of the world. The personnel should be, first of all, specifically trained and well educated to work in the arctic conditions. The requirements regarding overall health should be high, therefore a primary medical assessment by a certificated doctor is a must. When offshore, the effects of cold climate on personnel should be taken into account when scheduling work task, shifting, and in work permit system.

Following their obligations on the 2 degrees target, many countries are now looking at reducing the emissions to the atmosphere. Norway has also adhered to these plans, therefore requirements for any project in the High North will be very strict in terms of emissions to the atmosphere.

The international regulators could not be identified in the data, which was collected for this study. However, the communication with the relevant HSE personnel in Eni Norge has revealed a set of regulations and standards used specifically in this project:

- ISO Standards (Especially the the ISO 14001 standard)
- The IPPC directive (EU Directive 96/61) relating to the use of the best available technology
- NORSOK
- Integrated Management Plan for the Lofoten – Barents Sea area
- Government White Papers
 - a) Government White Paper #10 (2010-2011)
 - b) Government White Paper #8 (2005-2006)
 - c) Government White Paper #38 (2003-2004)

According a representative from Eni Norge, two context – specific documents were also used in the elaboration of environmental risk assessment and impact assessment (however, there is no specific information of what was used) - the *DNV Barents 2020 report*, and *RU-NO Barents project*.

The conclusion that can be drawn from this part is, that despite the alarmist moods coming from the science community, there is no lack of operational standards for the Barents Sea and for Goliat, and all the necessary requirements are available, however there is a common sense that they should be updated to specific conditions of the Arctic – this work is already being done.

Additionally this chapter has shown, that there a set of context – specific regulations was also applied to this project.

5.3 The Goliat project

5.3.1 Introduction

Goliat is an oil and gas discovery located in Production Licence 229 (PL 229) in the south-western Barents Sea, approximately 70 kilometers north of Sørøya in the county of Finnmark, and approximately 50 kilometers south-east of the Snøhvit field. The water depth is estimated between 320 and 420 metres. The field is located in Blocks 7122/7 and 7122/8 and partly in Blocks 7122/9, 7122/10, 7122/11, and 7123/7. The development project proposed

involves a production of hydrocarbons from the Realgrunnen and Kobbe reservoirs, and the recoverable oil reserves are estimated to be near 28 million Sm³. During the initial fase of production gas will be reinjected to provide the necessary pressure in the reservoir, but it is planned to produce this gas during the latest phases of the production. The recoverable gas is estimated to be 8,8 Sm³ (PDO for Goliat, Pt. 2 – Impact Assessment).

The field consists of 8 seabed templates linked to a circular floating production, storage, and offloading (FPSO) installation. A total of 22 wells are planned to be drilled, including 12 production wells, 7 water injection wells, and 3 gas injection wells (PDO for Goliat, Pt. 2 – Impact Assessment).

In reference to the Project Schedule it should be noted, that the production start-up took place only in mid 2016.

Submission of the IAS	November 2008
IAS consultation	Novenber 2008 – January 2009
Submission of PDO	1st Quarter 2009
Approval by the Norwegian Parliament	Spring Session 2009
Detailed Project Design	2009 - 2010
Building/construction	2010 - 2013
Drilling	2011 - 2014
Installation of subsea facilities and pipe systems	Summer half – years 2011 and 2012
Installation of field facility, risers and laying of electric cable	2013
Production start up	2013

Table 5. Project schedule (Source: Eni IAS for Goliat, 2008)

5.3.2 Goliat project in light of HSE

Recalling the specific environmental properties of the Barents area described in the first subchapter to this part of the study, the Goliat project was subject to strict environmental

requirements before the project development even started, and enormous attention to these requests was paid from the very moment of the green light to the project. Several additional factors further complicated the task: a) it was expected that the FPSO would be the first installation to start production in the Norwegian Barents Sea, which will be close to the coast; b) the vulnerability of the environment around the field and climatic properties of the northern areas and their potential effect of health and safety of personnel and people in surrounding areas; contingency and oil spill liquidation; protection of flora, fauna and the ecosystem in the area of the field; c) the project was subject to strict environmental terms which are represented in the *Integrated Management Plan for the Lofoten – Barents Sea area (at a certain point it was updated and the requirements became almost the same as in other parts of the NCS – source in Eni Norge)*, which are considered areas with the most fragile ecosystems - the management plan included such measures, as zero discharge in the sea during normal operations and requirements for reinjection or other technology to prevent discharges of the produced water; in the event of the operational hazard no more than 5% of the produced water may be discharged, on condition that it was purified (specific purification requirements are also present); d) the project incorporated several technical and design decisions, that were to be used for the first time on the NCS (circular permanently anchored floating unit, direct offloading to shuttle tankers).

The main emphasis on the HSE aspects of the project are delineated in Plan for development and operations of Goliat Pt.2, Impact Assessment. First of all, explanation is given of the selection of the development concept. The FPSO option was given a priority, because this concept was found better in the following terms: environmental, energy efficiency, maturity of technology, suited for tying in to new discoveries in the area, cost effectiveness. The selection of supplier for the construction was carried out by means of tender competition between Sevan Marine and Aker Solutions, and a priority was given to the following HSEQ criteria (were applied together as a single criteria):

1. **Risk to personnel**
2. Risk to the environment and barriers to prevent serious oil discharges
3. Routine discharges into the sea and emissions to the atmosphere
4. Application of risk – reduction principles
5. Safety-related design
6. Working environment, design and solutions
7. Winterization (safety-critical equipment)

Even prior to awarding of a license, Eni both individually and in cooperation with other companies placed great emphasis on environmental issues connected with possible operations in the area: *surveying of natural ecosystems and habitats, developing new technologies and environmentally sound practices*. The development projects incorporated, and were made in accordance with *principles inherent in the legislation*: risk reduction, ALARP, BAT assessments. Additionally, the company has conducted several *thematic studies* specific to Goliat and the development concepts:

1. Environmental impacts of the evaluated development concepts
2. Emissions to the atmosphere
3. Discharges to the marine environment
4. Physical disturbances
5. Seismic surveys
6. Decommissioning
7. Environmental risk and oil spill protection
8. Impacts of the evaluated development concepts on commercial activities for fisheries and other industries
9. Social impacts of the evaluated development concepts (socio-economic benefits and analysis of impacts on employment and businesses)
10. Sami interests
11. Heritage sites

5.3.3 Study of the available documentation

Following the part and the whole methodological approach, several documents provided by Eni Norge, and related to the operational phase of the project will be taken into account for this part of the study. The documents represent a part of the long and continuous process of applying for licenses and permissions for operations, while this process, on its own turn, is a part of the whole – conducting activities on the Norwegian Continental Shelf:

1. Plan for development and operations of Goliat Pt.2, Impact Assessment
2. Goliat development project concept definition phase. Unofficial translation of the Norwegian parliamentary bill #64 (yy. 2008-2009). Development and operations of the Goliat field
3. Application for permission to carry out activities pursuant to the Norwegian Pollution Control Act in connection with the operation of Goliat field, PL 229

4. Permit pursuant to the Norwegian Pollution Control Act for production and operation at the Goliat field by Eni Norge AS

These files will be assessed in the same order as in the previous paragraph, and only the essential information directly related to the research question will be presented in this part of the study.

5.3.3.1 Project development stage requirements: The Parliamentary Bill

The Parliamentary Bill emphasizes, that the IAS was submitted for consultative consideration in 2008, about 70 consultative bodies have consequently submitted comments on the Impact Assessment, and any circumstances which suggest the project should not be implemented were not found. However, the Bill itself include the evaluation of the NPD, Ministry of Petroleum and Energy, and that of the Ministry of Labour and Social Inclusion. A number of recommendations are consequently being proposed (terms and conditions), supposingly elaborated collectively with other bodies.

The document belongs to an earlier stage of the project, however it may provide a hint on how the overriding principles are actually being applied in practice. There are several claims that will be expressed here in a detailed way, because they may also provide additional information about the project and the requirements of the authorities.

«The need for an assessment of the possibility of increasing the capacity of the underwater cable used for the power supply of the installation from the mainland and additional arrangements to ensure that it will be possible to install an additional power transmission cable from land». In the Bill the authorities have emphasized that power supply from land shall be considered for all development and major redevelopment project on the NCS. Consequently, the Operator has evaluated several energy supply concepts, including power and heat generation entirely on the facility, partial electrification from land, and full electrification from land. In response to the Ministry's guidelines, it was decided that Goliat will receive power from land, combined with gas and liquid fuelled turbine on the facility, that will satisfy energy requirements of the field from production start up. This concept also differentiates from the others in carbon footprint: the system is expected to contribute to reduce emissions from the NCS by an average of 115000 tonnes CO₂ per year during the lifetime of the field. Additionally, the company has planned arrangements to reduce the power generated on the facility by adding another cable from land to the installation, also in line with the Ministry's requirements. Additionally, the local grid in Finnmark had to be upgraded. In reference to the power supply, the operator will submit an application for a license pursuant to the Norwegian Energy Act and Norwegian Water Resources and Energy Directorate.

