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SEINÄJOEN AMMATTIKORKEAKOULU
SEINÄJOKI UNIVERSITY OF APPLIED SCIENCES

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# Importance and Real Added Value of Sustainably Manufactured and Installed Artificial Grass in Finland

Thesis

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## Thesis abstract

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Sustainability and life cycle thinking are more important today than ever before. Pollution, plastics, overconsumption, and global warming has risen a ton of questions, demands but luckily also solutions. The purpose of this work is to determine what is the real added value of sustainable solutions in artificial grass business. It will be measured in terms of additional investment towards the whole project. The whole project comprehends raw material of the grass, construction of the base of the field, field installation, filling material of the field, maintenance and finally recycling. It is important to know what is the value that customers see in these sustainable solutions and what is the level of their knowledge towards the subject. Not only for the planet, but also for the continuous improvement in regulations and laws concerning for example microplastics.

First there needs to be examined the background theory of sustainability, microplastics, life cycle thinking, sustainable development goals and much more. The next move is to examine the field of business that the case company is operating in. Lastly there is background information about the case company itself.

This thesis includes interviews with carefully picked cities from Finland that have made this kind of purchases. Thesis required detailed, high-quality answers from people in similar positions but in different circumstances and environments. Position had to be in touch with projects of building or renewing artificial grass fields in order to conduct answers that are reliable and accurate as possible.

From the results and analysis can be discovered information of what is the level of knowledge around sustainable topics within the respondents, how they rank the importance in each topics, and what is the value of a sustainably manufactured and installed artificial grass field project.

[1] Keywords: Artificial grass, Sustainability, Microplastics, Football

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## Opinnäytetyön tiivistelmä

Tutkinto-ohjelma: Kansainvälisen Liiketalouden tutkinto-ohjelma

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Kestävyys ja elinkaariajattelu ovat nykyään tärkeämpiä kuin koskaan. Saastuminen, muovit, liikakulutus ja ilmaston lämpeneminen ovat nostaneet kysymyksiä, vaatimuksia mutta onneksi myös ratkaisuja. Tämän työn tarkoituksena on selvittää, mikä on kestävien ratkaisujen todellinen lisäarvo tekonurmiliiketoiminnassa. Se mitataan lisäinvestoinneilla koko hankkeelle. Koko projekti käsittää nurmen raaka-aineen, kentän pohjan rakentamisen, kentän asennuksen, sen täyttömateriaalin, huollon ja lopuksi kierrätyksen. On tärkeää tietää, millaisia arvoja asiakkaat näkevät näissä kestävissä ratkaisuissa ja mikä on heidän tietämyksensä aiheesta. Ei vain planeetalle, vaan myös esimerkiksi mikromuoveja koskevien määräysten ja lakien jatkuvaan parantamiseen.

Ensin on tarkasteltava kestävän kehityksen taustateoriaa, mikromuoveja, elinkaariajattelua, kestävän kehityksen tavoitteita ja paljon muuta. Seuraava askel on tarkastella toimialaa, jolla tapausyhtiö toimii. Lopuksi on taustatietoa itse tapausyhtiöstä.

Tässä opinnäytetyössä haastatellaan tarkasti valikoituja kaupunkeja Suomesta, jotka ovat tehneet tällaisia hankkeita. Opinnäytetyö edellytti yksityiskohtaisia, laadukkaita vastauksia samanlaisissa tehtävissä, mutta erilaisissa olosuhteissa ja ympäristöissä olevilta ihmisiltä. Työntekijän aseman piti olla yhteydessä tekonurmikenttien rakentamis- tai uudistamishankkeisiin, jotta vastaukset olisivat mahdollisimman luotettavia ja tarkkoja.

Tuloksista ja analyysistä voidaan löytää tietoa siitä, mikä on vastaajien tietämyksen taso kestävistä aiheista, miten he arvostavat kunkin aiheen tärkeyttä ja mikä on kestävästi valmistetun ja asennetun tekonurmikenttähankkeen lisäarvo.

[1] Asiasanat: Artificial grass, Sustainability, Microplastics, Football

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## Pictures, Figures and Tables

## Terms and Abbreviations

| | |
|---|---|
| **Artificial grass** | Alternative solution for natural grass in football- and outdoor fields. Usually manufactured synthetically and installed to areas where year around use of natural grass brings challenges. |
| **Microplastics** | Small, up to 5 mm of diameter pieces of plastic waste. Can be harmful for humans, waters and life in the ocean. |
| **SDG** | Sustainable development goals gathered by United Nations in order to provide direction for international development of sustainable future. The main goal is to make the world a better place for everyone to live. |
| **Life cycle thinking** | In this case, life cycle thinking means research and development around the product from it's manufacturing part all the way to recycling or declining the product finally. |
| **LCA** | Life cycle assessment is a tool for conduction sustainability research around the life cycle of a product or service. |
| **B2B** | Business-to-business markets. The opposite of business-to-consumer markets. |
| **Qualitative research** | Research, which aims to achieve results that provide a big picture of the issue. Mostly conducted with interviews. |
| **Quantitative research** | Research, which aims to achieve results that provide the biggest possible amount of data that helps to analyse a bigger phenomenon. |
| **Climate change** | Remarkable long-term change in global or local environment. Changes can occur in temperatures or wind patterns. The interval for examination can be anything from years to million years. |

# 1 INTRODUCTION

## 1.1 Sustainability

We are currently experiencing times, where sustainable actions are mandatory for every organization, business and an individual. Planet needs to be taken into consideration when making it as a playground for development of industries. The bright side is that many companies today are genuinely taking actions to be able to offer sustainable solutions for their customers. Unfortunately, in many cases the sustainable alternative of a product has additional value, not only for the product itself, but also for the price. Creation of sustainable product requires a lot of planning, differentiation in the manufacturing part, raw material picking, and skilled sales force to clearly show the customer what can be achieved with the new type of sustainable product. In many cases the problem is that clients are demanding more and more sustainable development from a company, and there might be difficulties to answer them.

## 1.2 Research question

In this case, the issue is the awareness of sustainable alternatives among the customers. Saltex is a manufacturer of artificial grass in Finland and their products are seen widely in the Nordic Countries as football fields. Company has a long history in turf production, installation, and innovative business practice. In case, all the components can be delivered in a sustainable way. Life cycle of a football field is 10 years according to Saltex, it happens to be the same exact time frame for a footballer to develop his/her skills to the highest peak. With sustainable high-quality turf, sustainable maintenance, biodegradable filling material of the field and appropriate recycling of the old field, players get the best environment to develop in the sport.

Thus, Saltex has committed to develop their products and life cycle towards sustainability, how is the situation between the clients in Finland? Usually, this kind of projects are quoted with open request for quotations. This means that for instance cities can open a website where companies can see their requirements towards the project, and therefore by following the guidelines they are able to make a quotation.

First, are the potential customers aware of the sustainable development in the industry? If the responsible members in the city sports procurement department are not aware of different sustainable filling materials for the field, how can they demand it in the request for quotation? Second important aspect is money which is the core of this research. What is the real value of sustainability in this kind of projects? To be more precise, what is the extra amount of money customers are willing to invest towards a football field which has a large, 10 years life cycle? Even without further knowledge in artificial grass production and turf fields, it is obvious that the price can be dramatically lower when choosing the project which has minimal consideration of sustainability.

### 1.3 Limits and boundaries of the research

Research about this subject could be huge because the subject is quite complex and huge. That is why there needs to be set limits and boundaries. Keeping in mind the research question, limits are set to

### 1.4 Research methods

Thesis is researching and analyzing data that will be collected from carefully selected group of customers instead of a survey for a larger audience. The data that is collected should be able to indicate what customers really think and value, not just a wide span of yes or no - answers. Therefore, the appropriate research method that has been chosen is qualitative research method.

