

THE FUTURE RELEVANCE OF SUSTAINABLE  
DEVELOPMENT FOR THE CONSTRUCTION SECTOR  
COMPANIES IN FINLAND

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Thesis

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Buildings and structures produced by the construction sector are part of our everyday life. The sector has tremendous environmental, economic, and social impacts to our society. Construction sector is responsible for vast amounts of energy consumption and waste generation, which has led to new sustainable alternatives. Sustainability in construction is often seen in the form of green building, which looks at building from the perspective of environmental, economic, and social factors.

The topic for this thesis is sustainable development in the construction sector and its future relevance for construction companies in Finland. The purpose of this research was to find out what sustainability means in the construction sector, what it means for the construction sector companies, and how relevant it will be in the future.

The research method for this thesis was qualitative. Information was gathered from three interviews which were conducted with different construction sector companies from Finland. The semi-structured interviews were analysed using coding and categorising. The interviews were first coded, then translated, and lastly categories were formed. Final categories were created from all the categories of each interview, and the final categories were used to give answers to the research question.

The results of the thesis showed that sustainability is currently extremely relevant and is expected to become even more so in the future. There are environmental, economic, social, and legislative reasons that encourage construction sector companies to start preparing for the changes that sustainability will bring. Sustainability becoming trendier is giving stakeholders new expectations and demands for companies, and the increasing legislation is putting pressure on the whole sector.

The results of this research can be used to share general knowledge about sustainability in the construction sector and how construction sector companies can prepare for it. Sustainability can not be avoided, so companies should take full advantage of all the possible benefits and opportunities it brings.

**Keywords** Sustainable development, ecological construction, environmental damages

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Rakennusalan tuottamat rakennukset ovat osa jokapäiväistä elämäämme. Alalla on laajat ympäristölliset, taloudelliset ja sosiaaliset vaikutukset yhteiskuntaamme. Rakennusala on vastuussa valtavasta energiankulutuksesta ja jätteen tuotosta, mikä on johtanut uusiin kestäviin vaihtoehtoihin. Kestävyyden rakentamisessa nähdään usein vihreänä rakentamisena, jossa tarkastellaan rakentamista ympäristöllisten, taloudellisten, ja sosiaalisten tekijöiden näkökulmasta.

Opinnäytetyö tutki rakennusalan kestävästä kehityksestä ja sen tulevaisuuden merkityksestä rakennusalan yrityksille Suomessa. Tämän tutkimuksen tarkoituksena oli selvittää, mitä kestävä kehitys tarkoittaa rakennusalan yrityksille, ja kuinka merkityksellistä siitä tulee tulevaisuudessa.

Opinnäytetyön tutkimusmenetelmä oli laadullinen. Tietoa kerättiin kolmesta haastattelusta, jotka suoritettiin suomalaisten rakennusalan yritysten kanssa. Teemahaastattelut analysoitiin pelkistämisen ja luokittelun avulla. Haastattelut pelkistettiin, käännettiin englanniksi ja lopuksi luokiteltiin. Tutkimuskysymykseen vastattiin lopullisilla luokilla, jotka luotiin jokaisen haastattelun omista luokista.

Opinnäytetyön tulokset osoittivat, että kestävä kehitys on tällä hetkellä äärimmäisen tärkeää ja sen oletetaan tulevan vielä tärkeämmäksi tulevaisuudessa. On ympäristöllisiä, taloudellisia, sosiaalisia ja lainsäädännöllisiä syitä, jotka kannustavat rakennusalan yrityksiä varautumaan kestävästä kehityksestä tuomiin muutoksiin. Kestävän kehityksen trendikkyys luo sidosryhmille uusia odotuksia ja vaatimuksia yrityksille, ja lisääntyvä lainsäädäntö asettaa paineita koko alalle.

Tämän tutkimuksen tuloksia voidaan käyttää jakamaan yleistä tietoa kestävästä kehityksestä rakennusalan yrityksille ja siitä, miten rakennusalan yritykset voivat varautua siihen. Kestävyyttä ei voida välttää, joten yritysten tulisi hyödyntää kaikki sen tuomat mahdolliset edut ja mahdollisuudet.

**Avainsanat** Kestävä kehitys, ekologinen rakentaminen, ympäristö vahingot

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## SYMBOLS AND ABBREVIATIONS USED

|        |  |
|--------|--|
| EU     | European Union   |
| FIGBC  | Green Building Council Finland                                     |
| LEED   | Leadership in Energy and Environmental Design                      |
| BREEAM | Building Research Establishment Environmental<br>Assessment Method |

# 1 INTRODUCTION

## 1.1 Research topic

Construction sector is important as its own field but also as an enabler of the operations of other fields. We can see it as part of our daily life, as the houses we live in and the buildings where we work are produced by the construction sector. (Ahonen et al. 2020, 15.) Due to this, the sector has enormous environmental, economic, and social impacts on the society. While the industry provides us with buildings, employment opportunities, and contributes towards the national economy, it also creates noise, waste, emissions, and uses large amounts of natural and human resources. (Zuo & Zhao 2014, 272.) All these factors relate to the increasing importance of sustainability in the Finnish construction sector, which makes it essential to research how relevant it is going to be in the future. For this reason, the topic for this thesis is about sustainable development in the construction sector and its future relevance to the construction companies in Finland.

As sustainability is considered to be a megatrend, it is important to research if it will become even more relevant in the future. For businesses, this information holds a lot of value, as sustainability involves the economic, environmental, and social aspects of the society. Being able to deliver customer value, globalization of business, competition for (natural) resources, consumer demand for sustainable alternatives and recognizing that they can be profitable, etc. (Mittelstaedt, Shultz, Kilbourne & Peterson 2014, 255.) All these factors relate to sustainability and can change the way a business operates. Due to the importance of the field, changes concerning the construction sector are reflected into the entire society. On the other hand, several future development directions and megatrends are reflected into the construction sector. (Ahonen et al. 2020, 20.) Sustainability as a megatrend has become more relevant in the construction sector and it is a topic that is constantly being observed and researched.



## 1.2 Methods and objectives

The first objective of this research is to identify how sustainability is seen in the construction sector and what it includes. This will be done in chapters 3 and 4, which gives background information about the construction sector, sustainability, and sustainable construction. The second research objective is to find out what sustainability currently means for the construction companies. Lastly, the third objective is to research the future relevance of sustainability for the construction companies. These two objectives will be looked at in the chapters 5 and 6, where the results of the interviews will be shown and discussed. This thesis is aiming to answer the research question: “What is the future relevance of sustainable development for the construction companies in Finland?”

Qualitative research method will be used for this research and individual interviews will be conducted to give better insight into what is being researched. The interviews are conducted via Teams meeting and via email. The Teams meeting interviews will be transcribed and then all interviews will be analysed by using Grounded theory method. In this method, the interviews will be coded, and categories will be formed from them. This process will be explained more in detail in the methodological implementation chapter of the thesis.

## 2 METHODOLOGICAL IMPLEMENTATION

### 2.1 Qualitative approach

For this thesis, qualitative approach will be implemented, since the methods of data collection used in qualitative research are suitable for the research topic and question. One of the key methods of data collection is an interview. For this thesis, semi-structured interviews were implemented. The semi-structured interviews are made of main questions, but it allows the interviewer to give guidance and extra questions if the interviewees need help with what to talk about or to give deeper answers. This approach is more flexible, which can help with discovering something new or what the researcher previously thought was not relevant. (Gill, Stewart, Treasure & Chadwick 2008.)

### 2.2 Data collection process

To find relevant background material for this research, scientific literature was searched from various sources. After articles, books, and other sources related to the research topic were found, they were evaluated to find only relevant sources. In the evaluation process, the publishing date and the authors' qualifications were considered. Other important notices were if the literature was peer-reviewed, and the authors supported their claims with sources. During the thesis, original sources were used as often as possible, and scholarly literature was preferred. Usefulness of the source was also evaluated to see if the source relates to the topic of the thesis. The reliability of the information was also assessed, and trusted sources like academic journals were seen as reliable.

For this research, three interviews were conducted from three different construction sector companies. To find the construction sector companies for the interview, the author searched for construction companies in Finland from internet and contacted the first five companies via emails. Three of those companies agreed to the interview.

The companies were given the choice to have the interview in the form that is preferable for them, for example, through a phone call, email, or video call. The

possibility to choose was given, since it was expected that the potential experts in the companies would be busy and arranging an interview can be time consuming. Two of the interviewees preferred to have the interview via Teams meeting and the third one preferred to have it via email. The interviews were held in Finnish as the interviewees are from Finnish speaking companies, and it would be the most comfortable language for them.