«The licences on estimated full power consumption linked to the full electrification in 2017 should be submitted to Statnett SF». Moreover, in case of a positive outcome of the licence application, the power grid in Hammerfest had to be augmented. As soon as the power distribution in the area will be increased, the Licensees had to submit a plan to the Ministry on increased utilisation of power from land. The Ministry made an assessment and consulted the Licensees whether further measures should be taken to increase the levels of power utilisation from land.

«The Operator must no longer than 2 years prior to start of the operations submit a plan for gas exploitation».

«The contingency strategies must be assigned very high priority due to the particular challenges of the northern areas. The Operator should evaluate the infrastructure of the area of influence of potential polluting emissions and discharges. The Operator should implement measures aimed at unification of the oil spill contingency strategies in the potentially affected municipalities: Måsøy, Hasvik, and Nordkapp. The measures and requirements will be specified during the consultation process with the Norwegian Coastal Administration».

It should be noted, the the Operator has had already provided a thorough contingency strategy. As stated previously, the Operator had to incorporate the particularities and challenges of oil spill protection in the Barents Sea: strong wind and breaking waves, poor daylight conditions in the polar night (should therefore incorporate technology for locating oil on the sea surface in conditions of reduced visibility, forms of remote measurement can be downloaded to the vessels taking part in the operation), low temperature combined with strong wind (important to take care of health and safety aspects). Moreover, according to the High North Strategy, the Operator had to establish special observation and communication systems to enable efficient monitoring of potentially polluting discharges.

The authorities have also specified that the oil spill contingency plans should be *at least* as good as elsewhere on the Norwegian shelf. *The primary objective nonetheless had to be a minimization of consequences of a possible discharge.* The contingency plans are stated to be described in detail in the applications for licences for production drilling and operations, which had to be submitted to the Norwegian Pollution Control authority (hereafter SFT). The SFT was to decide what specific requirements for preparedness against serious pollution are to be applied. Environmental risk and contingency analysis form the basis for contingency strategy, provided in the company's Impact Assessment, and although the environmental risk

without this strategy is found to be low, the *SFT required the contingency analysis to be updated* in relation to the ongoing activity on the field.

The Operator had guaranteed, that in addition to all the requirements, it would also build on contingency concepts established by the Coastal Administration, NOFO and inter-municipal groups responsible for addressing serious pollution. Moreover, the Operator had stated, that it would reinforce collaboration between public and private actors to achieve an integrated and improved contingency strategy. It would provide training initiatives built on the existing base of training providers in oil spill protection. The courses were aimed for representatives from Finnmark County by offering training or job placement in existing contingency organizations or in Eni to representatives of the municipalities, companies, or other organizations, and will be accessible whenever possible and arranged locally. Local fishermen were also involved in the described activities, in order to integrate local skills and knowledge, and additionally make use of the small fishing vessels in oil spill protection operation in coastal areas. It was stated, that the Operator had to consult with the Coastal Administration (in Finnmark county) with regard to the development of oil spill contingency plans.

Nonetheless, additional requirements and consultations were found to be necessary. This indicates an extremely high priority on the contingency plans for the Norwegian authorities.

«The Operator should follow up measures to promote local and regional spin-offs from the Goliat development project». The total list of specific measures is presented in document.

These requirements were introduced in 2009, that was prior to the operational stage, and were supposedly subject to a number of additional documents and consultations. However, it is not directly implied by the data. However, the requirements provide a number of relevant insights for this study.

First of all, it is evident, that the Ministries not only do their own evaluations of the propositions, they also consult with a number of independent organizations, which provide their considerations on propositions and opinions/evidence on whether the proposition should be satisfied or not. In fact, the consultations take place on all stages of the project, prior to any issuing of permits or satisfying the operator's applications. Evidence of that is also provided by the Plan for development and operations of Goliat Pt.2, Impact Assessment, where the company provides a list of independent bodies in charge. This said, not only we see another

player that assesses compliance – *the independent bodies*, but also the communication established between the Ministries, organizations, and the Operator – *the “threepartite communication”*.

Based on the evidence it can also be assumed, that the independent organizations assume their role only in reference to specific documents, such as, for example, the IAS, because such documents are the representation of what the operator actually proposes. Finally, in several cases it was stated, that the Operator should “communicate” with the authorities. Semantically, the notion used does not have any coercive component, but instead implies a “dialogue”.

In addition, it should be noted, that strong emphasis is put on the contingency strategy in case of a spill, and measures applied to the discharge of polluted water or other chemicals in process on normal operations, as well as a hazard. It is thus clear that according to the Norwegian authorities, any possibility of pollution, except for that of the CO₂ emissions (that will also be minimized to a maximum possible level), must be extremely low or zero.

It is important to mention, that document also provides an insight on what the company did in order to secure the challenges of this project are met and addressed: «The Operator has prepared a strategy regarding organizational structure, work procedures and management systems to suit the challenges of the Goliat field». This said, it can be concluded that primary to any activities, Eni has established a sound management system and procedures. Mentioned only in one sentence, this affirmation might be *one of the key components of the answer to the research question*.

5.3.3.2 The environmental requirements: Permits

The next document - the Permit pursuant to the Norwegian Pollution Control Act for production and operation at the Goliat field by Eni Norge AS was issued in connection with the preparation, installation, and production start of the Goliat FPSO. The permit was applied to the use of chemicals and discharges to the sea and air, and the use of chemical dispersal agents for combatting oil spills in case of such an event. This document is really important for this study because it relates to the operational stage of the project and describes the process of application, consultations and decision – making.

In the document it is stated, that the reference incident taken for the risk analysis and assessment of environmental risk is the loss of well control leading to a *blowout*. This was also confirmed by a representative of Eni Norge. This is the direct application of the *worst case scenario* approach.

The environmental risk in the production phase has been analysed in accordance to the principles of MIRA METODE FOR MILJØRETTET RISIKOANALYSE (MIRA, REVISJON 2007). According to this analysis, the selected ecosystem components, both individually and collectively *lie within the company's acceptance criteria by a good margin*.

The rest of the measures taken by the company a related to the emissions to the atmosphere, discharge of water (95% reinjected, 5% discharged, but purified according to the requirements), the usage and discharge of chemicals during the production, contingency plans (mechanical recovery + dispersal using vessels and aircraft, plans for procedures for detection and remote monitoring of spills).

During the processing of the application, the nature conservation organizations (Naturvernforbundet, Natur og Ungdom, and Bellona) were given the opportunity to comment on the company's plans. These actors were against the production start of the field, mainly because, in their opinion, the project goes against Norway's commitment to reduce climate change, the company didn't take into account the potential changes in ecosystem as a result of climate change (therefore, the company used the outdated knowledge in its environmental risk and contingency analysis), and lower level of ambition regarding discharges to the sea. However, they gave recommendations in case the permit would be granted anyway:

- Before any permit can be granted, Eni must explain the consequences of potential changes to the ecosystem resulting from climate change
- In consideration of vulnerable and unspoilt natural resources of the Barents Sea, the target of zero physical emissions shall be maintained (discharges of purified 5% in case of a malfunction allowed pursuant to the Government White Paper #10, 2010-2011)
- The zero emission for black and red category chemicals¹³ must be maintained (black and red category chemicals were planned to be used in tracers, hydraulic fluids and firefighting foam). No form of dispensation must be granted for the use and discharge of environmental toxins
- If chemical dispersal is included as a potential barrier for combating oil spills, Eni must submit a separate application setting out which dispersal agents it wishes to use. This application must be processed by NEA before permission can be granted pursuant to the Pollution Control Act

The statements were sent to the company, and its reaction included the following statements:

¹³ Pursuant to the section 63 of the Activities Regulations, chemicals shall be classified into colour categories based on the inherent eco-toxological properties of the substances in question

- Both the *environmental risk and contingency analyses were revised in connection with the application, and most up to date environmental data were used as input.*

- The claims regarding the Norwegian climate commitments, potential changes in ecosystems, and issues regarding management and control of the Barents Sea goes over and above the operator's responsibility.

- Resulting from a revision of the management plan for activities in the Barents Sea zero discharge of produced water is no longer a requirement.

- *The risk – based assessment* was taken into account when determining the priority of HSE initiatives and deciding on the use red and black category chemicals (in line with Section 11 of the Framework Regulations). *Safeguarding life and health is a priority* in consideration of the environment and installations. Therefore, it is right to plan for the use of a chemical (with fluorine compounds, which are in the black category), which satisfies the the technical requirements for operations in temperature down to 20 degrees (in Application for permission to carry out activities the minimal winter temperature in winter is expected to be -15, so obviously a *worst case scenario* has been taken as the basis for the usage of chemicals. However, Eni has emphasized its plans to initiate a qualification process to find a firefighting foam without the black category compounds that can be used at temperatures around minus 20. If such option will be found, Eni will replace the existing foam. Additionally, the firefighting foam is planned to be used only in relation to the actual incident.

- In compliance with the official requirements Eni must test the fire extinguishing systems, so it is inevitable that small amounts of chemical compounds will enter the sea. However, the company will endeavor to reduce the time necessary for testing to a minimum.