According to Surbhi (2018), qualitative research method is in fact the type of tool that develops understanding from the thinking and feelings of the target of questionnaire.

| BASIS FOR COMPARISON | QUALITATIVE RESEARCH | QUANTITATIVE RESEARCH |
|---|---|---|
| Meaning | Qualitative research is a method of inquiry that develops understanding on human and social sciences, to find the way people think and feel. | Quantitative research is a research method that is used to generate numerical data and hard facts, by employing statistical, logical and mathematical technique. |
| Nature | Holistic | Particularistic |
| Approach | Subjective | Objective |
| Research type | Exploratory | Conclusive |
| Reasoning | Inductive | Deductive |
| Sampling | Purposive | Random |
| Data | Verbal | Measurable |
| Inquiry | Process-oriented | Result-oriented |
| Hypothesis | Generated | Tested |
| Elements of analysis | Words, pictures and objects | Numerical data |
| Objective | To explore and discover ideas used in the ongoing processes. | To examine cause and effect relationship between variables. |
| Methods | Non-structured techniques like In-depth interviews, group discussions etc. | Structured techniques such as surveys, questionnaires and observations. |
| Result | Develops initial understanding | Recommends final course of action |

*Figure 1. Comparison of qualitative and quantitative research methods (Surbhi, 2018).*

Above Surbhi presents the comparison table between qualitative and quantitative research.

Tilastokeskus (n-d.) emphasizes that the selected group of respondents in qualitative research are able to answer freely about their experiences and opinions regarding the subject. This appreciative method grants the possibility to gather data in its full gloriousness. Sometimes, qualitative research can be used together with quantitative research in order to get the best possible outcome for the research. In this research, combining these two

methods is not necessary, it could even make the data more complicated, and the results might turn out confusing.

### 1.5 Structure of thesis

Main headings 1 & 2 are for background theory research. In main headings 3 & 4 the research will be analyzed with conclusions.

# 2 SUSTAINABILITY AND CUSTOMER SATISFACTION

The fact that everyone has seen or heard news concerning glacier melting, ocean level rising, or temperature differences is guaranteed. It affects consumers, businesses, distributors, wholesalers, consumers, and everybody else. As concerns will spread hugely across economies, this research is focusing on the marketing and manufacturing side of the issue.

According to Hoffman (2018), corporate sustainability has taken a giant leap from sustainable movements to regulations towards environmental improvement, and there can be noticed the fact that almost every CEO is reflecting sustainability as a key for future success. Environmental aspects implemented to corporate world has enabled a lot of new positions. Find a Job -part of The Guardian's website reveals numerous environmental positions, such as Climate Action Environmental Engineer, Environmental Data Customer Coordinator, and many more. When sustainability might create pressure for other person, simultaneously it could open a door for two new experts.

## 2.1 Concept of sustainable development

In 1987 a phenomenal report was written about sustainability, environment, and development. Today, it can be recognized as a handbook of sustainability. Brundtland (1987, p. 16) states that humanity owns the ability to develop sustainably in the present time, in a way that it does not compromise the opportunities for the people in the future to do the same efforts. Brundtland (1987, p. 17) emphasizes that sustainable development requires certain point of direction in the investments, and careful planning of technological development. All the components travel hand-by-hand and must be in order. He also points out that the process will be difficult and though decisions must be made. But in the end, development of sustainability will lean on the will of politics.

Sustainable development is being supervised around the world. To restrain the global warming caused by humans, an additional protocol was merged to United Nation's global warming contract. This particular protocol carries the name of "Kyoto Protocol", and it was

first adopted in December 1997. But difficulties in complexity of the ratification process delayed the implementation of the protocol until February 2005 (United Nations, n.d).

Kyoto Protocol consists of many agreements towards sustainable and better tomorrow. The protocol is being held together by 28 different articles, each one with their own agreements. Second article of Kyoto Protocol holds the topics of efficient energy use, technology research and development around new and renewable energy sources, and energy efficiency development (Kioton pöytäkirja 13/2005). These topics are the most concerning ones towards this research and thesis.

## 2.2 Life cycle thinking

Clients expect the products to be tailored, delivered quickly with high quality and relativel low price. At the same time, all the elements of the product must be as environmentally friendly as possible. In order to make this all profitable, the need for co-operation and use of developed technology through the value chain is essential (VTTresearch: Kestävä Valmistus, n.d).

Jussila describes the life cycle thinking being the most important driver towards UN sustainable development and bioeconomy. The rush of climate change motivates companies and their customers to make the transition towards more sustainable ways of living, products and manufacturing (Jussila, n.d).

According to Acaroglu (2018), every product ever created will go through the stages of life cycle, all the way from the material extraction to end of life.

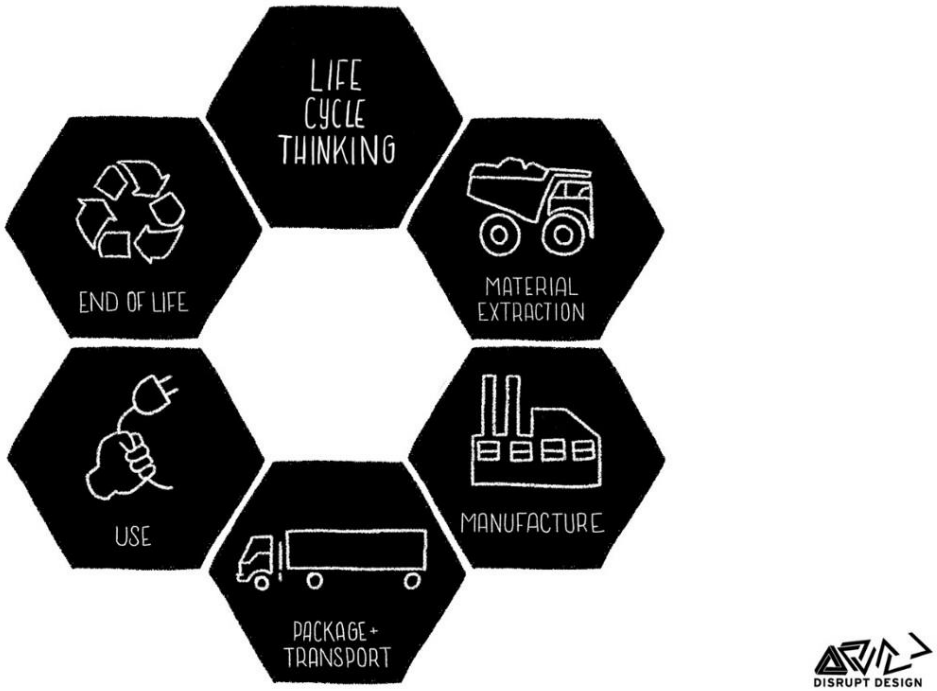



*Figure 2. Life cycle thinking stages (Acaroglu, 2018).*

With the different stages of life cycle, life cycle assessment is an important tool to measure the results. Life cycle assessment (LCA) is a method for evaluating the environmental effect of the whole life cycle of a product. A perfect life cycle holds everything from how the raw materials are gathered, their processing and transporting, manufacturing of the product, distribution, usage, reusage, maintenance, all the way to recycling or declining the product (Nissinen, A. 2013).

