

Sustainability Management

Environmental Case Study

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EXAMENSARBETE

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Abstrakt

Detta examensarbete har gjorts på uppdrag av Havator Oy. Examensarbetet behandlar hållbarhet, dess utveckling och vad det innebär att vara hållbar. Syftet med examensarbetet var att, på basis av teorin se över hur hållbar Havator Group är i dagens läge, för att sedan utifrån ett miljövänligt perspektiv ge förslag på var man kunde förbättras eller var förbättringar kunde göras för att ytterligare växa inom hållbar utveckling.

Teoridelen förklarar grunderna för hållbarhet och dess betydelse. Teoridelen förklarar också varför hållbarhet är viktigt samt ger förslag på några exempel på hur hållbarhet kan uppnås och hur man som ett företag kan vara mer hållbar i praktiken. I teoridelen nämns också fossila bränslen, förnybar energi, elektrifiering av fordon samt Agenda 2030, alla relevanta för detta ämne.

Kvalitativa forskningsmetoder i kombination med intervjuer har använts som metoder i detta arbete. Intervjuernas längd och antal frågor varierade beroende på intervjuperson.

För att fastställa hur och var Havator är hållbar i nuläget gjordes olika intervjuer med olika anställda med olika titlar från olika ansvarsområden. Förslagen på var Havator skulle kunna förbättra vad gäller hållbarhet ur ett miljövänligt perspektiv, baseras också på intervjuerna.

Språk: engelska

Nyckelord: hållbarhet, miljö, koldioxidavtryck

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Tiivistelmä

Tämän opinnäytetyön on tilannut Havator Oy. Opinnäytetyö käsittelee kestävyyttä, sen kehittämistä ja sitä, mitä tarkoittaa olla kestävä. Opinnäytetyön tarkoituksena oli teorian perusteella selvittää, kuinka kestävä Havator Group on nykytilanteessa, ja sitten antaa ympäristöystävällisestä näkökulmasta ehdotuksia siitä, missä voitaisiin parantaa tai missä voitaisiin tehdä parannuksia kestävä kehityksen jatkamiseksi.

Teoriaosuus selittää kestävä kehityksen perusteet ja sen merkityksen. Teoriaosuus selvittää myös, miksi kestävyys on tärkeää ja antaa ehdotuksia siitä, miten kestävä kehitys voidaan saavuttaa ja miten yritys voi käytännössä olla kestävämpi. Teoriaosuudessa mainitaan myös fossiiliset polttoaineet, uusiutuva energia, ajoneuvojen sähköistäminen ja lopuksi Agenda 2030, jotka kaikki liittyvät tähän aiheeseen.

Työssä käytetyt menetelmät ovat kvalitatiivisia tutkimusmenetelmiä yhdistettynä haastatteluihin. Haastattelujen pituus ja kysymysten määrä vaihteli haastateltavan mukaan.

Sen selvittämiseksi, miten ja missä Havator on kestävä nykytilanteessa, haastateltiin eri työntekijöitä eri vastualueilta. Lisäksi haastatteluihin perustuvat ehdotukset siitä, missä Havator voisi parantaa kestävä kehitystä ympäristöystävällisestä näkökulmasta.

Kieli: englanti

Avainsanat: kestävyys, ympäristö, hiilijalanjälki

BACHELOR'S THESIS

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Abstract

This thesis has been commissioned by Havator Oy. The thesis addresses sustainability, its development and what it means to be sustainable. The purpose of the thesis was to, based on the theory, review how sustainable Havator Group is in the current situation, and then from an environmentally friendly perspective give suggestions as to where to improve or where improvements could be made, to further grow in sustainable development.

The theoretical part explains the basics of sustainability and its significance. The theory part also explains why sustainability is important and gives suggestions on how sustainability can be achieved, and how a company can be more sustainable in practice. The theoretical part also mentions fossil fuels, renewable energy, the electrification of vehicles and lastly Agenda 2030, all of which are relevant to this topic.

Qualitative research methods in combination with interviews have been used as methods in this work. The length and number of questions of the interviews varied depending on the interviewee.

To establish how and where Havator is sustainable in the current situation, interviews with various employees with various titles from different areas of responsibility were done. Furthermore, the suggestions as to where Havator could improve in terms of sustainability from an environmentally friendly perspective, are also based on the interviews.

Language: English

Key words: sustainability, environment, carbon footprint

Table of contents

1	Introduction	1
1.1	Background.....	2
1.2	Purpose	2
1.3	Delimitation.....	3
1.4	Methodology.....	3
1.5	Disposition	4
2	Theory.....	5
2.1	Sustainability	5
2.2	The Three Pillars of Sustainability	6
2.2.1	Environmental Sustainability	6
2.2.2	Social Sustainability.....	12
2.2.3	Economic Sustainability.....	12
2.3	Why Sustainability Is Important	13
2.4	Energy Sources.....	14
2.4.1	Fossil Fuels.....	14
2.4.2	Renewable Energy.....	15
2.5	The Electrification of Vehicles.....	15
2.6	How To Achieve Sustainability	16
2.6.1	How To Be More Sustainable	17
2.7	Agenda 2030	18
3	Havator Group	20
3.1	The Company	20
3.2	Havator Group Investment Programs.....	20
3.2.1	Electric-driven Crane Investment.....	20
3.2.2	The Largest Investment Program in the Group's History.....	21
3.3	Interview with Jukka Laksola, Country Director of Havator Finland.....	22
3.4	Interview with Henrik Mod�er, CEO Havator Ab.....	26
3.5	Interview with Joakim Mette, Fleet manager	30
3.6	Interview with Ari Henriksson, Vice President, Special transports	37
3.7	Interview with Rami Hirvel�, HSEQ manager, Havator Oy	41
4	Results	44
4.1	Sustainable Developments Already Made at Havator	44
4.2	Suggestions of Improvement.....	46
5	Discussion	48
5.1	Challenges	48
5.2	Problem Areas	49

5.3	Further Work.....	50
6	Conclusion.....	50
7	References.....	52

Table of figures

Figure 1.	The Three Pillars of Sustainability	6
Figure 2.	The nine planetary boundaries	8
Figure 3.	The 17 Different Goals of Agenda 2030	19

Abbreviations

CO₂ – Carbon dioxide

GDP – Gross domestic product

PPMV – Parts per million by volume

UV – Ultraviolet

E/MSY – Extinctions per million species-years

BII – Biodiversity Intactness Index

DNV – Den Norske Veritas

NPS – Net Promoter Score

ESG – Environment, Social, and Governance

1 Introduction

Global warming, climate change, and pollution are all hot topics in today's day world and not without reason.

Consequences caused by human activities, such as burning fossil fuels, which increases the temperature of the atmosphere by trapping the heat captured in greenhouse gases, have brought about long-term warming of the Earth's climate system since the pre-industrial era. Since the pre-industrial era, mankind is estimated to have increased the Earth's global average temperature by one degree Celsius. This increase is currently rising at a rate of 0.2 degrees Celsius per decade, which may not seem like a lot, but it can and will have a devastating effect if we let this to continue.

Many people mistake climate change for global warming, though climate change refers to both human- and naturally caused warming and the effects it has on our planet. Apart from global warming, other natural processes such as internal variability in the form of cyclical ocean patterns, and external forcings such as volcanic activity, changes in the Sun's energy output and variations in Earth's orbit also contribute to climate change. (NASA, n.d)

Pollution may be more common in cities than in rural areas, but it can also spread to remote spots and places where no man lives, making it a global issue. Pollutants can be natural, but usually when talking about pollutants and pollution, we refer to the ones caused by human activity. Many of the things that are essential for us humans nowadays, and things that we use on daily basis, are the same things that cause and produce pollution.

Not only do we humans depend on Earth's air and water supply, but so does every other living thing and species on this planet, and when these resources are contaminated with pollution, all forms of life on planet Earth are threatened.

The Great Pacific Garbage Patch is a massive accumulation of microscopic plastic particles in the middle of the northern Pacific Ocean. (National Geographic, 2011)

All these topics have one thing in common; they are not sustainable as they are in the long run and are in desperate need of change. This is where sustainability and sustainable development plays a crucial role.

1.1 Background

This thesis is made for Havator Group and was assigned to me by Stefan Wollsten, Head of Project Management at Havator Oy.

Stefan contacted Kaj Rintanen, Associate Professor for the Mechanical and Production Technology programme at Novia UAS via e-mail regarding a possibility for a thesis project about Sustainability at Havator Oy. Kaj later forwarded the e-mail, tipping us students about this project.

Seeing as I did not have a project and being greatly interested in renewable energy and environmental-friendly solutions, I contacted Kaj and explained my interest in this project.

We set up a Teams meeting with Stefan and discussed possibilities regarding the project. After the Teams meeting, we scheduled a meeting in person, a “get-to-know” meeting, and discussed the project more in depth. The meeting took place in Espoo, one of Havator Oy’s many offices in Finland. After some brainstorming and exchanging of ideas, we came to a mutual understanding of what sustainability is, how we can adapt it to this project, and what is expected from this project.

1.2 Purpose

The purpose of this thesis is to delve into, and get an understanding of what sustainability is, why it is important and how it can be achieved. From there, we will be looking at how sustainable Havator Group is in general, based on the theory on which this thesis is based on. By interviewing various employees at Havator, we can get an understanding of how sustainable Havator Group is today.

Furthermore, after looking at how sustainable Havator Group is today, we will dig into the environmental aspect of sustainability and give suggestions as to how Havator could be more environmentally sustainable. The results, in form of suggestions from an environmentally friendly perspective, are based on the interviews as well.

1.3 Delimitation

This thesis will be limited to the environmental aspect of sustainability. Sustainability is built on the three pillars of sustainability, and they are always more or less dependent on each other but no further delving into, nor any suggestions of improvement are made for the social and economic aspects of sustainability even though they are briefly explained.

1.4 Methodology

The method of this thesis is presented in this chapter. Both the selection of the methodology as well as the approaches will be described to provide a better understanding of what the results are based on.

Since this thesis project is a case study of how sustainable Havator is in the current situation, and based on the purpose, qualitative methods of examination were considered best suited for this thesis project to achieve the best results possible. The method of examination could have taken a quantitative method of approach as well but was ruled out since the qualitative method was in general better suited for this project.

The collection of data for the theoretical part was done by researching various websites and documents from websites. The selected data are all relevant to the topic and therefore lay the foundation of this thesis project. No in-house data was used in this thesis project.

To establish where Havator has made sustainable developments, and how sustainable Havator is in the current situation, interviews with various employees of Havator with various titles and positions from different areas of responsibility were done. The interviewees were chosen based on questions made beforehand. Even though the questions for the interview were thought out beforehand, some additional questions occurred during and after the interview. The interviews took place in Microsoft Teams and were recorded through said software with the consent of the interviewee. Since the interviews were in either Swedish or Finnish, they were later transcribed and translated to English.

The results are then presented, in form of suggestions of improvements from an environmentally friendly perspective, based on the interviews. (McCombes, 2019)

1.5 Disposition

This thesis is built up in different chapters.

