

Norway's response to the issue of climate change

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Abstract <p>Nowadays, climate change is one of the most urgent global issues. The future of civilization depends on how effectively it is addressed. Therefore, many scientists, researchers, activists and politicians around the world advocate for making more proactive decisions in order to achieve sustainability and sustainable development.</p> <p>In the future, most countries will have to develop strategies for solving the climate change issue. Therefore, it will be useful to have a role model for responding to the problem. Norway is considered to be one of the environmental leaders of the world. Thus, the objective of the study was to investigate the reasons and factors that contributed to Norway's environmental progress.</p> <p>The Quintuple Helix model was used as a theoretical framework in order to study the impact of four pillars, namely government, industry, universities and society, on the fifth pillar, the environment. The data was gathered and analyzed by using the qualitative approach. The collected data was secondary and was acquired from trustworthy online sources.</p> <p>The findings revealed that all helixes contributed to Norway's progress in addressing the climate change issue. Governmental organizations of the country managed the response in the form of legislation and regulations. Industries and universities with research centers developed more sustainable practices and solutions, and the society put pressure on institutions and demanded proactive decisions related to solving the problem.</p> <p>Practical implications of the study included the illustration of an effective response to the climate change issue for countries that need, or will need, an example to follow.</p>		
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Contents

1	Introduction	5
1.1	Background.....	5
1.2	Motivation	9
1.3	Research problem, question, approach and structure of the thesis	10
2	Literature Review	12
2.1	Sustainability	12
2.2	Bioeconomy.....	16
2.3	Sustainable Development	19
2.4	Theoretical Framework	21
3	Methodology.....	24
3.1	Research approach	24
3.2	Research context	25
3.3	Data collection.....	27
3.4	Data Analysis	28
3.5	Verification of the results.....	31
4	Results	32
4.1	Preliminary Analysis	32
4.2	In-depth analysis	36
4.2.1	Government.....	36
4.2.2	Industries	43
4.2.3	Universities	48
4.2.4	Society.....	50
5	Discussion	52
5.1	Answers to the research question	53
5.2	Practical/managerial implications.....	56

5.3	Assessment of the results in the light of literature.....	57
5.4	Limitations of the research	59
5.5	Recommendations for future research	60

References.....	62
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Figures

Figure 1. World GDP over the last two millennia.....	5
Figure 2. Quintuple Helix model	22
Figure 3. Geographic location of Norway	26
Figure 4. Norway's exports in 2017.....	27
Figure 5. Data analysis process	30
Figure 6. Plug-in Vehicle Market Share in Top 4 Countries	33
Figure 7. Progress of Norway's average carbon dioxide emissions per unit of oil and gas from 1997 to 2012	35
Figure 8. Environmental management system in Norway.....	37
Figure 9. EU Emission Trading System	42
Figure 10. Greenhouse gas emissions by source in 2018	47

Tables

Table 1. Norwegian laws regarding Climate Change	38
Table 2. Climate and Environment programs in Norwegian universities	48

1 Introduction

1.1 Background

Over the past decades, countries have been chasing economic growth and companies have been constantly competing with each other in terms of revenue. Most of them have been willing to sacrifice all available resources in order to gain more income. As a result, the world has achieved significant GDP growth. According to Roser (2020), the world GDP index in 2015 was almost ten times bigger than in 1955.

The chart below from indicates the world GDP growth over the last two millennia.

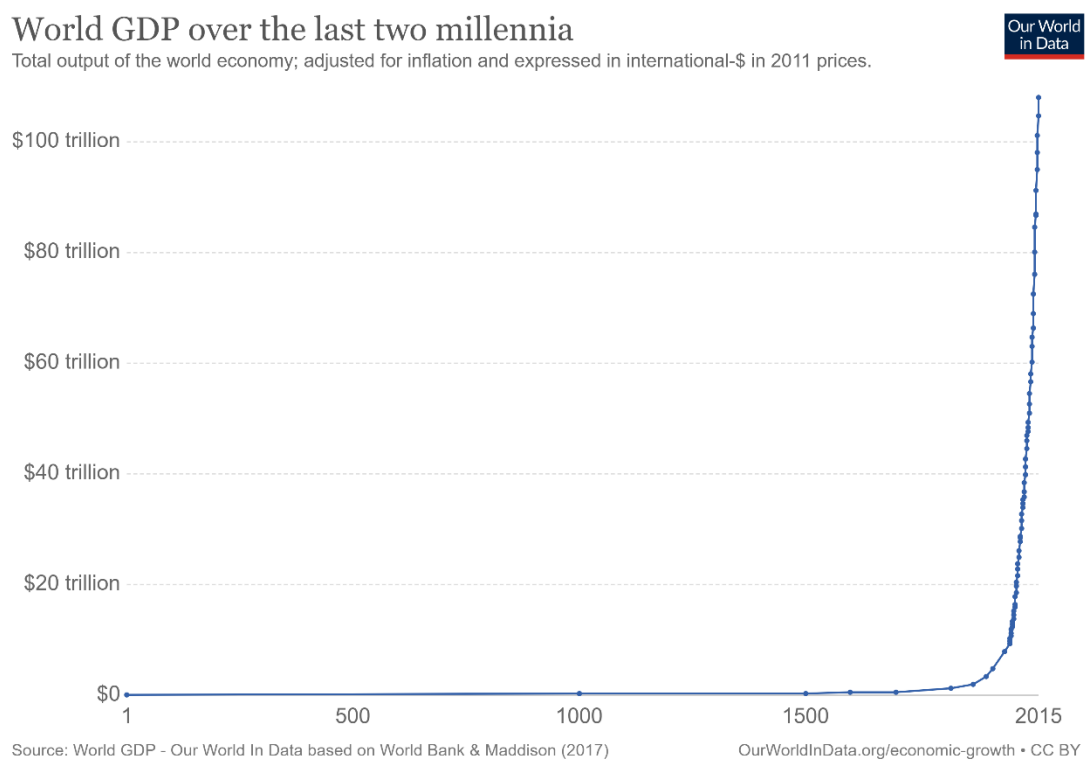


Figure 1. World GDP over the last two millennia (adapted from Roser 2020)

However, our actions have depleted the world's natural resources and seriously affected the environment. According to Skaza and Blais (2013, 1), there are many indicators showing that economic growth increases pollution level, thus, there are rea-

sons to believe that economic growth negatively affects the environment. For example, oil and gas producing countries and companies may have an unfavorable impact on the nature by conceding various types of incidents such as oil spills, groundwater and soil contamination and air pollution. Therefore, oil and gas manufacturing instances strive to avoid destructive scenarios. (Borthwick, Balkau, Read & Monopolis 1997.) Despite organization's efforts to prevent dangerous accidents, they have happened several times. For instance, BP's Deepwater Horizon oil spill, which is considered as one of the biggest oil spill accidents in history, happened on April 20 in 2010 and significantly damaged the natural habitat. Negative circumstances of the accident include erosion, destroyed vegetation and wildlife depletion (Amadeo, 2019). White and colleagues (2012, 1) add that there is evidence that the Deepwater Horizon oil spill caused huge damage to deep-water ecosystems. Another example of a catastrophic oil spill is The Ixtoc 1 oil spill, which happened in 1979 and caused massive environmental and economic damage.

However, Skaza (2013, 1) comments that the effect of economic growth on the environment may also be positive. He explains that the economic development often leads to creation of new technologies and innovation, which is highly important for nature preservation. For instance, electric cars are becoming more and more popular nowadays because many people, especially in developed countries, do not want to purchase petrol vehicles due to their unfavorable environmental impact. Skaza (2013, 1) adds that, rather than poor citizens, rich and middle-class people are more likely to demand environmental protection from the government. Indeed, people are more concerned about nature protection in developed countries like Norway and Finland rather than in countries having weaker economic performance.

Carillo and Maietta (2014, 16) focuses on rural areas and agrees that economic growth and environmental protection are able to coexist there. Therefore, we can acknowledge that there are different points of view on the relationship between environment and economic growth. Most of the experts admit that economic prosperity comes with both positive and negative circumstances for the environment. Skaza (2013, 1) concludes that this relationship is neither direct nor inverse. He states that

it is more complex and takes into account a lot of variables, including ones that may be fundamentally random.

Recently, many researchers considered Environmental Kuznets Curve (EKC) as a model representing relationship between economic growth and environment. The term was first mentioned in the environmental context by Panayotou in his “Empirical tests and policy analysis of environmental degradation at different stages of economic development” in 1993. However, the model’s application to nature protection was described earlier in 1991 by Grossman and Krueger. The EKC has a U-shape and indicates that societies with different levels of economic prosperity and growth have a different impact on the environment. U-shape of the curve shows that the pressure on the nature is, first, rising, and after a certain level of prosperity, which is called a turning point, is reached, starts decreasing. (Carillo and Maietta 2014, 17.) One of the reasons to believe that there is a shift from negative to positive influence on the nature, is the fact that the more developed a society becomes, the more technologies and innovative practices it utilizes.

Lieb (2003, 1) agrees that the environmental pollution is only a transitional obstacle in the history of economic development. Therefore, the Environmental Kuznets Curve is considered as a useful tool for researching the relationship between economic growth and environmental protection (Carillo, Maietta 2014, 17).

On the other hand, many specialists have questioned and critiqued the model. For instance, Anderson and Cavendish in 2001 pointed out that in the EKC model environmental pollution is only dependent on the economic performance of a society, therefore, it does not take into account various practices and policies that governments establish. Indeed, actions of authorities and decision-makers have a huge impact on the environmental stability.

Lieb (2003) also mentions that the Environmental Kuznets Curve has certain disadvantages. He states that, firstly, the curve differs from pollutant to pollutant (NO_x, CO, SO₂, SPM, etc.), so it is not possible to calculate universal emission patterns, and, secondly, the data regarding pollution is not always valid and reliable as it is usually

estimated, not measured. Moreover, we should not overlook the fact that the statistics and relationships of environmental protection and economic growth vary from country to country (Dijkgraaf & Vollebergh 1998). Lieb (2003) agrees that curves will be different for many countries because of the heterogeneity factor and adds that the impact of income on environment is not always immediate, hence, we must take it into consideration.

Regardless of a type of model scientists use to explain the humanity's impact on the nature, it is obvious that, at the moment, there is a negative influence on it. Therefore, we have to aim at achieving sustainable ways of energy production and sustainable development. In the past several decades, the term sustainability has been becoming more and more popular among scientists, decision-makers and all the other people who have never heard about this concept before. There is a variety of definitions given by different scientists and researchers. The most widely accepted definition was given by Brundtland Commission of the UN in 1987. In the Brundtland Report, sustainable development is described as "development that meets the needs of the present without compromising the ability of future generations to meet their needs". Sustainable development has to be achieved in all aspects of the society. In fact, the common belief is that there are three aspects of sustainability: economic sustainability, social sustainability and environmental sustainability.

However, the shift from current model of the society to the sustainable model requires long-term thinking and a holistic approach. Carillo and Maietta (2014, 20) stress that we have to involve all social actors into the process of innovating the society and have a consistency of choice.

Norway is one of the countries that have been successfully cultivating sustainable practices. According to EPI (Environmental Performance Index) report from 2018, Norway is ranked 14th in the world in terms of environmental protection with 77.49 points. This score is highly impressive because, at the same time, Norway's petroleum industry is the largest in the country (The Royal Norwegian Ministry of Petroleum and Energy 2020). According to The Royal Norwegian Ministry of Petroleum

and Energy (2020), the country is the 3rd biggest manufacturer of gas and the 8th largest producer of oil in the world. Due to the fact that the mentioned industries are among the most polluting ones, the achievement of Norway in terms of environmental sustainability deservedly appears to be even more significant.

This research is conducted in order to understand the factors that contributed to Norway's success in reaching environmental sustainability. Given the fact that nowadays there are a lot of countries striving to become environmentally sustainable all over the world, potential findings of this thesis may be useful for many countries.