Life cycle thinking requires framing and accuracy towards the articulate being explored. The methods must be transparent and clear. Acaroglu (2018) emphasizes the importance of goal and scope when implementing LCA. For instance, studying a restaurant but ignoring the meat production would not be considered as a proper LCA. Raw materials in food production require first cutting down trees, then building a factory, growing the animals, processing the meat along with transportation concerns. Therefore, great variety of variables needs to be taken into consideration.

## 2.3 Alternative solutions for LCA

Nissinen (2013) points the fact that LCA can be expensive and time-consuming, in the worst case it might not give any additional value compared to a simple research or explanation. Luckily there are more tools available for assessment of life cycle such as material and energy stream-based ones.

Environmental footprint connects the different effects and footprints described in LCA.

Ecological footprint concerns ground and water surface that is essential for producing the amount of consumed resources and recycle the piled waste of a community. Typically, ecological footprint can be calculated for lands and areas, but also for companies and products. Comparison happens with ecological footprint and usable biocapacity, with this method the sustainability of the practice can be stated. The outcome is expressed as global hectares, which is the medium ground area for producing and handling the waste of the used resources. Though ecological footprint obtains a wide definition, it only contains bio-based resources and carbon dioxide waste.

Carbon footprint is based of LCA and ecological footprint, but it remains a seperate indicator and contains great variety of different definitions. Difference will appear depending on which greenhouse gas is being taken into account. They can be linked to the process, product, human, company, area or a country. Outcome is expressed as carbon dioxide equivalents, which indicates the certain greenhouse gas effects for climate change with one digit. International instructions for standards are available in order to make carbon footprint calculation easier for all products and services.

Water footprint evaluation is developed for monitoring sweet water consumption. This is because sweet water is one of the scarce natural resources. Water footprint is divided to three water consumption components: water taken straight from blue surface- or ground water, green evaporated rainwater and grey spoiled water storage. Water Footprint Network has published a manual which guides people with calculating water footprint.

In LCA some of the streams of the system can be left unnoticed. They can be left out for presumed small environmental effects or because of small mass- or energycontains. This

can lead to great, even 20 % miscalculations. The centered difference for LCA is measuring the streams in monetary units, instead of fysical units such as mass and energy.

Environmental risk analysis has been developed for recognition of situations in production facilities or transportation, that might bear quantitative or qualitative exeptional emissions to nature. Effects and probability of these effects can be evaluated or estimated to make easier decisions in risk management sector. Environmental risk analysis can be conducted with same methods that have been developed in process safety, such as potential problem analysis.

Environmental system is a tool in an organization that helps management to take all of the environmental aspects into consideration. Functional environmental system is meant to reduce the environmental effects from the whole life cycle of the product or service. When all of the emissions and life cycle effects are known, it is possible to boost the product design and look for more environmental ways for production. Methods for saving the environment will bring advantage in competition and benefit for organization's image.

### 2.4 Customer behavior in B2B

Basic elements of B2B buyer behavior are longer decision making, a small number of leads, large number of stakeholders and deep product knowledge.

According to Gupta (2020), B2B purchases require heavy investments when comparing to B2C sector. Decision making and quotation comparison can take time anywhere from months to even years. Prospective clients can be hard to obtain, and usually B2B sector has very limited number of clients available. A purchasing process in B2B may involve many stakeholders, such as different teams, external consultants, or even different organizations. And finally, link from the heavy investment part, B2B clients usually want all the specific information about the investment they are about to make. Nobody wants to make huge decisions about investments without knowing every possible detail about the upcoming purchase. Pressure is ongoing and Gupta (2020) claims that the marketer of the company might even be working as an unpaid consultant for the buyer.

## 2.5 Agenda 2030 & SDGs

Partner countries of United Nations agreed in 2015 about sustainable development program and appropriate goals that guide the development between years 2016-2030. The pursuit is to swipe away extreme poverty from our planet and secure the wellbeing of environment with sustainable habits.

According to Ulkoministeriö (n.d), the action program of development is applying for every country on earth and the primary responsibility lays on governments. Though governments can not reach this type of goals alone, they require the active participation of local governments, private sector, civil society and citizens. The agreement contains different goals that are linked to sustainable development, and they are supposed to be fulfilled by 2030. These goals are called Sustainable Development Goals (SDGs).

Sustainable Development Goals are a universal action towards planet protection, ending poverty and ensuring prosperity and worldwide peace. Other goals are such as ending hunger, AIDS and gender discrimination. SDGs were formed by the United Nations in 2015. There are 17 different SDGs and they all are linked to each other, in fact UN website describes that actions made in one area will affect other areas as well.


*Figure 3. Sustainable development goals of United Nations (Global data barometer, 2022).*

In addition to economical, human wellbeing, environmental and poverty ending goals Agenda 2030 contains a plan for implementation methods and tools for surveillance and measurement of these implementations. Even when the big topics are just represented as 17 goals, they include 169 subgoals with more than 200 measurement tools (Ulkoministeriö, n.d).

But how is the case company's home country Finland situated with Agenda 2030? In fact, Finland is one of the forerunners with the subject. Implementation in Finland requires a report to parliament every quarter, the first one was given in 2017. Every report contains actions towards all 17 sustainable development goals on national and international levels. Also, the methods must be made clear in every report, and how they are evaluated and analyzed. In addition of report for parliament, Finland also reports the progress to United Nations. In 2016 Finland became one of the first countries to report about their Agenda 2030 implementation plans voluntarily. Ulkoministeriö (n.d) offers the most recent country report in PDF format which was represented by Finland's current prime minister Sanna Marin in July 2020.

## 2.6 Case company and SDGs


*Figure 4. Saltex's impacts on the SDGs.*

The figure above shows the level of impact of the case company to SDGs. They are divided in to three different groups, biggest impacts, direct impacts and indirect and little or no impacts.

Case company has prioritized five SDGs to guide their work base on their impacts and opportunities.

First one to be presented is number three, good health and well-being. This specific goal is about ensuring healthy lives and promoting well-being for all, at all ages. According to United Nations website (n-d.), the goal includes workers health, importance in investment towards universal health coverage. Even though the case company does not have obvious link to the SDG 3 targets, they have considered that good health and well-being is at the core of what their products provide for the end-user. The framework functions around safe and high performing surface for athletes of all ages and levels.

Second prioritized goal is number eight, decent work and economic growth. This goal is about promoting sustainable economic growth, full and productive employment and decent

work for all. Present topics under this goal are economic recovery from the pandemic and recovering the lost full-time jobs which there are about 255 million (United Nations, n-d.) The case company sees the opportunities for economic growth and decent employment in the sports industry in general, as it is a big employer throughout the world. The case company has stated that they could improve the conditions with long-term scope by developing effective measures inside their value chain.

Third goal, number 12, is ensuring sustainable consumption and production patterns. This goal is concerning matters of material footprint, waste, fossil fuels etc. Case company is manufacturing products, therefore the care about the footprint of production is real. Their relevance also leans towards sustainable management and efficient use of resources that can be enhanced in sports, especially in their field which is outdoor sports. The case company believes that sporting events, products and services could work as platforms for promoting sustainable consumption and production through education and campaigns. Also, they have already products that meet the highest standards, and construction methods that are up to 45 % more eco-efficient than traditional system build ups.

Fourth goal, number 13, is about taking urgent actions to combat climate change and it's impacts. Highest priority areas in this goal includes human health, freshwater resources, food security and protection. This is quite wide goal, and anybody could imagine that it suits for all of the companies throughout the world. The case company emphasizes that sports in general can make contributions towards climate change battle through awareness raising and joint efforts.