The first chapter introduces the reader to the thesis by briefly mentioning some global concerns and problems such as global warming, climate change and pollution. Furthermore, this chapter explains the background behind this thesis. This chapter also brings up the purpose, delimitation, and methodology.

The second chapter explains the theory behind this thesis and everything that is relevant to it such as the three pillars of sustainability, why sustainability is important, various energy sources, the electrification of vehicles, how a company can achieve sustainability and Agenda 2030.

The third chapter consists of a brief introduction of the company, the company's investment programs and interviews with employees of various titles and positions at the company.

The fourth chapter presents the results for this thesis project. The results are divided into two sections, with the first one being the establishment of how sustainable Havator is today, and the second one with suggestions of improvements from an environmentally friendly point of view.

In the fifth chapter we discuss the challenges of sustainability and practicing sustainable developments. Problem areas are also brought up. Lastly, we discuss possibilities of further work and how this project can continue.

The sixth and last chapter, wraps this thesis project up with a finishing conclusion.

2 Theory

In this chapter, all the relevant theories, which this thesis is based on, will be brought up. This includes the definition of sustainability, the three pillars of sustainability, why sustainability is important and how sustainability can be achieved. Furthermore, this chapter also brings up the importance of energy resources in sustainability and the various forms that energy resources come in. Lastly, this chapter mentions Agenda 2030, all of which are relevant to the topic.

2.1 Sustainability

According to the Brundtland Commission, sustainable development is described as: *“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”* (World Commission on Environment and Development, 1987)

Sustainability is a very broad concept, and everyone on this planet may have a different perception of what it is, but the general understanding of sustainability is that we cannot continue doing what we are doing today by today's standards, or else there will not be a bright future for our generation and for future generations to come.

Sustainability questions are debated both locally and globally and they affect every one of us. We need to think about how we can work towards a sustainable future through enhancing our understanding of and knowledge about sustainable use of natural resources, sustainable production and consumption, sustainable housing, and transport.

We must not forget about questions regarding social well-being, peace and democracy, equality, and gender equality. The ideal sustainable society is one in which humans live in harmony with the environment, preserving resources for future generations, so that everyone can enjoy social justice and live a high-quality life.

Sustainability is something that we as individuals, consumers, customers, businesses, and governments need to work towards together. (Mollenkamp, 2021)

2.2 The Three Pillars of Sustainability

The foundation of sustainability is built out of three pillars. The Three Pillars of Sustainability are: Environmental, Social, and Economic.



Figure 1. The three pillars of sustainability. (The Core Concept of Sustainability, 2018)

2.2.1 Environmental Sustainability

Environmental sustainability implies conserving biodiversity and adjusting the economic and material activities of people to the natural resources and tolerance of the Earth. As one of the three aspects of sustainability, environmental sustainability is perhaps the most important because it enables the other two aspects of sustainability to realize.

Today's lifestyle and way of living are irresponsible, and it is the future generations who will suffer the consequences of the choices we make today. If the whole world lived as we do in Finland today, we would need more than three planet Earths to be able to sustain our lifestyle. The existence of nature, microbes, streams, soils, and bedrocks must not be endangered by us humans. Emission created by us humans and our activities must not exceed nature's tolerance level.

Humans are experiencing the most serious environmental problem in human history, climate change. Our interaction with nature is negatively impacted, and unfortunately, it is getting worse each day. We can still prevent a disastrous climate change from happening if we act now, and the actions we take now will have a big impact on how climate change advances in the future. (Kestävä kehitys, n.d)

Businesses play a major role in ensuring a more sustainable world. Corporate sustainability, in this context, refers to the business' role in sustainability. To achieve effective corporate sustainability, we need to understand the connections between economic, social, and environmental sustainability. We also need to understand each of these dimensions, individually in more depth.

Regardless of where a business is located or what industry the business operates in, all businesses use natural resources to make and provide products, produce waste, including CO₂, and experience climate change. By reshaping the businesses' operations, the business can play its part in preserving natural resources. By for example, cutting emissions, lowering one's energy usage, and making sure the disposal of waste is done correctly, the business' carbon footprint would be significantly lower which would qualify the business as practicing sustainable developments. (Mollenkamp, 2021)

To sustain human life on planet Earth, researchers have identified nine systems. These systems are thought of as Earth's operating system and are called the nine planetary boundaries. For these systems to continue life as we know it, they must remain within certain boundaries. Earth's nine planetary boundaries serve as a way of measuring environmental sustainability throughout the planet.

Climate change, land use change, biogeochemical fluxes, and biodiversity loss have already crossed their respective boundaries. Below are the nine planetary boundaries and their respective explanation of their current situation. (Lahneman & Hicks-Webster, 2022)

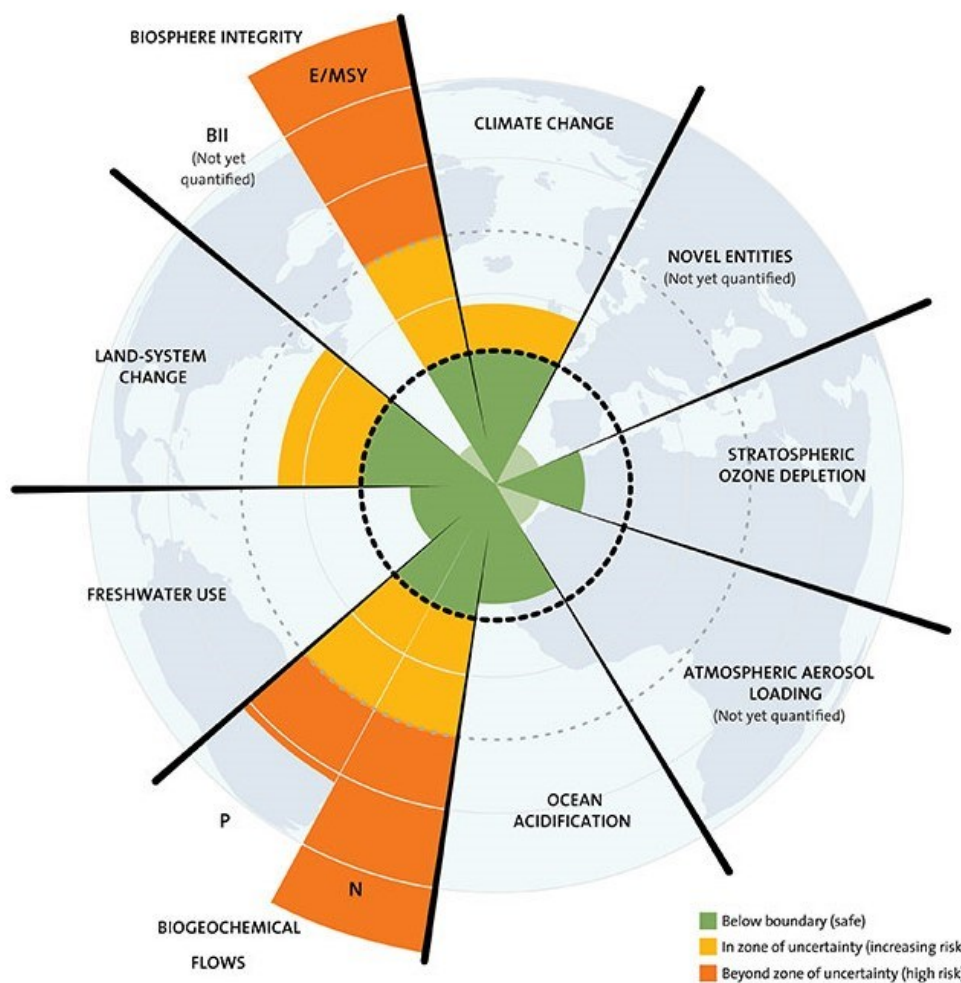


Figure 2. The nine planetary boundaries. (Stockholm Resilience Centre, n.d)

- **Climate change** – According to NASA (NASA, n.d) Earth has crossed the planetary boundary with a concentration of nearly 420 ppmv CO₂ in the atmosphere.

It is also approaching several of Earth's system thresholds. Take the loss of summer polar ice, for example, it is most certainly a thing of the past, which in turn will lead to increased sea levels thanks to the rapid physical feedback mechanisms that drive the Earth's system into a warmer state. Another example is the weakening or reversal of terrestrial carbon sinks due to the destruction of the world's rainforests, where the climate-carbon cycle feedbacks accelerate Earth's temperature and intensifies the impact it has on the climate. The question here is how long we can remain over the set boundary before even bigger and more irreversible changes become unavoidable.

- **Novel entities (not yet quantified)** – Human caused changes to the planet's environment include the emission of toxic and long-lived substances such as synthetic organic pollutants, heavy metal compounds, and radioactive materials. As these compounds affect atmospheric processes and climate, they can have irreversible impacts on living organisms as well as the physical environment. Although there are many examples of additive and synergistic effects from these compounds, they are still poorly understood from a scientific point of view. In the current state there is no way to quantitate a single boundary for chemical pollution, but a risk of crossing Earth's system thresholds is deemed well-defined enough to be included in the list for further research and precautionary action.
- **Stratospheric ozone depletion** – UV radiation from the sun is blocked by the stratospheric ozone layer in the atmosphere. As this layer decreases, more UV radiation will reach the ground. This in turn could result in a higher incidence of skin cancer in humans as well as damage to terrestrial and marine biological systems.
- **Atmospheric aerosol loading (not yet quantified)** – Because of aerosols' influence on Earth's climate system, the idea of an aerosol planetary boundary was developed. Aerosols interact with water vapor in a way that significantly affects cloud formation and the circulation of the atmosphere, such as the monsoon in tropical regions of the world. Additionally, they affect climate directly by changing how much solar radiation is reflected or absorbed by the atmosphere.

By emitting atmospheric pollution, such as pollutant gases that condense into droplets and particles, and through land-use change, we humans change the atmospheric aerosol loading. Changes in climate regimes and monsoon systems have already occurred in highly polluted areas and environments, allowing us to calculate a measure of a regional aerosol boundary. Inhaling highly polluted air is very dangerous for us humans and has in many cases led to death, giving us another reason for an aerosol boundary.

- **Ocean acidification** – About a quarter of the CO₂ that is emitted by human activity into the atmosphere, will eventually dissolve into the oceans. In the ocean it forms carbonic acid, which alters the ocean chemistry and decreases the pH of the surface water. The increased acidity results in a reduced amount of available carbonate

ions, which is an essential so called “building block” used by many marine species for both shell and skeleton formation. As the degree of acidity rises, organisms such as corals, shellfish, and plankton cannot grow and survive. If these species were to go extinct, it would drastically change the structure and dynamics of ocean ecosystems and could lead to significant reductions in fish stock. If we compare today’s acidity levels to the pre-industrial times, we have an increase of 30% and it is only going to keep rising if no changes are made.

While most other human impacts on the marine environment are often local in scale, the ocean acidification boundary affects the entire planet. The boundary is also a good example of the way the boundaries are closely interconnected since atmospheric CO₂ concentration is the controlling variable for the climate and ocean acidification boundaries, although they are outlined in terms of different Earth system thresholds.