- The contingency strategy emphasize plans for the usage of a dispersal agent, which was tested through various approaches and has satisfied the requirements demanded by the environmental organizations.

Then, the Environmental Agency stipulated its *terms and conditions*, based on pollution – related *drawbacks*, assessment of what can be achieved implementing the *best available technology*, and *precautionary principle*.

The issues that were evaluated according to these principles were: discharges to the sea, use and discharge of chemicals (the discharges of black and red category chemicals were found very low and distributed over a long period of time), discharges of oil-containing water (the purification system was found compliant with the regulations, although the operator should adhere to a documented objective to further reduce the oil content of the water and to

make a maintenance and inspection program to ensure high efficiency of the purification system), injection, emissions to the atmosphere (the principle sources on Goliat are power generation, flaring, cold ventilation and diffuse emissions, from storage and offloading of crude oil, from diesel engines (all sources of emissions were found to correspond to BAT, however it is stated that the level of emissions is something the industry should work on continuously and is subject to NEA's inspections); energy management (in line with BAT); contingency requirements with the requirement of response time of 3/12 hours (notably, the remote monitoring strategy include process monitoring and pressure monitoring, oil detecting radar with IR and video cameras, each seabed templates equipped with four capacitive sensors and three acoustic sensors, supply ships equipped with ODR, IR, video cameras, AIS buoys, and ROV's, the tank vessels equipped with three SECurus and one ODR radar, and the installation and vessels all connected to TCMS server, which is is connected to SECurus, ODR radars, and satellite systems enabling all of them sharing information internally and externally, and finally the helicopters equipped with IR, video, downlink, radar and satellite systems); combatting pollution (the general requirements are of 3 barriers and the overriding principle of combatting pollution as quickly as possible, as close as possible to the source of discharge, and with a system resulting in as less as possible pollution). The NEA expects the operator to consider the significance of new information regarding the relationship between chemical dispersals and risks to organisms in water column, and revise the environmental risk analyses if necessary. According to the Agency, the operator also has to weight up mechanical and chemical combatting methods in an emergency situation. The NEA will further perform audits to make sure the stipulated requirements are respected.

The Permit pursuant to the Norwegian Pollution Control Act for production and operation at the Goliat field by Eni Norge AS summarize the requirements for the issues listed above by NEA, in reference to which the audits are to be performed.

5.4 Discussion of results of the case study and conclusions

In this part of the study, which will also be the last one, we should sum up the findings to which this research has led us and to draw conclusions. Usually, the conclusive part of any body of text is a reminiscence of ideas and suggestions from the first part – the introduction.

What was the plan? Besides all, the intention was to do a practical, hands-on study. Did we reach this objective? For this research, the two bodies of regulations were analysed and presented accordingly to a predefined approach. Moreover, several documents, which are directly related to the case in matter were retrieved and assessed. The author has established continuous communication with the personnel that were directly involved in the project and

the company in question. However, the study has faced some limitations. The author has been able to conduct only one interview, because the thesis was written in Russia, whereas the company and the project are placed in Norway. Moreover, the author wasn't able to establish a contact with representatives of the Norwegian authorities: an additional interview with one of the representatives would have been helpful for this study, but not essential. All in all it is possible to say, that the thesis has obtained the stated practical and real-life case appeal and filling.

The stated purpose of this study is to provide an overview of the regulatory regime and main practices in addressing HSE issues in Norway and Eni, and to emphasize the main differences of these. It is possible to claim, that the purpose of this study has been fulfilled in the Chapter 4. Does and will this analysis create any value for the companies, which consider working on the Norwegian Continental Shelf? This is something to verify in the future, while it will also depend on whether the quality and value of this research will be recognized by the institution it will be submitted in. However, the study has reached several important results that will be presented further.

Following the methodological approach allowing different hypotheses to pop up from the data and the presented information, this study has addressed several of these. The first one was tested in the analysis of the regulations, which has shown, that the two regulations are similar in many aspects. The second hypothesis regarding the focus on technology and management of the Norwegian regulations and, therefore, authorities appears right, which will be emphasized further in this chapter. Finally, the last hypothesis regarding the state - company regulations and interaction was also right. All in all, the further analysis shows, that the process illustrated in the Figure 21, which was a hypothetical process, of course, because no evidence of that was present, found its proof in the case study.

What is it possible to emphasize from the information presented in the case study? First of all, it is possible to fulfill the *gap, which appeared in the Chapter 4 concerning the scope of the Norwegian regulations* – it is very large. While it is not explicitly stated in the text of the regulations themselves, the responsible organs (the PSA, NEA), oversee the compliance to the requirements and many other aspects on all stages of the project, from the seismic exploration to decommissioning.

Secondly, the case study has revealed what are the most important regulatory aspects in the real-life project on the NCS. Basing on the analysis above, there are several of them, and they will be emphasized further. As for now, it is necessary to remember, that in the Methodological analysis it was said, that in the development of a project of this complexity an

interaction between the company and state realities, involving a third component – *location* of the project, might be present. The study has revealed, that this interconnection is present, first, in the regulatory aspects, and then, after analysing a project itself, it is evident that there are clearly *three interconnected and interdependent realities (3 FACTORS)* that have influenced the project up to its core. This consideration constitutes ***Finding 1*** of this study (illustrated in the next Figure).

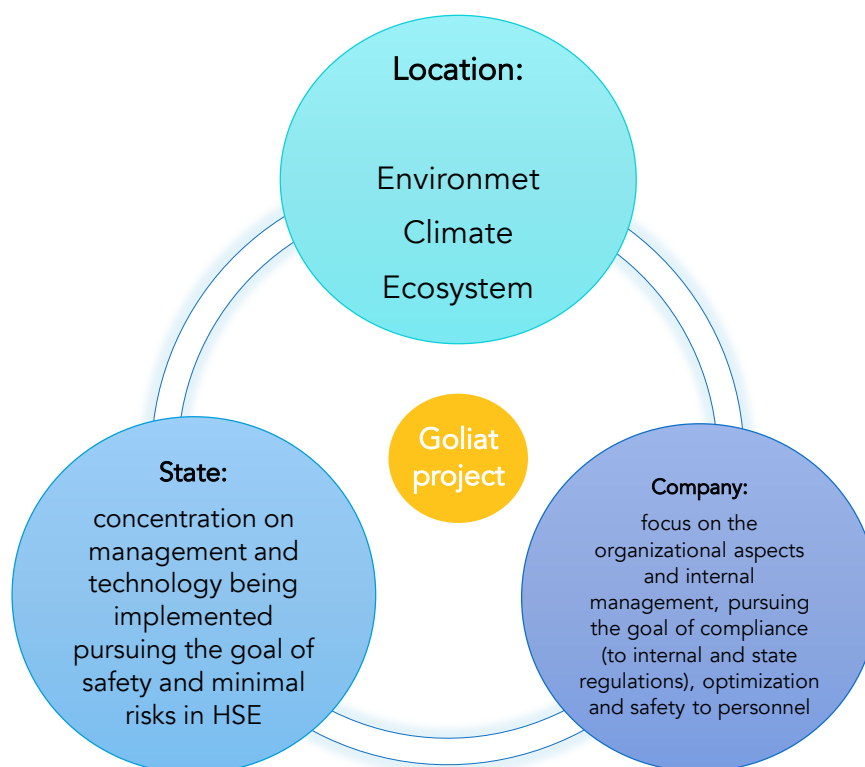


Figure 22. Representing the interdependent realities (3 FACTORS) that have influenced the Goliat project.

It is, however, hard to say whether this relationship is influenced by the regulations or the general approach, demonstrated by the Norwegian regulatory organs. But it is clear, that the alignment process involves not only state regulations and these of a company, but also properties of a particular **location**.

What might potentially connect these three realities? While the previous Chapter has covered only the principles of the regulations, now, after the thorough assessment of the case, we apply the picture to the *overriding principles of oil and gas activities in the Barents Sea*.

And, in fact, these might represent the connections between the state-company-location. Finalizing this discussion, it is also possible to add, that the realities represented in the Figure above are not only regulatory, but also can be characterized by presence of certain “properties” or “criteria”, that in the end influence the whole project and, therefore, risk management processes.

So what are these must-have properties, that can be found somewhere inbetween these three realities?

Finding 2.

As emphasized previously, the *compliance with the regulations* is an imperative; therefore, one should consider that this principle is present by default, because it is the basis for any activity. Moreover, as the analysis shows, another imperative principle is *safety of people*, which in the Barents context finds additional components and becomes amplified to *nature and ecosystem*. These two principles can be considered fundamental and aboveall for any petroleum activities in general, and especially in the Norwegian High North.

Retrieving the information from the interview and combining it with the considerations and conclusions from the analysis of the documents related to the Goliat project, it is now possible to cover other ***aspects and overriding principles to be applied in a Brents Sea project.***

I. Communication

Maybe the most important and the fundamental principle on every stage of the project. The Regulations and the PSA themselves emphasize the importance of this principle, but this study has revealed its actual scope, and it is enormous.