1.2 Motivation

Nowadays, environmental sustainability is one of the most popular and important topics for discussion, especially in developed countries. Throughout the last decades, human activities have seriously damaged natural environment in many different ways. In fact, there are particular industries that have the strongest impact on the nature. One of them is oil and gas industry, which, nowadays, is significantly important for the society as it is the main source of energy.

However, some countries like Norway have taken actions in order to make the economy operate sustainably. Norway has implemented an impressive shift to renewable energy and acts proactively in order to decrease emissions. Hence, it is important to research this case in order to come up with useful tools and practices that may help other countries and companies shift to a more sustainable way of managing the economy.

I became interested in the environmental sustainability issue shortly after moving to Finland, a neighbor of Norway. Both of these countries succeed in building socially, economically and environmentally sustainable society. The majority of people here are informed about environmental threats and strive to be pro-active in terms of protecting the nature. The public awareness of this issue in Finland is one of the factors that have motivated me to conduct a research on this topic.

My interest in this problem has become even bigger as a result of taking a course named Economics of Internationalization and Competitiveness at my university. During this course, I was introduced to and studied the World Economic Forum report and Environmental Performance Index, where Norway was ranked high in terms of both competitiveness and environmental sustainability.

1.3 Research problem, question, approach and structure of the thesis

Research problem

Nowadays environmental issue is one of the most important problems because it directly affects the future of every country and the planet in general. Therefore, many countries, especially the ones with developed economic and social systems, strive to address it and achieve sustainability. Some countries do not respond decidedly to environmental challenges in the present, but, in the future, they will have to solve issues like global warming in order to secure their future prosperity. Hence, it is helpful and important to have an example, a role model to follow. Norway is a solid option for a role model because it has achieved impressive results in reducing emissions into the atmosphere. In fact, the country's share of renewable-resource use is one of the highest in the world and its overall environmental policies are ranked 4th in the world by SGI (Sustainable Governance Indicators 2019). The author of this research aims at discovering factors and actions that have made the country one of the environmental leaders of the world. It is important to note that even though Norway is a great example to follow in terms of environmental sustainability, it still takes actions in that direction and has an official goal to reach climate-neutrality by 2030 (Government of Norway 2020 a).

Research question

After reviewing the literature related to the topic of the thesis, the following research question was formulated:

How does Norway respond to the climate change issue?

Research approach

In order to answer the research question, the author chose a qualitative approach for the thesis. This approach was chosen due to the need of reviewing a lot of textual secondary data. What is more, the qualitative approach is suitable for this thesis and helps to accurately answer the research question.

The theoretical framework for the thesis is Quintuple Helix model, which will help to find information about impact of different factors on the environment in Norway as well as organize data and findings. The model takes into consideration and, in the case of this research, helps to analyze the influence of government, industries, universities and society on the environment.

Structure of the thesis

The thesis consists of five chapters. The first chapter is Introduction, where the author familiarizes readers with the thesis topic, provides with background information on it, explains his motivation and interest on the topic, covers research problem and approach and formulates the research question. The second chapter is Literature Review, in which the author reviews previous literature on the topic and existing definitions of sustainability as well as describes the theoretical framework of the thesis. The third chapter is Methodology, where the author gives an in-depth description of research approach, research context and describes the process of data collection, data analysis and verification of the results. The fourth chapter is named Results and includes findings and results of the research, and, the fifth chapter is Discussion, which includes implications of the findings, limitations of the research and the author's recommendations for future researchers.

2 Literature Review

2.1 Sustainability

Definition

The term "sustainability" has been described by different scientists and authors. According to Watson (2018), in the 80's, when the overall public awareness of environmental challenges and social issues was much lower than it is today, the term "sustainability" was familiar to a very small number of people, who were mostly scientists and environmentalists.

However, the public awareness of the term and its concept was growing every year, which led to including sustainable development in the international political agenda by the UN, namely the Brundtland Commission. In the Brundtland Report in 1987, sustainable development was identified as a "development that meets the needs of the present without compromising the ability of future generations to meet their needs".

Pearce and Barbier (1989) added that a sustainable society is the one that has stable and effective social and economic systems, high level of income, high health rates and high ranked educational institutions. Daly (1990) then argued that the environment must be an important part of the sustainability. Pearce (1993) then added that the sustainable society is the one where the costs of development do not damage the future generations. The World Bank in its World Development Report in 1992 gave more specific definition of sustainability. The document stated that a society is sustainable if it is leaning on the comparison of costs and benefits and on accurate economic analysis that will enhance environmental protection when defining developmental and environmental policies.

According to Munasinghe (2004), sustainable development is a process of developing people's quality of life and meeting their needs over a sustained period of time while

preserving the resilience of economic, social and environmental systems. He adds that there are two definitions of sustainable development: narrow and wide. According to the narrow definition, sustainable development is a continuous growth of income per capita or well-being indicators. The wide concept is less precise and defines sustainable development as a growth or maintenance of a set of indicators, including economic indexes.

The “term” sustainability has three widely accepted aspects proposed by Munasinghe (1995): economical, social and environmental. Each aspect has its own perspectives and agenda. Munasinghe comments that any development activity will improve certain elements of the society, but at the same time will compromise others. Therefore, in order to make decisions that lead to sustainable development, we have to consider all of the elements and factors like economic, ecological, political, social and cultural together. We have to develop a practice of using a holistic approach when defining our principles.

However, scientists from different industries have disparate opinions on what the sustainable development is. For example, economists state that it is the improvement of economic indicators and living standards. Ecologists argue that the most important concept of sustainable development is environmental and the sustainable development means protecting environment and ensuring that it functions properly. At the same time, anthropologists emphasize the importance of social and cultural systems.

Economic sustainability

Economic sustainability is strongly linked to social and environmental sustainability. Birch (2012) stresses that bioeconomy connects environmental and economic sustainability. It lets us use natural resources more efficiently, hence substitute fossil fuels and synthetic chemicals. Birch (2012) emphasizes that using renewable raw materials will enhance global prosperity.

Spangenberg (2005) states that in the economic discussion, sustainable development is often identified as the need to preserve a long-lasting income for people that is produced from non-declining capital stocks and the planet's natural resources.

Meadows and colleagues (1972) state that if the countries will continue to deplete the planet's resources beyond its limits. At 1972, they predicted that if the population's demand continued to grow at the same pace as it had been growing, it would outpace the supply by 20% by 2000. At 2004, Meadows and colleagues updated their research and confirmed that the trend in non-renewable natural resources remaining, food and services per capita, population, industrial output per capita and global pollution has been in line with the prediction made back in 1972 in his study.

According to Strathcona County's publication in 2011, the economic sustainability is aimed at strengthening the fiscal sustainability of countries, providing the world's population with infrastructure, arrange and plan future development initiatives and, most importantly, establish and support innovative responses to social and environmental sustainability.

Social Sustainability

According to Woodcraft (2015), social sustainability concept has emerged not long ago comparing to economic sustainability and even environmental sustainability concepts. During the 20th century it was overlooked in debates and policy practices, but nowadays more and more scientists and politicians around the world are paying attention to this challenge.

Saffron Woodcraft states that social sustainability is a process constructing sustainable places that promote and build up wellbeing around the world by figuring out what people need from the places in which they live and work. She adds that social sustainability combines the physical dimension with the dimension of social world: infrastructure that supports social and cultural life, convenient social amenities, organizations for people's commitment and engagement, and, what is

also important, places for people to evolve. Social sustainability must involve concerns related to wellbeing and social capital. According to Pieper (2013), social sustainability involves improving social security, social empowerment, social inclusion and social cohesion for a population in a certain region and over time.

Environmental Sustainability

Munasinghe (2004) states that the environmental aspect of sustainability mainly focuses on protecting the integrity and resilience of ecological systems all around the world. Development in the environmental sense is a concern that focuses on managing scarce natural resources of the planet in a wise way because the humankind ultimately depends on ecological services. If government continue to ignore environmental issues, the undermining of humanity's long-run prospects for development will become possible. According to Borthwick and colleagues (1997), oil and gas industry is one of the sectors that has negatively impacted the environment before (oil spills, incidents of air and water pollution, damaged land, accidents and fires), but over the last years the organizations have strengthened the environmental security. However, there are still many aspects and practices that have to be improved.

In the recent years, people all around the world start concerning about ecological issues. Nowadays, a lot of scientists talk about these problems and invoke governments to address them. Munasinghe (2004) claims, that the environmental sustainability interpretation focuses on overall viability and normal functioning of the planet's natural resources. Holling (1973) described a resilient ecosystem as the ecosystem that can operate normally despite external shocks. However, governments and people have to decrease the amount of actions that damage the environment, because the planet cannot supply the humanity, if the demand keeps rising constantly year after year.

2.2 Bioeconomy

Bioeconomy is an important part and concept of sustainability. In the 21st century this term has become extremely popular and was described by many researchers. According to Maciejczak and Hofreiter (2013), the concept of bioeconomy is becoming one of the main discussion topics in the European Union, United States and other countries. Nowadays, bioeconomy principles, which had a significant impact on the evolution of the biotechnology industry, are successfully implemented by biotechnology companies and international organizations.

According to European Union (2020), the organization strives to address environmental issues and chooses a course for a sustainable and resource-efficient economy. The organization has set up a goal to achieve environmental protection and ensure biodiversity. It lists several actions like moving to a more innovative and low-emissions economy, taking a sustainable approach when using renewable biological resources, achieving food security, sustainable agriculture and fisheries and reconciling demands that are going to be taken in order to reach the target.

Maciejczak and Hofreiter (2013) comment that there are many narrow definitions that mainly focus on one industry. For instance, pharmaceutical organizations often focus on innovations, research and development when defining bio-based economy. In contrast, environmental organizations interlink bioeconomy with sustainability. They add that narrow definitions that favor certain companies or industries may lead to wrong decisions in policy-making. Therefore, it is highly important to take a holistic approach to defining bioeconomy, taking into consideration all sectors of the economy.

According to Priefer (2017), German policy strategy defines bioeconomy in a very comprehensive way. It describes bioeconomy as a system, in which different sectors such as energy sector, agriculture, horticulture, forestry, animal and plant breeding, fisheries, food processing, the paper, leather, wood, textile, pharmaceutical and

chemical industries are developed and operate in a sustainable way. It is also mentioned that technologies and innovations will be a significant part of transition to the bioeconomy.

At the same time, some authors emphasize how challenging it is to define bioeconomy in a holistic way and agree on what refers to it. For instance, Maciejczak (2015) states that from the point of view of social sciences, it is hard to understand what elements of our society are already bioeconomy and which ones are not. There are several reasons for this uncertainty. Firstly, scientists still do not have a specific definition of bioeconomy and its boundaries are not clear. Secondly, we do not have strong and widely accepted theoretical framework and analytical tools to study this complex issue.

However, many researchers gave their definitions of the bio-based economy. For instance, Mateescu, Popescu, Paun, Roata, Bancila and Oancea (2009) comment that bioeconomy is a direction of social science that aims at analyzing disciplines of economics and biology together, finding common characteristics and explaining certain processes in one these fields with the help of another. They state that proponents of bioeconomy agree that most of the activities happening during biological evolution can be applied to stock market behavior. For example, in nature we can see animals gathering into groups in order to protect themselves from predators or to use their resources in a more effective way. In the same way, companies nowadays collaborate in order to achieve better results.

Mateescu and colleagues conclude that bioeconomy is the science that defines the amount of socioeconomic pressure that can be put on the environment without destroying and depriving it of the possibility to regenerate.

Bugge, Hansen and Klitkou (2016) emphasize the increasing relevance of this concept. According to them, there are several major challenges, including industrial restructuring, health, food security, climate change and energy security, that emerged over the last decade. Bugge and colleagues define them as persistent issues, which makes it complex and uncertain in terms of the right solution for them. Nonetheless,

they stress that transition to bioeconomy is a significant part of addressing the problem and can potentially be the best solution for it because moving from fossil-based to bio-based products will help us overcome a lot of challenges, including climate change, energy security, health, industrial restructuring and food security.