- **Biogeochemical flows** – Several industrial and agricultural processes have radically altered the nitrogen and phosphorus biogeochemical cycles. Both nitrogen and phosphorus are essential elements for plant growth. Human activities convert more atmospheric nitrogen into reactive forms than all of Earth’s terrestrial processes combined. Rather than being taken up by crops, a big amount of this reactive nitrogen is emitted into the atmosphere. A remarkable amount of the applied nitrogen and phosphorus ends up in the sea and can push marine and aquatic systems across ecological thresholds of their own.
- **Freshwater use** – Human pressure is now the major driving force determining the functioning and distribution of global freshwater systems, even though freshwater cycles are strongly affected by climate change and their boundaries are closely linked to the climate boundary. Human modification of water bodies has resulted in both global-scale river flow changes and shifts in vapor flows caused by land-system change. Hydrological shifts can be abrupt and irreversible. It is estimated that about half a billion people will likely be facing water stress by 2050, increasing the need to intervene in water systems. To maintain the overall resilience of Earth’s system and to avoid cascading local and regional thresholds, a water boundary has been proposed.

- **Land-system change** – Mankind has made agriculture out of forests, grasslands, wetlands, and other vegetation types. This change in land use is one of the driving forces behind the serious reductions in biodiversity. It has impacted water flows, and the biogeochemical cycling of carbon, nitrogen, phosphorus, and other vital elements. While each change in land cover occurs locally, the cumulative impacts on the Earth system can have global implications. Boundaries for human changes to land systems must account for not just the quantity, but also the quality, the function, and the distribution of land. Forests play a vital role in controlling land use and climate dynamics and are at the heart of land system change.
- **Biosphere integrity (E/MSY passed boundary, BII not yet quantified)** – In 2005, the Millennium Ecosystem Assessment concluded that human-induced ecosystem changes have been more rapid in the past 50 years than at any time in history, increasing the risk of abrupt and irreversible changes.

The main driver for change is the increasing demand for food, water, and natural resources that has caused severe biodiversity losses and altered ecosystem services. These drivers remain steady, they do not show any evidence of decline or increase in intensity. The damage to ecosystems and extinction rates can be reduced if we protect the integrity of living systems, improve habitats, and improve connectivity between ecosystems while maintaining agricultural productivity. (Stockholm Resilience Centre, n.d)

Businesses can help humanity keep within the planetary boundaries by first understanding how their business affects the environment, and then reducing negative impacts and making changes in those areas.

Environmental protection aims to conserve natural resources and to develop alternate sources of power and use these at a rate where they can replenish themselves. Therefore, it is our responsibility, the people of planet Earth, to use the environment and its resources rationally and protect it at all costs. It is not only for the good of the Earth, but also for our environment, our humanity, and all other living things.

2.2.2 Social Sustainability

Social sustainability often gets way less attention than environmental sustainability but is very important for sustainable development and should not be taken for granted.

Social sustainability aims to ensure equal opportunities for well-being and basic security, as well as to allow everyone to be involved and influence decisions both in their own country and globally. Diversity, balance, and equal rights are hallmarks of sustainable social development. No poverty is one of the goals of social sustainability, which strives to eradicate poverty in all its forms.

The government program emphasizes social sustainability as a way of creating employment, preventing marginalization, and ensuring the health, well-being, and living conditions of the aging population, as well as improving social functionality in terms of health and function. (Kestävä kehitys, n.d)

The primary responsibility for protecting, respecting, fulfilling, and gradually achieving human rights lies with governments, but businesses can and should do their part as well.

Social sustainability matters for both individuals and for society. It is also important for organizations, including businesses. These organizations and businesses have the capacity to shape change and profit from it. For example, when employees, suppliers, and partners feel respected and safe, they are more loyal and productive. Businesses often suffer when society struggles; for example, unequal societies dampen long-term economic growth. (Agarwal, 2021)

2.2.3 Economic Sustainability

The global business community is one of the worst polluters of the environment. Businesses around the globe continue to have a devastating impact on the environment by failing to prioritize economic sustainability.

Often, it is the products that are the cheapest to manufacture and purchase that have the worst impact on the economy. Another barrier to sustainable economic growth is that businesses and nations expect economic growth to naturally flow and increase as the population grows. Bigger economies use more stuff than smaller ones, this is problematic because we live on a planet with finite resources. An end to growth is inevitable.

Businesses must shift their mindset from relying on exponential growth and harmful environmental practices to deliver ongoing growth, this mindset has and will continue to wreak havoc on our planet. If we are to ever achieve environmental sustainability, we need to embrace a new way of doing business that prioritizes the health of the environment and the people of our planet. (Bish, 2021)

Investing in the environment is an important consideration in all investments made. To thrive and live well, people need products and services. People use commodities by using the factors of production: natural resources, labor, machinery, and equipment. In other words, capital. This so-called capital allows a person to produce the goods and services he or she needs from natural resources.

Economic sustainability is characterized by balanced economic growth, without excessive debt or overconsumption, and activities that consider the carrying capacity of our environment and future generations. Generally, society desires steady economic growth. Concerns about the availability of natural resources have also led to much debate over the need to continue economic growth in society.

Without a solid financial foundation, it is impossible to pay wages, invest in the well-being of employees, or develop environmentally friendly products. Therefore, a stable and sustainable economy is the foundation for all other sustainable development. (Mollenkamp, 2021)

2.3 Why Sustainability Is Important

We live on a planet of finite resources but often treat the planet and its resources as if they were infinite. Due to the over-exploitation of our natural resources, we, as well as future generations, are already suffering from droughts, floods, desertification, soil salinization, forest fires, and air pollution, as well as the destruction of habitats for plants and animals. If no changes are to be made for our generation, future generations will suffer even more. The longer it takes to start making changes for the better, the longer it takes to achieve a sustainable society for us humans and all other living things to live in. (Watson, 2018)

With sustainability comes many benefits, both short- and long-term. Earth's ecosystems will not be able to function if we do not adopt more sustainable practices. With no change

to harmful processes, fossil fuels will deplete, huge numbers of animal species will become extinct, and the atmosphere will be damaged beyond repair. Sustainability practices provide us with clean air and nontoxic atmosphere conditions, the growth of resources that can be relied on, and clean water. (TWI, n.d)

We all have a moral obligation to sustain the planet and its ecosystems for our generation, for future generations, and all other living things, regardless of who we are or where we live. It is our choices and actions that we make today that determine not only ours, but also the planet's future.

Sustainability benefits the whole planet, regardless of species, and makes living in cleaner and healthier conditions possible. Practicing sustainability ensures a sustainable future for everyone.

2.4 Energy Sources

Energy sources play a big role in sustainability and sustainable development. More and more people and businesses are looking for greener and more environmental-friendly alternatives and solutions to replace its counterpart that is bad for the environment. In modern society, energy resources include all types of fuels used for heating, generating electricity, or converting energy into other forms.

2.4.1 Fossil Fuels

Fossil fuels, as we know them today, originate from plant and animal remains that died millions of years ago and have been subjected to heat and pressure over the years to create fossil fuel. Crude oil, coal and natural gas are the three major groups of fossil fuels as we know them today.

Crude oil, coal, and natural gas are the most used energy resources worldwide, but they are also the most harmful resources for our planet. Fossil fuels come from a depleting source that cannot be replenished over time and is therefore not a renewable resource. This means that we will eventually run out of said resources, and that is why it is utterly important that we start looking into more renewable and environmental-friendly resources to replace the ones causing harm to our planet before it is too late.

The reliance on fossil fuels used to be considered as unsustainable because the world would eventually deplete those resources, however, today such reliance is considered unsustainable because of the environmental consequences of burning said resources. Fossil fuels have helped our civilization get to where we are today, take the industrial revolution for example, but it is now time to make a change for the better, a change towards a greener future. (Inspire Clean Energy, n.d)

2.4.2 Renewable Energy

Renewable energy, also known as clean energy, is energy that is constantly replenished by natural sources or processes. Renewable energy is often considered a new technology, but harnessing nature's power has been used for centuries. Solar energy for example, has been harnessed by humans for thousands of years to grow crops, stay warm, and dry foods. Wind energy has powered boats to sail the many seas of the world and windmills to grind grain. Renewable energy comes in many shapes and forms, but all these processes have the same result, which is the production of electricity. (Shinn, 2018)

Industrial development, social welfare, and improved healthcare have all been enabled by electricity in the past, and its importance today is only growing. Electricity has become the backbone of the world's energy supply due to its wide electrification of end-user sectors like mobility and heating. Renewable energy sources will likely play the largest role in electrification in the future since renewable energy is already a competitive energy option that is increasingly replacing the old conventional energy sources.

2.5 The Electrification of Vehicles

We are experiencing a change towards an electrified world, and the transport industry is one area of an example where this is both visually and audibly evident. The electrification of the transportation industry, or vehicle electrification, is driven primarily by the reduction of pollution, the development of new smart transportation systems, and the eventual lack of fossil fuels.

Electric motors have an efficiency range of 85 – 90%, compared to 17 – 21% for conventional fossil-fueled engines. A conventional vehicle has an internal combustion engine, as well as mechanical, pneumatic, and hydraulic transfer power systems and in

comparison, to the electric systems, these are big, heavy, and less efficient. The ease of monitoring and better communication of the electrical system makes it more effective and efficient compared to the fossil-fueled counterpart. A vehicle powered entirely on electricity will have high efficiency and zero emissions, resulting in a lowered carbon footprint.

Considering the current battery technology and where it is at, it is challenging to fully replace fossil fueled engines with electric-powered ones and still meet consumer demands. The technology is simply not there just yet. Nevertheless, various hybrid models do exist, and they can bridge the gap between electric and fossil fueled vehicles. Conventional fossil fueled vehicles can also be made more efficient with hybrid technology.

It is important to keep in mind that, while the electrification of vehicles is seen as something that is worth investing, and generally seen as a pro, cons will also follow. Electric-driven vehicles have limited driving range and battery issues. The design of the battery pack is limited by the size and mass of the pack. More battery cells mean more mass for the vehicle which results in more energy required for vehicle movement and vehicle maneuverability.

Compared to the conventional fossil fueled vehicle where refueling takes only a few minutes, electric-driven vehicles have long charging times and insufficient charging infrastructure for example, charging stations that are not always available along the road and installing fast-charging stations is a huge investment. Other issues that relate to vehicle electrification are various power semiconductors and other devices.

Despite these challenges, vehicle electrification is worth developing because it will play an important role in the transformation of the transportation industry and will present major opportunities across all vehicle segments, regardless of the pace and how the extent of change will differ. For electric vehicles to succeed, the entire mobility ecosystem must work together. (Synopsys, n.d)

2.6 How To Achieve Sustainability

Because ecological conditions and both economic and social systems are different from country to country, there is no single blueprint for how sustainability can and should be achieved. Sustainable development should be carried out as a global objective.

Social sustainability depends on economic sustainability and vice versa, and both strongly depend on environmental sustainability. In the past, the dependency of the environment from social and economic sustainability is smaller in comparison to the others for millions of years. In today's day and age however, all three aspects of sustainability are dependent on each other in one way or another, therefore making it important to take all three aspects of sustainability into consideration when making changes and decisions for the better, for the greener future. (Watson, 2018)

2.6.1 How To Be More Sustainable

Every business has a different level of impact on the planet, but everyone somehow contributes to climate change, pollution, and the waste crisis.