The interviews consist of 7 questions that have been translated into English for this thesis (Appendix 1). The first two questions are about the importance of sustainability in the sector and how the construction companies see it. The first question is about the current situation of the sector and what kind of importance sustainability holds at this time. On the other hand, the second question is about the future. Do the companies see sustainability becoming more important, stay the same, or possibly it could hold less significance. The third and fourth questions are more about how sustainability is seen in the company processes and how companies take notice of it. The fifth question is also referring to the future and if there could be more factors like law and regulations that would force the construction sector to take sustainability into account. Question six is asking if the construction sector is already moving towards the sustainable direction and how. Lastly, question seven is about how companies are preparing or should prepare for sustainability.

### 2.3 Analysis of the data

To analyse the interviews, grounded theory method was used. Both oral interviews were recorded with the interviewees' permission and transcribed from speech to text to make the analysis process easier. The most important points from each interview were picked and simplified, creating codes. As the interviews happened in Finnish, the codes were translated first into English before being integrated into the thesis. An example of the coding process can be seen in figure 1. The first box holds the original sentence that was said during the interview. The second box has the simplified code version of the sentence. All unnecessary words that are used during speech have been taken out without changing the meaning behind the original message. Then lastly, for this thesis, the simplified sentence has been translated into English by the author.

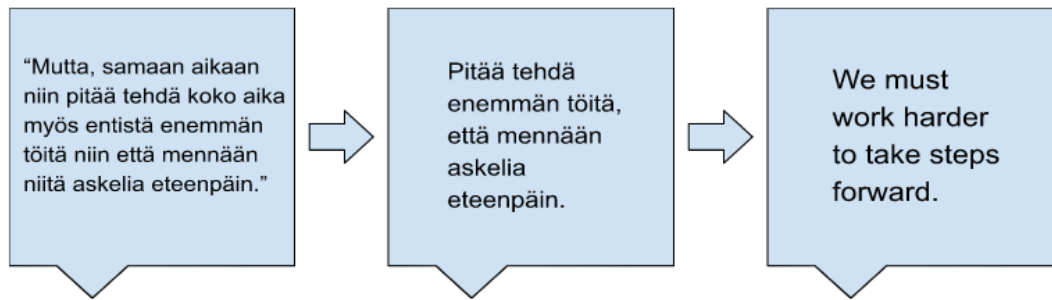


Figure 1. Example of the coding and translation process.

After coding was done, three categories were made from the codes for each interview. This process can be seen in Appendix 2 after the coding, where all the interviews have their coding and own categories. After this, the categories from each interview were compared and put into higher categories, creating the main categories that were used to answer the research question.

### 3 CONSTRUCTION SECTOR IN FINLAND

#### 3.1 Construction sector

In 2020, Finland's broad construction sector had 89,079 enterprises, and 341,031 persons employed. The construction sector's share of gross value added in the GDP was 20,5% in 2018, and the sector's total turnover was EUR 70,8 billion in 2020. (European commission 2021, 2, 5-6.) According to the Rakennusteollisuus RT, the built environment accounts for 83% of Finnish national wealth. As for employment, construction, and the maintenance of built environment employs every fifth employed person in Finland. (Rakennusteollisuus RT 2023a.)

In figure 2, the dark blue line represents the number of people employed in the entire construction sector and the light blue line underneath represents the share of employment in the entire business sector. The figure shows that the construction sector as a whole, employees 18% of the total employment of companies in 2017. Almost 43% of the employment from the entire construction sector comes from building houses. (Ahonen et al. 2020, 16-17.)

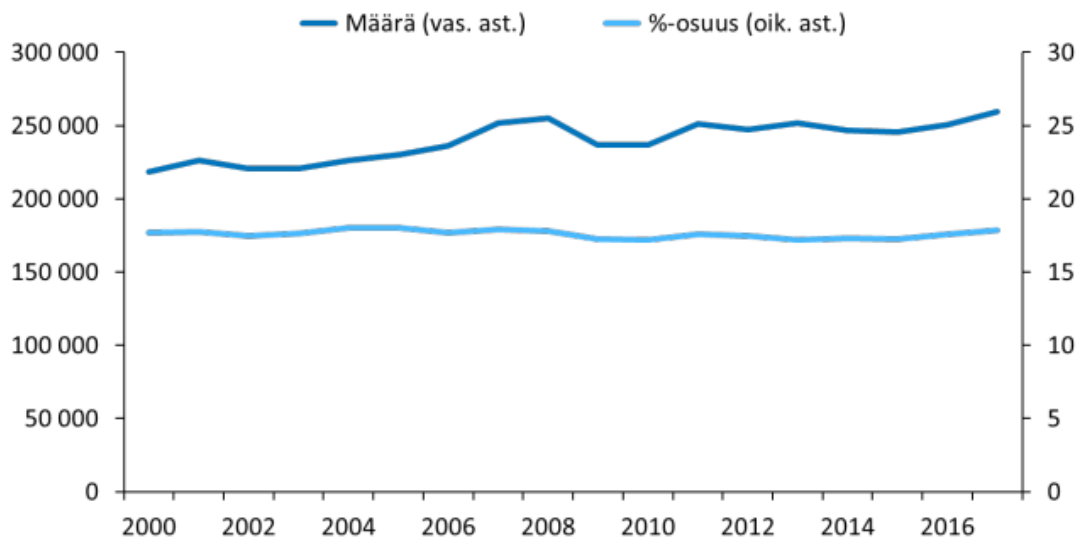


Figure 2: Number of people employed in the entire construction sector and the share of employment in the entire business sector between the years 2000-2017. (Ahonen et al. 2020, 17).

The construction sector is a highly networked sector, and there are plenty of companies and other entities that deal with each other in the industry. The core

activity of the sector is the cooperation of builders, designers, contractors, and the product industry. Construction sector also differs from other sectors of the economy in that its target market is mainly the domestic market. Preserving or possibly increasing their domestic market position is an important goal for construction sector companies. (Ahonen et al. 2020, 21-22.)

### 3.2 Construction sector's emissions

Around the world, the construction sector is responsible for vast amounts of greenhouse gas emissions as well as other negative impacts to the environment. (Munaro & Tavares 2023.) Construction sector uses more raw materials than any other field of industry in Europe. In Finland, around 40% of the consumed energy comes from construction and buildings. From all the waste generated in Finland, around 40-50% comes from construction and demolition. (Tähkänen & Tähtinen 2021, 4.)

Construction sector has many goals and objectives to be more energy efficient and reduce carbon footprints, but a lot more work needs to be done. Finnish cities, municipalities, and private sectors have set their own goals for reducing emissions and their impacts to environment. For cities and municipalities, their goal for carbon neutrality typically means reducing emissions by 80%. The Finnish construction sector has become more aware of their impacts to the climate change, and more companies have made their own commitments to reduce their own emissions and make plans on how to create more positive impacts. (Tähkänen & Tähtinen 2021, 41.)

Finland is aiming to meet the targets set by the EU for reducing energy consumption and greenhouse gas emissions, while also preventing the progress of climate change. The built environment has a significant role when discussing the progress of climate change, due to the energy consumption and greenhouse gas emissions caused by the construction sector. According to the Rakennusteollisuus RT, the operators in the construction and real estate sectors have a mission to develop and implement the best and most cost-effective means to achieve the energy and environmental goals set for buildings. (Rakennusteollisuus RT 2023b.)

## 4 SUSTAINABLE DEVELOPMENT IN THE CONSTRUCTION SECTOR

### 4.1 Sustainability

In the 1980s, the idea of sustainability was brought up, and it has gone through massive and significant evolution since then (Portney 2015, 1-2). Sustainability often deals with three dimensions: environmental, economic, and social dimensions (Boström 2012, 3). Environmental sustainability focuses on environmental effects, like urban pollution and global warming. These environmental effects are based on impacts like extracting or emitting substances from and into the environment. Extracting substances from the environment can lead to resource depletion, which is why it is important to focus on preserving resources. Emitting substances into environment cause effects like emissions and impacts like global warming, which is why sustainability is also about preventing pollution. (Vezzoli 2018, 10-11, 13) Essentially, economic sustainability is about meeting the economic needs of today, without losing the economic opportunities of the future. Economy is not sustainable if it does not meet people's basic economic needs. It is not about what people want, but what they need for physical and mental development and wellbeing: sufficient food, shelter, clothing, and other necessities. (Ikerd 2012, 1.) The concept of social was introduced into sustainability later than environmental and economic. Only after further research and new theories, did people start to debate how issues like climate change, natural disasters, and other impacts to environment affect societies as well. However, the definition for social sustainability is still unclear, as there are multiple concepts, frameworks, and definitions for it. (Eizenberg & Jabareen 2017.) The key concepts that are often included in social sustainability research are about creating and developing better conditions for living people and future generations, as well as the quality of governance (Boström 2012, 5).