Maciejczak and Hofreiter (2013) agree on the importance of bio-based economy concept. They state that bioeconomy is becoming one of the most relevant and popular topics on scientific and political agenda all over the world. The researchers also add that nowadays bioeconomy is already a widely used concept that creates links and relationships between different companies and industries. It connects processes such as innovations and technologies, business and sustainability, biomass and products, ecosystem services and industrial activities. These processes are accomplished in a more effective way when they are interlinked.

McCormick and Kautto (2013) add that the concept of bioeconomy, “bio-based economy” or “knowledge-based bioeconomy” can be identified as an economy, in which the basic resources, building materials and energy are taken from renewable sources without depleting them. This economic model is highly sustainable and is able to meet the population’s needs without compromising its future if its designed and implemented intelligently. McCormick and Kautto list potential benefits from transition to the knowledge-based bioeconomy. For instance, wiser management of natural resources, reduction in dependence on fossil resources, improved food security and reduction of greenhouse gas. Moreover, transition to bioeconomy will create employment in both rural and urban areas.

McCormick and Kautto (2013) conclude that the potential positive impact of bio-based economy is significant. However, there are several challenges and obstacles of full transition to the new economic model. For example, nowadays, industries cannot generate enough resources using the bioeconomic approach to fully meet the population’s needs. Nonetheless, the concept of bioeconomy and the ways of implementing it still need to be analyzed more.

Priefer, Jörissen and Frör (2017) comment that although there must be more research conducted on this topic, we should not postpone transition to the bioeconomy. Rather, we must reach consensus on what the bio-based economy is and what are its main concepts.

According to Maciejczak (2015), it is important to remember that bioeconomy cannot avoid failures, inefficiencies, trade-offs that accompany every economic system, including traditional. Therefore, it is highly important to consider inherent flaws and limitations of bio-based economy and create strategic plans in order for the system to be efficient.

Priefer and colleagues (2017) comment that the concept of bioeconomy is highly perspective and potentially effective. It is an innovative approach that will help us overcome future challenges such as climate change, global population growth, water shortage, decreasing non-renewable resource stock and overall environmental degradation. However, it is significantly important that the transition to the bioeconomy is implemented in a sustainable way. Otherwise, it may not be effective and match expectations.

2.3 Sustainable Development

Sustainable development is an integral part of sustainability, which was described by many researchers over the last years. For the first time, sustainable development was defined by the Brundtland Commission in 1987 as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". Since then, many researchers gave their own definitions of "sustainability" and "sustainable development". Most of them lean on a "three-pillar" or "triple bottom line" concept, in which development concept is divided into:

1. economic,
2. social,
3. environmental sustainability.

On the other hand, the definition in the Brundtland Report is based on a “two-pillar” system, emphasizing:

- development concept,
- environmental sustainability.

Munasinghe (1995) states that the term “sustainable development” was created to show that economic growth and ecological protection can be suitable and compatible. He identifies sustainable development as consistent growth of a set of well-being indicators, including economic indexes. Daly (1990) focuses on the world “development” and compares it to “growth”. He emphasizes that growth of an economy is a quantitative increase and means natural gain of size, while “development” is a qualitative improvement. Daly concludes that growth cannot be sustainable over a long period of time, whereas development is the right process to be called sustainable.

According to Daly (1990), there are two main principles of sustainable development:

1. Harvest rates have to equal regeneration rates,
2. Waste emission rates have to equal assimilative capacities of the ecosystem.

The researcher stresses that these two rules are essential in achieving sustainable development. The reason why Daly suggests to keep harvest and waste emission rates not lower, but at the same level as the regeneration rates and assimilative capacities of the ecosystem is the profit-maximizing criteria. Daly (1990) comments that there is no reason not to maximize profits and produce more products if there is a possibility for that., because if the principles mentioned above are applied, we are maximizing sustainable annual profit, which is acceptable in a sustainable economic system, rather than present value.

In 1992, United Nations’ Agenda 21 concluded several actions that companies and countries were recommended to take in order to decrease the damage on the environment. These recommendations are: protecting the atmosphere, managing land sustainably, combating deforestation, combating desertification and drought, sustainably developing mountains, sustainably developing agriculture and rural

areas, conserving biological diversity, managing biotechnology, protecting and managing the oceans, protecting and managing fresh water, using toxic chemicals safer, managing hazardous wastes, managing solid wastes and sewage and managing radioactive wastes. Agenda 21 has a strong impact on organizations, that is one of the reasons why the oil and gas companies in some countries have achieved significant results in terms of protecting the environment.

An important part of achieving sustainability is its assessment. According to Devuyst, Hens and De Lannoy (2001), sustainability assessment is “a tool that can help decision-makers and policy-makers decide what actions they should take in an attempt to make the society more sustainable.” This definition explains the importance of assessing sustainability: if we have criteria for evaluation and characteristics of a sustainable system, we have a clear vision of what we want to achieve. Verheem (2002) adds that the goal of sustainability evaluation is to ensure that “plans and activities make an optimal contribution to sustainable development”.

2.4 Theoretical Framework

In order to achieve sustainable development, we have to learn how to assess it. Priefer and colleagues (2017) state that defining criteria for sustainability evaluation and identifying limits to be observed have a considerable influence on the potential of sustainable biomass production.

The theoretical framework used for the thesis is Quintuple Helix model, which was developed by Carayannis, Campbell and Barth in 2012. This model has originated from Triple Helix Model that was created by Etzkowitz and Leydesdorff in 2000 and added two more helices to the framework.

As shown in the figure below, the helices are government, industries, universities and society. It is important to notice that all of the helices are interconnected and strongly affect each other. In fact, not all institutions in the model exist strictly within

one helix. Some of them may belong to more than one pillar and are called hybrid organizations. Etzkowitz and Ranga (2013) describe hybrid organizations as organizations that possess characteristics of more than one helix and are controlled by institutions representing different helixes. They add that hybrid organizations boost the level of collaboration between different pillars and institutions and increase innovation capability. (244.) Some examples of hybrid organizations are science parks, research centers founded by the government and research and development facilities created by enterprises.

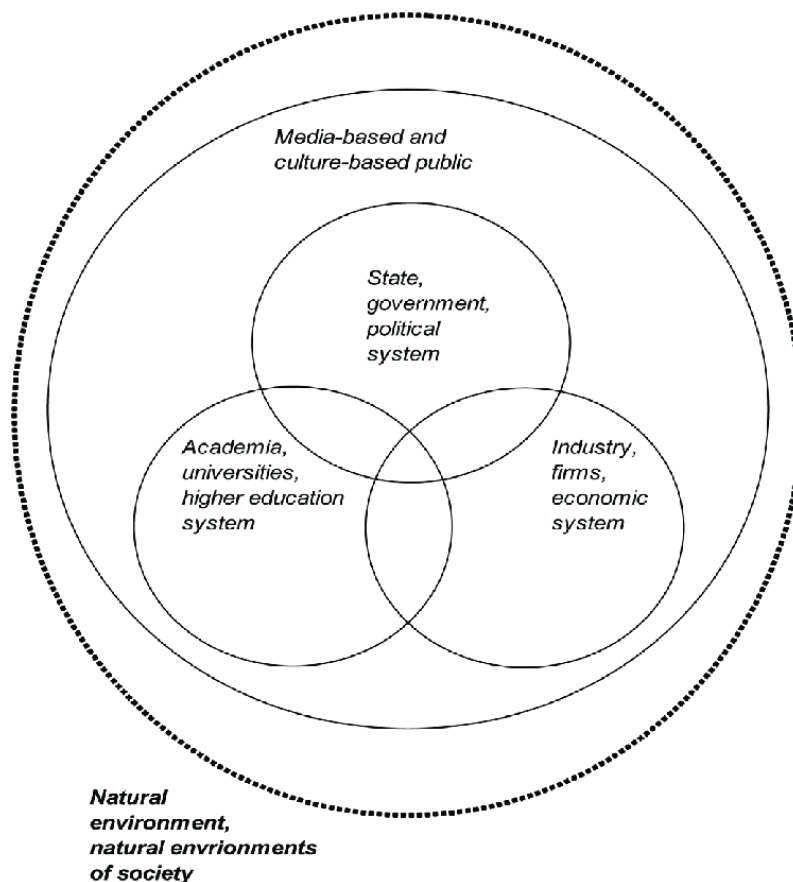


Figure 2. Quintuple Helix model (adapted from Carayannis, Campbell & Barth 2012, 62)

In their Triple Helix model, Etzkowitz and Leydesdorff (2000) take into account relationships between government, industries and academic institutions, whereas Carayannis and colleagues (2012) in their Quintuple Helix model add two more subsystems: society and environment. Interreg (2018) stresses the importance of including

society into the model. According to their document “A Quadruple Helix guide for innovations” (2018, 4), involvement of citizens into the innovation process leads to more successful and widely accepted innovations. Interreg (2018, 4) lists possible consequences of isolating society and citizens from the process: products and services are not used; innovators and end-users do not understand each other; technical innovation instead of social innovation and lack of transparency.

The purpose of Quintuple Helix model is to consider natural environment as a new subsystem affecting innovation and knowledge production that is as important as other components of the model. This model also includes an environmental subsystem and answer a question: “How do innovation, knowledge and environment relate to each other?” (Carayannis et al. 2012, 42.)

Carayannis et al. (2012) describe Quintuple Helix Model as a practical and theoretical framework for the exchange of the resource of knowledge, based of five societal subsystems, in order to support and promote the sustainable development of society. The model is useful for this purpose because it creates information flow between different social institutes. Various parts of the society exchange knowledge and develop together.

Indeed, sustainable development can only be achieved if the political, economic, education systems, media-based and culture-based knowledge and natural environment knowledge operate together.

Leydesdorff (2012, 25) comments that it is highly important to use the N-tuple Helix models to evaluate the innovation system and processes instead of assuming their existence on priori grounds.

Carayannis et al. (2012, 2) state that the Quintuple Helix model can help us overcome environmental challenges and conclude that it is a highly suitable framework for understanding relationship between knowledge and innovation in order to achieve sustainable development.

3 Methodology

3.1 Research approach

When conducting a research, it is extremely important to choose the right approach. The three most popular methods are qualitative, quantitative and mixed method. The choice must be based on research questions and objectives, because it is more effective and convenient to answer different questions using particular approaches. (Creswell 2014.) However, it is important to note that none of these approaches are good or bad. The decision on which one of them to use depends on its ability to answer the research question and objectives. Glyn Winter (2000, 9) states that criticism towards each of these methods is a result of failure to understand purposes and implementation of each approach.

According to Creswell (2014), qualitative method is a tool for researching and explaining meaning that humans or societies give to certain issues and thoughts behind their actions. He adds that a researcher that implements this method plays a big role in interpreting the data based on his findings. One of the main reasons for it is the fact that qualitative approach helps us understand and explain issues that cannot be calculated mathematically (Ospina 2004). For instance, using qualitative approach researchers can analyze words and images, which often contains a lot of appropriate information about a subject. It is particularly helpful when learning important preliminary and fundamental insights of a problem. (Opoku, Ahmed & Akotia 2016, 34.) Punch (1998, 4) explains that qualitative method is extremely effective when analyzing data that is not based on numbers. Given the fact that in today's world people often do not agree on many subjects and interpret them differently, and the fact that online communities provide us with a lot of various opinions on any subject, qualitative analysis becomes more and more popular among scientists and gives them certain advantages when conducting research. However, Denzin (1997) adds that qualitative approach is criticized by some experts. For instance, politicians and some parts of scientific community tend to call qualitative researchers "soft scientists" and journalists.

On the contrary, quantitative method is a tool for analyzing relationships between variables that, commonly, can be measured and displayed in the form of numbers (Creswell 2014). According to Sarantakos (1998), the key characteristics of the quantitative approach is that a researcher is extremely objective and the level of measurement and precision is particularly high. However, the quantitative method may be too mechanistic, inflexible and limited in terms of grasping concepts that surround a studied issue (Toor & Ofori 2008). It is important to note that quantitative and qualitative approaches are not polar opposites. In fact, they may complement each other and, sometimes, are combined. (Newman & Benz 1998.)