Last but definitely not the least, fifth goal, number 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development. Goal is concerning life under water. One of the main targets for this goal is preventing and reducing marine pollution of all kinds from land activities including nutrient and marine pollution. This goal is the most relevant at the moment for the case company. Artificial grass fibers and granulates are one of the main sources of microplastics in waters. Case company has a negative impact on this SDG because the microplastic granules from the fields enter the environment within time. Awareness of the issue is high, to fulfill the goal of the SDG they aim to have the right plastics in the right place and follow European Union discussions and regulations on microplastics.

Developed filling material of the field is one of the replies to the microplastics challenge, and the reducing of it is one of the focus areas.

Obtaining and prioritizing possible SDGs is highly important in present time. According to SDSN Youth (n-d.) we are closer than ever to see the poverty in an extreme level. Also human societies are damaging the planet and the nature continuously. Talking about equality, decrease has been recorded between countries. In 2017, more than 750 million people went to bed hungry, when 2 billion people are overweight.

# 3 RESEARCH ENVIRONMENT

Natural and artificial grass have their own concerns in maintenance, installation and features. Both have advantages and disadvantages, which depend on the planned type of usage, geographical location and possibilities for taking care of it.

## 3.1 Artificial grass field business

### 3.1.1 Life cycle

Everything starts from solutions and innovations towards the design of the fiber. For example the length plays an important role, it affects the spread of the filling material outside the field. Also the flexibility of the fiber has to be taken into consideration, it should be soft enough, but still rise vertically upwards after pressure. In the field, different solutions offer increased reduction of migration, biodegradability and bio-based options.

The location of the production also brings it's own concerns. Raw materials and the origin can vary a lot, but also the packaging and even the use of energy. When combining green energy with trusted raw material suppliers and ISO standards, the production process can be trusted.

Installation of the big field can be environmentally thought through. Starting from the transportation from the factory to the field, which can be also planned with sustainable and CO2 compensating methods. Building can be conducted as energy efficient and shockpads can be used to minimize the polymer usage. One big factor in installation is the machinery, which usually are equipped with combustion engine. Installation can be also done with electric machinery, which has zero emissions. Luckily, electric motors are being currently developed all over the world and they are becoming a reasonable option also in the actual use. They are not considered as toys anymore, but real professional tools.

Maintenance is one of the challenges of the life cycle in artificial grass fields. It can be also done sustainably with electric maintenance, for example robots. Electric maintenance

robots have zero emissions. Taking care of the field is important, not only environmentally but also for the playability of the field and the safety of the players.

### 3.1.2 Usage

According to FS-Group (2021), premium artificial grass fields can offer a greater life cycle, more durability, easier and lower maintenance. FS-Group also emphasizes that the development of modern football has a direction towards artificial grass materials.

## 3.2 Artificial grass business in Finland

According to Auvinen (Palloliitto, n.d.) in 2020 there was almost 400 playable artificial grass football fields in Finland. 290 of the were full-size fields and 92 smaller ones. Most of the artificial grass field projects in Finland are requested by public sector, for example a city. Auvinen also points out an observation that usage of artificial grass fields is growing rapidly in Finland, about 20-25 new fields are being built every year.

Biggest artificial grass manufacturer in Finland is Saltex, they are also one of the few FIFA Preferred Providers. Saltex has sertificates of FIFA Quality Pro, World Rugby and International Tennis Federation.

### 3.2.1 Ground and infrastructure

When planning a new area of artificial grass field, first step is to think about the ground and infrastructure which is between the planet and the field. Aspects to take into consideration are connected to protected water areas, stormwater storages and filling material spreading. There are possibilities to build such infrastructure around the field that it benefits the surrounding areas also.

## 3.3 About Saltex

## 3.4 History

History of the case company is interesting, and it contains a lot of happenings. Artificial grass production, installation and maintenance was not definitely the first area of business the owners were involved. To get the best and most accurate images of the fascinating events throughout the years the writer decided to set up a personal interview with the founder of the company.

### 3.4.1 Before artificial grass

Year 1959, brothers from the same family were working as painters. Business for winter seemed quiet so they decided to buy carpets from the next town and sell them in the following months. Carpet business quickly developed and just after few years they started to manufacture handmade carpets and Finnish rugs. New line of carpets started to appear to the stores for resell and in 1970 the first official production facilities were built. Years went by and simultaneously one of the brothers had his own manufacturing in Jyväskylä, the best solution was to merge these companies together.

It was time to build new and bigger facilities since the business was in growing phase. Pastoral carpets came more and more common in Finland. In 1980 need for even bigger facilities lead to a new production location with 5000 square meter of space and about 130 employees. Sales were domestic and exports to Russia.

In 1988 the business was sold, and new company was established in order to manufacture wool and cotton carpets.

### 3.4.2 Transition towards artificial grass production

In Alajärvi, a German company came to install a new artificial grass playground for baseball. Why it was interesting for the case company, is that they noticed the procedure of artificial grass manufacturing was very close with pastoral carpets manufacturing. The interest towards the new type of manufacturing took a leap when they rented out 500 square meters more space and started to develop the manufacturing process. The first field was made to Ulvila and it was for baseball. Same year, 1996 another field was made to Peräseinäjoki.

Artificial grass production quickly developed and took part in the business, the sales reached Sweden, Norway, Poland, Russia and Finland.

### 3.4.3 Merge and acquisitions

Remarkable event took place in 2015, when Saltex and Unisport combined their powers. Saltex, part of the Unisport Group was born. Research, development and manufacturing of Saltex together with Unisport's great marketing granted the possibility for them to offer even better solutions to their customers together.

in 2016 Unisport made an acquisition of Kerko Group to enable one-stop-shop strategy and secure their market leader position in indoor-sports business also. Later there have been more acquisitions in order to expand the product portfolio.

### 3.4.4 Saltex today

Today Saltex is a Preferred Provider of FIFA, and they have obtained certificates of FIFA Quality Pro, World Rugby and International Tennis Federation. Saltex is undisputedly a market leader in sports facilities surfaces and equipment in the Nordic countries.

Product portfolio today includes football, tennis and American football and rugby fields, landscaping turf, systems for fall protection surfaces. Together with Unisport's sport venues they are able to provide huge variety of products.

At the moment, Saltex is focusing heavily on Research and development in order to provide more sustainable solutions for customers. Main focus today is in the filling material of the field.

According to Taloussanomat (n.d.) In 2021, the turnover of Unisport Saltex Oy was 152,4 million euros, with 345 employees.

# 4 ARTIFICIAL GRASS SUSTAINABILITY CASE, SALTEX

## 4.1 Microplastics

Plastic is making life easier in many ways. It is often lighter and cheaper than the compared alternative. If plastic is not disposed or recycled correctly, there is a chance that it could end up in the environment. In this case it will remain for centuries there and keeps degrading into smaller and smaller pieces. These extremely small pieces, which usually have under 5 mm diameter are called microplastics and they are raising a big concern throughout the world (European Chemicals Agency, n.d.)

European chemical microplastic ECHA

Science direct

### 4.1.1 What is considered as a microplastic?

European Chemical Agency (n.d) describes microplastics as solid microparticles that are composed of a mixture of functional additives and polymers. They may also contain some impurities. Microplastic can be formed unintentionally from the wear of large plastic components, like synthetic textiles or car tires. In addition, microplastic can be intentionally manufactured and added to a specific product for a specific cause, like the peeling effect in cosmetic lotions.