There are many ways for a business and its employees to be more sustainable but it is not always very clear how to achieve it. Businesses should encourage their employees to make changes and to be more sustainable in their work. Below are examples of how to be more sustainable and how to achieve them.

Set goals – It is important to decide what the business wants to achieve before making any decisions. Apart from the environment, going green has many other benefits as well. Many people believe that going green will hinder their business' growth. This is false. By being an environmentally friendly business, chances are that your reputation with consumers, shareholders and employees will enhance. Changing the business' operations to benefit the environment forces the business to innovate and differentiate its products and services to provide a better product and service for customers whose values and ideals are changing.

Save energy & go green – Saving energy by using less energy. Offices require electricity to power their equipment, amenities, and facilities. It is important to be aware of the businesses' energy consumption. By monitoring it, it is easier to find areas where improvement and changes to reduce energy consumption could be made. For example, turning off appliances and devices when they're not needed or not in use, saves energy.

If possible, consider powering the business with renewable energy resources, either through energy suppliers or by installing your own renewable energy systems yourself.

Although the initial installation of such systems may be expensive, switching to renewable solutions could ultimately result in substantial savings for the business. Switching to renewable energy is an easy way to reduce the businesses' carbon footprint.

Reduce, recycle & reuse – Every business produces waste in various amounts. It is important to know how the waste is handled and how and where it can be reduced. It takes little effort to recycle correctly and by doing so, the amount of work and time it takes to dispose of it, is reduced significantly. Instead of throwing products and materials away, and buying new ones to take their places, consider reusing, if possible, to minimize waste and cost.

Reduce your carbon footprint & measure it – the goal here is to achieve net-zero carbon emissions. The first step would be to measure and document the business' current carbon footprint. When you have this information, it makes the planning of a sustainability strategy much easier and straightforward.

One way to reduce a business' carbon footprint is to drive less and drive smarter. Changing ones driving habitats can significantly reduce the carbon footprint.

Another way to do this, if possible, is to switch to electric-driven vehicles. Switching to a hybrid model can also reduce the carbon footprint. Planning a transports route beforehand, usually means fewer mishaps along the road and results in saved money, fuel/electricity, environment, and time. (James, 2021)

2.7 Agenda 2030

In 2015, the UN summit agreed on the action plan and the goals for sustainable development to guide the work sustainable development from 2016 to 2030. The purpose of Agenda 2030 is to create sustainable development in the economy, human welfare, and environment. The primary goal is to end extreme poverty. In addition to the political declaration and the goals for sustainable development, Agenda 2030 includes funds for achieving the goals and monitoring their implementation. Agenda 2030 and its goals for sustainable development affect every country in the world. Even though the state is primarily responsible for the implementation of Agenda 2030, the local government, the private sector, civil society, and citizens must all work together to achieve the goals set.

The action plan contains 17 different goals concerning sustainable development. The intention is to achieve the goals before 2030. All countries are committed to promoting Agenda 2030 in its entirety. The principle is that no one should be left behind in development. (Kestävähelys, n.d)



Figure 2. The 17 Different Goals of Agenda 2030. (Kestävähelys, n.d)

Finland is a great role model in terms of sustainable development. According to an international comparison of development, Finland has achieved or is close to achieving the UN Sustainable Development Goals related to poverty, alleviation, health, education, water, energy, reducing inequality, peace, and the rule of law. In Finland, the biggest challenges include climate change, the need for more sustainable consumption and production patterns, and the threat of biodiversity loss.

Finland has received international praise for its participation in implementing the Agenda 2030 as a whole. Finland's National Commission on Sustainable Development was honored with the Catalyst 2030 Award for sustainable development in the spring of 2021. A wide variety of stakeholders from different areas of society are represented by the Commission. (Finnish Government, 2021)

3 Havator Group

3.1 The Company

Havator is the Nordic leader in lifting, special transport, and heavy haulage services. Havator operates in over 30 locations in Finland, Sweden, and Norway as well as Estonia. Havator offers a wide variety of services to an even wider variety of industries.

Havator strives to be in the front line of development, to be a leader in developing the safety and efficiency of all the services they offer, hence their slogan: “Think twice, lift once”. The Havator Group has a net sale of approximately 100 MEUR and employs about 450 people. The company’s business is divided into three areas: Finland, Sweden, and Projects.

Havators’ operating platform has been certified with the following management standards: ISO 9001, ISO 14001, and ISO 45001. The certifications are issued and supervised by the internationally accredited accreditation organization DNV.

Havators’ goal is to continuously develop as an industry leader and deliver the best service possible to their clients. Providing high-quality service to their customers is their priority.

Based on a customer satisfaction survey conducted by an independent service provider, customers value reliability, safety, flexibility, quality of service, and ease of cooperation. Havator performs excellently across all these areas and receive good feedback related to the team’s willingness to service, smooth cooperation, and ability to provide solutions that meet the client’s needs. Their combined (Finland and Sweden) NPS is at 52 which is considered high. (Havator Group Oy, 2022)

3.2 Havator Group Investment Programs

3.2.1 Electric-driven Crane Investment

It is an important step forward in meeting the demand of the customers who are supporters of and want to contribute to the green transition in society. There are three new electric cranes of the crawler-crane type that are expected to hit the Swedish market shortly. (Stordåhd, 2022)

“We are facing an environmental change and we want to adapt our operations to contribute to reduced emissions and become more environmentally friendly. In general, higher environmental requirements are set for each passing day and therefore we have chosen to buy electric cranes. With the large investments we are now making, we are taking a step in the right direction, and we have been met with a very positive response from our customers.” (Rudolfsson, 2022)

The electric crawler-cranes are of the Liebherr brand and have a lifting capacity of 160 and 250 tons respectively. They work and operate in the same way as the corresponding diesel-powered cranes, except that they are powered entirely on electricity and battery packs. In addition to reduced emissions, they are almost silent and can withstand minus 25 degrees Celsius without affecting the battery. The battery is also recyclable.

They are suitable for constructions with prefabricated concrete frames, for example in the construction of apartment and industrial buildings as well as in infrastructure projects and port works.

The smaller crawler-crane of the Palfinger brand, can handle 30 tons and can be used in indoor environment, for example in assembly and installation work. (Stordåhd, 2022)

“It feels really good that we can offer 100 percent electric-driven cranes to our customers. Several of them carry out construction and industrial projects within sustainable conversion. An important step in our sustainability work and that we can contribute to reduced emissions.” (Modéer, 2022)

3.2.2 The Largest Investment Program in the Group’s History

Extensive industrial investment will be made in Finland in the coming years. The investment program to be announced is more than 60 MEUR in size. At the center of it are basic industry, energy production and construction, and investments supported by these projects, for example, infrastructure will cost several billions of euros. Havator is responding to the growing demand for lifting and special transport services by investing in both new equipment and expertise. (Havator Group Oy, 2021)

“We want to be involved in building the Nordic future and we are ready to take on the challenge of industrial and social development. Our nationwide depot network, our

extensive equipment and our strong lifting and special transport expertise creates a safe and easily accessible basis for major industrial projects.” (Landtman, 2021)

For Havator, the year 2021 has been the starting point for growth and a fossil-free future development. From the announced investment program, equipment for over 30 MEUR has already been ordered. (Havator Group Oy, 2021)

“We will be needing skilled personnel for various tasks, from drivers to foremen to project managers. In Finland alone, we will be recruiting more than 50 new employees in the coming years. We are also heavily investing in training to attract new enthusiasts to the industry.” (Hirvelä, 2021)

“We have set a target goal of 30 % growth by year 2023. The newly launched investment program is the Group’s largest investment in 60 years, and about half of the investments are directed to Finland and half to Sweden. By choosing the latest technology, such as electric machines, we are taking a leap closer to our goal of not only being the leader in the market and services, but also accountability.” (Landtman, 2021)

The cranes to be purchased under the investment program have a capacity of 50 – 750 tons and are located around Havator’s depot network in both Finland and Sweden. (Havator Group Oy, 2021)

3.3 Interview with Jukka Laksola, Country Director of Havator Finland

What is sustainability and sustainable development to You?

Sustainability is important but it is a little difficult in this business, for example, we have many times seen that a large Nordic industrial company requests an offer on environmental-friendly cranes, and when the offer is given to them, the customer then wants another “normal” offer, without the added costs of the environmental-friendly aspects. It is interesting how the decision always ends up being made based on the price of the service. We struggle to be in the front of the development if no one is ready to pay for it.

One project comes to mind, where the customer paid for biodiesel and wanted us to use that instead of regular diesel, well actually we paid for it ourselves but in the end the

customer made an offer to refuel at the expense of the customer, so in practice it was a plus minus zero situation.

It is hard for us to develop this if no one is ready to pay the price, basically it begins with our biggest customers, they set a minimum level below which they will not accept, then it is easier for us to fulfill this customer requirement, but without this, this will not develop. Take occupational safety for example, Neste and other big names in the industry like UPM set a standard that safety helmets, safety glasses, reflective workwear, safety shoes, and work permit practices, were required to be worn and used on the work site. These same standards have, in the past 5 – 10 years, evolved to the construction industry as well. Roughly 20 years ago, no helmet was needed nor required on a construction site, meanwhile Neste followed strict standards. It is these names that lay the playing field where we operate and develop.

Yes, we do have a desire to develop in terms of sustainability, but we need someone that demands something from us before we can deliver. It is hard for us to compete when no one is ready to pay more.

You mentioned customer requirement, how has that changed over the years? Do customers require that your services are sustainable?

In Southern Finland we have these mobile cranes that can run on electricity, the demand on these cranes has increased but surely not for the sake of the electricity because we have been able to come down in price when the customer pays for the electricity themselves. These kinds of projects have been few, I would say around 20% of our projects but it has basically been a win-win situation for both us and the customer, the customer got cheaper service and we saved on fuel consumption.

In Sweden they have these bio-oil demands but there is no demand for such here in Finland according to my knowledge. Our new machines come with bio-oil, in a way, during the life cycle of a machine, it is a small cost. This also makes the moving of the machines between Finland and Sweden easier because we do not need to change the oil in these machines.

YIT published an ESG-program in the end of last year I think, meaning they commit to the goals that are basically based on science. When interviewing the purchasing director and asking about what this means, how this affects purchasing, the answer was “in no way”.

There were lots of stories but in practice the effects were insignificant. I do think there will be results though, it surely is a growing trend.

Have any sustainable developments been made at Havator?

The bio-oil example was a concrete example, then there's of course the investment of new machines which have better emission classes than the old ones, and in that way our fleet turns more environmentally friendly over time. Our fleet's middle age is around 8 years, meanwhile the average middle age in the industry is around 13,5 years, and one of our views are that if there was a sudden implementation of emission class limitation, where every machine would have to be classified as class 3B or 4 or else, they are not allowed to enter the work site, an implementation of the 4th class alone would mean that 80% of our fleet would have to stay in the yard and not be allowed to be used for work, but for many of our competitors it would mean that 100% of their fleet would stay in the yard.