Mixed method is a combination of qualitative and quantitative approaches. Creswell (2014) points out that in some cases this method may be an effective tool for analyzing data in a holistic way. The most suitable approach for this thesis is qualitative because the data that will be analyzed is mostly presented in the form of words.

3.2 Research context

This research is focused on analyzing climate change of one specific country, which is Norway. It is important to note that Norway was chosen due to its outstanding results in terms of reducing greenhouse gas emissions. The example of Norway is a great role model for other countries that strive to combat global warming. By studying Norway's policies, laws and actions, we can understand, what brought it to such impressive environmental progress. However, when conducting a case study, it is important to study the context and conditions in which the results were achieved. Therefore, information about Norway's geography and economy is presented below.

Norway is one of the most northerly countries. It is located in Scandinavian Peninsula in Northern Europe and has land borders with Sweden on the east, and Finland and Russia on the north-east. Total area of the country is about 385,1 thousand square kilometers, including approximately 17 thousand square kilometers covered by lakes. Norway is surrounded by Skagerrak Strait and the North Sea on the south, the Nor-

wegian Sea on the west and the Barents Sea on the north. The biggest cities in Norway are Oslo, which is a capital of the country, Bergen, Trondheim, Stavanger and Drammen.



Figure 3. Geographic location of Norway (adapted from Nations Online 2020)

Norway has a population of 5,3 million people. Most people live in the south of the country because of better connectivity to other European countries and more favorable climate. Living conditions of the country are one of the highest in the world. What is more, Norway is ranked 16th in Global Competitiveness Report in 2018 by World Economic Forum. Its gross domestic product (GDP) per capita is 81,695 thousand US dollars (2018), which, according to the World Bank (2020), is the 3rd best performance in the world.

Oil and gas industry is the largest industry in Norway. It drives the Norwegian economy forward. In fact, exports generated by it compose approximately 17% of the national GDP. (World Atlas 2017.) According to the Observatory of Economic Complexity (OEC) (2020), 58% of Norway's export goods in 2017 were mineral products.

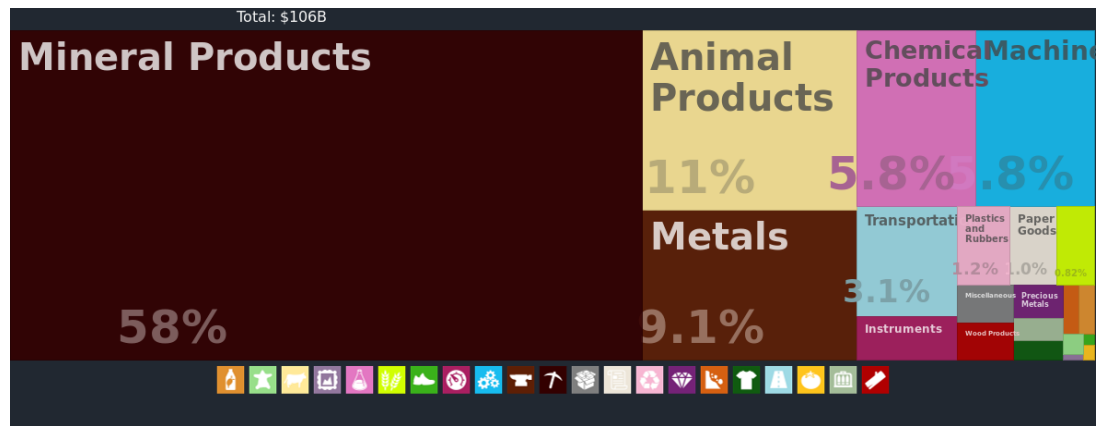


Figure 4. Norway's exports in 2017 (adapted from OEC 2020)

Despite oil and gas industry being the largest in the country, Norway has achieved great environmental progress and keeps reducing greenhouse gas emissions every year. In the Environmental Performance Index (EPI) ranking from 2018, Norway is ranked the 5th in terms of environmental health and 11th in terms of overall environmental performance.

3.3 Data collection

In order to collect the needed data, the author has mainly used secondary data. According to Hox & Boeije (2005, 596), secondary data is data that has been gathered by other researchers or gathered for different purposes like journals or accounts kept by companies or official statistics. The data collected by other researchers may be very useful for studying topics different from the ones that the data has been originally gathered for. Secondary data may be retrieved from government datasets, interviews, documents, conversations and other publications (Smith 2006, 4-5). Moreover, it may be found in scientific journals and academic articles (Saunders, Lewis, & Thornhill 2009, 263-265).

There are several advantages of using secondary data. First of all, it requires considerably less amount of time and resources to collect (Crossman 2019). Nowadays most of researchers have access to a lot of academic articles that contain useful information. Therefore, in many cases it is rational to use it instead of collecting primary data. Another advantage of secondary data is its multiplicity (ibid.). Indeed, it is possible to find data on nearly any subject.

On the other hand, there are some disadvantages of using secondary data. For example, found data sources may not contain enough relevant information on the topic or may include data that answer different questions (ibid.). Therefore, it is important to spend enough time and effort in order to find relevant information that may be successfully used. What is more, it is important to search for valid and reliable data (ibid.).

The secondary data needed for this research was collected on the Internet. One of the main sources of information was the official website of Norwegian government. Moreover, the author used websites of credible global organizations such as the World Economic Forum, EPI (Environmental Performance Index), OECD, the European Union and the World Bank.

3.4 Data Analysis

This chapter is aimed at explaining the secondary data analysis process and approach. According to Miller & Brewer (2003, 285), secondary data analysis includes analysis of secondary data that was gathered by a researcher beforehand. Data analysis is a process of assessing collected data using different tools and techniques in order to detect existing relationships between variables. Hinde (1991) explains that secondary data analysis might bring a researcher to conclusions and assumptions that have not been achieved on previous publications because the analysis process may be based on a different theoretical framework or a different perspective. One of the important features of secondary data analysis is that it requires an immersive

and holistic approach because often data from various sources and authors must be analyzed simultaneously (Creswell 2014, 150).

The technique chosen for the secondary data analysis in this thesis is content analysis. The benefit of this technique is its ability to provide with organized and efficient interpretation and analysis of communicative material, which might be presented in the form of texts, pictures, musical or other similar material (Flick, von Kardorff & Steinke 2004, 266). Cavanagh (1997) stresses that content analysis technique is highly useful for interpreting text data.

It is important to note that, according to Quintuple Helix model, which is a theoretical framework for this thesis, it was necessary to study the influence of four pillars (government, industries, universities, society) on the fifth pillar (natural environment). Therefore, the data analysis process was organized in a way that takes into consideration these pillars. In fact, the author assigned separate codes for each of these pillars in the process of generating codes.

The graph below illustrates the sequence of the secondary data analysis process steps.

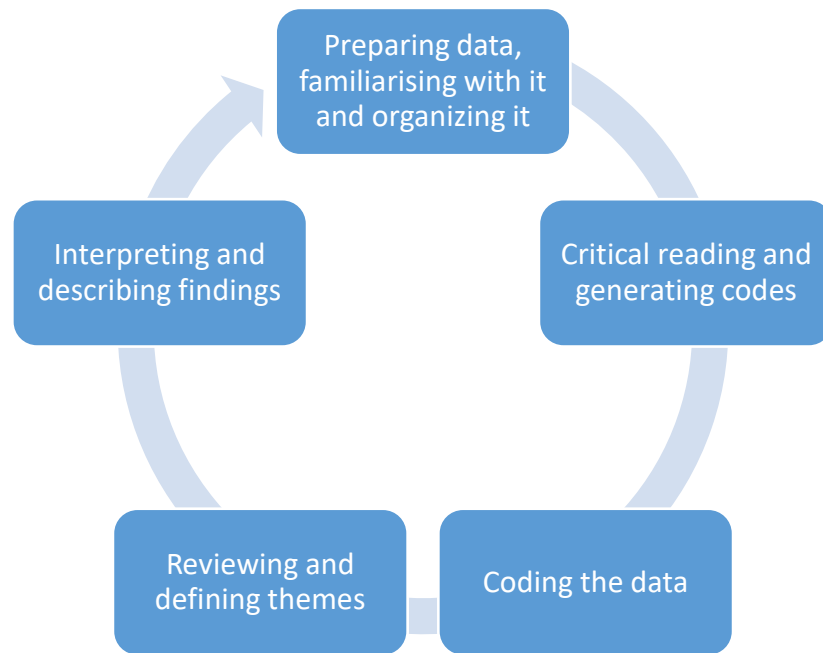


Figure 5. Data analysis process. (Creswell 2014)

After the secondary data was gathered from Internet, downloaded on the author's computer or saved in Internet browser's bookmarks section, and after the author familiarized himself with the found data, it was allocated into different folders according to the theme each article represented. The next step was to critically read the data and generate codes for it. In order to do it, the author created an MS Excel document and two different sheets inside of it. One of them included the codes that were previously defined by the author based on the theoretical framework of the thesis and codes that were identified during critical reading.

Then the author dedicated time to coding the data in order to organize it. The process included reading the collected documents and other forms of data and categorizing different pieces to codes that they related to. The final step was to analyze, interpret each code and the data that it contained and make conclusions based on the findings.

3.5 Verification of the results

Validity

In order to explain validity, Creswell (2014, 251) cites Gibbs' (2007) definition of it. According to it, qualitative validity of data and findings is their accuracy, and, in order to assess the validity, researchers often use several procedures such as peer debriefing, member checking and others. Creswell (2014, 251) recommends using several strategies to in pursuance of increasing the researcher's ability to evaluate the validity. In this thesis the author utilized strategies like triangulation and clarifying bias.

Triangulation means reviewing information from various data sources in order to ensure that the data is not taken from one or several biased studies (Creswell 2014, 251-252). The author implemented the triangulation strategy in this thesis by critically reading a variety of different articles and documents from different authors and sources. Additionally, the author has carefully studied the data sources in order to detect and only use credible ones.

In order to clarify the bias that the author might have involuntarily brought to the thesis, it is necessary to explain his background in the topic of the thesis. Firstly, the author had not been in Norway and did not have deep knowledge about Norwegian society and culture, which might had helped to understand more thoroughly the attitude of Norwegian people to the concept of sustainability. Secondly, the author was a bachelor level second year student and only studied the concepts of bioeconomy and sustainability in a course named "Economics of competitiveness". However, the author had studied a variety of academic articles and research in order to minimize the subjectivity of his findings.

Reliability

Creswell (2014, 251) states that reliability is stability, or consistency of research, data collection and data analysis methods. He refers to Gibbs (2007) when recommending

procedures that help to check research for reliability. One of them is to constantly check codes for mistakes. The author of the thesis made sure that the codes identified from the theoretical framework and the codes that were added later during the critical reading process do not contradict and stand for different themes. What is more, the author created an MS Excel sheet that contained definitions of the codes and memos that occurred during the research process, which helped to avoid errors and confusion. Moreover, the author often compared the codes with data in order to ensure that they were matched correctly.

4 Results

In this chapter, the author presents findings of the research based on analysis of gathered secondary data. The chapter is divided into two subchapters: preliminary analysis, where the author presents current environmental state of Norway and its goals, and in-depth analysis, where the researcher defines reasons behind the current state and actions that are taken today to improve it.

The findings in the second subchapter are reported according to the theoretical framework of the thesis, which, in this case, means that influence of each one of four Quintuple Helix models' pillars on the fifth pillar, the natural environment, is described separately.

4.1 Preliminary Analysis

According to OECD (2011), Norwegian government and population have been aware of existing environmental issues in the country for a long time, which is one of the reasons the country is one of the environmental leaders of the world. The main environmental issues that have been discussed in Norway are "climate change, biodiver-

sity, conservation of ozone layer, toxic contamination, hazardous waste, eutrophication and acidification”. (2.) This thesis focuses on exploring climate change response of the country, which, according to Norwegian Ministry of Finance and Ministry of Foreign Affairs (2019), is drastic as the country deployed a broad range of policies and laws to resist the climate change. For example, in 2020 one of the introduced laws bans “the use of mineral oil for heating of buildings”. (68.)