According to Liitschwager (n.d) microplastics can be categorized into primary microplastics and secondary microplastics. Primary microplastics covers cosmetics, microfibers from clothes and even fishing nets. Secondary microplastics on the other hand are bigger particles, for instance water bottles.

| Particle category | Diameter range (mm = millimetres) |
|---|---|
| Nanoplastics | < 0.0001 mm (0.1µm) |
| Small microplastics | 0.00001 – 1 mm |
| Large microplastics | 1 – 4.75 mm |
| Mesoplastics | 4.76 – 200 mm |
| Macroplastics | >200 mm |

*Figure 5. Plastics particle category. (Youmatter, 2020).*

The figure above reveles that microplastics can be also divided to small and large ones.

### 4.1.2 Environmental effects

*Figure 6. Living organisms tangeled in microplastics. Sample water off the coast of Hawaii shows the concern of microplastics in everyday life of marine animals (Liitschwager, D. n.d.)*

Microplastics are found in the oceans, all the way from beaches and plankton to whales. Therefore, it is also detected in seafood and sometimes in drinking water. Big issue remaining is that standard water treatment is unable to remove microplastics (National Geographic, n.d).

Yearly, about 42 000 tons of microplastic from various products ends up in the environment. About 16 000 tons of this amount is from artificial grass field's filling material. Also, about 176 000 tons of secondary microplastic is spreading to European waters (European Chemicals Agency, n.d).

### 4.1.3 The first demonstration of microplastics in bloodstream

Results of a research project called "Immunoplast" were released today in Environment International, a scientific journal. New research shows for the first time that very small pieces of plastics around the environment are carried into the human bloodstream. Vrije Universiteit Amsterdam (2022) who actually implemented the research and the tests reveal that they developed an analytic method for tracking remains of micro- and nanoplastic particles in blood. 22 anonymous blood donors and examinations for five different polymers resulted in 75 % of the blood donors having plastics in their blood. It was the first actual proof that plastics can find their way into human bloodstream. The most common plastics found in the bloodstream were polyethylene terephthalate, polyethylene and polymers of styrene. Now that there is tangible proof of plastics in blood circulation, the concern of public health issues are rising. The studies conducted about the health issues now are not accurate and the knowledge is lacking. In Netherlands, there is new research being conducted from the results of this one, where we should be able to get new and more accurate knowledge from the harmful effects of plastics in bloodstream.

### 4.1.4 Regulations and laws concerning microplastics

Currently, there is not a single law covering microplastics in a manner that can be considered comprehensive. In addition, companies do not have any incentives to take actions towards

reducing microplastics in the environment. Despite the lack of current laws, the first step has been taken by ECHA.

According to Borealis (n.d), which is a worldwide supplier of polyethylene and polypropylene, European Commission's "Strategy on Plastics" was complemented with a section of microplastics as an emerging issue in 2017. European Chemicals Agency (ECHA) proposed restrictions for intentionally added microplastics in B2B and B2C products. The proposal was targeting three types of measures: restrictions in markets, labelling and reporting. It seems that the risks around intentionally added microplastics are not fully understood or controlled, therefore the restrictions may even continue towards pellets, powders, flakes and other forms that could have also high risks but remain still unknown.

### 4.1.5 Details of the proposal

As a primary goal, the proposal of ECHA aims to the development of standardization, certification, developed labelling and measures of regulatory for unintentional release of microplastics, also by increasing the reclamation of the plastics at the different stages of the life cycle.

Development and harmonizing different measurement methods for unintentional microplastics, especially secondary microplastics such as textiles and car tires. Goals also reach seawater, in a connection of harmonized data delivery of microplastics.

Last goal is to raise scientific knowledge around the risks of microplastics in drinking water, environment and food.

The main objectives of the proposal rely on ultimate reduction of environmental pollution and risks to human health, and reduction of unintentional release of microplastics. The latest publication of any action around the law establishment has been recorded on February 22nd 2022, when a public consultation was opened for feedback (European Commission, n.d.).

### 4.1.6 Plastics strategy

The new proposal was added to already existed strategy on plastics, but what is the strategy on plastics? According to the European Commission (n.d), the plastics strategy functions as a key element of the transition towards carbon neutral economy in Europe. The contribution aims to reach the 2030 SDGs, Paris Climate Agreement objectives and EU industrial policy objectives. Actions of the strategy are updated rules for packaging in order to increase the recyclability of plastics, improve the ability to separate collections of plastic waste and launching a campaign targeting public authorities and the whole industry. Last action of the plastics strategy was marked on March 11th 2020, when European Commission adopted a new circular economy action plan which included revised legislations to proposals on waste.

## 4.2 Conducting and implementing the research and interviews

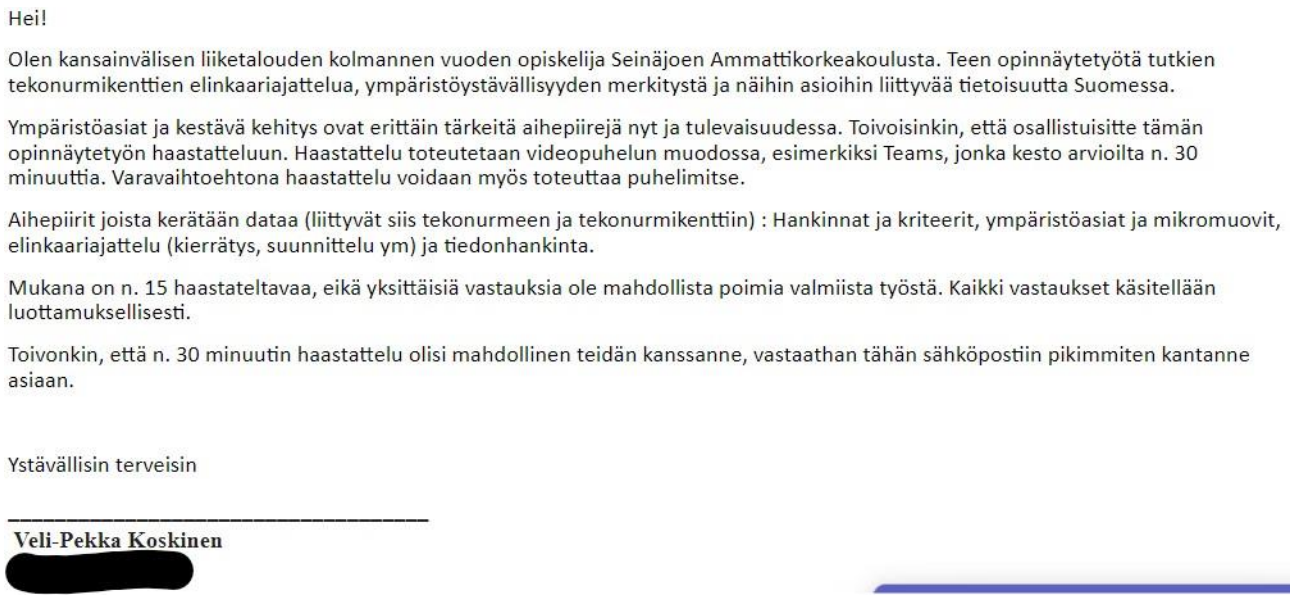
The starting point of this thesis was to implement research in the area of sustainability and artificial grass. To specify further, what is the value of sustainable development, knowledge and new innovations of artificial grass products in Finland, and what is the level of knowledge about these topics between the biggest cities? Studying these topics is highly beneficial for building the sustainable solutions for sports, which is the interest of the buyer, provider, nature, players and the markets in general. Sports where artificial grass can be used as the playground material are playing a huge role in the world, and different conditions require different solutions. Perhaps, in the southern parts of Europe some aspects may be easier to solve because of the weather, but in The Nordic Countries the weather might be a huge obstacle.