And then we have these environmentally friendly investments we have made, for example, the mobile tower cranes in Finland, more specifically in the Port of Kemi, where we invested in an electric-driven harbor crane. I do not think these investments have been made because of sustainability, it has come more as a bonus. Of course, if we want to grow to invest into new and more cranes, so the sustainability part kind of automatically follows.

Have you encountered any problems or setbacks in these mentioned areas?

Not in Finland at least. Apparently in Sweden, more specifically in Northern Sweden, there has been some problems with the bio-oil when changing oils, but according to my information no such problems have occurred in Finland.

Are there any concrete areas where Havator could improve and increase sustainability and sustainable development?

Well, there is surely some simple things that can be done, in some way surveillance of driving habitats and driving habitat training. If we think about the cranes fuel consumption on the road, you could say that it consumes about 50 – 60 liters, it can rise to 100 liters if the driver pushes 80 km/h against the limiter. Then when the crane is all set up at the work site, the consumption is generally between 5 – 10 liters, so relatively, more fuel is consumed on the road.

I think driving surveillance in general, a GPS to track the drivers' driving habits, but also driving habit training where we would learn how much the drivers' own driving habit or chosen driving speed affects the fuel consumption. It would not be an incredibly big investment financially.

Then of course the investment of electric-driven cranes or the prioritization of these in our investment programs. If we look at the future, and as a concrete example, we have these medium sized crawler cranes that are employed at construction sites, at least in the capital region, at some point, in about 10 years, combustion engines will no longer be used or allowed at the construction sites. I think the demand for electric-driven crawler cranes will increase, and these are even currently available, or manufactured and sold, so the prioritization of these in the investments to some extent.

We would have to see a little further down the road how sustainable the investment of these cranes is, there is a big risk that, because of the sustainability aspect, that combustion engine machine becomes in practice worthless and no longer has a market in Finland. And, to get experience as to how the electric-driven crane differs from the fossil fueled ones, and what competences it demands. A bunch of our service technicians are mechanic installers, so we would have to see whether they can be trained to get electrical licenses and what now, so they are licensed and able to service and repair the new cranes.

Does Havator have a sustainability program or what does the future look like?

To my knowledge there is no built-in program. I just described what our investment policy looks like as a whole, but I think it would be good to have something broader in mind, now the sustainability is in small parts here and there, and maybe there is a need to form a more holistic view on the theme. Especially in these days when many of our customers are committed to those science-based targets to reduce CO2 emissions by half by the year 2030, there is a big question mark as to what this means for our business and what potential effects there will be.

So far, every single mobile crane is powered by an internal combustion engine and there is no invention yet made where the main power would not be of an internal combustion engine. That is a big question mark as well, what does this mean for our business and does it have effects on the shrinking of the entire market. The challenge for us is that every

investment, for cranes for example, have a calculated holding period of 12 – 20 years which is quite a long time so we would have to see into the future and guide this is in our investment policy.

Maybe some sort of a survey for our customers, so we would have a better understanding of how the customer is going to develop its own future, that would strongly guide us and our own developing, because we are subcontractors or partners to those customers, so if we understand in what direction our customers are going, we can easily adjust our own development to their liking. (Laksola, 2022)

3.4 Interview with Henrik Modéer, CEO Havator Ab

What is sustainability and sustainable development to You?

To me, sustainable development is a holistic responsibility. It is about how the company and its contact surfaces such as stakeholders, work together and how they will be working together in the long run. These relations should not only be environmentally sustainable, but also economically sustainable, and socially sustainable for everyone working at the company. Working for the company should be both pleasant and developing for the individual. I also think sustainability is about how the customer experiences Havator and the cooperation between the customer and the company. In my opinion this experience should contribute to the customers own possibility to succeed in sustainable development.

Have any sustainable developments been made at Havator?

We have done a few sustainable developments, but we do have a long way to go. We are naturally great with resource efficiency because our business model is built on having expensive investments, we have machines that cost a lot of money and it is important that these machines work for as many years as possible, we need to maintain, repair, and take care of these machines instead of replacing them too soon because of mismanagement. Another area would be the fleet question, which benefits from the fact that we are sustainable when it comes to maintaining machines. We also have built-in efficiency to reduce emissions with crane-logistics. We do not want to drive the machines more than necessary; we want to move the cranes from one workplace to another without having to go back to the depot. That type of built-in condition in our business also makes the solution

more sustainable. There are a few areas where these naturally exist in the crane-business for Havator.

Then there are also certain specific investments that we are now making in Sweden where we, for example, switch to electrification of cranes by buying and investing in electric-driven crawler- and mobile cranes. They are few seen in the entire fleet, but it is a step in the right direction, for example, we now have a 250-ton electric-driven crawler-crane up and running which was delivered to us sometime in April – May 2022 and we are expecting another 160-ton crawler-crane shortly. This way we are testing and learning if this is a sustainable solution. We have an initiative where we install emission filters on certain existing crawling-cranes that lowers their emission which makes them eligible for indoor use. We have done similar initiatives for the big diesel fleet as well.

Looking at the other part, power consumption, we have 13 depots in Sweden which all are energy mapped, we know how much energy and power they consume, we know what locations, should they need it, are areas in need of improvement. That also contributes to the initiative. And generally, about customer interface, some of the big “conversion industries” that will be built in Sweden in the next 3 – 5 years to produce, for example, fossil free steel. Havator is engaged in these projects, and this way we have a positive effect by making it possible for these projects to happen, we can then help those customers realize a fossil free steel production in Gällivare and Boden. Another interesting effect with Havator is that by engaging into business projects, and development industry projects, we contribute to sustainable development.

Have you encountered any problems or setbacks in these areas that you mentioned?

Our machines that we do heavy lifting with, require strong cranes and there is no technology in place to handle the corresponding lifting with, for example, with the electric-driven cranes there are certain technical limitations. I do think the development will advance fast, but it is a problematic area. Then we have our own engagement like time and our own possibility to prioritize sustainable initiatives in the daily work. The biggest obstacle is that we do not have a high enough priority on the internal work.

How do you measure progress in these areas and how do you see a difference?

It is hard to have a set number on it, it is easier to know that we did the activity rather than how much carbon dioxide we saved by doing said activity, I would say that that's where we are with measuring the progress, we have a hard time putting a carbon dioxide equivalent on it. And that is the assignment Juha Hautala, HSEQ Manager, has been given, how should we report our sustainability work, we need to set some simple key figures to be able to show other people what we do.

Are there any concrete areas where Havator could improve and increase sustainability and sustainable development?

I think that such an area could be that we find ways that allows us to reduce fuel consumption or reduce emissions from the machines, there are some technical solutions to install in the diesel machines, to make upgrades to the diesel machines and generally work more systematically with that.

Another interesting area, which is also a little challenging, is the electrification of the cranes that we have started, these cranes are more expensive, and the question is that, can we charge more money for the lift if we do it with an electric-driven crane instead of a diesel one, that is something we would have to do for it to be financially sustainable. I think it stands somewhere there right now, that it would be required in the long run, if the companies like Havator are to invest a few more millions for an equivalent product.

How has customer requirements changed in recent years? Do customers demand that your services are sustainable?

I feel that the pressure from customers, is unfortunately, a lot less in this industry compared to previous industries I have worked in. A big part of our customers is from the construction industry, and there are certain demands from our customers, but it usually lands way down the list of requirements anyway. Customers think that the electric-driven crane initiative is interesting, and they sometimes ask for it but usually the price is more important unfortunately. I think that you have a responsibility as a seller of sustainable services, it must be done and sold differently, we need to sell the service a little more clearly linked to the fact that it is a sustainable service and not just a higher price for a crane.

Even though the number of requirements from the customer is small, do you feel that these requirements are realistic and something that Havator can meet and achieve?

In general, yes, but it has also become clearer that customers want to see the electrification of the cranes, but they are not sure if they are willing to pay more for it. For example, when we bought SSAB which we have a Nordic contract with, they were very interested in the electrification of resources, but in the end of the day, their main interest was to cut down on costs. I think that many see the sustainability question as a must have, as a requirement, per paper at least, but in the end, they are not ready to pay for it.

But on the other hand, sustainable qualities such as good business ethics, and social responsibility are requirements that the big customers assume we have, that we follow all guidelines and recommendations that sustainability organizations give out internationally. It is becoming more and more normal to require social responsibility, to have sustainability reporting, to have sustainability work, these are becoming requirements to even be involved in the business to begin with, but if you have these, in many cases, it usually ends with that you don't prioritize the most sustainable solution because it costs more money.

What does the future hold for Havator in terms of sustainability and sustainable development?

We are interested in advancing the positions so that we become an even clearer leader in the industry for these sustainability issues. I think we have good conditions to do so, we have a sufficient size to be able to have the effects with our customers. We could profile it better, put more work into it, live as we learn, but I also think that we have started a few important parts as earlier mentioned. I think we need to improve on putting up copies, set goals, set a clear follow-up so that we can show, both internally and externally, what we have done what kind of an effect we have gotten. We need a clearer sustainability vision, we need to be more transparent, we want to be able to show a report like the annual report. I think these are developments that we must dare to take, we must dare to be more transparent in our work. (Mod er, Sustainability Management Interview, 2022)

3.5 Interview with Joakim Mette, Fleet manager

What is sustainability and sustainable development to You?

I believe that sustainability is about making long-term choices, choices that are in line with your and the company's values, and the fact, that we think about this planet that we all live on, so that the planet also can feel good. Sustainability also involves that for this globe that we live on to feel good, our company and its staff must also feel good in the choices we make. Sustainability is a multifaceted thing, you can tackle it from many points of view, you can go through an environmental point of view, or through financial, you can get it through your or the company's values, you arrive at the so-called intersection from many different directions, I think that is important to keep in mind.

What are some differences of the electric-driven crane compared to its fossil fueled counterpart?

There are different types of cranes, if we take the mobile crane for example, with this one you need to be able to drive on roads to get from the depot to the work site, and on the work site you need to be able to lift with it. I do not think that the mobile cranes will be electrified on roads any time soon, but to some extent you can perform lifting with electricity. Then we come to the limitation that limits the production of mobile cranes is that in most cases, not in Finland, but in most other countries you are allowed to have a maximum of twelve tons of axle load on the crane, and this then makes them to try to build them as light as possible. It is not only about the weight but also the width and the height, and all these they must consider when designing a crane, and you simply cannot put whatever electric-driven engine or battery into a limited space. The other bottleneck is that if you are going to operate on electricity, you must have electricity available where you want to do the lifting, and nowadays you can get 32 Amperes up to 63 Amperes on a construction site. If you want to go higher than that, it is very unlikely you will find it. And when we have a mobile crane that has a capacity of 100 tons, that crane needs an engine of at least 110 kW, and to be able to operate effectively it needs about 120 Amperes of electricity, and if that is not available to you it means that you will be lifting with bad lifting values, the crane is going to operate slowly, and it will not be able to lift it as it should.

I have a hard time now predicting how this development will advance, maybe one day there will be hydrogen-powered engines, so that we would switch from electric-driven to something else, something will happen there, but it has its own problems as well. In diesel and petrol there is so much energy compressed that it becomes difficult to beat that concept, even if you were to drive with hydrogen, the volume of it is so much greater that it then has its own problems.