The results of the actions towards reducing air emissions are obvious. For instance, Norway is a global leader in terms of shifting towards usage of electric vehicles. In fact, share of passenger vehicles registered in February in Norway is about 68%. (Holland, 2020.) Holland (2020) emphasizes that the percentage increased from 10% in 2013 to 68% in 2020, and, taking into consideration rising availability and affordability of electric vehicles, assumes that the number will continue to grow.

Plug-in Vehicle Market Share in Top 4 Countries

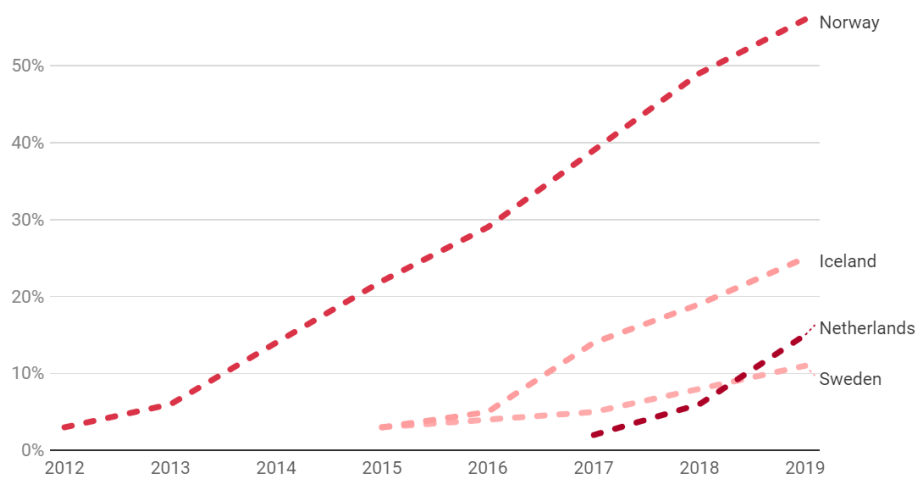


Chart: CleanTechnica • Source: EV Volumes • Created with Datawrapper

Figure 6. Plug-in Vehicle Market Share in Top 4 Countries (adapted from Clean Technica 2020)

The figure above represents plug-in electric vehicle market share in four leading countries. It shows that in 2019 the index in Norway was higher than 50%, while Iceland had a percentage of, approximately, 25, and in Netherlands and Sweden the index was lower than 20%. The main factors, positively impacting the electric vehicles

market in the country, are government policies and regulations. Here are the main benefits of purchasing electric vehicles in Norway:

- No annual road taxation
- Discounts on parking spaces
- No purchase/import taxes
- Minimum 50% discount on fares for electric vehicle owners
- Access to bus lanes. (Richardson 2020.)

The case of Norway proves that it is possible for other developed countries to transition to usage of electric vehicles in a relatively short period of time. Another area, where Norway has succeeded is electricity production, which, in the country, is almost entirely emission-free and renewable. In fact, in 2017 hydro power plants generated 96% of overall electricity production, and wind farms produced 1.9% of it. Consequently, emissions of Norwegian electricity manufacture were about 38 times lower than the European Union average. (Climate Action Tracker 2019.)

However, pollution from industry sector in Norway is significantly high due to its large oil and gas production level. Even though the country exports most of manufactured oil and gas, the emissions are still very high due to the extraction process, which, in 2018, generated 27% of overall emission volume in Norway (Climate Action Tracker 2019).

Norway has been strongly criticized for its economic dependence on the oil and gas industry, which is the main source of carbon dioxide emissions in the country. By producing and exporting oil and gas Norway contributes to weaker environmental protection both directly and indirectly, both inside and outside of the country because the manufactured oil and gas is mostly consumed in other countries (Sustainable Governance Indicators 2019). According to The New York Times (2017), Peter Erickson, a scientist from the Stockholm Environment Institute, has discovered that in 2017 emissions from the country's exports would be approximately 10 times higher than its domestic emissions. Thina Margrethe Saltvedt, an analyst and researcher at

Nordea company, noticed: “We want to be a leader in climate change. But what we do is export the CO2.” (The New York Times 2017.)

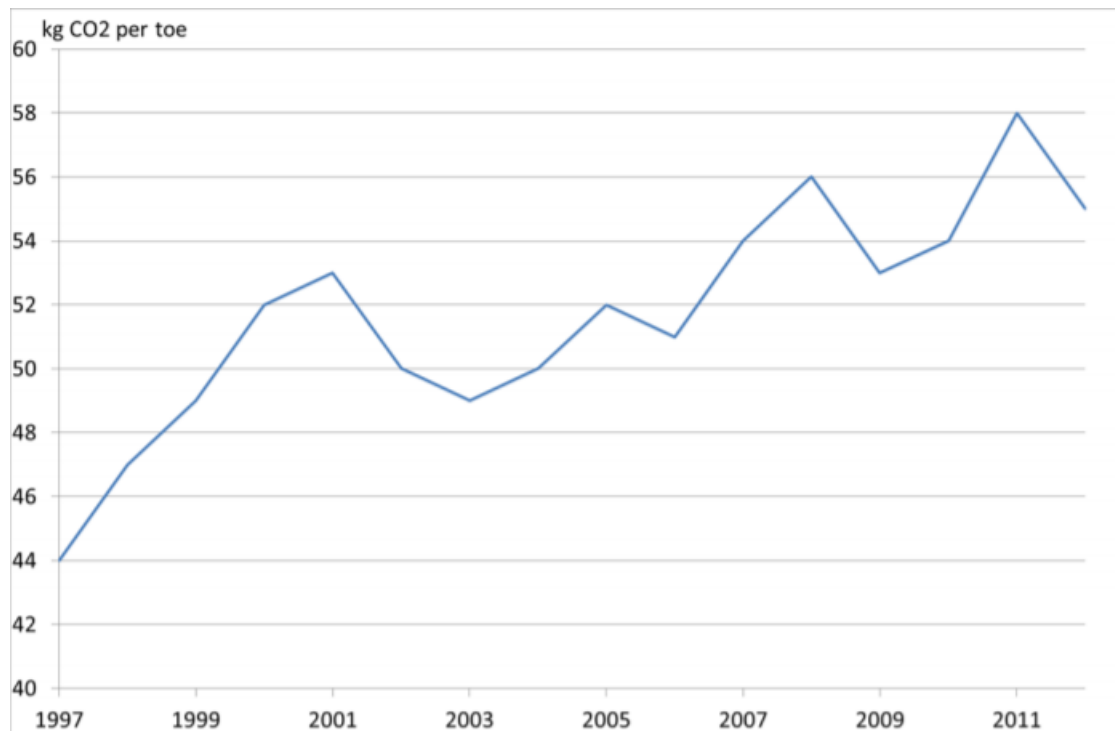


Figure 7. Progress of Norway’s average carbon dioxide emissions per unit of oil and gas from 1997 to 2012 (adapted from Statistics Norway 2015, 5)

The figure above shows that average carbon dioxide emissions per unit of oil and gas in Norway considerably increased from 1997 to 2012. The plan of Norwegian government, along with gradually decreasing emissions across different sectors, is to tax carbon emissions and purchase emission allowances from other European countries through the EU ETS. However, environmental organizations and activists criticize authorities for trying to “buy its way out of the problem rather than enacting appropriate and lasting economic and organizational reforms”. Moreover, critics demand that the country decreases the supply of oil and gas to other countries in order to contribute to global environmental development and prosperity. (The New York Times 2017.) However, the state still grants licenses for oil and gas exploration, particularly because of the sprint for Arctic oil. In order to stop exploration and drilling in Arctic, an environmental organization Greenpeace Norway has sued Norwegian government for violating the Paris Agreement. (ibid.) Even though the court did not ban the

state's actions, pressure from environmental activists on the government keeps rising, which might soon lead to more sustainable environmental management.

Norway's targets and pledges

Over the course of past several years Norway has signed several international agreements and set goals on protecting the environment. The main arrangement is signed in 2016 Paris Agreement, which sets an unconditional goal to decrease carbon emissions by 40% until 2030 relatively to 1990, and by 44% relatively to 2010. Additionally, in 2017 the Norwegian government approved a goal of growing into "low carbon society" by 2050, which assumes GHG emissions reduction by 80-95% compared to 1990 levels. (Climate Action Tracker 2019.)

4.2 In-depth analysis

4.2.1 Government

In order to analyze environmental actions of the Norwegian government, it is necessary to explain environmental management system of the country.

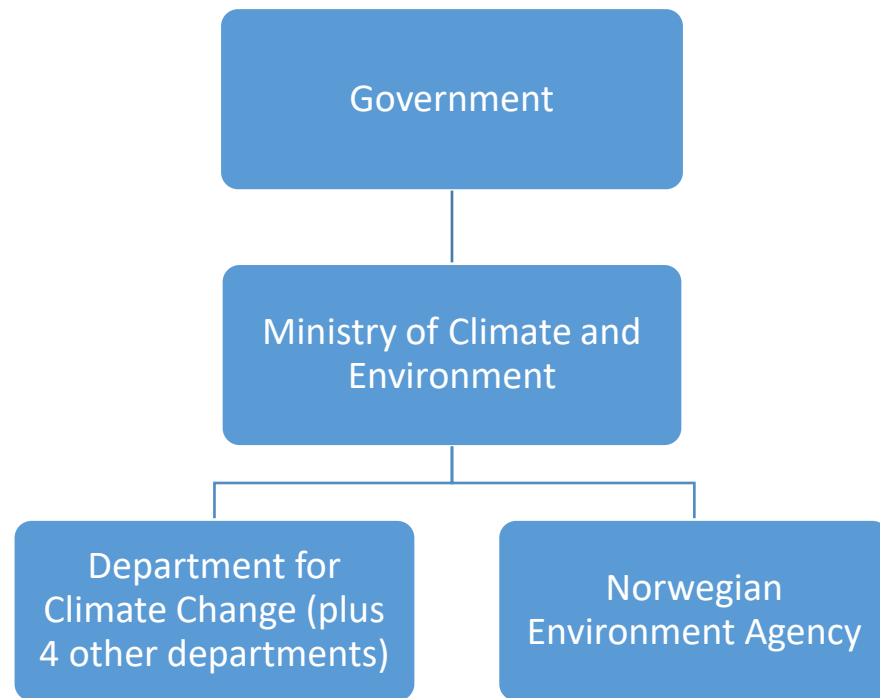


Figure 8. Environmental management system in Norway (Haugen 2016)

The power in Norway is divided between 3 separate branches: the Storting (parliament), which is a legislative branch; the courts, which represent judicial branch; and the Government, an executive branch (Government of Norway 2017). The Government consists of a number of ministries, including the Ministry of Climate and Environment. The main responsibilities of the Ministry are to ensure and protect unified climate and environmental strategies in Norway, develop and execute its own procedures and coordinate authorities' actions towards implementing the environmental policies. Specific areas of target are climate, pollution, biodiversity, polar areas, outdoor recreation and environmental heritage. (Haugen 2016, 4.) The Ministry of Climate and Environment consists of several departments, including Department for Climate Change and Department for Nature Management. Furthermore, it includes several agencies including the Norwegian Environment Agency, which plays an important role in the environmental management. According to the Government of Norway (2020 b), the main functions of the agency are:

- Operate as a counselor cooperate with other organizations on environmental activities
- Observe the state of the environment and provide relevant data

- Monitor and advise municipal and regional authorities on environmental issues
- Cooperate with authorities responsible for environmental actions

Laws

In this section, the author presents Norwegian climate and environmental laws that counteract the climate change and air emissions. The table below includes all substantial laws in this sphere adopted from 1981 to 2017.