In Finland, sustainable development is high on the political agenda, and it is being promoted in domestic policies and international development co-operation. Finland is considered a leader when it comes to sustainable development and environmental policy. Finland is aiming for carbon neutrality by 2035, and to become a circular economy. However, there is still a long way to go. While greenhouse gas emissions have decreased considerably, more should be done

to reduce waste generation and material consumption and halt the loss of biodiversity. (OECD 2021.)

#### 4.2 Sustainable construction

Sustainable construction is about the ecological, economic, and social issues of a building when thinking of community as a context. Environmental sustainability is about preventing harm to the environment, while also protecting and possibly enhancing the environment (Hussin, Rahman & Memon 2013, 34). In the middle of sustainable construction is the resource-conscious design, as it is important to reduce natural resource consumption and the impact on the ecosystem. Examples of environmentally sustainable objectives are minimizing solid, liquid, and gaseous emissions, and recycling and using the materials again instead of disposing of them at the end of a project. It is also about viewing land as a precious and limited resource that should be preserved and recycled as much as possible. So, disturbed land, like former industrial zones, should be restored to become productive again. Also, increasing energy efficiency and using renewable energy sources can reduce CO<sub>2</sub> emissions and help with climate change. Impacts like climate alterations caused by climate change are affecting the availability of potable water, so it is important to protect groundwater and surface water supplies. (Kibert 2016, 10-13.) Economic sustainability is aiming to increase profitability by using materials, water, labour, and other resources more efficiently, which also relates to the resource-conscious design. Social sustainability responds to the needs of people in all stages of the construction process. Whether it is the demolition or commissioning of a building, it is important to work together with the customers, employees, suppliers, local community, and the other stakeholders. (Hussin et al. 2013, 34.)

#### 4.3 Green building

Green building has become a topic of discussion in the building and construction sector, and many designers, builders, and building owners want to take part in the green building practices (Kubba 2012, 61). If sustainable construction is about the sustainability issues of a structure, then green building is about the features



and quality of the building that is built using the principles and methodologies of sustainable construction. (Kibert 2016, 10-11).

During the past decades, the amount of new research related to green building from both developed and developing countries has increased, showing that this is a global issue. However, the definition of green building and what it should include is still unclear, which can make it challenging to promote or implement. (Zuo & Zhao 2014, 272-273.) There have been many different definitions for green building, but essentially it is about improving designs and construction practices to make the buildings last longer, be cost efficient, help with increased productivity, and create better environments for workers and residents. It is also about protecting natural resources and making sure that the ecosystems, people, organisations, and communities can lead a healthy and prosperous life. (Kubba 2012, 1.)

Green building usually focuses on the environmental aspect more closely, as can be seen by the large number of studies related to energy, water, and resource efficiency as well as other issues like waste and greenhouse gas emission reductions (Zuo & Zhao 2014, 273). However, green building is not just about the environmental aspects, but also creating a healthy community and quality way of life (Kubba 2012, 2). As mentioned before, sustainability takes into account environmental, economic, and social aspects, which are also important aspects to the green building.

#### 4.3.1 Environmental

Until the green building movement began, not much attention was given to the impacts of construction to the environment. Currently, there exists numerous studies on environmental sustainability of buildings. These studies often relate to energy, water, and resource efficiency, as well as reduction of pollution and emissions. (Zuo & Zhao 2014, 273.) To create, operate, and maintain a building, several resource categories are needed: materials, energy, water, and land. High performance green buildings make previously utilized land productive again by reusing it and often reusing buildings instead of creating new ones. (Kibert 2016, 238-239.) Green buildings are usually constructed on previously developed

property, and different measures are used so that plant life is restored at the building sites. This can be done by reducing the area meant for parking or by using green roofs, which are more ecological than conventional roofing systems. (Lucuik, Trusty, Larsson & Charette 2005, 13.) There are many designs that integrate nature into the building and reduce pollution. For example, passive solar design takes full advantage of the sun, wind, and foliage at the site, and integrating a careful design of the lighting system can minimize light pollution. Green buildings should also minimize any disturbances that come from the construction project and use erosion and sediment control practices, for example, by replacing soil with native soil so it is suitable for the plants of the region, or not removing vegetative cover unnecessarily. Natural systems can cool and heat buildings during appropriate seasons, and they allow plenty of sunlight which lights the building without energy. (Kibert 2016, 239, 245, 266.)

Water is a critical resource for the built environment. Like all resources on this planet, water is limited, precious, and stays in a closed loop. One important issue that green building is trying to include is the interaction of built environment and natural water cycle. (Kibert 2016, 325, 333.) There exists a cycle, where clean water is drawn from the environment and contaminated water is delivered back to the environment. Green buildings aim to use water more efficiently, so that the effects of water use on local ecologies can be reduced as much as possible. (Lucuik et al. 2005, 13.) Many strategies exist to develop water cycles, like choosing right water source for each purpose, design landscaping for little water use and to support the infiltration of stormwater, include green roofs to store and process stormwater, and other strategies. (Kibert 2016, 334-335.) It is important to address the water pollution and environmental damage done by the construction activities, and more regulations related to water monitoring and handling at construction sites should be implemented (Waidyasekara, De Silva & Rameezdeen 2013, 115).

Green buildings use materials and products that are recycled, reused, locally available, and wood products that are certified and made from renewable resources. Selecting the right materials and products is important for the green building project, but many definitions exist for green building materials. When selecting the building materials, it is important to pay attention to the quantity of

materials that are needed, so there would be no unnecessary waste. Reusing materials is also important, so it is encouraged to use the deconstruction strategy: dismantling a building that already existed and using those materials again in the new building. Recyclable products and materials containing recycled content or renewable resources should be prioritized. (Kibert 2016, 367, 375-376.) According to a study by Coelho and De Brito (2012), to get any notably environmental impact reduction, recycling would have to be raised above 90%, and the resulting materials must be included into new construction. Recycling percentage of 90% can be achieved and some real demolitions have even exceeded that. (Coelho & De Brito 2012, 16-17.)

Developing green buildings has many challenges, and one of the most important ones is reducing energy and carbon footprints by a significant amount. Renewable energy systems, like solar or wind systems would be better options, since they would not have as much negative health and climate change impacts. For example, using solar energy, ground coupling, and radiant cooling, a building could generate the same amount of energy as what it consumes. Using better energy designs can reduce energy consumption, but it should also be supported by strict energy standards and codes. (Kibert 2016, 269, 272.) However, green buildings should aim to use little energy, and that energy should come from renewable energy. Energy-efficient building uses different design strategies to decrease the building's energy use, such as insulation and efficient ventilators. When energy needs to be used, sustainable sources of energy like solar power and wind energy are preferred. If sustainable sources are not enough, then fossil fuels need to be used, but it should be used as effectively as possible. (Sayigh 2014, 13-14.) If the building is designed properly, and it has low energy and carbon footprint, there should be no increase in the capital costs and the operational costs should be significantly lower (Kibert 2016, 274).

#### 4.3.2 Economic

A challenge that comes with introducing sustainable construction and green building comes from the belief that new technologies, green materials, and extra design would increase the initial costs. Many clients believe that green building is more costly and risky, even though numerous studies have shown the

economic benefits of a sustainably designed buildings. (Johnson 2000, 1.) The upfront costs for green building might be higher compared to conventional construction, but that premium is decreasing. There are many benefits that would later save on costs, like reduced energy bills and potable water consumption. Several methods exist for analysing costs for green construction, for example, LEED Rating System or the Green Globes Rating System. (Kubba 2012, 494-496.) However, most building owners and developers are only interested in building a project and selling it. For developers, this might be due to them usually being paid a fee based on the first costs of the project. If the sustainable design costs more for them, they do not get to experience the economic benefits that come on the long run. (Johnson 2000, 3.)

The misconception that green building is more expensive can cause fear for the developers since there is already concern over the costs of short-term debt and building materials. It is believed that the direct capital costs, which include those costs linked to the original design and construction, are higher in green construction than in the conventional construction. Direct operational costs include costs needed to operate and maintain a building through its full life, for example, energy and water use, waste, insurance, maintenance, property taxes, etc. However, studies have shown that increased costs that come from advanced systems can be paid off by having better design which in turn downsizes the number of systems. (Kubba 2012, 502-504.) Green buildings are generally designed to be energy efficient, take advantage of solar energy, utilize geothermal heating and cooling systems, utilize rainwater collection systems, reduce venting, etc. All these designs can make the building more economically beneficial for owners and operators. (Johnson 2000, 4-6.) Green buildings also have benefits that reduce many risks and liabilities, which should affect the insurance rates. Such benefits could be natural light, off-grid electricity, and commissioning. (Kubba 2012, 502-504.) Other than saving money on costs, there is a possibility of higher return on investment. For example, investing into energy performance can bring added economic value, which can pay off when the building is sold. (Popescu, Bienert, Schützenhofer & Boazu 2012, 454-455.)