First approach of conducting the research was to think about the possible questions in order to receive high-quality, trustful and beneficial answers. In this case, qualitative research was selected as the research method. Qualitative research will require considerably more time in comparison to quantitative research. Luckily, time was not object in this thesis, the quality and usefulness were the main goals. Qualitative research was set and the next stage was to conduct a pattern of excellent questions.

Questions were formed together with the case company and Seinäjoki University of Applied Sciences. The questions were divided in 4 different categories: present moment,

microplastics, life cycle and background information. The aim was to receive information about the current state of purchases and the planned ones in the future to get the image of the volume. The first section was also meant to reveal the frames of general life cycle knowledge and the environmental goals of the city. Second section, microplastics, was supposed to contain questions about knowledge around microplastics, alternative solutions for rubber grit filling material and the laws and regulations regarding microplastics. Third section, life cycle, was formed around recycling the materials, life cycle thinking, life cycle assessment and the environmental aspects in the infrastructure and construction part. The purpose was to find out what is the value of sustainable solutions in percentage rate, and how different cities see the value of recycling the fields. The last section, background information, would contain questions of gathering information to support the purchasing process. Do they think that there is enough information available, what would be the preferred source of information, and which is the best format for this kind of information? With carefully selected pattern of questions between these topics, the research would contain valuable information for the thesis.

When the questions were ready and double checked, it was time to think about the people for interviews. This part was also implemented together with the case company and Seinäjoki University of Applied Sciences. We came up with about 15 different persons that would be able to give their opinions around the subject. Some of them were from the same cities, but it would be only a positive impact. Cities were from South of Finland all the way to North, every point of Finland. The spread of the interview targets is a valuable matter, because even in Finland the weather conditions and habits change a lot when travelling from South to North. Once the candidates were selected, it was time to politely approach them to take part in the research.



Hei!

Olen kansainvälisen liiketalouden kolmannen vuoden opiskelija Seinäjoen Ammattikorkeakoulusta. Teen opinnäytetyötä tutkien tekonurmikenttien elinkaariajattelua, ympäristöystävällisyyden merkitystä ja näihin asioihin liittyvää tietoisuutta Suomessa.

Ympäristöasiat ja kestävä kehitys ovat erittäin tärkeitä aihepiirejä nyt ja tulevaisuudessa. Toivoisinkin, että osallistuisitte tämän opinnäytetyön haastatteluun. Haastattelu toteutetaan videopuhelun muodossa, esimerkiksi Teams, jonka kesto arvioilta n. 30 minuuttia. Varavaihtoehtona haastattelu voidaan myös toteuttaa puhelimitse.

Aihepiirit joista kerätään dataa (liittyvät siis tekonurmeen ja tekonurmikenttiin) : Hankinnat ja kriteerit, ympäristöasiat ja mikromuovit, elinkaariajattelu (kierrätys, suunnittelu ym) ja tiedonhankinta.

Mukana on n. 15 haastateltavaa, eikä yksittäisiä vastauksia ole mahdollista poimia valmiista työstä. Kaikki vastaukset käsitellään luottamuksellisesti.

Toivonkin, että n. 30 minuutin haastattelu olisi mahdollinen teidän kanssanne, vastaathan tähän sähköpostiin pikimmiten kantanne asiaan.

Ystävällisin terveisin

**Veli-Pekka Koskinen**

[redacted]

*Figure 7. Email invitation for the interview.*

Because of the spread, the selected method for the interview was a Teams meeting. It is also very easy for the responder to attend. For the approach as seen in the figure above, I selected a formal email with a backup alternative of a phone call. Email should contain some information about the questions, but never reveal exact phrases. This way the respondents would not be able to for example look answers for them on internet beforehand. It is also important to emphasize the nature of the interview, in this case everything was confidential which in a way might lower the bar to attend this process.

After sending the invitations, I immediately received positive answers and started to fix the timetable for the meetings. Every meeting was a success, people attended with the right amount of importance and seriousness, but also with a taste of relaxed school interview attitude.

### 4.3 Interviews

As mentioned before, in the writer's opinion the interviews were a success. Here are some points that seemed interesting regarding the quality of the interviews.

There is a nonverbal contract of turning the web camera on during Teams meetings, and I must say most of the attendees did it. Although, there was few exceptions and some analysis from the situations. Estimated duration for the interview was about 30 minutes,

but when the attendees had a web camera turned on, they used to stretch to 40 minutes and even 50 minutes. This is not in a way that it would be harmful for the attendee, but it was more because of the high-quality discussion and the flow of information of the topic. People who did not turn their web camera on, for whatever reason behind it, used to last under 30 minutes, even 20 minutes. These discussions were not as qualitative as the longer ones, but still valuable for the thesis. Best way to boost the discussion was to record the meetings with permission and collect the notes afterwards, this way I could participate to the interview with full mind and worry about writing after the meeting.

As a conclusion about interviews is that they were all extremely good, and even many of the attendees said that the topic is up-to-date and important, which made their participating effortless. High quality data was collected as expected, and totally I managed to interview 9 professionals who worked in a field of artificial grass fields, either for sports or playgrounds. Next step is the analysis of the collected data.

## 4.4 Analysis and the results

### 4.4.1 General

We can assume that the questions were formed in the right way and presented to the right people, because many interesting elements could be recognized. Such as similarities, differences and variations between opinions and methods. Presentation of the answers and the analysis are divided to their own categories for clarity.

### 4.4.2 Current situation

Talking about the frequency of replacing old field materials or building a whole new establishment for artificial grass field, 100 % of the interviewed cities had projects of artificial grass fields in the past five years. Situation was quite even with renewing old ones and building new ones. Not all of them were for football, as many people might think. They can be for baseball, and the main usage might be in the winter if it fits for the type of sports people in the city like to cultivate. When asking about the future, all of the respondents

were planning to make new purchases in the next five years. Rise in the price levels is a big concern, but majority of the persons in charge were optimistic towards the future.

100 % of the cities had emission reduction goals, about 30 % of the respondents knew details about them, but the awareness seemed to be in a great level in general. about 20 % of the respondents could tell actual numbers and plans how to reach the goals towards sustainable future.

A great link from the emission reduction goals is to think if the alternative materials and machines regarding artificial grass fields and their assembly could further help these goals? 100 % of the respondents answered yes. A valuable answer from anonymous respondent was: “New grass fields are being planned, and old solutions are not an option”. This shows highly motivated behavior and generally thoughtful thinking towards sustainability level of the city, and how it can benefit their emission reduction goals.

Life cycle assessment was a known method for more than 75 % of the respondents, but only a minority knew what it really meant, and how it can be used when planning to make purchases like this. One of the respondents was sharing his opinion, that LCA could be considered more important aspect than a one-time purchase. Here we can notice that LCA as a tool is known, but mostly only by it’s name, not the way it works and benefits.

Respondents who are professional in their field of business, shared similarities and differences at this section. Generally speaking, we can notice that this section shared positive answers and did not contain any shocking differences.

### 4.4.3 Microplastics

Talking about microplastics, 100 % of the respondents knew what they are and why they are important aspect in artificial grass fields. About 50 % of the respondents shared details and concerns about them, in a link to artificial grass fields, but also other subjects such as transportation and cosmetics.

Interesting question about options for the most used filling material, rubber grit, shared a lot of thoughts and opinions. 100 % of the respondents knew about other solutions, such as natural materials. About 44 % of the respondents had real experience from other innovative materials, but they shared opinions. About half of them thought that they are too expensive at the moment in comparison to performance and durability. Other half was optimistic towards trying more products to find the right one. This is valuable answer, which indicates that cities and sports people are motivated to develop these materials together with suppliers in order to develop the sports environment. A comment to bring up: “We have tested different materials in different fields, but the best solution is still in search. At the moment, it feels like the development is standing still and not moving ahead. Rubber grit seems to be the preferred materials for players, so new innovations are hoped from the manufacturers.”