Table 1. Norwegian laws regarding Climate Change (Government of Norway 2020 c)

Name	Year
Pollution Control Act	1981
Environmental Information Act	2003
Emission Regulations	
Climate Change Act	2017

“Pollution Control Act”

“Pollution Control Act” is a law adapted in 1981 concerning actions against pollution and waste. The goal of the law is to defend the environment and decrease pollution levels and amount of waste as well as promote environmental protection in the country. The act establishes following guidelines: prevent possible rise and reduce existing amount of the pollution levels; achieve satisfactory level of environmental quality; manage and coordinate authorities’ activities in order to develop an effective environmental management system; integrate innovations in the environmental protection process and utilize technologies in order to limit the pollution levels. Moreover, the act instructs to develop an effective waste management system and recover waste when it is possible; make people responsible for the pollution and waste economically accountable for the environmental damage; prevent pollution and waste

occurring as a result of activities of Norwegian territory regardless of whether Norwegian or other country's natural environment receive the damage. (Government of Norway 1981.) However, there are some exemptions from the law, which are decided on a case-by-case level by the Ministry of Climate and Environment and the Norwegian Environment Agency (Haugen 2016, 8).

What is more, the law obliges organizations to compose a public impact statement for any activities that may result in "major pollution problems" (Government of Norway 1981, § 13,14). The Act states that pollution management and control authorities are responsible for auditing environmental state and counteracting pollution. Therefore, the law states that the pollution control authorities must be given a right of inspection of properties where pollution may occur. (Government of Norway 1981, § 48-50.) As already mentioned, according to the Act, people or organizations responsible for environmental damage must pay compensation to the state. In some cases, for instance, when deliberately causing environmental damage, a person may be imprisoned. (Government of Norway 1981, § 73,76,78,79.) What is more, the pollution control authorities are obligated to review requests from people and organizations damaged or potentially affected by environmentally harmful activities of other parties.

Haugen (2016, 13-15) marks that the Government executes the Pollution Control Act through 3 practices: inspections, receiving reports of emission information and monitoring environment and pollutants. Regular inspections by the pollution control authorities are implemented on the basis of the 50th section of the Act. Moreover, results of the inspections are posted online and are available for the public (Haugen 2016, 13). According to the Pollution Control Act (Government of Norway 1981, § 49), reports of emission data are mandatory for people and organizations whose activities present damage for the environment. Therefore, authorities have a possibility to effectively monitor and control them. Haugen (2016, 14) adds that the Norwegian Environment Agency, which is a national pollution control authority, requires annual emission statements from all Norwegian organizations that are granted with pollution permits. According to the Pollution Control Act (Government of Norway 1981, §

48), the pollution control authority, which, in this case, is the Norwegian Environmental Agency, is responsible for monitoring pollutants and environment. Moreover, the gathered information is available to the public and can be found on websites managed by the Agency. These websites are the Norwegian Pollutant Release and Transfer Register (PRTR) and Environment.no. (Haugen 2016, 15-16.)

In the course of several decades after adaptation of the Pollution Control Act, the Norwegian parliament passed several regulations either describing pollution control requirements in a more detailed way or introducing new regulations and restrictions. For example, Regulation on Pollution Control (Pollution Regulation) was commenced in 2004. According to Lovdata (2004), the Pollution Control Act adapted in 1981 sets general rules, whereas the Pollution Regulation adds detailed restrictions and requirements such as limit values on concentration of various substances such as arsenic, cadmium and nickel in the air in local areas. What is more, it provides authorities with more detailed information about pollution permission for enterprises.

Furthermore, the parliament has adapted other laws regulating industry-specific pollution or emissions in general. For instance, “Regulations on carrying out activities in petroleum industry” in 2011, “Regulation on the reduction of emissions of gasoline vapor” in 1999, “Regulation on the Pollution Control Act’s application to radioactive pollution and radioactive waste” in 2011, “Regulations on impact assessments” in 2017 and “Regulations prohibiting the use of mineral oil for heating buildings” in 2020 (Lovdata 1999, 2011 a, 2011 b, 2017 a, 2020). In addition, the Norwegian parliament, the Storting, continuously modifies the regulations concerning the environment in order to address present issues and reach future goals.

“Environmental Information Act”

“Environmental Information Act” was adapted in 2003 with a goal to provide the public with comprehensive data on the state of environment and existing issues in order to empower citizens to take action in discussions and processes of decision-making on problems related to the environmental protection (Government of Norway 2003). This Act affects Norwegian public authorities obliging them to spread

available information. However, the Act specifies that in certain cases, namely when benefits of keeping the data prevails over benefits of sharing it, the authorities have a right to keep it. What is more, decision-making instances are to involve the public into the processes by providing it with relevant information in advance. (Government of Norway 2003, § 4,11,14,20.)

In order to strengthen the impact of the “Environmental Information Act”, the Norwegian parliament adapted “Regulations on grants to the Nature Information Center” in 2015. According to this law, environmental information centers, museums and foundations that promote environmental knowledge and awareness can request annual grants from the Ministry of Climate and Environment (Lovdata 2015, § 2). In addition, the Storting has commenced laws financially supporting environmental actions and organizations. For instance, published in 2011 “Regulations on grants to NGOs and non-profit foundations” assigns grants to non-governmental and voluntary organizations protecting the environment (Lovdata 2011 c, § 1). Moreover, adapted in 2017 “Regulations on subsidies for climate measures in the municipalities” and “Regulation on subsidies for climate adaptation”, introduced in 2018, support and promote environmental actions of municipal authorities (Lovdata 2017 b, 2018 a).

Emission Regulations

According to Norwegian Petroleum (2020), in 1991 Norway became one of the first countries to announce a carbon tax. This was a big step towards decreasing pollution levels. Moreover, in 2008 the country entered European Union Emission Trading System (EU ETS) and adapted common rules on greenhouse gas emission regulation with all EU members, Iceland and Liechtenstein.

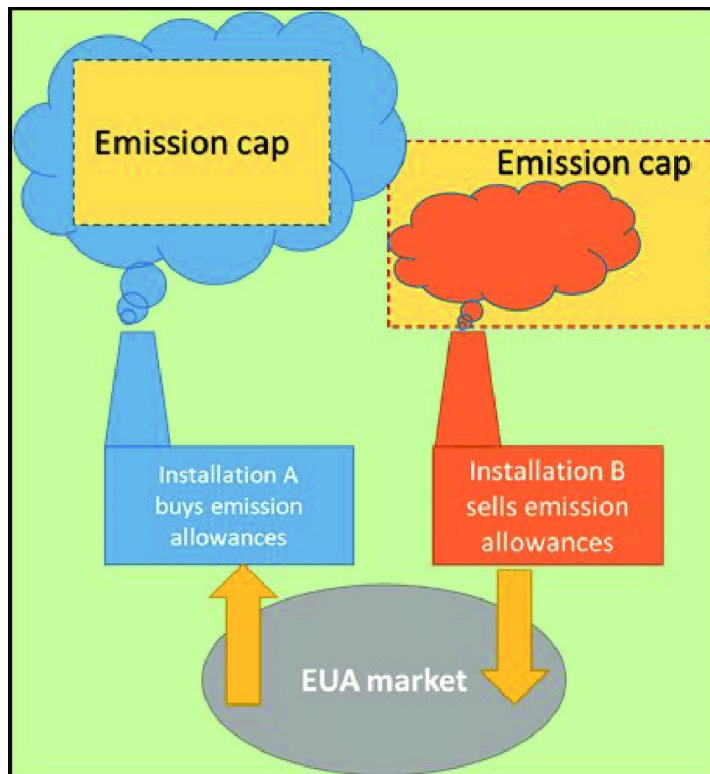


Figure 9. EU Emission Trading System (adapted from Gaurina-Međimurec & Mavar 2019)

The figure above illustrates a “cap and trade” system, which is employed by the EU. A cap is a limit of emissions that an installation or a company produces. As shown in the figure, some companies exceed the limit, whereas others do not surpass it. Therefore, they can trade allowances through the European Union Allowance market. According to the European Union (2020), companies are obliged to cover all its emissions by surrendering allowances at the end of a year.

This system secures gradual reduction of emissions and popularizes development of clean technologies. However, in some countries, particularly Norway, it also has led to rise of electricity cost due to higher demand. As a response, the Norwegian parliament adapted the “Regulation on CO₂ compensation for industry” in 2013. The purpose of this regulation is to compensate companies’ spending on the electricity if its annual consumption exceeds 10 GWh (Gigawatt hours) (Lovdata 2013, § 1,4).

“Climate Change Act”

“Climate Change Act” was commenced in 2018 with a goal to accelerate the transition into carbon-neutrality by 2050 and promote protection of the environment. The Act obliges the Norwegian government to annually report to the Storting changes in emissions and future projections, information on how Norway addresses the climate change issue, emissions budget based on EU ETS and data on emissions that are not regulated by the ETS. (Lovdata 2018 b, § 1,6.)

Local municipalities

Local municipalities in Norway have power to implement carbon emissions reduction strategies because they can affect local organizations directly. Local authorities have a right to develop and adapt environmental policies based on the performance and needs of their regions. (Nordregio 2020.) However, the scope of accomplished actions varies in different municipalities and depends on existing management practices and strategies. Some areas have more proactive environmental measures, while others prioritize economic growth and short-term benefits. (Hauge, Hanssen & Flyen 2019.)

One of the cities, where the local government strives to achieve sustainability and address current environmental issues, is Stavanger. Stavanger is a city in the southwest of the country with a population of about 142 thousand people. According to the “Climate and Environmental Plan 2018-2030” (2018, 56-57), approved by the Stavanger City Council in 2018, the municipality will focus on implementing available environmentally-friendly practices and fund environmental research in order to develop effective climate change management strategies.

4.2.2 Industries

In Norway, industries and companies play a big role in environmental protection. According to the Norwegian Ministry of Finance (2008, 85), Norwegian companies willingly take actions and responsibility for climate change and sustainability. One of the effective ways they address these issues is investing in research and development

and employing innovative technologies. The business sectors' actions towards environmental sustainability, especially integrating innovative practices, are crucial for Norway's success in achieving its environmental targets. Moreover, it is important that companies cooperate with national authorities and international organizations in order to operate according to defined principles and recommendations. (Bondevik 2004, 36.) According to the United Nations Global Compact, adopted in 2000, these principles are:

- Companies should promote discreet attitude to environmental challenges
- Advocate for environmental accountability
- Develop environmentally beneficial technologies

It is important to note that governmental regulations have a strong impact on the business sector. The Government in Norway has several environmental policy instruments such as various economic instruments (carbon tax, emissions trading system, etc.), direct regulations, recommendations and spreading relevant information. Therefore, it is highly important for the authorities to provide companies with the system that connects competitiveness and sustainability. (Bondevik 2004, 40.)

In addition, Norway's enterprises were among the first in the world to implement voluntary approaches for reducing greenhouse gas emissions. Norwegian Ministry of Trade and Industry (2004, 2) lists 3 factors that had a positive impact on the amount of emissions produced by the business sector:

- The Ministry of the Environment and the Federation of Norwegian Process Industries reached an agreement, according to which companies that did not take part in the emissions trading system had to reduce their emissions. The goal was to reduce emissions from several industries including ferro-alloy, aluminum, carbon and carbide industries by 20% comparing to 1990.
- Agreements regulating emissions from companies manufacturing electric devices.

- Agreements ensuring reduction of greenhouse gas emissions in the aluminum industry.

A decade later, after countries all over the world signed the Paris Agreement in 2016, different industrial sectors in Norway created roadmaps for reaching “green competitiveness”. One of them was the financial sector, which published the “Roadmap for green competitiveness in the financial sector” in 2018. The document was provided by Finance Norway, an organization representing over 200 major Norwegian financial companies. The document outlines 7 recommendations on the journey for achieving sustainable, low-carbon economy:

- Provide a common classification for sustainable financial system. At the moment, many organizations assess environmental effects of their activities differently and use various definitions of sustainable financial operations, which limits the possibility to correctly evaluate them. Therefore, it is suggested to create a common taxonomy for financial operations in order to define risks and opportunities more effectively. (Finance Norway 2018, 15.)
- Coordinate climate reporting according to the guidance of the Financial Stability Board. It is suggested that companies use standardized climate reporting framework provided by “The Task Force on Climate-related Financial Disclosures” in order to secure transparency of data. (Finance Norway 2018, 16.)
- Develop climate qualification in the financial sector. The document suggests that executives in the financial sector should have environmental knowledge in order to manage the shift to sustainable operations. (Finance Norway 2018, 18.)
- Add climate risk in the mandate of “The Supervisory Authority’s Mandate”. At the moment, financial authorities in Norway develop markets and financial stability. However, it is suggested to include climate risk management as their competency due to the urgent state of the environmental issues. (Finance Norway 2018, 19.)
- Develop cooperation of the authorities and the financial sector. The financial sectors environmental performance is highly dependent on the government

policies. Therefore, a common goal and collaboration will improve the climate change response of both sides. (Finance Norway 2018, 20.)