Capital and operational costs are easily measurable, since the data is available and quantifiable, but there are many indirect and external factors that can have

an enormous impact but are harder to measure since they are not quantifiable, like productivity (Kubba 2012, 502-506). Numerous studies show that green buildings and their features have a positive impact on employee productivity (Miller, Pogue, Gough & Davis 2009; Singh, Syal, Grady & Korkmaz 2010). Features that are thought to influence indoor environmental quality include advanced ventilation, increased daylighting to reduce energy, views to outdoors increasing contact with natural environment, air quality enhancement, materials with low toxicity, etc. (Heerwagen 2000, 3). It is unclear why these features would have an impact on productivity, but healthier employees are usually happier employees, which in turn increases productivity and worker satisfaction. However, there are studies that challenge the claim that productivity could be measured precisely enough, and that the method of measurement does not include many important factors. For example, Byrd and Rasheed (2016) challenges the idea of precision in measuring productivity, since no agreed definition for productivity in an office environment exist. (Byrd & Rasheed 2016, 10.)

#### 4.3.3 Social

From the construction context, social sustainability is usually seen from these perspectives: quality of living, occupational health and safety, and future professional development. It should take into consideration all stakeholders, including the users, construction personnel, operators, and even the local community. It has also been argued that green building should take into consideration the wellbeing and comfort of users, accessibility within the building, and awareness of sustainability. For example, in a public green building, there should be high security, accessibility for disabled people, and recycling bins available. (Zuo & Zhao 2014, 273-276.) As mentioned before, there are many green building features that can improve tenant or employee health. Better air quality, plenty of natural light, view to the outdoors, and effective noise control. All these features make the building a more comfortable and better environment to live and work in. (Kubba 2012, 506-507.)

Many signs are indicating that the green building movement is becoming more standardized to owners, developers, tenants, and other stakeholders (Kibert

2016, 1). Figure 3 shows the varied reasons why developers, owners or tenants would be more interested in green building, and how their perceptions affect the value of green buildings (World Green Building Council 2013, 35). For developers to choose green building, there is a connection to sales and costs, as green building has usually higher sales prices and sales happen quicker, as well as rapid return on investment. Tenants would be more likely to lease a green building as it has positive impacts to health and wellbeing, which is also connected to increased productivity. The benefit for owning a green building relates to slower depreciation, lower exit yield, and increased rates for occupancy. Between developers, tenants, and owners, they also share many other benefits, like lower transaction fees, corporate image and prestige value, compliance with legislation and requirements, and lower refurbishment costs.

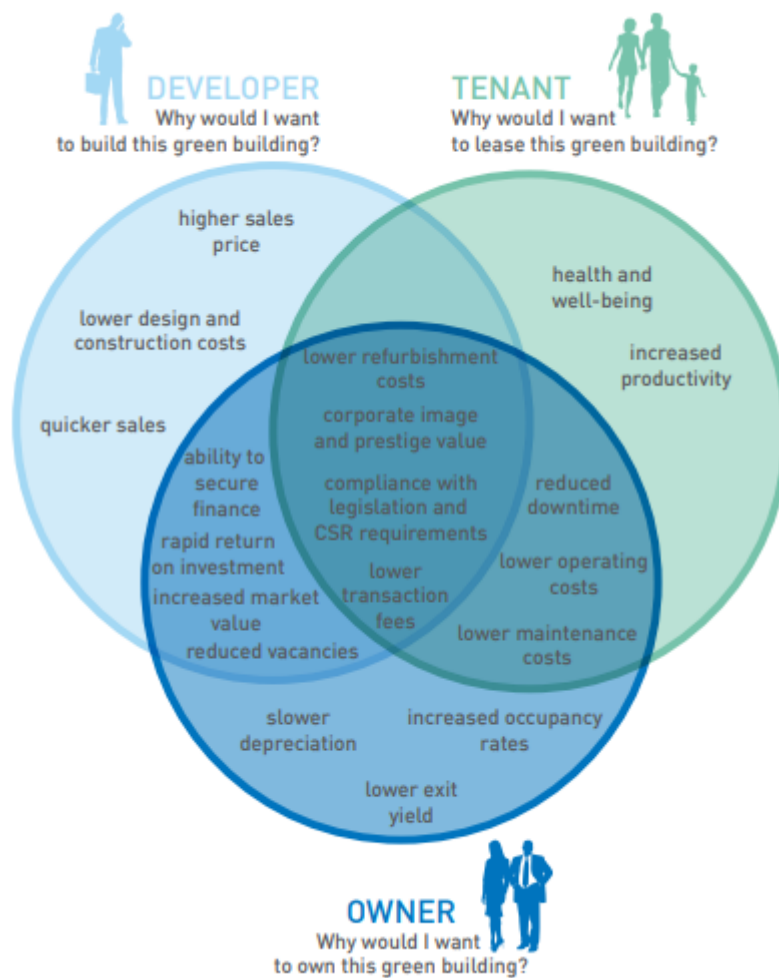


Figure 3. Stakeholder perceptions that affect the value of green buildings. (World Green Building Council 2013, 35)

Figure 4 looks at a case from Canada, and it shows how different stakeholders benefit from green building. The figure shows that occupants, owners, municipal government, and investor/lenders have the most benefits, while neighbours and designers do not benefit from it as much as the other stakeholders. Benefits like occupant health and comfort usually refers to factors like better air quality, natural light, having access to a view outside, etc. Ecology was explained in the environmental chapter, as green buildings aim to protect existing ecologies or improve what has been damaged in the past. There are many benefits like reducing emissions, water use, material use, etc. Green buildings can also benefit by reducing climate change impacts. There are also many economic benefits that were mentioned in the economic chapter related to direct capital costs, direct operating costs, and productivity effects. Also, reducing risks and decreasing the infrastructure reliance are benefits of green building. (Lucuik et al. 2005, 12-14.)

|                                   | Occupant | Neighbor | Owner  | Developer | Designer | Investor / Lender | Municipal government | Provincial government | Federal government |
|-----------------------------------|----------|----------|--------|-----------|----------|-------------------|----------------------|-----------------------|--------------------|
| Economic                          | Dark     | None     | Medium | Medium    | Medium   | Light             | Light                | None                  | None               |
| Occupant health                   | Dark     | None     | Medium | None      | None     | Light             | Medium               | Medium                | Light              |
| Risk reduction                    | Light    | None     | Dark   | Medium    | Medium   | Medium            | None                 | None                  | Medium             |
| Climate change impact             | None     | None     | None   | None      | None     | None              | Medium               | Medium                | Medium             |
| Ecological                        | None     | Light    | Light  | None      | None     | Light             | Medium               | Medium                | Medium             |
| Decreased infrastructure reliance | None     | None     | Medium | Light     | None     | Medium            | Dark                 | Light                 | Light              |
| Occupant comfort                  | Dark     | None     | Medium | Light     | None     | Light             | None                 | Light                 | None               |

Figure 4. Green building stakeholder benefits. (Lucuik et al. 2005, 12)

#### 4.4 Green Building Assessment

Many countries and regions have created their own green building assessment tools to help with developing green building, and the assessments change depending on the country's local climate conditions (Zuo & Zhao 2014, 272-273). Green building certificates are being recognized around the world, which shows progress towards sustainable practices in the construction sector. Already in 2021, there were at least 74 green building certification systems, from which most of them are conducted by members of the World Green Building Council. (United Nations Environment Programme 2022, 53.)

Finland has its own Green Building Council Finland (FIGBC), which is part of the World Green Building Council. They focus on sustainably built environment and making sure that the built environment is an important part to the solution for climate change. (Green Building Council Finland 2023a.) Finland uses different environmental rating systems to measure, verify and compare real estates' environmental performance. Some of the most used ones include LEED, BREEAM, RTS-ympäristöluokitus and Joutsenmerkki. (Green Building Council Finland 2023b.)

LEED (Leadership in Energy and Environmental Design) is the most widely used rating system for green buildings. LEED fits for all building types and building phases and it looks at all the critical factors that will make the building more sustainable. (U.S. Green Building Council 2023.) Its strengths are solid criterion and comparability with the rest of the world. Even though it is a system that uses American practices, it is still partly applicable with many other European countries, like Finland, which is why it is used in more than 130 countries. (Green Building Council Finland 2023b.)