Analysis of the documents has shown that certain requirements were placed by the independent bodies with which the consultations were carried out – this fact is extremely relevant for this study. It illustrates the principle of communication, established in the Norwegian regulation. Additionally, this principle is taken further to the threepartite communication. Evidence of this was found in *all* four documents: Goliat PDO (the list of the organizations with which consultations will take place is provided by the company itself); Goliat development project concept definition phase - translation of the Norwegian parliamentary bill #64 (2008-2009): Development and operations of the Goliat field; and in the Permit pursuant to the Norwegian Pollution Control Act for production and operation at the Goliat field by Eni Norge AS. The last document provides a clear illustration of the whole process.

The Operator, following the main Statutory Regulations and guidelines submits to the relevant authorities a set of documents, equal to applications for permissions to carry out a certain activity. The application is supported by plans, data, and various benchmarks of what the operator actually aims to do. The Ministry or other responsible authority establishes a threepartite communication and evaluates feedback from both sides, and decides whether the Permit should be granted or the proposition are not in line with the main regulations. No activities are allowed before the consultations and the decision of the responsible authority is available. The Permit itself is granted based on the fact that the plans are in line with the main regulations and requirements and the consultations. If the third parties are against the issue of the permit, they should provide their evidence of why a permit should not be granted. The Operator also presents its considerations on the requirements set by the independent parties. Then, the Ministry decides which side to take although additional recommendations might be placed. From an outsider point of view, the process resembles a bit a court hearing. It is possible to conclude, that the communication with the authorities took place throughout the project and on all of its stages. The project probably would not have existed or would be largely different from what we can observe today, if it wasn't for this principle. All in all, the threepartite communication undoubtedly represents a fundamental concept for the Norwegian regulatory framework.

The informant from Eni Norge has also emphasized a strong collaborative spirit of the Norwegian regulations, and this principle is obligatory *in all activities*. The main tools for communication with the authorities are *L2S (licence to share), meetings, e-mails and phone calls*. Moreover, according to the source, «in Norway there is in general an open and constructive dialog with the authorities and all documents sent to the authorities can be considered available for the public domain. If anyone in the public do request a document names and sensitive information can in some cases be omitted». In case of the Goliat project, the communication with the authorities was established *both on technical and management levels*. Interestingly, the company has requested for exemptions, but these requests were not approved by the authorities and so the company had to modify the design/installations.

II. Continuous improvement

This characteristic can be considered a “twin brother or sister” to the previous one, because it would not have existed without it. The continuous improvement principle is reflected in the fact, that the project, even facing delays, gets better and better, since additional requirements and recommendations are set by the authorities.

Starting from the IAS and the consecutive Parliamentary Bill, there was a continuous emphasis on certain aspects of the project. These include *contingency strategy, oil spill protection, reduction and minimization of consequences of emissions and discharges, minimization of HSE risk*. This focus was due to the environmental characteristics of the Barents Sea and the zone the project found its “home” in. All this led to a pretty outstanding set of results: the contingency plan presented by the company, implementing a state of art technology acting as a single system, which is one of a kind in the Norwegian Barents Sea and on the NCS in general. Emissions and discharges are reduced to minimum levels – the discharges to sea are expected to be extremely low, with the quantity of chemical compounds reduced to 10-ppm, and minimal emissions to the atmosphere. The last property of the project is quite an achievement, considering the plant uses reinjection technology, which is usually considered to contribute to increased emissions of the installation.

As a representative of Eni Norge AS has mentioned in the interview, the company sometimes had to review and correct such documents, as, for example, the environmental risk assessment study, based on the feedback coming from the communication with the authorities as well as third parties. The source has also emphasized, that Eni Norge updated risk assessment according to pre-defined milestones and in related to other relevant changes in the project.

Moreover, evidence of new requirements and lifted requirements was found. It is emphasized, that these implications are in line with the main regulations. Both document were made after consultations with independent bodies.

Summing it all up, the principle of continuous improvement is, as in the previous case, a basic principle. Nonetheless, it may be as general, as case specific.

III. Technical parameters

The Table 2 shows, that labeling the main features of the Norwegian regulations leads to the idea, that there might be a technical focus. The documents analysed in relation to the case study suggest, that there was mainly a *strong emphasis on barriers, contingency plan, and discharges*. This inference, according to a representative from Eni Norge was right, because he also emphasized that there was a high focus among others on *environmental issues, oil spill contingency and winterisation*. This focus, according to the source, is due to the ***location of Goliat***. This is also supported by the fact, that the HSEQ department is given a high priority and it reports directly to the Managing Director.

According to the documents provided by the company, the main principle related to the decisions on technology to be implemented is the *best available technology*.

In the Methodological elaboration it was emphasized, that there might be sort of a «clash» between the regulatory reality and external reality. This might be a clear representation of this idea, because following the main principles of communication and continuous improvement, the authorities have placed a clear emphasis on several specifically technical issues the project should fulfill. In addition to this claim, these aspects were due only to the location, environmental, and climatic aspects of the area.

IV. Organization

It is evident, that addressing the difficulties of the project, as well as the mentioned principles of the Norwegian regulations the company has established organizational and other internal procedures and systems. As shown in the Table 3, the Eni regulations themselves have a strong organization and management component. Moreover, the company has guaranteed compliance to the regulations on all stages of the project, and congruent internal measures were introduced.

As for the project, the Goliat Development project did have its own HSE unit working exclusively on Goliat. In addition, the main HSE department did spend the majority of its time on Goliat.

Combining all information, can we now answer the research question for this study: ***How company has aligned its own regulations and procedures to Norwegian regulations and guidelines in case of Goliat project operations?*** Yes, we can.

As the research of the regulations and the case study has revealed, the company has produced ***10 main actions*** in order to start producing in the Norwegian Barents Sea.



1. *Safety of personnel was given the main priority*
2. Secured full compliance with Statutory regulations and the main principles of the Norwegian regulations (the company uses GAP analysis)

3. Followed the overriding principles of the Norwegians regulations and its own regulations, which are in many aspects similar
4. Established an organizational structure, work procedures and management systems to suit the challenges of the Goliat field. Especially, high priority was given to the HSE department, which spent the majority of time on Goliat, the project had its own HSE unit.
5. Paid enormous attention to field and location - specific issues, such as environmental issues, contingency plan, winterization
6. Followed up communication with the authorities on all stages of the project.
Main tools: L2S, emails, meetings, phone calls
7. Followed up audits (technical/organisational issues, general/specific)
8. Followed up internal control system and internal reporting
9. Reviewed/corrected plans/design and installations following to the consultations
10. Proactively addressed additional requirements arising from the consultations with the authorities and meetings with the third parties

The author considers it possible to claim, that the processes illustrated in the Figures 20, 22, and the 10 actions of the company are nothing else than representation of the company's alignment process to the state regulations.

Additionally, the mentioned set of principles and actions can be viewed as a brief «instruction» to any company that is planning to go for a project in the Barents Sea – this was the motivation and the target of the report. In line with the main approach for this study, this illustration aims at finally making a complex subject simple – the second aim of the report. Moreover, in the author's opinion, the conclusion for this study provides enough information for a, let's say, brief presentation for a smaller non-Norwegian company, that it considering a project in the Barents Sea in general, and especially in it's Norwegian part.

After the research question was answered and the relevant findings were presented, this study has reached its end in terms of content, logic, and relevant information and considerations of the author. The main goals and objectives this study had to achieve were reached. What's possible to say in conclusion? This was the author's first experience in research, while it is also his first experience studying HSE and risk management, not to mention exploring technical and design aspects of an actual FPSO. The topic of the study involves two complex, «sensitive» concepts: risk and HSE.

5.5 Final statement

All in all, the path towards the end of this study was not the easiest one. First of all, the mentioned concepts had first to be deconstructed in order to be understood, that's why the theoretical framework has so many smaller subchapters. Secondly, the aspect of regulations, their legislative and institutional nature and overriding principles had to be presented. And finally, the author had to face a struggle of putting all these pieces together and find out, how all of this applies in a real case scenario and in a real project. Noticeably, the author has reached a conclusion, which is in line with all the previous parts of the research, corresponds to the aim of the study, and actually provides new knowledge about HSE risk management in the Barents Sea, provides new knowledge for the oil and gas activities in the Arctic and contributes to future studies in this area.

5.6 Suggestions for further research

The results of this report imply several possibilities for further research:

1. Similar research with a different methodology to check whether the results of this study were right
2. Quantitative research related to this or another project (the aim could be, for instance, to define a correlation between the types of regulations in 2-3 different countries and the budget of a project)
3. A comparative research of IAS's and PDO's in countries with different types of regulations (for instance, Russia and Norway)
4. Study on similar topic (international company + local regulations + real project), but in another geographic area (for example, Venezuela, Brasil, or African countries) and to check whether the realities that have influenced the Goliat project can be the same in another areas (state-company-location) of the globe and the company shows similar actions.
5. A study to draw a correlation between different types of regulations (incentive vs command and control) and the actions of a companies, operating in these countries and define, whether the alignment is similar or different

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Eni Regulations and Documents (internal documents - available only in paper copies)

- Eni HSE Management System Guidelines
- Professional Operating Instruction: Risk Management and Reporting.
- Eni Management System Guideline HSE, 2 November, 2015
- Plan for development and operations of Goliat Pt.2, Impact Assessment
- Goliat development project concept definition phase. Unofficial translation of the Norwegian parliamentary bill #64 (yy. 2008-2009). Development and operations of the Goliat field
- Application for permission to carry out activities pursuant to the Norwegian Pollution Control Act in connection with the operation of Goliat field, PL 229
- Permit pursuant to the Norwegian Pollution Control Act for production and operation at the Goliat field by Eni Norge AS

Appendix 2. Interview guide

I. Questions regarding organization

- How many people are there in the HSEQ department?
- How many teams are there? What are they responsible for?
- Department is equal to others or has priority for top management?