- Utilize digitalization to improve the market of environmentally-friendly products and services. It is suggested to use online platforms to promote “climate-smart” products and services in order to accelerate the shift to sustainable economy. (Finance Norway 2018, 22.)
- Assist innovation in other industries. The financial industry has a significant impact on other industries and should contribute to their sustainable development. (Finance Norway 2018, 23.)

In addition to industries promoting sustainable practices, Norwegian companies also integrate them into their agenda. One of the examples of a company using a thoughtful environmentally-friendly approach is Norway Post and Bring, which is one of the biggest transports and logistics organizations in the Nordic region.

In 2016 the company released a document named “Norway Post and Bring’s environmental practices”, where principles and strategies of the company are described in detail. According to the publication, the Norway Post Group considers environment as one of the biggest priorities and strives to be the industry’s environmental leader. The main goals are to decrease energy consumption level and reduce pollution and waste. Indeed, by 2015 the company decreased their emissions by 34% relatively to 2008. (Norway Post and Bring 2016, 3.)

The paper provides with exact steps that the company is taking to address the environmental issues. Here are the main improvements: in 2015 approximately 1000 heavy fossil fuel trucks were replaced with low-emission renewable diesel trucks; use of over 1200 electric vehicles secure carbon-free mail delivery; regularly replacing vehicles with new, environmentally-friendly models; increasing rail road usage resulting in reduction of pollution; installing solar panels on buildings owned by the company. As a result of its outstanding strategies and results, the company has received following awards: “The Green Car Award” in 2012 for strongly relying on electric vehicles use, “The Environmental Award of the Confederation of Norwegian Enterprise” in

2014 for its distinguished environmental strategy and “The Environmental Achievement of the Year” in 2015. (Norway Post and Bring 2016, 5.)

However, share of emissions produced by the business sector in Norway is much higher than in a lot of other countries. The reason for that is the country’s large oil and gas production sector, which composed about 22% of its GDP in 2017. (Climate Action Tracker 2019.) Even though the majority of the oil and gas is manufactured for export, extraction process generates large amount of greenhouse gas emissions.

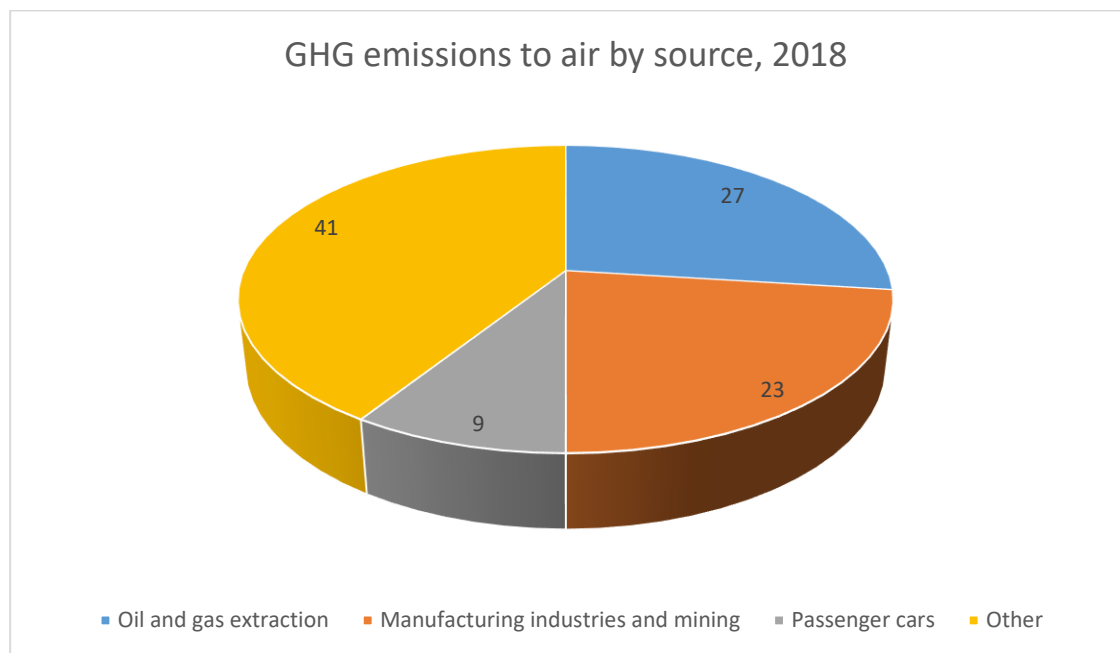


Figure 10. Greenhouse gas emissions by source in 2018 (Statistics Norway 2020)

The figure above illustrates greenhouse gas emission shares of different sectors in 2018. The most pollution sector is the oil and gas industry, which contributes 27% of Norway’s overall emissions. Manufacturing industries and mining and passenger car use compose 23% and 9% accordingly. It is important to note that as Norway exports most of its oil and gas products, it indirectly contributes to the world’s emission levels, which the Norwegian authorities are often criticized for.

Nevertheless, Norwegian petroleum companies claim to actively respond to the climate change problem by using new technologies in the extraction process and even

concede less greenhouse gas emissions in the extraction process than the global average (The New York Times 2017).

4.2.3 Universities

Universities in Norway have a vital role for promoting environmental awareness and providing society with valuable knowledge and research. Former prime-minister of Norway Bondevik (2004, 40) emphasizes that the key elements for sustainable development and growth are innovations and research, and educational institutions are well equipped to generate them. Universities not only have to use sustainable practices, but also provide students with understanding of importance of addressing the climate change issue and provide them with resources and knowledge for conducting research on the topic. Educational institutions all over the country provide opportunities for researchers, students and staff members to participate in governmental programs and competitions based on environmental activities and achievements. (Science Norway 2020.) What is more, most of the universities provide separate full-time programs dedicated for climate, environment and sustainable development.

Table 2. Climate and Environment programs in Norwegian universities (Masters Portal 2020)

University	Course	Level	Duration
University of Oslo	Renewable Energy Systems	Master	2 years
NHH Norwegian School of Economics	Energy, Natural Resources and the Environment	Master	2 years
Norwegian University of Science and Technology	Sustainable Manufacturing	Master	2 years
Norwegian University of Science and Technology	Natural Resource Management	Master	2 years
Western Norway University of Applied Sciences	Climate Change Management	Master	2 years

The table above shows climate and environment management courses in the country's leading universities such as University of Oslo and Norwegian University of Science and Technology. The courses' learning outcomes vary from management of natural resources to creating and maintaining renewable energy systems and managing sustainable manufactures. Most of the found programs' duration period is 2 years.

Furthermore, many universities in Norway contribute to the battle against climate change by conducting research on environmental topics. For instance, University of Oslo has launched the "UiO: Energy" project, which is initiated with a goal to bring scientists and researchers from different fields of science together in order to study environmental issues. "UiO: Energy" is one of the most prioritized projects because addressing climate change and environmental problems is among most important tasks of the university. In order to advance research faster, University of Oslo actively collaborates with companies, authorities and other universities. (University of Oslo 2016.)

According to the University of Oslo (2016), "UiO: Energy" includes four research areas based on the needs of society. These areas are:

- Energy Systems
- Materials for energy
- Energy Transition and Sustainable Societies (generating new, sustainable political and societal models.)
- Carbon Capture and Storage

Rector of the university Steven Stolen stresses that administration follows environmental recommendations from UN and Norwegian authorities and adds that the University of Oslo has developed long-term thoughtful environmental strategies (Science Norway 2020).

In addition, Norway is a home for many research centers focused on conducting high-level studies on relevant environmental issues. The largest centers are "Center

for International Climate and Environment Research (CICERO)”, “High North Research Centre for Climate and the Environment (The Fram Centre)”, “Norwegian CCS Research Centre (NCCS)”, “Research Centre for Sustainable Solar Cell Technology (SuSolTech)” and “Norwegian Centre for Energy Transition Strategies (NTRANS)”. These and other research institutions not only provide companies and authorities with innovative solutions, but also have an important role in organizing international climate communication and cooperation. What is more important, the research centers advise and collaborate with authorities, organizations and the public in order to promote environmental awareness and innovations. (CICERO 2020.)

4.2.4 Society

Norwegian society plays an important role in promoting sustainability because many Norwegians participate in voluntary organizations. In fact, about 75% of the adult population in Norway is assigned to at least one of them. Moreover, an average adult participates in 2.1 voluntary organizations. (Nilsen, Stromsnes & Schmidt 2017, 20.)

The largest voluntary environmental organizations in Norway are:

- “Nature and Youth”, which includes 7600 official members all over the country. According to the official website of the organization, its main goals are promoting environmental awareness and putting climate change issues on the agenda, influencing and pressuring authorities and politicians and popularizing environmentally-friendly solutions. (Nature and Youth 2020.)
- “Norwegian Society for the Conservation of Nature” (also known as “Friends of the Earth Norway”), which was founded in 1914 and is the oldest environmental organization in Norway. According to the official website, the main goal is to protect the environment, especially in areas like climate change, transportation, conservation and energy. (Norwegian Society for the Conservation of Nature 2020.)

- “Eco-agents”, which is a voluntary organization for children with over 9 thousand members. According to the official website, the main goal of the organization is to increase environmental awareness among children as well as “make their voices heard”. (Eco-agents 2020.)
- “Bellona Foundation”, which is an international environmental organization with a headquarter in Norway. It was founded in 1986 in order to protest against pollution of the oil and gas industry. Today the main focus areas of the organization are climate change, energy efficiency, renewable energy and fossil fuels. (Bellona 2020.)
- “Green Warriors of Norway”. According to the official website, the organization will fight for anything that will secure better environmental protection in all areas. For instance, as a result of a report filed by the organization, Statoil was charged 25 million NOK for an oil spill in 2009. (Green Warriors of Norway 2020.)
- Green Party, which is a political party that participates in parliament elections. According to the official website of the party, it does not position itself according a standard “left-center-right” political system. Instead, it prioritizes and focuses on environment and sustainability. (Green Party 2020.)
- “Zero Emission Resource Organization” (ZERO), which is an organization with a main goal of reduction of greenhouse gas emissions and promoting investments in renewable energy sources (Flickr 2020).

Voluntary organizations play a huge role in organizing and cooperating environmental protests all over the country because they have a system of local groups in every major city. What is important, protests in Norway have considerable influence on national policies and political agenda because of a strong relationship between the society and authorities (Hayward, Selboe & Plew 2015).

The climate change protests and strikes are organized on a regular basis. For example, on 22 March 2019 school children in Oslo, Trondheim, Hammerfest and other cities participated in protests against irresponsible environmental management of

adults. “Politicians talk a lot about acting for the sake of future generations, but the problem is that they almost do not act”, stated a 15-years-old protester from Oslo Michelle Koudrik. (Bellona 2019.)

About two months later, on 24 May 2019 a group of environmental activists blocked the entrance to the country’s central bank. The main requirement was to stop national investments into the coal and oil and gas industry. (Reuters 2019.) As a result of this protest and pressure of environmental organizations on authorities, Norwegian parliament in June 2019 voted for banning investments into more than 150 companies representing coal and oil and gas industries (Climate Action Tracker 2019).

Three months later, on 30 August 2019, Norwegian people gathered in front of the national parliament in Oslo and performed organized roar to “wake politicians up”. The main requirement for authorities was to comply with the Paris Agreement. (Norway Today 2019.) As a result of the climate change movement, in 2019 a word “climate-roar” was declared as the winner of the “Word of The Year” by The Language Council of Norway (The Local 2019).