As presented before, there are laws and regulations for microplastics being set up at the moment in the EU level. What was the level of knowledge about this subject? More than 30 % of the respondents did not have knowledge about the possible upcoming regulations. The rest of the respondents, who knew that some actions are under construction, shared good knowledge and seemed prepared. More or less, it is just waiting for the results and then implementing withing them with the next project.

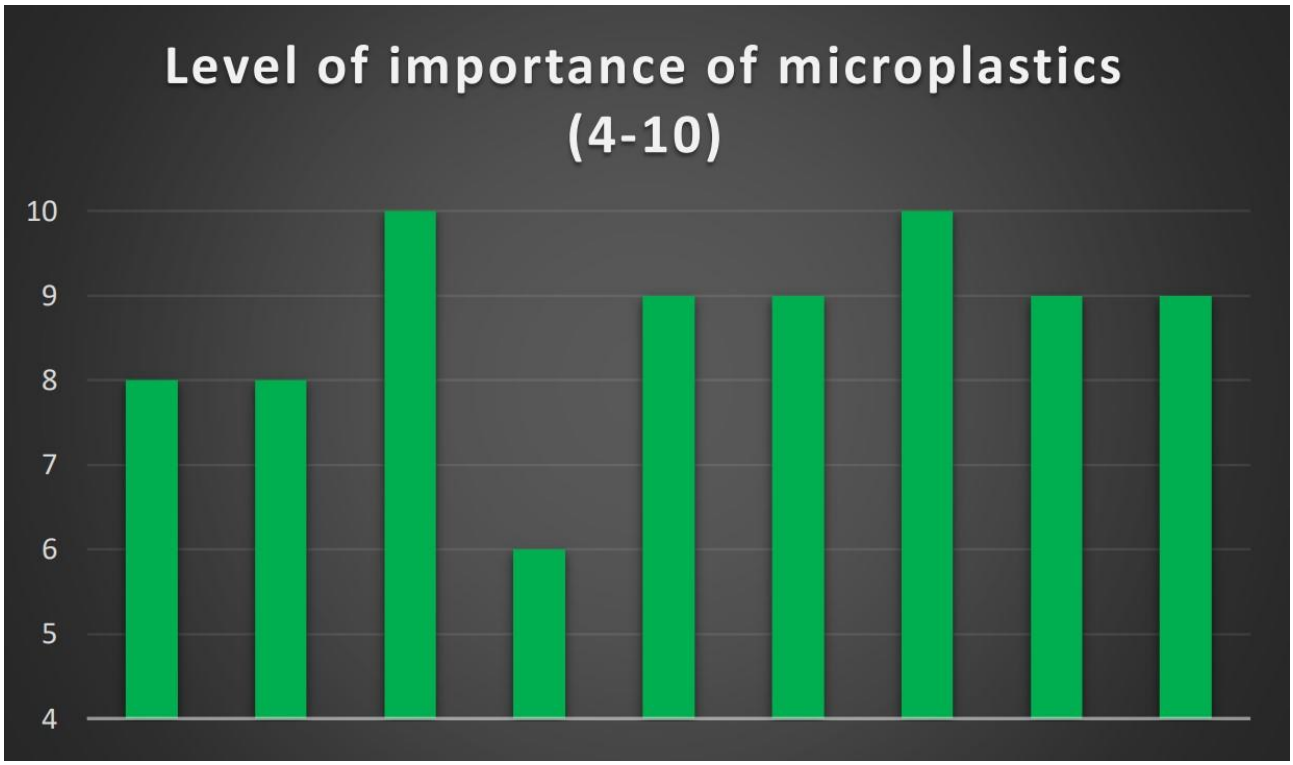



*Figure 8. Chart of the level of importance of microplastics between the respondents.*

From the figure above, we can clearly see that majority of the respondents are thinking that microplastics are an important matter. In addition to the level of importance as a number, comments were made, such as “serious” and “I think it is very important”. None of the respondents neglected the subject.

### 4.4.4 Life cycle

100 % of the respondents thought that recycling is an important factor in a purchasing process of artificial grass fields. But which type of recycling? There we can see differences. One of the respondents had a way of strictly never reusing the grass field. This was simply for clarity, they used to reposition the grass fields for example to filling material in noise walls on highways. Nowadays they use proper waste management companies for it.

Other recycling spots for old artificial grass fields were playgrounds, landscaping, golf fields and even horse stables. Anonymous comment from a respondent: “Recycling is an important selection criteria, but still it is always on a case-by-case basis”.’

Recycling difficult products is not always easy for the end user, and one of the respondents thought that it would be very valuable if the supplier could propose a method or solution for recycling the old field.

100 % of the respondents answered that they take sustainability and environmental affects into consideration in the planning and construction phase of the artificial grass field. 55 % of the respondents particularly brought up that they have plans for stormwater drainage and filters to collect the filling material in order to place it back to the field. Also, majority of the respondents brought up other aspects regarding drains, such as runoff water storages. It is great to see that the sustainable thoughts start from the very beginning of the life cycle of the field.

When asking about the importance of domesticity, all of the respondents answered that it is important and wanted aspect, but the European Union procurement law denies this desire. When an open request for quotation exceeds a certain amount of money, there is no possibility to scope the offers from one country.