II. Questions regarding the Goliat project

- A bit about the history of the project, how much time involved personally in the project
- Did you do risk reassessment each time the regulators turned off the production start?
- Among the possible HSE risks, what was the most important issue to solve? Did it take most of the concentration of the department?

III. Authorities and requirements

- What was the main tool of communication with authorities?
- What are other authorities involved?
- What are the main tools the department uses for internal reporting?
- Is there a priority in internal/external reporting?
- How many times the PSA did the auditing?
- Tell me more about the communication with authorities
- Is it representative of the Norwegian legislative principles?
- Tell me more about audits, what is usually included? Only technical parameters?
- Tell me about a situation what you could not come to an agreement? Was there a situation like this?
- Tell me more about internal control system, how is it implemented in eni Norge?
- Did the communication with authorities and other parties influence the whole project process? How? Positive or negative? Who is usually responsible for communication, Norwegians or expats?

- External vs internal regulations, what was prioritized in this project? Was there a priority?
- Were there any new regulations or requirements added to the project? Did it happen because of the communication with the authorities?
- If there was not any communication with the authorities, how do you feel about the project? Do you think there could be any differences in design, etc.?
- In the documents you gave me there was a strong emphasis on barriers, contingency plan, and discharges by the authorities. Did they place any specific requirements for these aspects, other than what you can find in general regulations and guidelines? I mean, something specific and prescriptive, for example the contingency plan should include the radars, IR and so on...
- The only specific requirement regarding these aspects I found was the zero discharge goal, but this was lifted. Could you please explain why it was no longer a requirement, what was the evidence to lift it?

Appendix 3: Tables and figures



Figure 1. Goliat FPSO (Photo credits: Marus Fiskum. Source: maritime.no)³

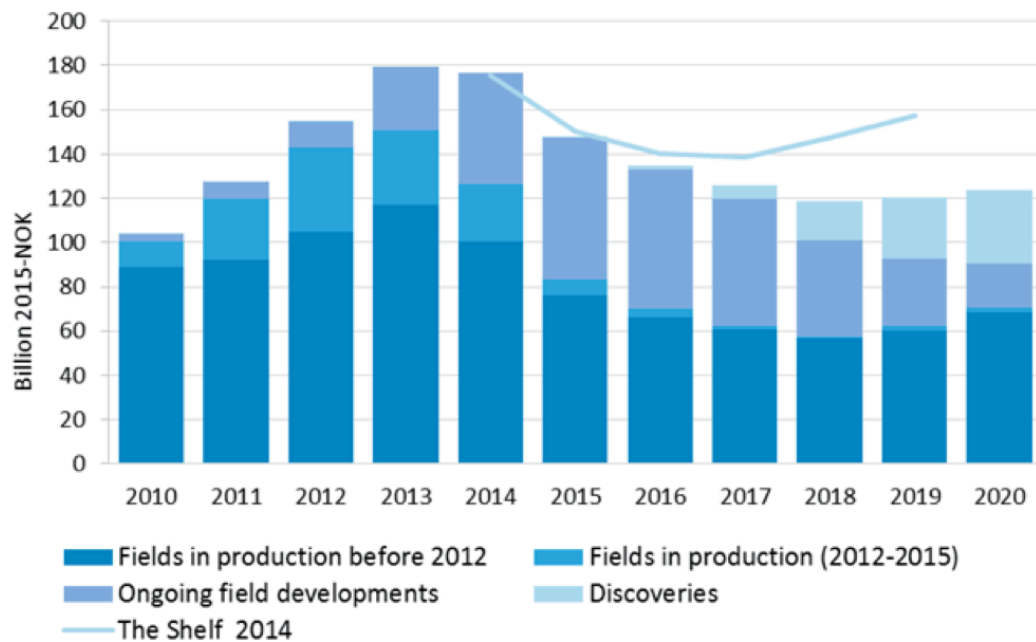


Figure 2. Investments excluding forecast for 2015-2020 (Source: NPD, 2016)⁴

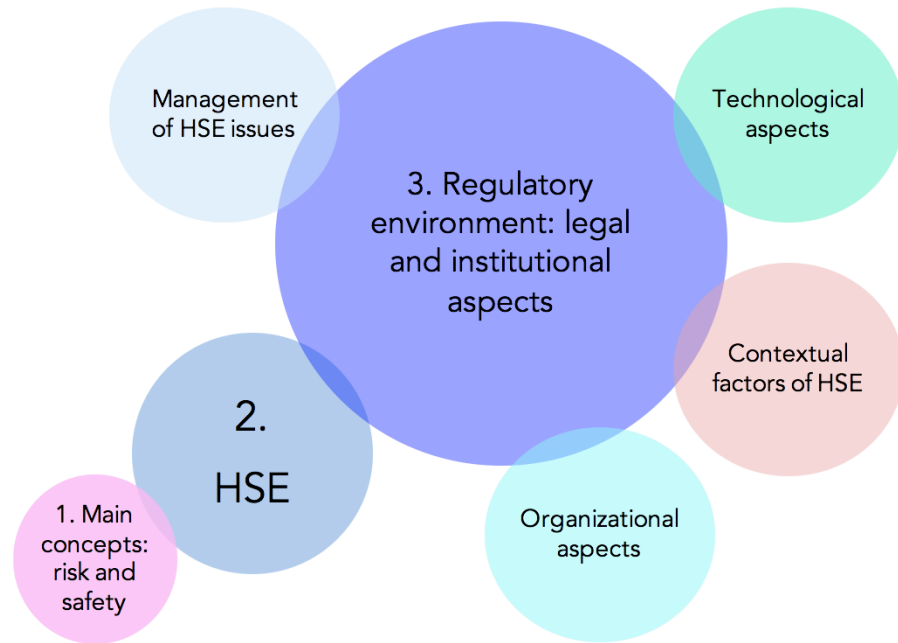


Figure 3. The illustration of the theoretical approach. Fundamental for the further analysis and the thesis in general

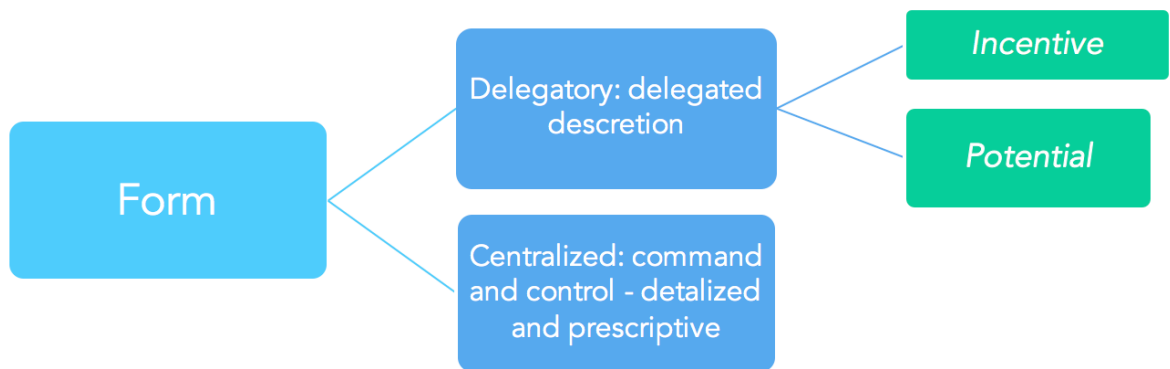


Figure 4. The form of regulations (Sappington, 1993)

Location	Total No. of Blowouts	Blowouts with Pollution				
		Large	Medium	Small	Unknown	Total
UK	30	0	0	0	0	0
Norway	34	1	0	1	1	3
D/DK/NL	2	0	0	0	0	0
North Sea*	66	1	0	1	1	3
US GoM	273	5	9	40	9	63
Worldwide	498	22	11	56	39	128

Figure 5. Blowouts Resulting in Pollution, by Geographical Area, 1970 – 2007

(Source: OGP, 2011)