But if we look at crawler cranes that you do not have to drive on roads on, so there maybe the concept is easier because you do not have the requirement then to have a maximum axle load on those cranes so you can have those cranes with batteries, and it is then easier to have them there, and that means that you can have electric-driven cranes that are actually boosted by these batteries, so then 32 or 63 Amperes is enough to charge these batteries. Nowadays you get up to a 250-ton crawler crane fully electric-driven, so there we can see that the development goes further and faster than on the mobile crane side and the differences are of course that then you must have electricity supply to be able to work with them, in some cases you need direct power connected and in other cases it is enough if you have charged your batteries. Then when you have batteries, you can in theory for example have an extra set of batteries so that when the others run out, you just replace them. Batteries are of course expensive it is not easy as that, it sets different requirements for the construction site we work for and then we must have electricity available there to be able to work with our electric-driven machines.

What happens if the battery for some reason runs out or stops working out in the field?
How do you deal with this?

If it is an electric-driven and it runs out then it is over, if it is a plugged-in version so that you can connect electricity to it then you can continue to drive with it, if not, then you will have to replace the battery if possible, and it is not possible on every model. Some manufacturers have solutions where you can have replaceable batteries while others have them as compact built-ins, so in those cases it would be a total stop if you do not have electricity available. We do have a little bit of experience, not ourselves since we got our bigger electric-driven crawler crane in the Spring of 2022, so we haven't really driven it in the winter season ourselves, but our competitors have done that in the North and they have not experienced any bigger problems there, they have been able to work their 8 hours on

electricity in any case. The more the crane moves, the more electricity it takes, so they are very energy consuming when moving and depending on how heavy the lift is. In many cases this means that if you have an electric-driven machine you must slow down the production speed because it does not go as fast as its fossil fueled counterpart.

If we look at economic aspects, it is probably cheaper today to run on electricity than on diesel, fuel oil, or then the HVO type which is a more sustainable fuel with less emissions. Then it also depends on how the electricity is produced, it may feel good when you run an electric-driven machine but in the big cycle you must also understand how the electricity is produced. It is also welcome for indoor projects because it does not produce exhaust.

What is the estimated lifetime of the battery used in these machines?

They usually give a guarantee of 5 years and then they say that after 10 years it should still have 80% of its capacity left, what happens next after that I think that they do not know themselves either because they do not have experience of that yet. I am not an expert on batteries, but I guess it also depends on how you use the batteries, it may be that they last 15 – 20 years but it is hard to say yet but we only live in beliefs of what the manufacturers say

How long does a fully charged battery last and how long does it take to charge it up?

But as mentioned, there it depends if you want to move the crane, then they promise that you can drive up to 600 meters with a fully charged battery, but if we're talking about lifting only, it usually does not move as much. The battery is meant to be able to handle 8 hours of lifting, and then it takes about the same time to charge it back up, so the idea is that you plug in and charge overnight and then in the morning when you get to work it is fully charged. Then there are also hybrid solutions, they either have an integrated electric motor or they have a separate e-pack, these are electric-hydraulic units where the electric motor drives the hydraulic pumps, it is then connected to a 63 Ampere outlet and then you can drive. It also runs at 32 Amperes but then it is much slower in motion. This always needs a power source available to be able to work, and as for these hybrid alternatives, if you happen to get a power outage, you still have the option of the internal combustion engine so that you can choose what you drive so that might be a lesser problem.

Do you think it would be possible to power the electric-driven cranes' battery with renewable energy, for example by installing solar panels on the cranes or having renewable energy at the depot so you can use this to power the battery?

There are certainly ways to be able to charge directly with renewable energy as well, but it seems highly unlikely with today's technology to produce enough electricity only in this way to be able to operate the cranes – more than just a few solar panels are needed.

By using electricity that is produced from renewable energy sources, you can also charge the batteries through the normal electricity network. Then you must buy such electricity.

Do you have a way to measure how much more environmentally friendly the electric-driven crane is compared to its fossil fueled counterpart?

No, we do not have an exact calculation for that. You should get it from the manufacturer, if you now look at the environmental impact, you should get some exact impression of how sustainable the battery and the whole fleet is to be able to analyze it, maybe we need a sustainability manager who does things like this. Perhaps one could calculate in the form of fuel consumption, that how much emissions do we have when, for example, we do not operate on diesel.

Are electric-driven cranes an expensive investment that pays off in the long run or how do you see it?

Electric-driven cranes are more expensive in proportion than to one that is powered by an internal combustion engine, now we do not know yet because we have had them for such a short time, but the life cycle of a crane should still be something between 15 – 20 years. We do not have the answer in our hands, but we will get savings via fuel costs, in the current situation we do not yet have to pay for the electricity we use, but that day will probably come, our customers will demand payment for the electricity we use at the work site. But I think that cost is independently less than compared to diesel expenses, it is clearly a saving you get there, today we pay nothing for an electric-driven cranes' "fuel", but we can get at least the same hourly rate charged for it.

The other thing is that our customers also make certain demands, in our business, Sweden (areas around Stockholm and Gothenburg) is the forerunner and there are several

customers who have direct demands that you cannot enter the work site with a crane that does not have at least 3B engine classification and bio-hydraulic oil and so on. The demands will probably be strengthened through both legislation and customer requirements in the future. A problem that we tackle with is the mobile cranes, although we would like to buy electric-driven mobile cranes, they are not available on the market, it is only those smaller cranes that are electric-driven because of the problem that you do not get enough power, or that you need 125 Amperes and upwards the larger the crane becomes to be able to effectively lift, it simply doesn't exist.

They have not even solved the problem with an electric-driven mobile crane on the road either, there are two different concepts, 1- and 2-engine concepts, in the 2-engine concept you have 2 different engines; one in the chassis and one in the tower, the lower engine is then used for country roads and the upper engine for lifting. Of course, they are looking for advantages of only having 1 engine, 1 engine weighs less than 2 and takes up less space, these are issues that the manufacturers tackle, we are not crane builders ourselves so we can only make demands and wishes to the manufacturers. This whole issue of electric drivability, it is the Nordic countries and maybe the Netherlands plus Belgium that make these demands in the current situation for the manufacturers, in other parts of Europe and the world the electric drivability is a small thing, and where there is not a big of a demand, manufacturers have not invested in either. But through legislation it will certainly have to be pushed in that direction, but we are in such a situation where we should certainly on our own look at such a retrofit modification of an existing used crane in our machine park, if it could be rebuilt into a hybrid or electric solution, we still have a large machine park with 250 cranes and as I said the lifespan is up to 20 years even, so we cannot renew our machine park overnight either. It is a long-term project, if one day it is a requirement that you are not allowed to show up to a work site with anything other than an electric-driven machine, then we must be able to work on it some other way than just buying new cranes.

Do you have plans to invest into more electric-driven cranes in the future?

Absolutely, every year we also have electric-driven cranes in the investment portfolio, it is clearly something that customers also to some extent want to get, if you can offer a more environmentally friendly solution or a more environmentally friendly alternative, it is probably more likely that our customers choose the environmental-friendly alternative over

the non-environmental-friendly alternative. In Sweden, as I mentioned, they are more prominent in this issue than what we are in Finland, there are many customers who only care about the hourly rate when you offer a crane and they do not put added value in sustainability issues, I also think that is an approach in this whole of issue of sustainability, we must at the same time be able to run a profitable business and operations, and many of these solutions that are more sustainable will initially cost more, if no one is willing to pay for them then it is a difficult equation to solve. It cannot be the case that Havator bears all costs and makes a loss or no profit at all, we are not a charity after all.

But Havator is of course a major player in the Nordic region, so it is probably through our values and sustainability choices that we can then to some extent control it, the rest of the market as well, and if we in a way sell sustainable solutions to customers then maybe they start demanding it from others as well, so it forces the others to act according to this so it is a long race. Today it is the hourly rate that is more important than environmental issues and sustainable solutions for many customers.

What is the deciding factor where the electric-driven cranes are placed?

Port cranes can perhaps be treated separately because the port cranes are in a way easier because they are always in a port and if the port can supply you with electricity, it is usually not a problem and there you get much higher current than just 125 Amperes as well. There is no problem in ports, it is really an easy choice if you have a port crane. The problem lies with the other machinery that is mobile, we in a way never know where its next address is, we do not know what the circumstances are there, take a wind farm for example, you would think that there is a lot of electricity produced and it should have a electricity supply there because they have an electricity network there to be able to feed electricity into the network, but it is still difficult to get hold of electricity at these wind farms in today's situation, instead you puff around there with an internal combustion engine equipped generator. There are many things to solve but the choice that where we choose to put an electric-driven crane we do not need to determine, we do not need to nail the positioning of a crane forever, if today we need a crane in Espoo, no one will stop us from moving the crane to Kiruna in a month, the crane goes to wherever there is a demand for it, for example, the capital region's major cities in Sweden and Gothenburg, indoor work, and mines. You

usually have easier access to electricity inside a city compared to when you are out somewhere in the forest.

How important is sustainability when you make investments?

We have built up an investment strategy where the cornerstones for the sustainability of machine investments are precisely this electricity issue, electricity, and hybrid versions, if there is something other than internal combustion engines and diesel machines we can use. Then we have the use of bio-oil, and always when we make those investment decisions, the goal is that all of them meet the criteria, but we do not really have a sustainability strategy to follow. There are many other things to it, it is not only that you invest into something that is sustainable, I can buy a hybrid crane that seems sustainable because it can run on electricity, but if no one runs it on electricity, it is not so sustainable in the end. This whole strategy should be shaped, and if you want to use fuels with less emissions, take Neste's HVO fuel as an example, which they say is up to 90% less emissions with it compared to traditional diesel, are you willing to run all machines with HVO, the HVO costs a little more and our oldest machines may not like it that much, the question is where we draw these questions.

The question is also how we communicate our choices to the customer, how do we market it, we can do a lot of things but in the end, it is still that end user who must also make certain demands, as said, if the end user is not willing to pay more for it, we are not able to run a financially profitable business. We lack this overall sustainability strategy, but we manage individual investments and all investments in such a way that we have certain criteria that we want to be met, in addition, there are such situations where it is not possible to meet those criteria.

In what areas could sustainable developments be made?

It would be to create a comprehensive sustainability strategy for the entire company that then takes these different sub-areas into consideration, such as new investments. And then we have the use of different fuels – how can we influence that, the optimization of our business, if we drive more fuel-efficient with our cranes, we will save in fuel consumption and if we drive in a smarter way without cranes, there is less wear on the tires, if we maintain our cranes better they will have a longer service life, that will result in globally

fewer cranes are produced, there are many things you can do. Since we must have the right values as a company, we also need to communicate to our organization so that everyone understand how we want to work, there are lots of things that can be improved with this and if you do these things well, I'm convinced that it will create cost efficiency for us in the long run. And because our machine park is large and the lifespan of most cranes is long, it is a long-term project that we must work on continuously, we cannot suddenly change everything, you must take it slowly but surely, but therefore it requires that we today make the right decisions because we will have to stand behind those decisions in the next 15 – 20 years.