BREEAM (Building Research Establishment Environmental Assessment Method) is Europe's leading environmental rating system since it is based on European practices. The rating system can easily be adapted to take Finland's best practices into account, which makes it easier to apply the requirements into projects. (Green Building Council Finland 2023b.)



RTS-ympäristöluokitus (eng. environmental classification) has been developed for Finnish conditions, and to take into consideration Finnish legislation and the diversity of the building stock. It is based on European standards (CEN TC 350 standards) and connects the best practices in the sector in Finland. (Rakennustietosäätiö 2023.)

Joutsenmerkki is the most well-known environmental rating system in the Nordic countries, and it shows to organizations and people that the products fulfil strict criteria. The criteria include the product's whole lifecycle from the raw materials to production, use, recycling, and disposal. It is a highly valued brand and there are around 15 000 products and services in the Finnish market approved by this rating system. (Ympäristömerkintä Suomi 2023.)

## 5 INTERVIEW RESULTS

### 5.1 Forming categories

Each interview creates 3 categories, forming 9 categories altogether (Appendix 2). The first interview had categories named “impacts to environment”, “business and market side”, and “stakeholder and society”. The second interview had categories “stakeholders”, “business and operations”, and “environmental factors”. The third interview had categories “nature and environment”, “stakeholders and society”, and “legislation and requirements”. From these categories, 4 main categories will be created to answer the research question: Environmental, Economic, Social, and Legislation and guidelines.

### 5.2 Background information on subjects

Three construction sector companies were chosen for an interview. The construction sector companies will be anonymous, and their interviews will be called Interview 1, Interview 2, and Interview 3. The reason for choosing to keep the interviewees anonymous is due to ethical considerations, however, short introduction will be given of each one. Interview 1 is a Finnish real estate and construction sector organisation. Interview 2 is a Finnish real estate development and construction sector company. Interview 3 is a Finnish construction company that operates in residence, business premises, and infrastructure sectors.

### 5.3 The future relevance of sustainable development for the construction companies in Finland

This chapter looks for answers to the research question of what the future relevance of sustainable development is for the construction sector companies in Finland. For the sake of clarity and readability, the following subchapters will be named after the 4 main categories.

#### 5.3.1 Environmental

All interviews mentioned something related to the environment and what an impact construction sector has on it. Environment has an important role when

discussing sustainability in the construction sector. These environmental impacts are one of the reasons why the interviewees considered sustainability to be currently so important in the sector. During the interviews, some of the points that came across were the consumed energy used by the construction sector and the emissions caused by the sector's actions. The interviewees also pointed out some current issues with materials. The construction sector uses more raw materials than the other fields and the use of materials should be minimized.

“Sustainable building means energy and material efficient building...” (Excerpt from interview #3)

Other than those, the interviewees also mentioned how construction sector companies should take notice of materials, for example, with responsible material chain, taking responsibility for used materials, and preferring sustainable alternatives for materials, for example, low carbon materials. Recycled materials were also mentioned a few times during the interviews. Materials was a recurring word through all the interviews.

While materials were mentioned many times, so was global challenges and goals. For example, Finnish and global climate goals was mentioned as an important point that construction sector companies should take into consideration. Also, other challenges like climate change, and diversity and loss of nature were brought up, as well as the goal for carbon neutrality. These global challenges are creating discussions around the world, and they are currently highly relevant topics in Finland as well.

Other than materials, another word was mentioned in all interviews: lifecycle. One interviewee discussed about the lifecycle-wise future, which would take the lifecycle of the whole built environment into consideration. Other points were that it is important to take responsibility for the lifecycle of not just the finished building, but the whole process that goes into building it.

“Responsibility should also be taken from the whole building's lifecycle, including energy consumption and used materials.” (Excerpt from interview #3)

Other than the building's lifecycle, there were many other criteria and requirements mentioned for the buildings to be considered sustainable. For

example, long-lasting, energy efficient, sustainable heating, green electricity, and environmental classifications and guidelines.

The interviewees seemed positive about the future, as they talked about preparing for the climate change and creating buildings that can endure future conditions. It was also discussed how certain concepts have already changed for the better during the past 10 years, like renewable energy and solar panels.

“Ten years ago... solar panels were quite rare, these days actually we are not building... buildings that do not have solar panels.” (Excerpt from interview #1)

It is expected that sustainability would be seen more important in the future from the perspective of environment. Since different environmental values related to diversity of nature, increasing greenery, and biodiversity are becoming trendier among customers and other stakeholders.

### 5.3.2 Economic

It was mentioned that one of the reasons why sustainability is currently so important for the construction sector companies is due to its economic effects. For example, competitiveness was mentioned as an important factor for the companies. Sustainability helps to create an image of the company and it can perform as a selection criterion for young employees, investors, and customers. These factors help with creating competitive advantage for the construction companies.

“... we see it (sustainability) as really important in terms of competitiveness...” (Excerpt from interview #1)

Sustainability could also be considered to create economic opportunities, as new alternatives for materials and designs are created. This also causes construction companies to expect their partners to understand the issues behind materials and designs that are not made sustainable. It also encourages them to look for partners that can provide these alternatives.

“We also use external designers, so they should be aware and understand.” (Excerpt from interview #2)

“In supply chain management we... map partners who can offer lower carbon products.” (Excerpt from interview #3)

It should also be noted that sustainable construction can be good on the long run due to its value preservation. The value preservation happens since the building is made using materials and designs that are made to last longer, but it could also happen due to the expectations that sustainability will become even trendier in the future, which would increase the value of the building.

“...sustainable buildings preserve their value in a different way compared to something... made by short-term optimization.” (Excerpt from interview #1)

It was also mentioned that financiers might demand for sustainability in return for funding and cheaper financing during high money prices. This could also force construction companies to take steps towards sustainability when funding is needed.

“Responsible operator can be the key to financing.” (Excerpt from interview #2)

The interviewees expected that sustainability will become even more important in the future when looking from the perspective of economic factors. Especially, as a trend, it has become important for investors and consumers as well, and the construction sector companies should have the ability to meet their requirements.

“The sustainability perspective is increasingly important to our investors and customers.” (Excerpt from interview #3)

As sustainable development is becoming more central, it has an important role in everything we do, including decision-making. However, there are concerns whether the customers would be willing to pay more for sustainable alternatives in the future. One interviewee explained how the customers answer in surveys that sustainability is important to them and they want more of it. However, when it comes time to pay, the customers are not ready to spend more for the sustainable alternatives. The amount of people willing to spend more create a small marginal group, which in this case, would not be enough to make sustainability profitable. One interviewee mentioned that they would be hesitant to do more than required if it creates additional costs, especially since there is no guarantee for return. For sustainability to work in a business sense, it must be cost effective for the companies.

To prepare for the sustainability, one interviewee mentioned to constantly use systematic analysis for the production to see what should be prepared for, what are the current trends, and what is the forecast. Technology was also pointed out for being important, as the amount of automation and building technology has already increased and will continue to increase in the future. Also, as another interviewee mentioned, companies could prepare for the business opportunities that sustainability can bring, for example, with sustainable alternatives for materials and designs.

### 5.3.3 Social

As was mentioned in one interview, one in five earns their living from the built environment directly or indirectly, so construction companies have an enormous impact on the society. Having the image of a company that practices sustainable actions and operations would be appealing for young and new employees looking for a job. Sustainability can also be shown in the company operations, for example, when endorsing diversity in the hiring process. Other examples of social responsibility could be gender distribution, supporting non-bullying and diversity, and ensuring that the employees are being heard.

“Personnel well-being and personnel surveys, from there comes opinions about which direction the employees think matters should be taken.” (Excerpt from interview #2)

There were also other examples related to company operations, such as human rights evaluations, good management, taking ethics into consideration, and looking after the employees and their rights.

“... employees... understand work safety... they actually get salaries...” (Excerpt from interview #1)

It is also important for the sake of future generations, and it can be used to attract investors. As global challenges, like climate change and loss of nature are becoming more relevant, there are increasing expectations for companies and the construction sector to start solving these issues. These global challenges are said to be one of the reasons why sustainability will become more important in the future.