5 Discussion

Norway is a country that has been established as one of the environmental leaders of the world. In order for it to reach this status, participants of different sectors and areas of the Norwegian society had to act jointly and decisively, especially at the times, when the climate change issue is one of the most urgent and important global problems. The main goal of the current study was to determine, how has Norway been addressing the climate change issue and what factors play the key role in shifting the Norwegian economy and society to a more sustainable state. As a result of reviewing

the relevant literature on the topic, the author has formulated the following question:

- How does Norway respond to the climate change issue?

In order to answer the research question, the author has elected and analyzed relevant secondary data from well-established online sources. Moreover, official websites of Norwegian governmental and non-governmental organizations and websites of Norwegian companies were used to gather the relevant data. The data was collected according to the study's theoretical framework.

5.1 Answers to the research question

The summary in this subchapter is presented as an overview of the Quintuple Helix model's four pillars' influence on the fifth pillar, the natural environment. These pillars are government, industry, universities and society.

Government

The research shows that the role of the governmental organizations in achieving sustainable development and addressing the climate change issue is highly important because they affect all companies and resident in the country and have enough power to influence the country's vector of development.

Over the course of the last decades, the Norwegian parliament has adopted a number of important regulations, which contributed to Norway's environmental health. For example, the "Pollution Control Act" was accepted in 1981. The main goal of the Act is to promote environmental protection in the country and decrease the pollution level by organizing regular environmental inspections of various organizations and making responsible parties accountable for possible environmental damage. Another example is the "Environmental Information Act" which was adapted in 2003 by

the Norwegian parliament with a goal to provide the population and organizations with the relevant data on the country's environmental health. The Act has positively contributed to the public awareness of the climate change issue and other environmental issues, which raised discussions and understanding of the importance of the problem among the citizens.

Moreover, the Norwegian Ministry of Climate and Environment, including the Department for Climate Change, the Department for Nature Management and the Norwegian Environment Agency, has a number of responsibilities and competencies aimed at executing the country's environmental regulations and policies. For instance, the Norwegian Environment Agency is responsible for cooperating with companies and authorities and coordinating their environmental actions; providing authorities with relevant data on the country's environmental state; advising and monitoring local municipalities' implementation of the environmental policies. It is important to emphasize the importance of local municipalities in addressing the climate change issue because they have a power to determine and implement their own environmental policies according to the needs of their regions and directly influence local organizations.

Industries

Air emissions from the business sector compose the majority of emissions in Norway. The reason for this prevalence is the country's large oil and gas manufacturing sector, which has a high contribution to the national GDP as well as the emissions levels because of oil and gas extraction process. However, companies from the industry invest in research and development in order to discover more environmentally-friendly solutions.

Other industries, such as the transportation industry, have significantly decreased emissions over the last years due to employment of electric vehicles. For example, Norway Post and Bring, which is one of the largest transports and logistics organiza-

tions in the Nordic region, has been successfully shifting its focus from fossil fuels vehicles to more sustainable, electric vehicles and has been given various awards for its positive contribution to the environment and the industry.

All in all, companies in Norway have financial and administrative power to organize research and development process and take innovative approaches in order to strengthen the environmental health of the country.

Universities

Many Norwegian universities include environmental research into their agenda. They inspire, support and organize studies related to sustainable development. Moreover, Norway has a number of environmental research centers, which aim solely at discovering and developing sustainable practices. Nowadays, decision-making processes strongly rely on and are driven by knowledge and data. Therefore, universities' role is significant, especially in Norway, where authorities and companies collaborate with educational and research institutions in order to make informed decisions.

Furthermore, universities promote environmental awareness among students and offer them courses, dedicated to the topic of sustainability.

Society

Norway is a democratic state, where society strongly impacts decision-making processes in governmental institutions and companies. Therefore, it often puts pressure on them by organizing protests and demands more regulations directed into environmental protection and sustainable development. In Norway, where public awareness of environmental issues is significantly high, the pressure on the government and oil and gas manufacturing companies is extreme.

In order to express their opinion in a more organized and effective manner, people in Norway join and support non-governmental voluntary organizations such as "Nature

and Youth”, “Norwegian Society for the Conservation of Nature” and “Zero Emission Resource Organization”.

5.2 Practical/managerial implications

Considering the importance and urgency of the environmental issue, it is safe to say that more and more countries all over the world will have to take actions in order to shift to sustainable development. Some countries, especially in the European Union and North America, have already started actively looking for and implementing environmentally-friendly solutions and approaches. The example of Norway illustrates tangible actions that need to be taken across different pillars of the Quintuple Helix model. Therefore, the findings of this study have a number of important implications for future practice.

First of all, legislative institutions in other countries have to pay more attention to the climate change issue and include it into their agenda. Given the fact that national and local regulations directly influence people and companies, they are highly effective and are able to considerably accelerate implementation of sustainable practices. It is important to note that there are also benefits for political figures because with increasing environmental awareness of people around the world, parties that promote sustainable development will gain more popularity among voters.

Moreover, executive branches, which in case of Norway, is the Government, have to strictly monitor compliance with the laws and regulations in order to ensure that they are effective. What is more, countries should establish special governmental institutions responsible for monitoring the state of the environment and advising authorities on important decisions.

Furthermore, the case of Norway has shown that it is important for governments to establish research centers dedicated for studying the environment and developing sustainable solutions because innovations and new technologies have potential to solve many important issues.

The findings of this research also suggest that companies have to prioritize addressing the climate change issue in order to reduce emissions and operate sustainably. For example, they should purchase and deploy electric vehicles instead of fossil fuel vehicles. Moreover, organizations through different industries have to invest in research and development and innovate in order to address the issue. It is also important to note that energy manufacturing companies should develop and promote sustainable sources of energy such as water, wind and solar energy. The example of Norway illustrates that it is possible to address the vast majority of the national demand for electricity by generating it from renewable sources.

Additionally, universities and research centers have to cooperate with companies in order to provide them with necessary research because educational and research institutions have infrastructure and needed experience to conduct studies and develop new technologies. Moreover, universities have to spread environmental awareness among students, providing them with related courses, in order to educate specialists who might potentially solve future sustainability issues.

The findings of this study also show that societies are able to positively influence government's decisions related to protection of the environment, especially in democratic and developed countries. Therefore, people around the world should join voluntary environmental organizations and actively demand more sustainable decisions from officials. The example of Norway proves that actions of citizens can significantly accelerate this process.

5.3 Assessment of the results in the light of literature

Similarly to the findings in the present research, a study conducted by Amundsen, Berglund and Westskog in 2010, where the authors analyzed climate change adaptation practices taken by local municipalities in Norway, have discovered that there is an urgent need for proactive measures from local officials and that multilevel governance strategy is the most effective approach for addressing environmental issues.

A study, conducted by O'Brien, Eriksen, Sygna and Naess in 2006, stresses the importance of paying more attention not only to the economical, but also to the social context of climate change and supporting people that are vulnerable in the times of climate change adaptation.

This thesis was conducted based on the Quintuple Helix model as a theoretical framework. It was developed by Carayannis, Campbell and Barth in 2012. The researchers note that the model is highly suitable for analyzing the innovation process and information flow government, industries, universities and society. They add that the model is also useful for studying, supporting and promoting sustainable development. (Carayannis et al. 2012.) Indeed, the findings of this study confirm that interconnection between pillars is vital for development. For example, companies representing the business sector have to collaborate with universities and research centers in order to discover and deploy new technologies and optimize their resources. Another example of interconnection is the society's influence on authorities' decisions, which, in case of Norway, has led to more proactive governmental actions directed at battling the climate change issue. Maciejczak and Hofreiter (2013) agree that processes such as innovations and industrial activities must be interlinked. Otherwise, they will be implemented in a less effective manner and much slower. Carillo and Maietta (2014, 20) and Leydesdorff (2012, 25) also agree that the Quintuple Helix model is highly useful for studying a country's innovation system and sustainable development. Indeed, the model has helped the author to conduct an in-dept analysis and identify different pillars' role in addressing the climate change problem.

Additionally, this study's findings suggest that society's role in transforming Norway to be the world's environmental leader was vital. This is consistent with Interreg's document, which was released in 2018, where the important role of society is stressed. The Interreg's study suggests that if the society is not included in the innovation process, innovations are not widely accepted and, often, do not have demand among citizens. (Interreg 2018.)

Finally, Devuyst, Hens and De Lannoy (2001) state that in order to achieve sustainability, it is important to assess it. They add that the evaluation of systems can help

decision and policy makers make sustainable choices. The findings of the present research confirm the researchers' opinion. In fact, the Norwegian Government has established entities such as the Norwegian Environment Agency. One of the responsibilities of the Agency is to monitor and assess the state of the environment in Norway and provide the Government with relevant data.

5.4 Limitations of the research

This study was based on secondary data gathered from online sources, which gave access to a wide range of scientific articles, thus, there was no shortage of relevant secondary data on the topic. Additionally, the author has used official websites of companies, governmental and non-governmental voluntary organizations. For example, the official website of the Norwegian Government was used quite often in order to collect relevant data. However, the official website of Lovdata, which is an organization, managing legal information systems in Norway, contained official texts of laws and regulations only in Norwegian language (which the author did not speak), while the English version of the website was for information purposes only. Nevertheless, it was not an obstacle as the English versions of needed documents contained the same information as the original documents.

In order to ensure the internal validity of the research, the author conducted it according to the thesis' methodology, which is described in detail in the third chapter. First of all, the data was collected and analysed according to the pillars of the Quintuple Helix model, the theoretical framework of the thesis. The model was considered by the author as the most suitable framework for answering the research question as it helps to analyse each pillar in detail. Therefore, the researcher has rigorously applied the methodology and strived to maximize the internal validity of the study.

The findings of this thesis can be generalized, and the practices and approaches, taken by Norway, may be partially or fully implemented in other countries that have a goal of battling the climate change issue. However, it is important to take into consideration the context of each country when generalizing the results of the research

because economic, political, societal, geographical and other factors in different countries may suggest other solutions, which might be more optimal and applicable, or slightly change measures, taken by Norway, in order for them to address the needs of specific countries.

In order to ensure reliability of gathered data, the author used well-established and trusted online sources such as EPI (Environmental Performance Index), Climate Action Tracker and SGI (Sustainable Governance Indicators). Moreover, the author used the official website of the Norwegian Government, websites of other governmental and non-governmental organizations, websites of companies and the website of Lovdata, which contains official text of Norwegian laws and regulations.

In order to ensure reliability of the gathered data, the author implemented the triangulation technique, which means verifying data by comparing it with information on the same topic from other sources.

While conducting the research, the author strived to be as objective as possible and strictly followed the methodology of the thesis. Therefore, the findings of the study should be unbiased. However, as the author was a bachelor student and did not have much experience in the field of sustainability while conducting the research, there may have been some degree of subjectivity.

5.5 Recommendations for future research

The topic of climate change and environmental sustainability in Norway in particular and in other countries may be researched further in order to get deeper understanding of the issue. Therefore, in this subchapter the author gives recommendations for future studies on the topic.

Firstly, future research might be focused on studying one specific pillar and its role in solving the climate change issue. Even though the Quintuple Helix model allowed to research each pillar in a detailed manner, some pillars include interesting topics that

were not researched in this thesis and might be studied further. For example, it might be useful to research, how oil and gas companies, which largely contribute to global air emissions, handle and contribute to the transition to more sustainable ways of generating energy.

Secondly, it would be useful to study the relationship between and interconnection of national and local governments in addressing the climate change issue, because, in this thesis, the author found out that multilevel governance system is a factor that is highly important for solving the climate change issue. Therefore, it would be useful to research the Norwegian system as well as study alternative systems in order to compare them and identify advantages and disadvantages of each one.

Thirdly, it would be useful to research, how other countries respond to the climate change problem and what they achieve as a result of their response. It is a good idea for a study to focus on countries that have different political, economic, social or geographical backgrounds in order to find correlation between different factors and environmental health of the countries.

Finally, it would be highly relevant and useful to research application of the findings of this thesis to another country as Norway is considered as a great example for other countries to follow in order to accelerate transition to a more sustainable society.

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