(Mette, 2022)

3.6 Interview with Ari Henriksson, Vice President, Special transports

What is sustainability and sustainable development to You?

I would say that it is choices that are made in everyday life, they are not necessarily things taken from big speeches or such strategies, but I choose things that has been able to prove longevity or usability. When I make choices, I consider things like, do I want to buy something because it makes life easier for me in the moment but will be unused after 10 years, versus that I will replace it if I don't need to buy something, that has for example been used for construction or production. I am critical of the use of product. I would like to think that I don't buy unnecessary things, and I also think further ahead than the one-time use.

Do you have a route planning program for transportation projects?

Yes. The nature of our work comes from the fact that we only do special transports, and they are mainly subjects to permission, so the permission determines the transport route. In a sense every transport is, as a rule, heavy, large, and have a prescribed route, and it usually is the weight that dictates it, so the planning of routes comes automatically. Unfortunately, in the planning of the route, we are not able to take a position of whether it is the most economically advantageous for fuel consumption, it is the other criteria that determine the route. And it is many time the authority that decides this, for example, the ELY center in Finland and Trafikverket in Sweden. They then decide from where, and where

to the transportation goes and, it is like the nature of our work is so different compared to commercial freight where you can try to make savings in fuel by searching for a transportation route. We may have a different context in our work.

What are some of biggest positives, and negatives if such exist, in route planning?

The so-called pass ability check is crucial for us in the planning of routes, a check whether we can get to the destination at all. The transports are often so large that we search for routes that allow for maximum dimensions and weights. And that is basically a sustainable development in the sense that once an expensive commodity has been explored, a lot of energy has been used to make it, so our special transport will finally confirm that it will be put to its intended use. It is in a sense a sustainable development, when an expensive commodity is used, as in a lot of energy is used to make it, our special transport finally confirms that it will be put to its intended use, so it does not go to waste.

And in a way, we may not be able to optimize it for our fuel efficiency or anything like that, but it ensures that the committed energy and investments are foreclosed when it is delivered, that is basically our mission as to these are made, it replaces construction goods that cannot be built on site but must be taken there entirely to the construction site.

Do you have a completed list to follow when planning routes or do you plan the route in its entirety on your own?

We have a completed list so that we know roughly where to get a permit for transportation but in practice the size of the transportation determines the route and what options are in general possible for us, and then the amount of change along the route and whether these changes are possible for us. In a way it is these bigger class questions, we don't think about if the traffic sign can be removed, but that there is a railway bridge that is an obstacle for our transportation, and we can't get under it that makes the transport not doable.

It is based on an obstacle analysis, or a collision analysis in which points where a transport can stop because of it, are looked for. Then it is examined, based on a collision analysis, whether sensible measures and costs can modify the route so that the transport can take place. It is pretty much based on this collision analysis, meaning we look for points where the transport wouldn't fit or be allowed. It is a completely different aspect for us compared to basic transport where other benefits are sought after, such as a long downhill that you

want to take advantage of, for us that may be the worst option possible, we are looking for a completely different starting point and it is the individual's long, wide, or high and heavy transport characteristics of the transport that determine if the route is possible, and then there's also the collision analysis and the ELY-center, that gives us the information of how many bridges there are which would suit our transport.

Have any sustainable developments been made regarding transport and transportation?

In the investment of vehicles, prime mover vehicles that meet the Euro 6 standards have been made for example. By far, our fleet is according to the latest engine's emission classifications, we have as good engines as possible that are available from the car manufacturers, of course these are still internal combustion engines, but it is geared towards it and the latest available technology is used.

We may not be the first one to take an electric car for things where it would not be possible to use it to its fullest potential, but it will probably sometime be considered when the technology advances. And if we think about sustainable development, it must be for the long run and it must be reliable, something that really produces long-term benefits, and it can be chosen as a technology after it is so reliable and functional that it is worth using.

Are there any problems with transportation, if we keep sustainability and the environment in general in mind?

I would say that anti-slip protection is quite important for our transport roads, in other words the road must be practically black, also in the winter for very heavy transports, I mean that the roads are either melted with salt or sanded, these are of course required by big special transports, a large proportion is the anti-slip protection and road maintenance, they are inherently part of our transport. And it is certainly more than normal traffic. On the other hand, the costly things of sustainable development will never get there if it is not yet possible to maintain the road so we can achieve a sufficiently high coefficient of friction, so we stay on the road and don't end up in the ditch.

In those areas we are really demanding, we are more demanding than normal traffic, but it is part of our job. The general poor condition of the roads consumes our tires, we have a bunch of these carriages where there are hundreds of tires in one combination, and if the infrastructure is in bad shape, we wear out a lot of tires, of course, the cost of tires is also a

cost in terms of sustainability, it is a big cost in our work. It is not only related to the anti-slip protection, but also to the road surface material and its condition as it consumes our equipment.

Are there any concrete areas where sustainable development could be made?

I would probably say that in general freight transport, every transport where outbound and return transport can be arranged, that means that the car always moves loaded, provides an opportunity for sustainable development. But then again in this segment of ours, this special transport is not practically possible, or they are almost never there where they should be, and when it gets permission to do so, it can take up to two weeks or the equipment is not suitable for its use. In practice here you must accept that the equipment always moves empty a part of the trip, of course all the equipment always moves empty a part of its trip but here the nature of the work such that it practically forces you to go back to place of loading and then load move from there. You probably won't be able to adjust anything else other than trying to keep the transition trips as short as possible and use the vehicles that are closest to you and most suitable for the purpose, in that sense you must be skilled to arrange that.

But then the work and the requirements of the equipment and the features of the equipment limit its usability and not everything can be used for everything. We are not talking about vehicles with close-load compartments, tarpaulins, or cabinets than take in basically any goods, but about modular trailers that are extendable or shorten able or low-load models and are specifically designed to carry that piece, and the next piece may not be designed for that same purpose.

In a way we have a worse opportunity to choose the next job next to it, sometimes it succeeds and maybe it is because we are actively offered the opportunity to pick up something, but it may not even be possible from the transport permit perspective so it may not even be worthwhile to wait for it. In that sense this is a difficult species, big solutions are made much earlier before the transport has taken place, adjustments and savings are made in the planning phase, we can't do it during or right after a transport. (Henriksson, 2022)

3.7 Interview with Rami Hirvelä, HSEQ manager, Havator Oy

What is sustainability and sustainable development to You?

In principle, at least for a company like ours, it is the legal regulations that create the minimum standard. And then preparedness, which also goes to us in a certain way beyond the statutory matters, basically we are prepared for damages if they were to happen, we now for example have equipped our cranes with oil absorbers to make it possible to keep those damages to a minimum.

And of course, the fleet investment is a step in that direction, that automatically makes our cranes more environmentally friendly as the older cranes leave our fleet. Now we have the first fully electric-driven crane coming to the port of Ajos sometime next year. And in a way our network of depots is also one way to reduce our carbon footprint because we always have reasonably close depots from where we move to the work sites.

In what ways does Havator produce waste?

In principle, the office has waste same as a household, like biowaste, cardboard and paper, but then when you go over to the service hall, the biggest problem there is waste oil, either as solid or liquid, and of course chemicals such as washing chemicals that we use to wash the fleet with, that is also a big part, and then we have windscreen washers that also is actively used. And of course, water.

We do this through environmental reporting as CapMan owns Havator so we then have to report annually to the entire group how much, for example, renewable energy has been used. The monitoring, to get these figures, is at some level reasonably well but it is a big job to collect these figures from each site on an annual basis. The real figure, we will never be able to get because we have these properties which have these leases where electricity and or water, for example, is automatically included, so we are unable to report the total consumption.

And of course, fuel in a certain way even if it is not a waste per se.

How does Havator deal with waste?

We make an investigation report, with the first step being the investigation of why it has happened in the first place, and a normal procedure after that, depending on the size of the leak and if we were able to suck the leak from the soil ourselves, is to use a company like Lassila & Tikanoja or something similar who then retrieves the polluted land and delivers it to a waste treatment plant. From there we then obtain a documentation that it has properly been taken care of. Through the investigation report we get the job moving and done in a certain way so we can find the root that caused the whole thing.

So, you could say that waste management is important at Havator?

It is in that sense, and especially in the customer's eyes we need to take care of our own waste. And then again, we have the law and regulations that make sure we handle it properly. Transfer books are collected, and they must be kept for five years according to the law.

You mentioned renewable energy earlier, where is this used?

Well heating may be used by a renewable energy, and electricity that we use in general may be renewable energy, they are the main components where it is used. And then in certain cases the fuel that is used is, in principle, made from renewable energy, they are these so-called bio-products, they are used to some extent but if we are honest, we only use it if the customers' demands it and is willing to pay for it, it is more expensive than the regular and costs about 1 euro more per liter so if we started only using them, in terms of being responsible, we would go bankrupt related to that because no one is willing to pay extra for it in the end.

What happens to a crane when it stops working or is not used by Havator anymore for whatever reason?

That basically never happens, they are always sold forward, we never manage to get them in such a bad shape that they would not go somewhere else. In principle, we are never the last location for the crane, someone then buys it, and often when we make a new fleet investment, the old crane goes to the same place from where we bought the new one. Of course, we also sell ourselves directly, but we never leave with the old fleet in our hands.

Sometime ago there were cases where there were cranes so old that we decided to keep them, they are then just left there unused usually hidden somewhere in a hall or sheltered somewhere outside. But these have all been abandoned today.

With waste management in mind, what are some areas where sustainable development could be made?

It would probably be possible to increase the recycling rate and, in a certain way, train staff on waste issues now that there is a fair amount of different looking waste bins to use. As an example, take aerosol bottles for instance, these were used at our depot in Äänekoski this week and empty ones were found in metal waste where they do not belong. There is a lot of little stuff that could be improved, but otherwise another important thing to think about is the renewal of our fleet. And of course, fuel consumption is important, but then on the other hand in this field and industry we have the problem with the electrification of cranes, especially fully electric-driven cranes, there are a lot of challenges there. Those harbor cranes that don't move anywhere and have access to electricity all the time are often not problematic but then again, we have those mobile cranes which are limited by their weights and stuff like that. The manufacturers are not able to make those move fully on electricity yet. Crawler-cranes have recently entered the market, Havator has not invested in one of those yet, but they do exist.

And then, of course, it is possible to do some development in connection to lifting operations, especially with general purpose cranes, that when we start lifting with that machine we would use electricity, but those might be subject to site conditions that there is not enough power or a large enough cable. Those are probably the biggest things, and if we get those issues resolved, sustainable development will increase through that.

Increasing the recycling rate is probably one thing, and preventative maintenance is another thing. There is certainly room for improvement. (Hirvelä, Sustainability Management Interview, 2022)

4 Results

In this chapter the results, based on the interviews, will be presented. The results consist, firstly, of an establishment of how sustainable Havator is in the current situation by looking at what sustainable developments have already been made. Secondly, suggestions of improvements will be made which also are based on the interviews.

4.1 Sustainable Developments Already Made at Havator

By maintaining, repairing, and taking care of existing machines, Havator is more environmentally friendly since their machines do not break so often, and they do not have to buy new machines as often and can keep their existing machines for as long as possible.