“Sustainability will become more important in the construction sector, because we have global challenges... to solve...” (Excerpt from interview #3)

“... start to make... sustainable solutions that will last for the future generations and it is one of our supporting arguments for professionals, like investors.” (Excerpt from interview #1)

It is expected, that with the increasing issues like global challenges, the customers are also starting to demand more sustainable options from the construction companies. For example, increasing greenery has become important, especially since many people want to live in the city where exists a lack of greenery. Other values related to biodiversity and diversity of nature are also becoming more common and construction companies must have the ability to answer requirements related to their customers' values. As was mentioned in one interview, sustainability is also about good quality of life, so there are many different reasons that could cause customers and users to start demanding sustainable practices from the companies.

As one interviewee said, there are many different types of operators in the sector, and some of them are more sustainable than the others. Green Building Council Finland (FIGBC) ry and Rakennusteollisuus RT (RT) ry were mentioned for having an important role in the sector. According to one interviewee, FIGBC's activity and increasing number of memberships could reflect how there exists a common desire to develop the sector. According to another interviewee, the role of RT as an umbrella organisation was impressive. It was also mentioned that in the future, RT could work as an interpreter in the legislative preparations and as a bridge to take steps forward.

#### 5.3.4 Legislation and guidelines

All interviewees felt there would be more laws, regulations, and guidelines in the future that would enforce sustainability in the construction sector. Taxonomy was mentioned during all interviews, as it was thought to work well as an incentive. The taxonomy is referring to the new EU taxonomy, which is a classification system including a list of economic activities that are sustainable. The EU taxonomy provides appropriate definitions for sustainable economic activities, creating security for companies and investors, which in turn would increase

investments towards sustainable projects. (European commission 2023.) One interviewee worried about the lack of concrete requirements making it difficult to follow all the guidelines. There was hope that the increasing legislation and specific requirements, like taxonomy, would make it easier to follow the new standards. Another interviewee explained that the coming legislation would define, for example, what sustainable construction according to the taxonomy is like or what would be relevant and essential for the company and their stakeholders.

“There will be an increasing legislation on sustainability, e.g., the EU-taxonomy CSRD-directive...” (Excerpt from interview #3)

As part of the construction processes, it was mentioned that there are requirements and criteria that should be considered, for example, taxonomy criterion, energy economy, carbon dioxide emissions, EPBD-directive, environmental certificates, environmental classifications for buildings, and Building Act. On top of these, there exist additional requirements from customers, users, investors, and other stakeholders.

According to one interviewee, it is expected that the existing legislation will also become more specific and include more precise limits that should not be exceeded. Rules and guidelines related to sustainability would gradually become part of building codes and regulations, and there would no longer be separate taxonomy inspections. According to another interviewee, there is a new Building Act coming and it will not be the only change the construction sector will see. Besides the new regulations, one interviewee mentioned the importance of volunteers who are encouraging to invest into sustainable products and services. It was said to be more efficient and faster when the market wants sustainability, however, the legislation and regulations would act as a final push for the last operators of the sector to come towards sustainability.

“Legislation that perhaps pushes more in a certain way that even the last ones will cross the border.” (Excerpt from interview #1)



## 6 DISCUSSION

### 6.1 Review of results

When asked if the interviewees felt that sustainability is currently important in the sector, the answers were positive. Many reasons were given, but everyone seemed to agree that the environmental impacts that the sector is causing is one of the main reasons. Energy consumption and emissions were highlighted, as they were mentioned many times. As was discussed before, around 40% of the consumed energy comes from construction and buildings, and around 40-50% of all waste generated comes from construction and demolition (Tähkänen & Tähtinen 2021, 4). All interviewees seemed to be aware of the environmental impacts that the sector causes and pointed it out as something that is thriving companies to take responsibility.

Finnish and global climate goals, as well as carbon neutral goals were mentioned as one of the reasons why sustainability has become currently so important. Finland has the goal for reaching carbon-neutrality and fossil-free welfare society by 2035 (Ministry of the Environment 2023), which shows how serious Finland's government is about sustainability. With the government taking action, the construction sector is also following along.

Other reasons given for the importance of sustainability were seen from the economic point of view. Competitiveness was mentioned, as sustainability can create competitive advantage for the company. For example, being seen as a sustainable company or a company that practices sustainability, can be beneficial to the company image. As was mentioned in the interviews, sustainability might be a selection criterion for young employees, financiers, investors, customers, business partners, and other stakeholders. Companies are experiencing high demand for sustainable alternatives from customers and even employees seem to start expecting their companies to take steps toward sustainability. As one interviewee explained, they are taking the next generation into consideration in their decision-making and have started to use sustainability and their company's sustainable practices as a supporting argument for their investors. Since

sustainability has become globally trendier, it is no surprise that society has started to adapt it to their values.

Based on the interviews, it was clear that the companies saw the possibility of developing new alternatives, which could create new business opportunities. However, while it was considered important to meet the expectations and requirements of the stakeholders, one interviewee worried about the customers' willingness to pay more for sustainable alternatives. According to the interviewee, customers were excited for sustainability, but were not ready to pay more. However, there might not be need for customers to worry about the costs of sustainability. As was discussed earlier in chapter 4.3.2, sustainability may not be as expensive as many believe. The upfront costs for green building might exceed conventional construction, but many benefits later would save on costs, like reduced energy bills and potable water consumption (Kubba 2012, 494-496). As one interviewee also said, sustainable buildings preserve their value better compared to buildings made by short-term optimization. If customers were aware of all the benefits that green building and sustainable practices, designs and materials bring, perhaps they would be more willing to pay higher upfront costs. This way, construction companies would no longer feel pressured to pay additional costs for producing sustainable alternatives, since there would be higher guarantee for profit.

All interviewees seemed to believe sustainability only becoming more important in the future. Protecting the environment and nature was one of the reasons, but so was the increasing legislation. It is expected that sustainability will become an important part of the future legislation and more specific guidelines will be introduced for construction sector companies to follow. Examples of these legislations and guidelines would be the new Building Act and taxonomy. The new Building Act will enter into force in 2025, and it aims to combat climate change, speed up circular economy and digitalisation, and improve the quality of construction (Ympäristöministeriö 2023). As explained earlier, the EU-taxonomy is a classification system, which consists of economic activities that are environmentally sustainable (European commission 2023). Both, the new Building Act and EU taxonomy, are powerful tools to push the construction sector to take steps towards a more sustainable future.

There are many ways sustainability can be seen in the construction sector, for example, in the construction processes or in the company processes. Many environmental points that have been discussed earlier in the thesis were mentioned during the interviews as well. Energy and material efficient building, using recycled and lower carbon products and materials, building that is healthy and comfortable for the user, long-lasting and not needing much maintenance and repair, minimizing the use of materials and waste produced, taking responsibility for the building's whole lifecycle, etc. All these descriptions seem to fit into the idea of green building. As one interviewee mentioned, green building is one way a company can prepare for the future. Based on the interviews, the construction sector companies are already preparing for sustainability, as legislation has already proved that it is impossible to avoid. Environmental classifications for buildings were also mentioned and LEED, BREEAM, Joutsenmerkki, RTS-ympäristöluokitus, as well as BREEAM infrastructure (formerly CEEQUAL), were given as examples. These classification systems were discussed earlier in the thesis for being most frequently used in Finland.

Besides the construction process, the construction sector companies are including sustainability as part of their companies' other operations. One interviewee mentioned that sustainability should not be a separate part of the company processes, but it should be part of the other processes, like human resources, product planning, implementation process, etc. Like in human resources, sustainability could be seen when endorsing gender distribution and diversity in their hiring process, or non-bullying among employees. In the supply chain, sustainability could be seen by having a responsible material chain and preferring partners who can offer sustainable materials and products. Employees and their wellbeing were also highlighted as important. One interviewee mentioned that it is of utmost importance for them to make sure that the employees know work safety and that they are getting paid their salaries. Human rights evaluations were mentioned as well. As one interviewee said, it is not enough to follow environmental standards, but to also follow the ethical guidelines. Appropriate behaviour with customers and suppliers was given as an example of good management and ethics.

All interviewees believed that the construction sector was going towards a sustainable future. One interviewee mentioned that the sector has a common desire to develop the sector, which would encourage everyone to take steps forward together. Green Building Council Finland, which was explained earlier in the thesis, was also given credit for their activity. One interviewee admitted that there is still much work to do, and challenges are going to become even harder, but the sector is going to the right direction. Since there are customers, financiers, regulations, and other stakeholders putting pressure on the companies, the companies have no other choice but to be more proactive and start preparing.

It can be concluded that sustainability is currently extremely relevant and will only become even more relevant in the future. Construction sector companies need to start preparing themselves, since there can be many changes that they need to make for their business operations. Some of the examples on how to prepare for a sustainable future given by the three interviewees included keeping up with the development of new materials, designs, technologies, and processes. One interviewee mentioned that constant systematic analysis should be done on the production line as well. Construction sector companies need to understand and be aware of the future conditions, so that the buildings can also endure them and be long-lived. Lastly, companies need to keep track of current trends and predictions, while noticing risks and opportunities arising from climate change. Since sustainability has become impossible to completely avoid, construction sector companies in Finland should already start to plan and prepare for a sustainable future.