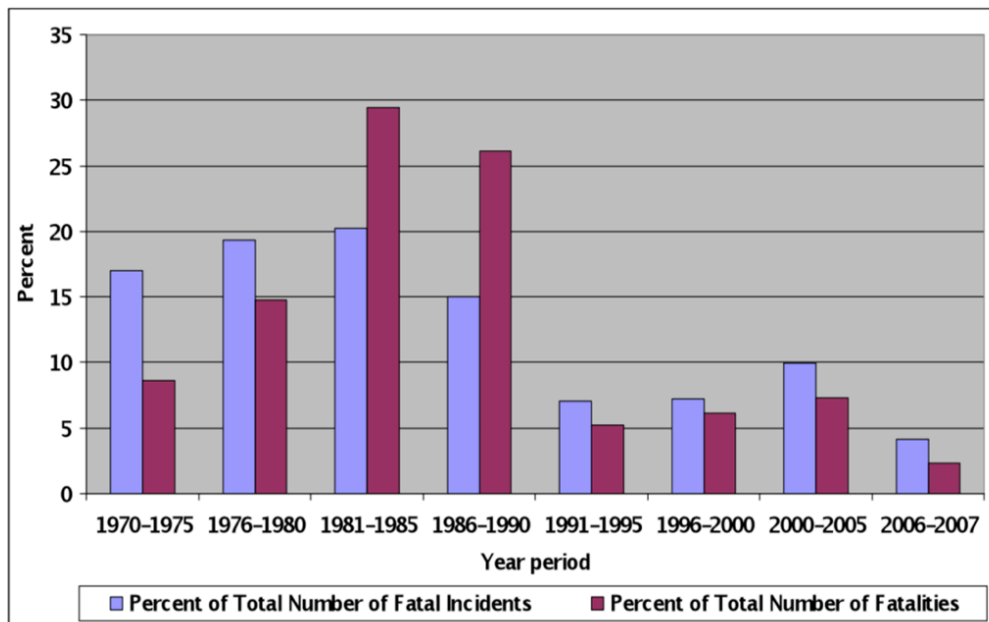


Figure 6. Breakdown of Number of Fatalities and Number of Incidents by Year Period: Worldwide, 1970 – 2007

(Source: OGP, 2011).

Geographical Area	No. of Fatal Incidents	% of Total No. of Fatal Incidents	No. of Fatalities	% of Total No. of Fatalities
US GoM	344	62.2	611	28.1
Europe N.S.	88	15.9	574	26.4
Asia + Australia	41	7.4	443	20.4
Other	80	14.5	543	25.0
Totals	553	100.0	2171	100.0

Figure 7. Breakdown of Fatalities by Geographical Area: Worldwide, 1970 – 2007 (Source: OGP, 2011)

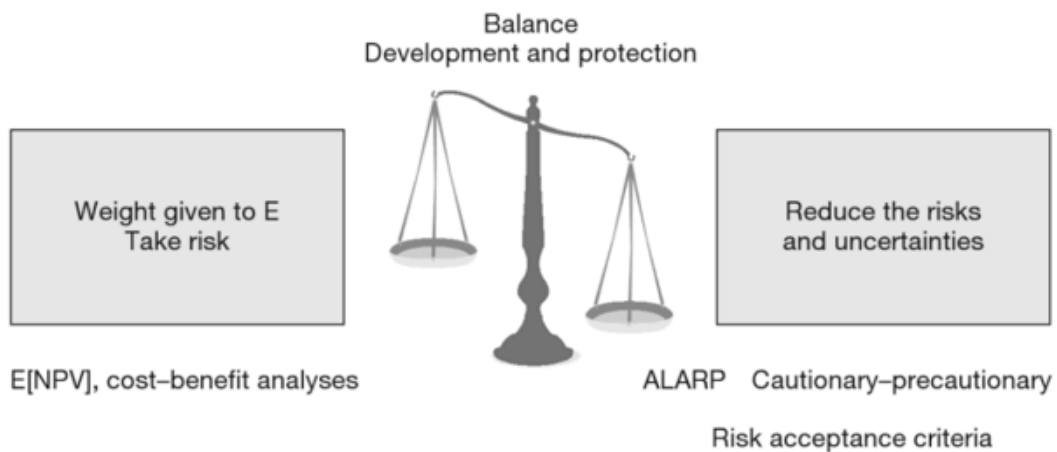


Figure 8. Risk management as an act of balance (Aven, 2014)

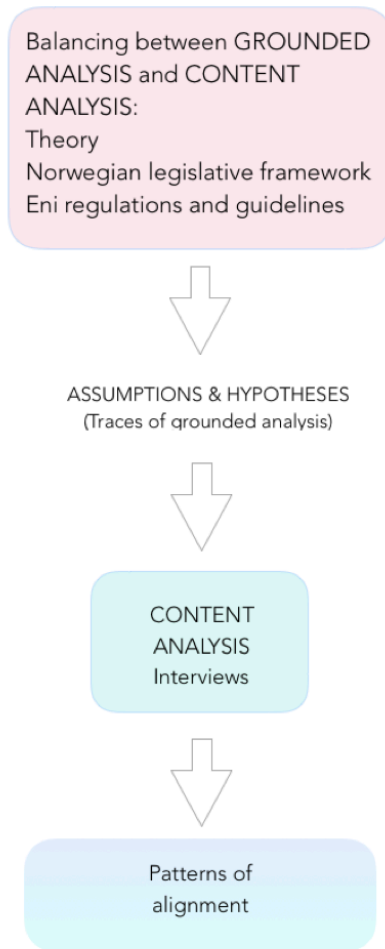


Figure 9. The «skeleton» of the research design

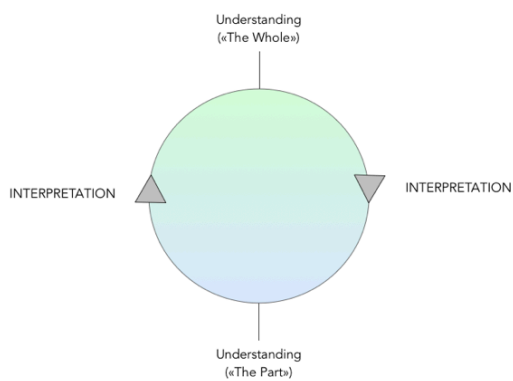


Figure 10. Basic hermeneutic circle participants

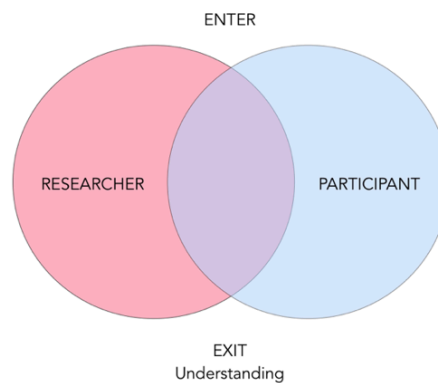


Figure 11. Hermeneutic circle with two participants

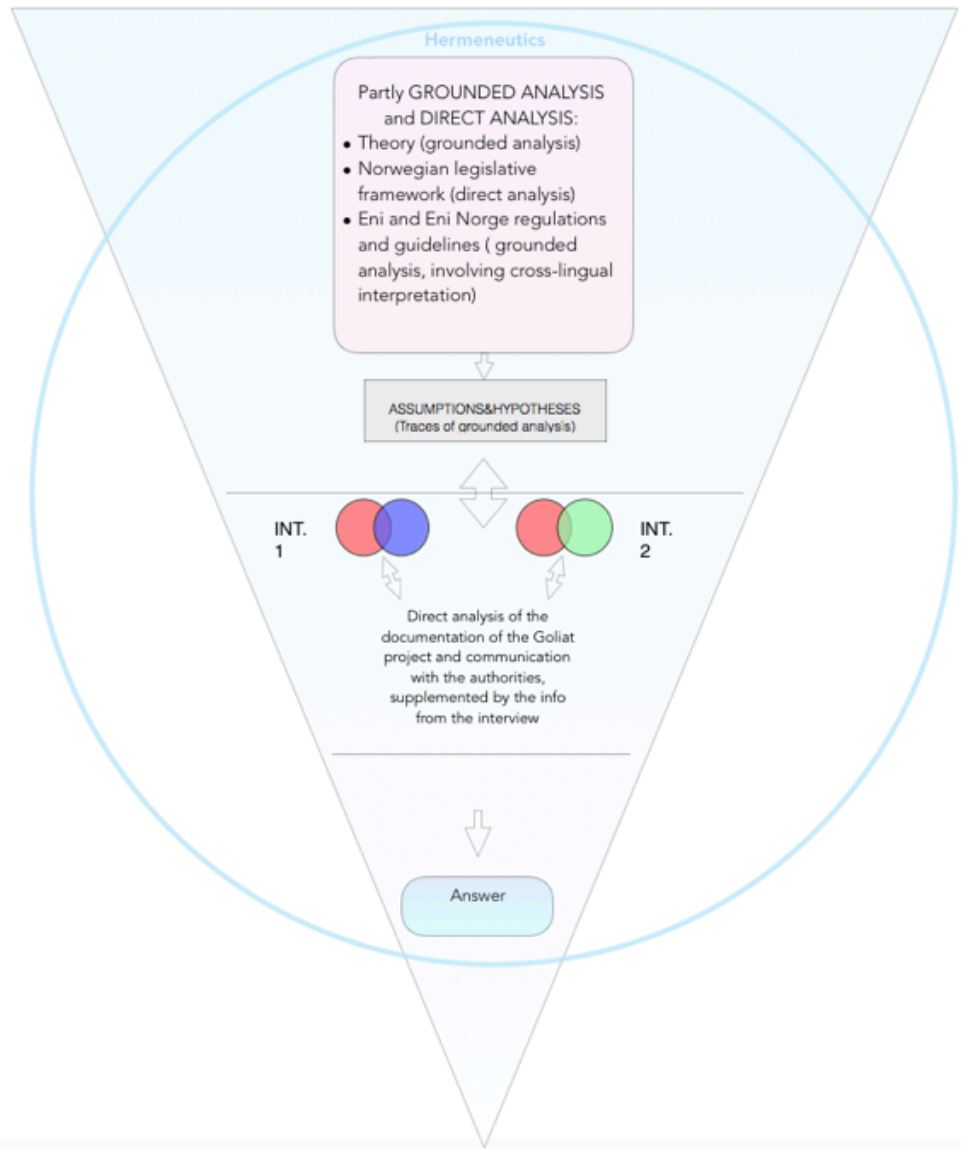


Figure 12. The research design.