However, Havator is regularly investing in new machinery with better emission classes, and by doing so, they lower their emissions and are therefore more environmentally friendly as well. Havator keeps their fleet up to date, and in the current situation, if a sudden implementation of emission class limitations, meaning machines below certain class limitations are not allowed to enter the work site were to happen, around 20% of Havator's fleet would still be allowed to operate on that worksite, whereas their competitors' fleet would have zero machines that pass the class limitations. They have also invested in prime mover vehicles that have Euro 6 standards.

Havator has made an initiative where they have built-in efficiency to reduce emissions with crane logistics. This is done by, as often as possible, driving from one work site to another without doing a so-called stopover at the depot. This basically means to drive only as much as necessary, but they are also reasonably close if needed. These depots, are energy mapped, meaning Havator has their energy and power consumption documented. This is an excellent way to check if an area is in need of improvement to eventually reduce energy usage.

Emission filters have been installed for existing crawler-cranes to lower their emissions which also makes them eligible for indoor use.

If a waste accident was to occur, Havator has a specific way to deal with it. It also takes the environment into consideration. They start with making an investigation report to investigate why the accident happened in the first place. Normally the following procedure

is to use a service company like Lassila & Tikanoja who properly deals with the potential leak and delivers it to a waste treatment plant. From there they obtain a document that proves that the waste has been handled accordingly. In some cases, if the leak is smaller in size, Havator can handle the leak themselves by absorbing the substance from the ground using appropriate equipment.

Certain preparedness developments have been made in forms of oil absorbers on the cranes to minimize the damage if there ever was one.

Havator is engaged in the project of building “conversion industries” that is going to produce fossil-free steel in Sweden. Havator is showing a great example of sustainable development by being a part of this project.

Bio-oils are also used to some extent, not so much in Finland because the customer requirement is nonexistent, but in Sweden it is a common sight.

The heating, and electricity in general that Havator uses, may be from a renewable energy source. Also, the fuels that are used, these so-called biofuels, but these are only used if the customer demands so. Havator makes an annual environmental report to their owner CapMan of how much renewable energy has been used in the past year.

Havator has invested in an electric-driven harbor crane that is placed in the Port of Kemi, Finland. Even though this investment was not made purely for the sustainability aspects and benefits, it is a bonus that follows and contributes to sustainable development. They are also expecting another fully electric-driven crane sometime next year. This crane is going to be placed in the Port of Ajos. In Sweden, investments in the electrification of cranes have also been made. There they have a 250-ton electric-driven crawler-crane up and running and they are expecting another, 160-ton crawler-crane shortly. They are few seen in the entire fleet, but it is a step in the right direction. Havator has made it clear that they want to keep investing in electric-driven cranes, it is part of their investment portfolio.

Based on this gathered data, we can see that Havator has, in terms of sustainability and sustainable development, a solid foundation. Many sustainable developments have already been made and it is a great starting signal to continue in the same direction down this path of sustainable developments and solutions.

4.2 Suggestions of Improvement

Training of staff – it has become clear that the staff could benefit from training, both in terms of waste management and driving habits and driving behavior.

Educating the staff on the importance of waste management, for example what waste goes into what bin, is an important step in the right direction. Dealing with waste correctly is not time consuming, it is good for the environment and can save money in the long run. Having a better recycling rate is also desirable.

Training crane chauffeurs on how to optimize their driving habitat and behavior to decrease fuel consumption on the road is also a way to be more environmentally friendly and save money. This could be done by installing GPS-trackers, making it easier to follow up on driving habits and address any problematic areas. Preventative maintenance could also be included in this training.

Keep investing in electric-driven machinery – this is already a given since its part of Havator's investment strategy but prioritizing this may open further opportunities and make the customers realize the importance of it. By investing in electric-driven machinery, they support the manufacturers in their work which can lead to faster development of fully electrical mobile cranes which would make Havator even more sustainable which could result in even more customers being open to sustainable development and willing to pay for the service.

Sustainability Program – Havator would benefit from having a sustainability program. This program would make Havator more transparent with their work in terms of sustainable development and it would make their sustainability vision even clearer. It would be easier to set goals and follow up on these set goals. Havator would also be able to show both internally and externally what sustainable developments have been made and where. It would also be easier to have everything regarding sustainability gathered and stored in detail in one place.

This program could be reported similarly to an annual report. The report could include a separate section with sustainable developments already made up until that point, another section for new and upcoming developments and lastly any future goals set. This way it

would be easy to follow the development on a yearly basis, to see if the set goals have been achieved.

Sustainability Program step by step:

Step 1. Have Someone in Charge of Sustainability. Employ a sustainability manager or a sustainability team whose main task is to deal with sustainability and its issues.

Step 2. Learn About Sustainability. This does not only mean for the person or people in charge of sustainability, but also for the whole company and its employees. Educate staff and make sure everyone has a fundamental understanding of what sustainability is. This means the understanding and the managing of the three pillars of sustainability.

Have the right mindset from the get-go - out with the “nature is ours to use” thinking, and in with the “we are part of the nature” thinking.

Step 3. Identify Areas of Improvement. Learn about any laws and/or standards related to sustainability. The business should follow any laws or standards that exist. Address global issues and how your business affects them. Identifying the areas where your business has an impact on the environment will make it easier to act.

Step 4. Look For Opportunities. To be successful in sustainability practices, you need to be innovative. The whole sustainability concept could be explained in short as out with the old, and in with the new. This is all about finding more environmentally friendly solutions and alternatives that will not set your business back in terms of economics, and that everyone involved with, will benefit from. It is also important to get employee input on these issues. Keep an open and clear dialogue with employees to get their feedback on what issues could be addressed where and how. Make sure everyone feels heard and consider every option.

Step 5. Have A Vision. Establish what the company is passionate about and what it values. The vision should be holistic, but it should also be broken down to suit the different departments within the company. The end goals should stay the same, but the path to it may differ. Adapt and define your own company’s sustainability model.

Step 6. Make It Happen. Inform your company's entire workforce about the new sustainable development plan. Make sure everyone understands what change or adaptation is happening and why. Get feedback on the change.

Keeping track of progress by measuring and documenting it, makes it easier to demonstrate in what ways the change was beneficial or not. This is also easier for troubleshooting and finding an eventual fix for a problem that may occur along the way.

5 Discussion

In this chapter we will discuss both challenges and problem areas. This chapter will also mention what further work could be done.

5.1 Challenges

The biggest challenge when practicing sustainable developments and solutions is money. Many people and customers alike want to see more environmentally friendly alternatives available to them, but they are rarely ready to pay the extra money for it. If a customer is presented with two different offers, and one of them is a more environmentally friendly alternative but it is also more expensive, in most cases the customer will choose the cheaper option.

The electrification of cranes also has challenges. The question, that if Havator can charge more money for services with electric-driven cranes for example, is quite challenging even if everything indicates that they can and has to be financially sustainable. There are certain models of electric-driven cranes that are plug-in models, meaning that they need to be plugged into an outlet to be able to work. These models become challenging to work with if there is no such outlet nearby, or at all, at the worksite. The electrification of vehicles in general is a new technology so no one really knows how it is going to play out in the future.

Another challenge is the investment of new cranes that are not electric-driven. These cranes have a calculated holding period of 12 – 20 years which could turn out to be unprofitable in the long run if any new investments were made when keeping an eventual emission class limitation change in mind.

The employee's own engagement like time and their possibility to prioritize sustainable initiatives in the daily work. Not having a high enough priority on the internal work can be challenging for sustainable development to grow.

5.2 Problem Areas

The electrification of cranes is not only challenging, but also problematic. Havator has stated that they are willing to invest into fully electric-driven mobile cranes, but the manufacturers are simply not able to make those yet, the technology is not there just yet. Fully electric mobile cranes are very limited by their weights and dimensions which make them problematic to manufacture in the current situation. The problem with fully electric-driven mobile cranes is not yet solved but the development is however advancing more and more.

Speculations, if a hydrogen-powered engine would be a possible candidate in the future are current, but that would have its own problems since the internal combustion engine has so much more compressed energy that it is hard to beat. The efficiency would be lacking.

The environmental report is somewhat problematic since Havator has properties with leases that include water and electricity, this makes it impossible to get the actual figure of how much renewable energy has been used by Havator themselves.

Another problem is waste oil in general, which is also evident at Havator. The storage, handling, and disposal of waste oil is tedious. There are clear regulations and instructions of how to deal with waste oil, and Havator does have a strategy of dealing with waste if an accident occurred, but it would be so much easier if we could move away from waste oil to something that is not as tedious and harmful for the environment as waste oil.

Havator is not able to optimize fuel consumption when planning routes for special transport projects since the route planning is determined by the size of the transport, so there is really no way to be more environmentally friendly in that aspect.

5.3 Further Work

A great way to further develop this project would be to start with the implementation of the suggested improvements made in this thesis project. The training of staff is not a big investment seen financially and is quite easy to address. As already mentioned in the suggestions of improvement section, the investment of new machinery, and if possible electrical-driven machinery, is a given. Electric-driven machines are constantly developing and need financial investment to be able to develop further. The sustainability program that is suggested in this thesis project may be a little harder to realize, meaning that Havator must want to take the step forward and invest even more into sustainable development for it to be able to grow.

Another way to further develop this project would be to investigate the other two aspects of sustainability. Since this thesis was limited to only the environmental aspect of sustainability, both social and economic sustainability were left untouched. Even if environmental sustainability plays the bigger role seen in the whole picture, social and economic sustainability is of great importance as well and a lot of work could be done for those.

6 Conclusion

Sustainability and sustainable development are ongoing issues that are rarely fully achieved by individuals or businesses. There is always something or some area that can be improved or changed for the better. When viewed as a whole, sustainable development may seem overwhelming; there are so many things of different sizes that can be developed or changed for the better. There are so many areas that have a direct or indirect impact on the environment, the economy, and the social aspect. Getting started with sustainable development and practices is not always easy but it is worth it in the long run. One way to start with sustainable development, is to start with the thing that are the most obvious and things that are easy to remediate. From there, it is then easier to dig deeper and go into more detail on smaller things.

For sustainability to thrive, we humans, both as individuals and businesses need to work together. Sustainability will never be able to grow if we do not accept it and invest into it. As seen in the interviews, customers are not really demanding sustainable services from

Havator, and this puts Havator in a tricky seat because Havator wants to develop and make sustainable investments, but this also means that the prices of their services will somewhat rise, and since there still are businesses out there that has no interest in sustainable development whatsoever and are able to offer cheaper services, the customer is then more likely to choose that. In modern society money plays too big of a role. Sustainability needs more marketing to make, not only customers, but people around the world realize that sustainability is something that they need in their life, and something that is worth investing time and money into. Our future depends on it.

Lastly, I want to thank Havator for giving me the opportunity to not only write my thesis project for the company, but also deepen my interest in the subject while doing so. A special thanks goes to my supervisor Stefan Wollsten for the assistance and guidance received during the making of this project. I would also want to thank my supervisor Kaj Rintanen from Novia UAS for assisting and supporting me through this project.

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