## 6.2 Conclusion

Sustainable development has become a worldwide trend, and its importance is only growing due to global challenges. These challenges are also the reason for why sustainable development has become so important in the Finnish construction sector. Construction sector is important and influential field, so changes concerning the sector gets reflected into the entire society. On the other hand, several future development directions are reflected into the construction sector as well. (Ahonen et al. 2020, 20.) The sector provides us with buildings, employment opportunities, and contributes towards the national economy, but it

also creates waste, emissions, and uses large amounts of resources. (Zuo & Zhao 2014, 272.) Construction sector uses more raw materials than any other field of industry in Europe. It also uses around 40% of the consumed energy and around 40-50% of all waste generated in Finland comes from construction and demolition. Construction sector is aiming to be more energy efficient and reduce carbon footprints, but a lot more work needs to be done. (Tähkänen & Tähtinen 2021, 4, 41.) Finland is aiming to meet the targets set by European Union for reducing energy consumption and greenhouse gas emissions, which means new legislations have been and will be introduced in EU and Finland.

Sustainable construction deals with environmental, economic, and social issues of a construction with community as a context. Environmental sustainability is about preventing harm to the environment, while also protecting and enhancing the environment. Economic sustainability is aiming to increase profitability by using resources more efficiently, which also relates to the resource-conscious design. Social sustainability responds to the needs of people in all stages of the construction process. It is important to work together with the customers, employees, suppliers, local community, and the other stakeholders. (Hussin et al. 2013, 34.) On the other hand, green building is about designs and construction practices that make buildings last longer, be cost efficient, protect natural resources and ecosystems, and create better environments for users, so that people, organisations, and communities can lead a healthy and prosperous life. (Kubba 2012, 1.)

Many countries and regions have their own green building assessment tools, and they change depending on the country's local climate conditions (Zuo & Zhao 2014, 272-273). World Green Building Council is accelerating sustainability in the built environment, and Finland has their own Green Building Council Finland, which is also part of the World Green Building Council. During one interview, FIGBC's activity and increasing number of memberships was mentioned to reflect how there exists a common desire to develop the sector.

Results of the interviews showed that the construction sector companies seem positive about the future from the sustainable perspective. The interviewees seemed to be aware of the environmental impacts caused by the sector and

believed it to be a thriving factor for companies to take responsibility. Companies also saw the competitive advantage behind sustainability, as it might work as a selection criterion for young employees, financiers, investors, customers, business partners, and other stakeholders. While some interviewees felt worried about the customers' willingness to possibly pay more for the sustainable alternatives, there was a strong belief that sustainability will only become more important in the future. This could be due to new legislation and specific guidelines related to sustainability that will force construction sector to take notice of sustainable practices. Examples of these legislations and guidelines could be the new Building Act and EU taxonomy. During one interview, it was mentioned that the sector has a common desire to develop the sector, which would encourage everyone to take steps forward together. Considering all this, sustainable development is currently extremely relevant in the Finnish construction sector, and will only become even more relevant in the future.

### 6.3 Ethical considerations

In Finland, researchers follow the same general ethical principles, and all scientific research must follow the guidelines on responsible conduct of research issued by TENK (Finnish National Board on Research Integrity). The ethical principles include respecting the dignity and autonomy of human participants, respecting cultural heritage and biodiversity, and research not causing harm or damage to the research participants or other subjects. People participating in research have the right to participate voluntarily, but they can also discontinue their participation, or completely refuse to participate. They also have the right to be informed of the content of the research and how their personal data will be processed. (Finnish National Board on Research Integrity 2019, 8-12.)

This thesis followed the general ethical principles and the guidelines on responsible conduct of research issued by TENK. Before the interviews, the emails that were sent had information about the thesis and the topic of research. For the privacy of the interviewees, they are marked as anonymous. The interviewees had participated in the research voluntarily and their consent was asked before the meetings were recorded. The recordings of the meetings will not be disclosed for anyone, nor will they be shared or shown to anyone. The

recordings will also be automatically deleted a couple of months after the thesis process is finished for the sake of privacy. The conversation that happened via email with the third interviewee will also not be disclosed and will be deleted after the thesis process is complete.

#### 6.4 Topics for further research

This thesis focused more on sustainability in the construction process, and how construction sector companies can take environmental, economic, and social factors into consideration in the construction and building part. However, the results of the interviews found that sustainability can be an important factor for the companies' other operations as well. Further research could be done to find out how construction sector companies are taking notice of sustainability in other parts of their operations and company processes.

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## APPENDICES

- Appendix 1. Interview questions
- Appendix 2. Coding and categories for interviews

## Appendix 1. Interview questions

1. How important do you think sustainability is currently in the construction sector? (Why do you feel this way? What makes it important?)
2. Do you see sustainability becoming more important in the construction sector in the future? (Why?)
3. How should construction companies take sustainability into account in the construction process? (Examples of standards or guidelines to be followed? How does your company take it into account?)
4. How should construction companies take sustainability into account in the other company processes? (For example, in human resources or supply chain management. How does your company take it into account?)
5. Do you think there will be new laws or regulations that push construction industry for more sustainable future? (Any examples of such laws or regulations?)
6. Do you think construction sector is moving towards more sustainable future? (How?)
7. How should construction companies prepare for more sustainable future? (How does your company prepare for it?)

\* The interview consists of seven main questions. The questions in the brackets are extra questions that may or may not have been asked to help interviewees to answer the questions.

## Appendix 2 1(9). Coding and categories for interviews

|            |   |
|------------|---|
| Question 1 | <p>Coding: Interview 1</p> <p>Lifecycle-wise future</p> <p>Competitiveness</p> <p>Finnish and global climate goals</p> <p>Climate change</p> <p>Using 30% of the energy and producing emissions</p> <p>Using raw materials more than other field of industry</p> <p>Developing new alternatives</p> <p>Making decisions for the next generation</p> <p>Supporting argument for the investors</p> <p>Sustainable buildings preserve their value better</p> |
| Question 2 | <p>Sustainability is also about good quality of life</p> <p>Important for customers: diversity of nature, increasing greenery, biodiversity values</p> <p>Sustainable development becoming more central and has an important role in everything we do</p>   |
| Question 3 | <p>Environmental classification for buildings</p> <p>Taxonomy criterion</p> <p>Own goals about diversity of nature, using low carbon materials, recycled materials, energy efficiency</p> <p>Communication with customers</p> <p>Planning the construction process</p> <p>Minimizing the use of materials and waste produced</p> <p>Reducing the time of construction also decreases the use of resources</p>   |

|            |  |
|------------|--|
| Question 4 | <p>Responsible material chain</p> <p>No human rights violation</p> <p>Environmental values, like recycled materials</p> <p>Following environmental standards and ethical guidelines</p> <p>Making sure employees know work safety and they get paid their salaries</p>   |
| Question 5 | <p>Taxonomy as a new way and encouragement</p> <p>Building Act</p> <p>Voluntarily encouraging for investing in sustainable products</p> <p>More efficient and faster when the market wants it</p> <p>Legislation will push to the limit</p>  |
| Question 6 | <p>Some operators in the sector are more sustainable than the others</p> <p>10 years ago, solar panels were still quite rare</p> <p>Challenges have become harder and there is still much to do</p> <p>I can see that we are going to the right direction</p> <p>More work needs to be done at all times to take steps forward</p> <p>It has become trendy to go towards sustainable direction</p> <p>Energy classification and environment certificates in the market</p> |
| Question 7 | <p>Keep up with the development</p> <p>New materials, processes, and technologies</p> <p>What kind of risks can come</p> <p>It is important that our buildings are long-lived</p> <p>How to prepare for climate change</p> <p>Buildings can endure future conditions</p> <p>Constant systematic analysis on our production</p> <p>What are the current trends and predictions</p> <p>Smart technology and automation is easier for the user</p>                            |