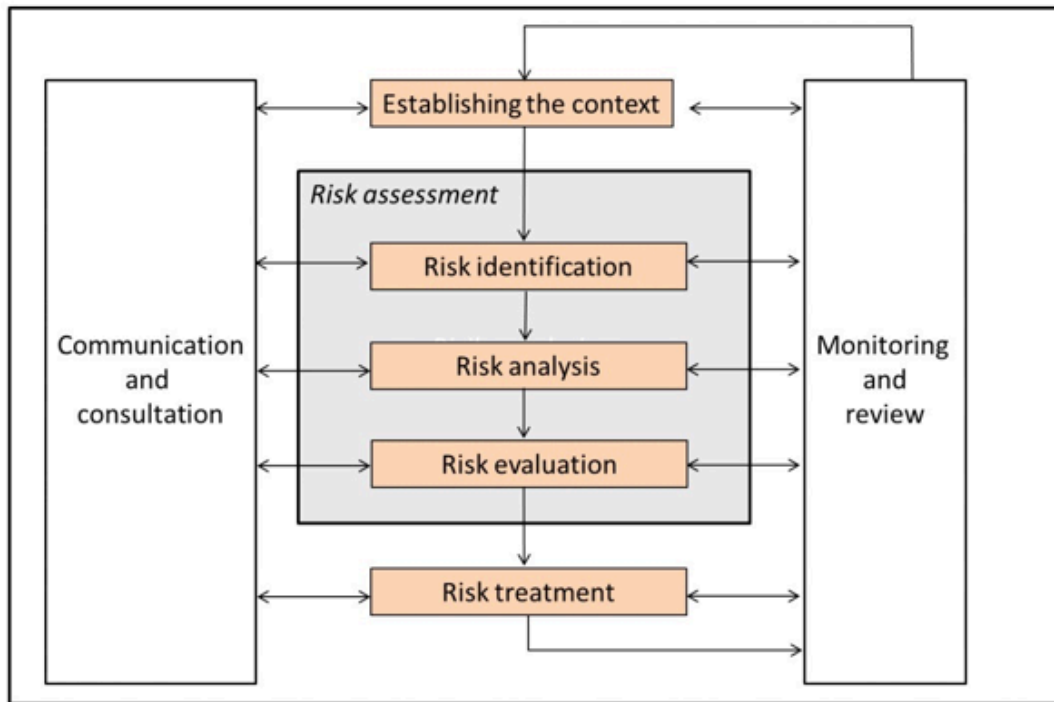


Figure 13. Risk management process (Source: ISO 31000)

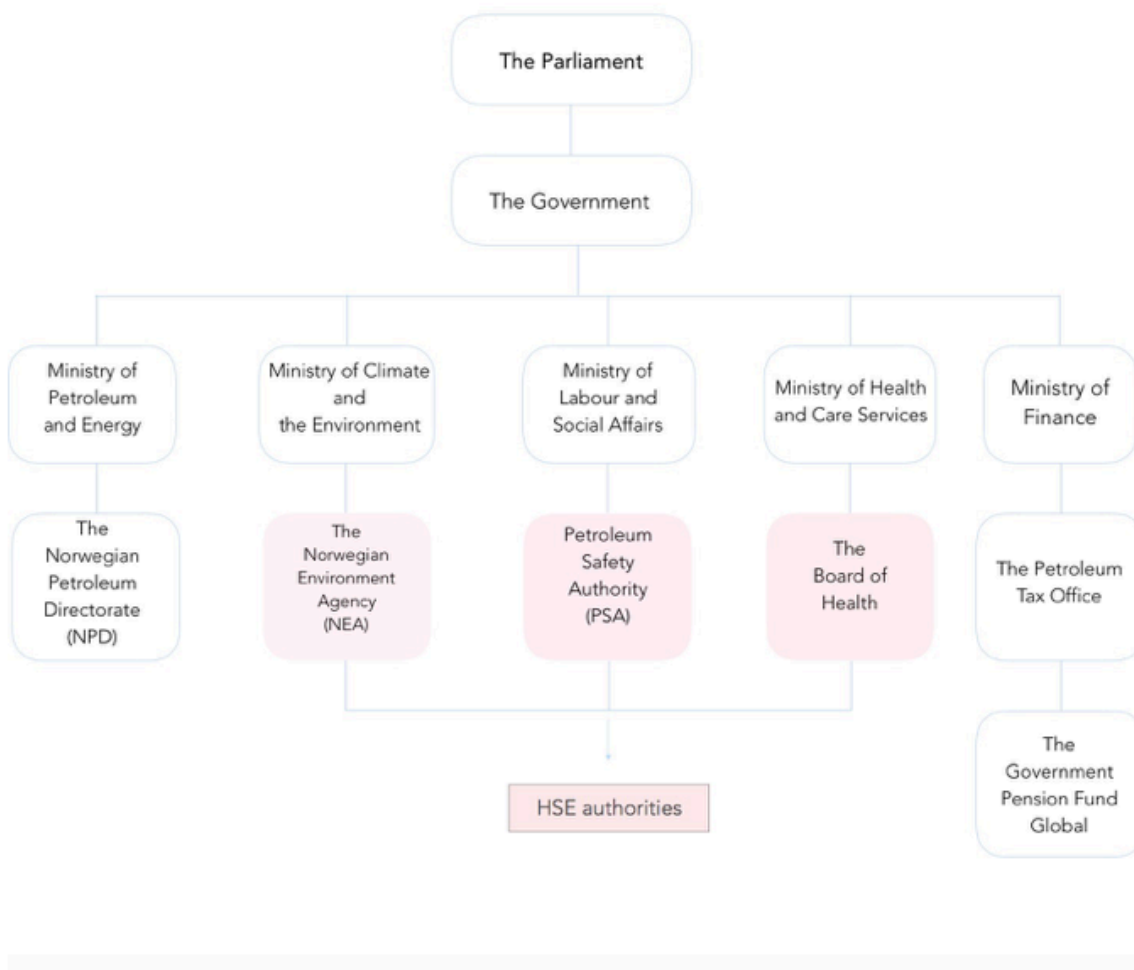


Figure 14. The Norwegian HSE authorities and governmental bodies responsible for the Norwegian petroleum sector

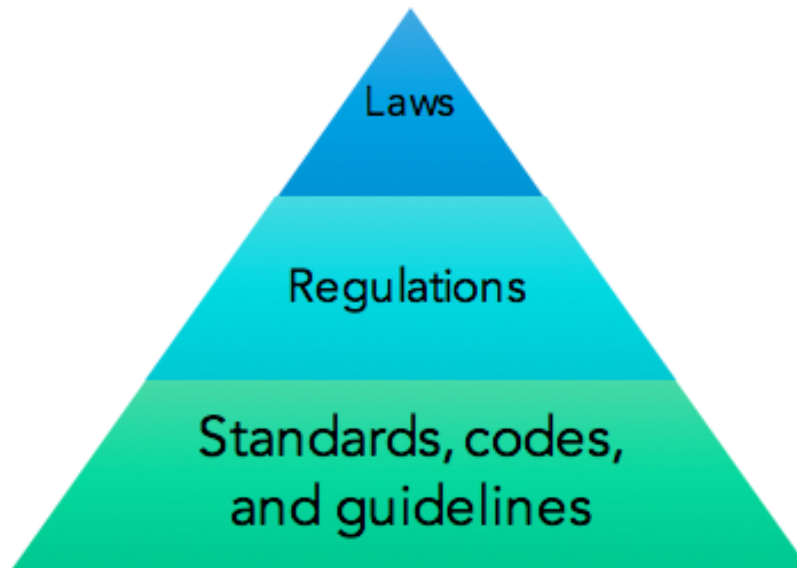


Figure 15. The Norwegian regulatory system (Source: Svein Erikssen, PSA)