## Appendix 2 3(9). Coding and categories for interviews

| Coding: Interview 1  | Category                        |
|--|---------------------------------|
| <p>Lifecycle-wise future</p> <p>Finnish and global climate goals</p> <p>Climate change</p> <p>Using 30% of the energy and producing emissions</p> <p>Using raw materials more than other field of industry</p> <p>Environmental classification for buildings</p> <p>Own goals about diversity of nature, using low carbon materials, recycled materials, energy efficiency</p> <p>Minimizing the use of materials and waste produced</p> <p>Reducing the time of construction also decreases the use of resources</p> <p>Responsible material chain</p> <p>Environmental values, like recycled materials</p> <p>Following environmental standards and ethical guidelines</p> <p>10 years ago, solar panels were still quite rare</p> <p>It is important that our buildings are long-lived</p> <p>How to prepare for climate change</p> <p>Buildings can endure future conditions</p> | <p>Impacts to environment</p>   |
| <p>Competitiveness</p> <p>Developing new alternatives</p> <p>Sustainable buildings preserve their value better</p> <p>Taxonomy criterion</p> <p>Taxonomy as a new way and encouragement</p> <p>Voluntarily encouraging for investing in sustainable products</p> <p>More efficient and faster when the market wants it</p> <p>It has become trendy to go towards sustainable direction</p>   | <p>Business and market side</p> |



|  |                                 |
|--|---------------------------------|
| <p>Energy classification and environment certificates in the market<br/>What are the current trends and predictions</p>  |                                 |
| <p>Making decisions for the next generation<br/>Supporting argument for the investors<br/>Sustainability is also about good quality of life<br/>Important for customers: diversity of nature, increasing greenery, biodiversity values<br/>Communication with customers<br/>No human rights violation<br/>Making sure employees know work safety and they get paid their salaries<br/>Smart technology and automation is easier for the user</p> | <p>Stakeholders and society</p> |

|   |   |
|---|---|
| <p>Question 1</p> <p>Question 2</p> <p>Question 3</p> | <p>Coding: Interview 2</p> <p>Business orientation<br/>Customer and personnel expectations<br/>Regulations<br/>Investors<br/>Selection criterion for a young employee<br/>Responsible operator can be the key to financing<br/>Customer may demand for sustainability<br/>Carbon neutral goals<br/>Energy classifications</p> <p>Sustainability as part of human resources, product planning, and implementation process, not separate<br/>Ability to meet requirements<br/>Customers' willingness to pay more</p> <p>Lifecycle</p> |
|---|---|

|            |  |
|------------|--|
|            | <p>Green electricity at the worksite</p> <p>Heating during work in a sustainable way</p> <p>Additional costs</p> <p>Cost effective</p> <p>Emissions from machines and equipment</p> <p>Energy used at the construction site</p> <p>Competitive products</p>                        |
| Question 4 | <p>Social responsibility</p> <p>Endorsing diversity in recruiting</p> <p>Personnel well-being and their opinions</p> <p>Good management and ethics</p> <p>Appropriate behaviour with customers and suppliers</p>   |
| Question 5 | <p>Lack of concrete requirements</p> <p>Building Act</p> <p>Efforts related to low carbon and circular economy</p> <p>Taxonomy</p> <p>New regulations will come</p> <p>Competitively sustainable way</p>   |
| Question 6 | <p>We have gone forward</p> <p>Financiers, regulations, and customers put pressure</p> <p>Responsibility report</p> <p>Must be proactive and go forward</p>  |
| Question 7 | <p>Awareness and understanding</p> <p>To integrate it into everything</p> <p>Need of consultants who know regulations</p> <p>The role of Rakennusteollisuus RTN</p> <p>Alternatives for materials</p> <p>New business opportunities</p> <p>This is more of an integrator thing</p> |

## Appendix 2 6(9). Coding and categories for interviews

| Coding: Interview 2   | Category                       |
|---|--------------------------------|
| <p>Customer and personnel expectations</p> <p>Investors</p> <p>Selection criterion for a young employee</p> <p>Customer may demand for sustainability</p> <p>Customers' willingness to pay more</p> <p>Social responsibility</p> <p>Endorsing diversity in recruiting</p> <p>Personnel well-being and their opinions</p> <p>Appropriate behaviour with customers and suppliers</p>  | <p>Stakeholders</p>            |
| <p>Business orientation</p> <p>Responsible operator can be the key to financing</p> <p>Sustainability as part of human resources, product planning, and implementation process, not separate</p> <p>Ability to meet requirements</p> <p>Additional costs</p> <p>Cost effective</p> <p>Competitive products</p> <p>Taxonomy</p> <p>Competitively sustainable way</p> <p>Financiers, regulations, and customers put pressure</p> <p>Responsibility report</p> <p>New business opportunities</p> <p>Good management and ethics</p> | <p>Business and operations</p> |
| <p>Carbon neutral goals</p> <p>Energy classifications</p> <p>Lifecycle</p> <p>Green electricity at the worksite</p> <p>Heating during work in a sustainable way</p> <p>Emissions from machines and equipment</p> <p>Energy used at the construction site</p> <p>Efforts related to low carbon and circular economy</p> <p>Alternatives for materials</p>  | <p>Environmental factors</p>   |

## Appendix 2 7(9). Coding and categories for interviews

|            |  |
|------------|--|
| Question 1 | <p>Coding: Interview 3</p> <p>Construction industry has effectiveness in relation to sustainability</p> <p>Uses nearly 40% of all consumed energy in Finland</p> <p>Causes over 30% from the emissions</p> <p>One in five earns their living from the built environment</p>  |
| Question 2 | <p>Global challenges to be solved</p> <p>Climate change and loss of nature</p> <p>Important for investors and customers</p> <p>Increasing legislations</p> <p>EU-taxonomy – CSRD directive</p> <p>EU Green claims initiative</p> <p>Sustainable construction according to the taxonomy</p> <p>Essential for companies and their stakeholders</p>   |
| Question 3 | <p>Energy and material efficient building</p> <p>Long-lasting and needs as little energy, maintenance and repair as possible</p> <p>Healthy and comfortable for the user</p> <p>Criteria and requirements: EU-taxonomy, energy economy, carbon dioxide emission, EPBD-directive, environmental certificates (LEED, BREEAM, Joutsenmerkki, RTS-ympäristöluokitus, CEEQUAL), Building Act</p> <p>Requirements from investors and users</p> |
| Question 4 | <p>Operational procedures are described including instructions and risk management related to sustainable construction</p>   |

|            |   |
|------------|---|
| Question 5 | <p>Inspecting sustainability aspects of operations on a corporation level and as part of business processes</p> <p>Human rights impact evaluation</p> <p>Map partners who can offer lower carbon products</p>   |
| Question 6 | <p>Existing legislation to be specified</p> <p>More precise criterion and limits in the future</p> <p>Guidance and rules change to building codes and regulations, no more separate taxonomy inspections in the future</p>  |
| Question 7 | <p>Sector has a common desire to develop the construction sector</p> <p>Green Building Council Finland's activity and their memberships increasing</p> <p>Through climate change related risks and opportunities</p> <p>Responsibility for the buildings' whole lifecycle including energy consumption and used materials</p> <p>Green building</p> <p>Green areas cool environment during summertime and reduces heatwaves</p> <p>Green areas bind water and act as small-scale storage for the urban runoff during rainstorms</p> |

| Coding: Interview 3  | Category               |
|--|------------------------|
| <p>Uses nearly 40% of all consumed energy in Finland</p> <p>Causes over 30% from the emissions</p> <p>Global challenges to be solved</p> <p>Climate change and loss of nature</p> <p>Energy and material efficient building</p> <p>Long-lasting and needs as little energy, maintenance and repair as possible</p> <p>Through climate change related risks and opportunities</p> | Nature and environment |

|  |                               |
|--|-------------------------------|
| <p>Responsibility for the buildings' whole lifecycle including energy consumption and used materials</p> <p>Green building</p> <p>Green areas cool environment during summertime and reduces heatwaves</p> <p>Green areas bind water and act as small-scale storage for the urban runoff during rainstorms</p>   |                               |
| <p>One in five earns their living from the built environment</p> <p>Important for investors and customers</p> <p>Essential for companies and their stakeholders</p> <p>Healthy and comfortable for the user</p> <p>Human rights impact evaluation</p> <p>Map partners who can offer lower carbon products</p> <p>Sector has a common desire to develop the construction sector</p> <p>Green Building Council Finland's activity and their memberships increasing</p> <p>Requirements from investors and users</p>                          | Stakeholders and society      |
| <p>Increasing legislations</p> <p>EU-taxonomy – CSRD directive</p> <p>EU Green claims initiative</p> <p>Sustainable construction according to the taxonomy</p> <p>Criteria and requirements: EU-taxonomy, energy economy, carbon dioxide emission, EPBD-directive, environmental certificates, Building Act</p> <p>Existing legislation to be specified</p> <p>More precise criterion and limits in the future</p> <p>Guidance and rules change to building codes and regulations, no more separate taxonomy inspections in the future</p> | Legislations and requirements |