Regulations	Source	Guidelines	Source
The Framework Regulations	PSAa	Guidelines to the Framework Regulations	PSAh
The Management Regulations	PSAb	Guidelines to the Management Regulations	PSAi
The Facilities regulations	PSAc	Guidelines to the Facilities Regulations	PSAj
The Activities Regulations	PSAd	Guidelines to the Activities regulations	PSAk
Technical and Operational Regulations (only onshore facilities)	PSAe	Guidelines to the Technical and Operational Regulations	PSAl
Working Environment Regulations	PSAf	?	PSAm
The Information Duty Regulations	PSAg	Drilling Reporting Guidelines (DDRS), Corrosion and Damage Reporting Guidelines (CODAM), Guidelines for application for Acknowledgment of Compliance (AoC), Guidelines for plan for development and operation of a petroleum deposit (PDO) and plan for installation and operation of facilities for transport and utilisation of petroleum (PIO)	PSAn

Table 1. The representation of the main regulations



Figure 16. The main regulatory policies and documents in ENI (Source: Eni corporate website)

B – Risk Matrix - B1. Basic Risk Screening Matrix (Full Qualitative Approach)

Consequence					Increasing Annual Frequency											
Severity	People	Environ.	Assets	Reputation	0	A	B	C	D	E						
					Practically non-credible occurrence	Rare occurrence	Unlikely occurrence	Credible occurrence	Probable occurrence	Likely/Frequent occurrence						
					Could happen in E&P industry	Reported for E&P industry	Has occurred at least once in Company	Has occurred several times in Company	Happens several times/y in Company	Happens several times/y in one location						
1	Slight health effect /	Slight effect	Slight damage	Slight impact	Continuous Improvement											
2	Minor health effect / injury	Minor effect	Minor damage	Minor impact							Risk Reduction Measures					
3	Major health effect /	Local effect	Local damage	Local impact	High Risk											
4	PTD or 1 fatality	Major effect	Major damage	National impact							High Risk					
5	Multiple fatalities	Extensive effect	Extensive damage	International impact												

Figure 17. «Full Qualitative Approach» (Eni HSE Risk Management and Reporting)

B3. Risk to People (Operations) Assessment Matrix

Severity	People (Operations Risk) (usually in the open)	0	A	B	C	D	E
		<10-6 occ /y (1)	10-6 to 10-4 occ/y (1)	10-4 to 10-3 occ/y (1)	10-3 to 10-1 occ/y (1)	10-1 to 1 occ/y (1)	>1 occ/y (1)
		Could happen in E&P industry	Reported for E&P industry	Has occurred at least once in Company	Has occurred several times in Company	Happens several times/y in Company	Happens several times/y in one location
1	Slight health effect / injury	Continuous Improvement					
2	Minor health effect / injury	Risk Reduction Measures					
3	Major health effect / injury	Compulsory reduction measures					
4	Permanent Total Disability or 1 fatality (small exposed population)	High for 3rd parties onshore					
5	Multiple fatalities (exposed groups)	High Risk					

(1) frequency expressed in occurrences per year

Figure 18. Example of «Semi-Quantitative Approach» (Eni HSE Risk Management and Reporting)

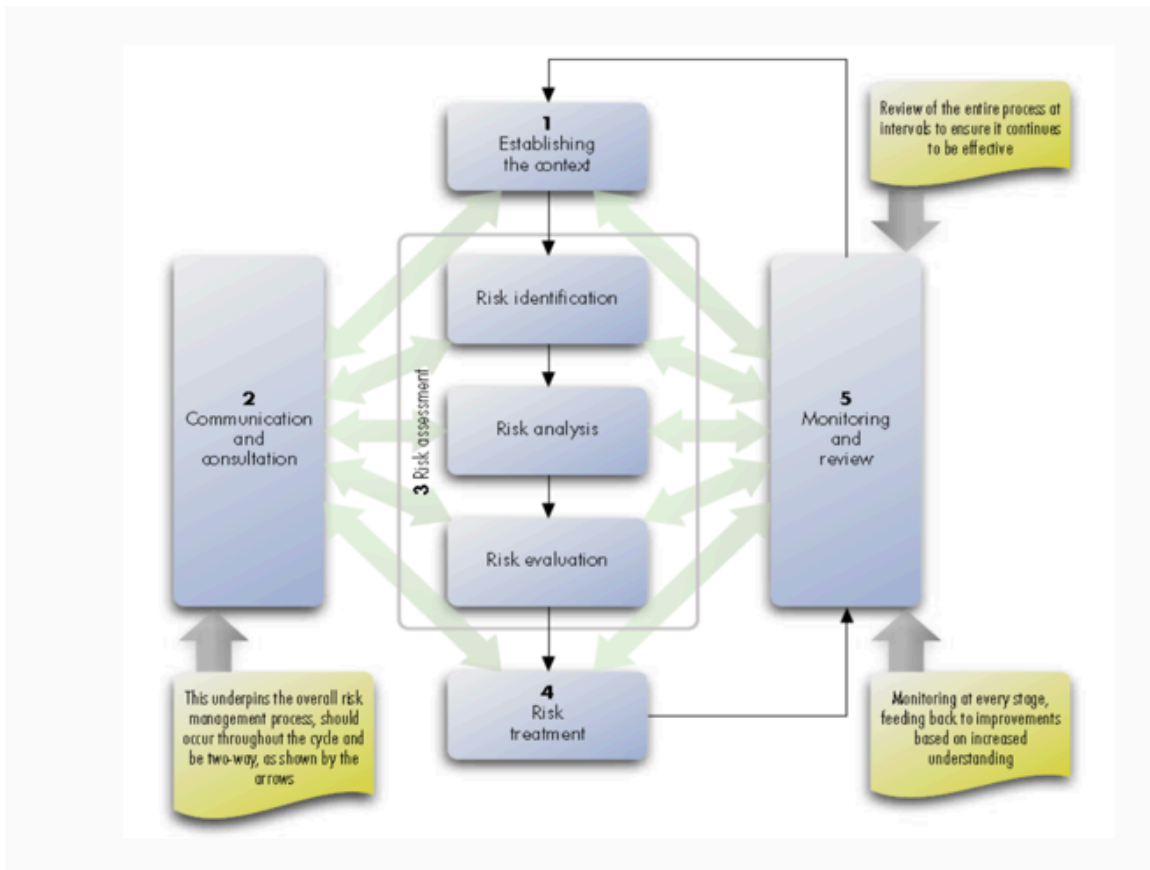


Figure 19. Risk Management Process in Eni (Professional Operating Instruction: Risk Management and Reporting)



Figure 20. Hypothetical representation of the state – company interaction over a project

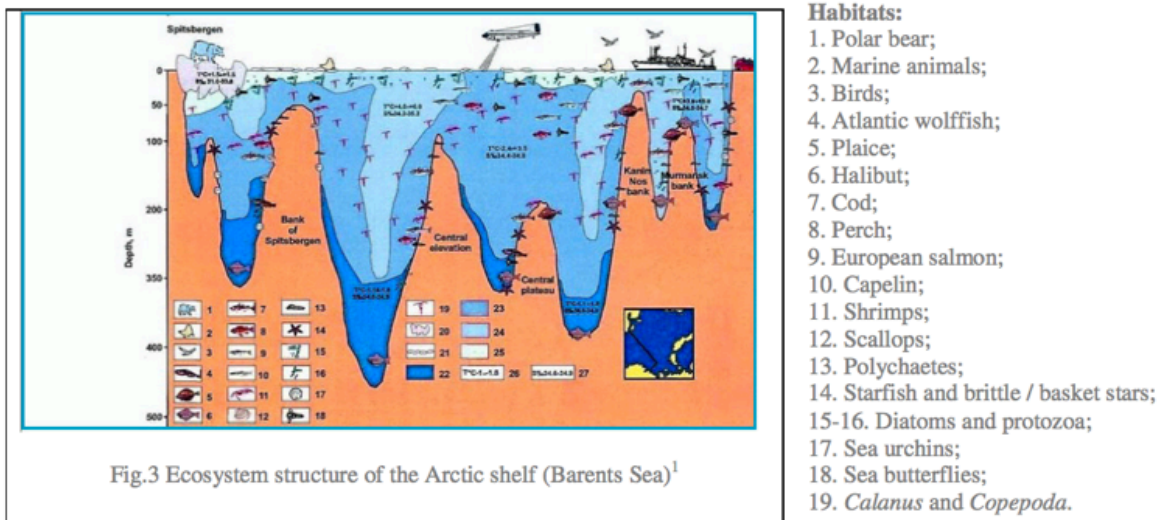


Figure 21. The ecosystem of the Barents Sea (Source: Bellona)¹²

Submission of the IAS	November 2008
IAS consultation	November 2008 – January 2009
Submission of PDO	1st Quarter 2009
Approval by the Norwegian Parliament	Spring Session 2009
Detailed Project Design	2009 - 2010
Building/construction	2010 - 2013
Drilling	2011 - 2014
Installation of subsea facilities and pipe systems	Summer half – years 2011 and 2012
Installation of field facility, risers and laying of electric cable	2013
Production start up	2013

Table 5. Project schedule (Source: Eni IAS for Goliat, 2008)



Figure 22. Representing the interdependent realities (3 FACTORS) that have influenced the Goliat project.



Photo: Thomas Nielsen