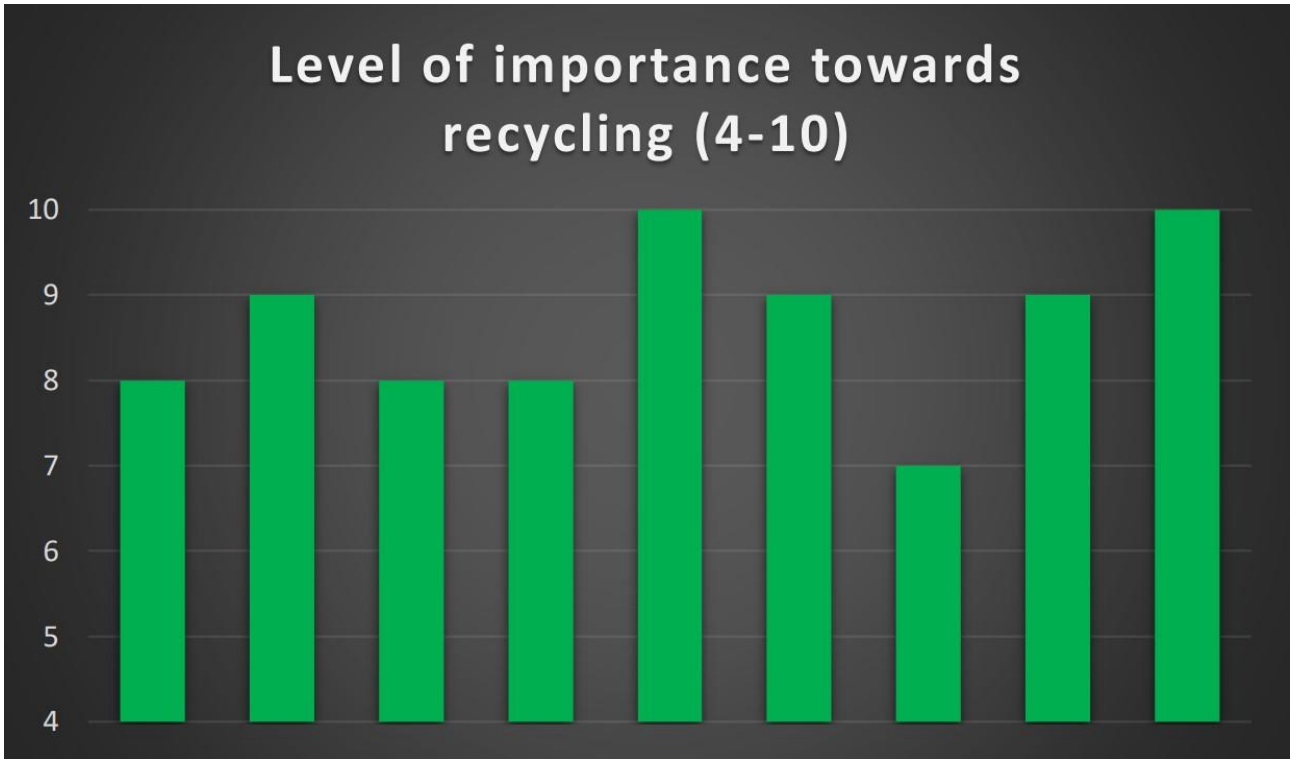



*Figure 9. Chart of the level of importance towards recycling.*

From the figure above, we can see the level of importance towards recycling among the respondents. There are differences in the importance, but none of them is dismissive. The average from this chart was 8,6 which can be considered as a positive number. In addition, 44 % of the respondents gave arguments for their number, such as: ”Keeping in mind the reality, what is the condition of the grass field material after the life cycle”.

The grand question, how much can a fully sustainable artificial grass field bring extra costs to the whole project? In this case, there is an assumption that every aspect of the whole project is considered as sustainable as the current development allows. From the base materials and installation all the way to the maintenance and recycling. The answers were following:


*Figure 10. Chart of allowed tolerance in price if the project is fully sustainable and environmental friendly, presented in percentages.*

From the figure above, we can note that in general level respondents are willing to make extra investments in order to receive a fully sustainable artificial grass field. The average from the values is 17,7 %. The average number shows interest and dedication to more sustainable future and healthly planet.

### 4.4.5 Information gathering

Talking about the information available regarding sustainable alternatives when building new artificial grass fields, more than 50 % of the respondents felt that there is not enough information available, it is difficult to get, or it can not be trusted fully. Information plays a crucial role here, the one requesting an offer should already know what kind of methods are available and what is outdated. Between the respondents, there was some mixed signals. One of them felt like manufacturers just want to keep within the same old methods, and refuse to spend time in R&D. Another important comment was that there is a lot of hype around the subject, so it is difficult to tell what is genuine information and what is false.

So what kind of information would the respondents want to get before making the decision of a new field? A list of subjects the respondents would want to know more about is following:

- Organic options
- Filling materials, and how the user itself feels about the difference
- Filling materials and what they really are made of
- How filling materials behave in hot or cold, if the field is heated
- Material and the manufacturing of the grass, how much does it cause microplastics
- Expenses, total and filling materials
- Is the product tested for Fifa Quality Pro
- Usage in years, quality and materials
- Maintenance

- What is the most recent product
- Sustainability
- Hours of usage, durability

Next, the respondents shared answers of who would be the desired organization to hear from or spread the information. The majority, about 75 % of the respondents thought that Palloliitto (Football Union) would be the best place to hear everything from. Just a few respondents said that they would not like if Palloliitto would give out information, because they might have too high standards to give out that are quite unreachable in costs. They are afraid that they would only refer the most recent, and most expensive one.

Most of the respondents said Palloliitto, because they have skilled and dedicated personell, such as the head of circumstances, Mr. Auvinen. Also, they would give out information that is from official tests, and other user experiences. Most of the respondents were afraid that the company that provides the product, might just give a sales speech that does not tell the whole truth.

Last question was about the information package, what would be the best form for all the information. The majority answered that it should be in digital material. It makes sense, it could be easily modified and updated as the regulations and development goes forward.

### 4.5 Additional interview from the head of circumstances in Palloliitto

As the interviews were going, Palloliitto (Football Union of Finland) came up in almost every conversation, in good and in bad. Palloliitto is the union that cities need to hear when building a new artificial grass field. Many of the respondets desperately wanted to have more information from them regarding sustainable alternatives. There was no choice but to conduct an additional interview with Tero Auvinen, the head of circumstances in Palloliitto.

### 4.5.1 Information sharing

When a new artificial grass is being planned, information plays a crucial role. In which different forms Palloliitto shares information and material to the cities that need it? Is there any upcoming changes or updates in information sharing?

Palloliitto has conducted a handbook called “Tekonurmiopas” together with ministry of culture and teaching. Also, since in Finland there is a limited amount of suppliers, they share information between each other almost weekly. Development in filling materials of artificial grass fields is so rapid, that for now Palloliitto does not see benefits in creating a handbook for them. Palloliitto will give instructions and help regarding planning, quotations and building surveillance. They offer it free of charge.

### 4.5.2 Information gathering

Where does Palloliitto get their information that they pass forward in Finland?

Mostly from the head of circumstances. Auvinen has worked at that role for 22 years, and he is a member and a former member in many important organizations regarding football and turf fields. Organizations are for example working group of circumstances of football in Nordic countries, Union of European Football Associations (stadium inspector), FIFA Technical Advisory Group and European Football turf Group. Auvinen had also given lectures of the subject in international conferences. The information that Palloliitto gathers, is mostly from these places and through Auvinen.

### 4.5.3 Mictoplastics

Does Palloliitto have a plan to announce about microplastics and life cycle assessment policies in the future?

Auvinen points out that Palloliitto is not an official operator of commenting material bans or permissions in artificial grass fields.

### 4.5.4 Impartiality

Palloliitto is a big union and trendsetter, do you think you are in an impartial position?

Naturally the mission of Palloliitto is to make sure that Finnish football clubs can arrange organized football practicing and competing in circumstances that are healthy for humans but also for the nature. They are following the guidelines of FIFA Quality Concept, if a product passes the standards and there is positive feedback available, Palloliitto shares information for other organizations. Also from fields where they receive negative feedback, they share the information.

### 4.5.5 Competition

What does Palloliitto think about the quality of Finnish artificial grass fields compared to other Northern Europe fields? Is the sustainability and recyclability at the same level?

Quality is good and even ahead of many other countries. It is sad to say that considering microplastic pollution, designers, buyers or contractors have not really awakened to the subject. Recyclability of the materials is possible already, but for the expenses it has not raised too much excitement across industry.

### 4.5.6 Importance of sustainability

Palloliitto takes sustainability always into consideration, and Auvinen has spent 4-6 years of his career to further help and gather information from the subject.

Auvinen emphasizes that this whole subject is very complex and partially difficult to explain. There is so much research and other data around the subject.

## 4.6 Observations and suggestions

First and the clearest observation in the results of the interviews was that all of the respondents shared the same mindset about development of sustainable artificial grass field building. Together with the results there is analysis and observations, but in this

chapter, we focus on the main reason this thesis was made: How much are customers willing to pay more in order to have the artificial grass field as sustainable as possible?

As mentioned before with a diagram, respondents together shared a 17,7 % tolerance in price increase if all possible sustainable methods are applied. Rather than looking at the average tolerance, bigger observation can be made in the deviation of the results. The lowest increase was 5 % and the biggest 35 %. That is a big gap, since we are talking about similar projects. Does this mean that some of the cities do not really care about the sustainability or the price?

# 5 CONCLUSION

## 5.1 Description of main results and recommendations

The main result of this thesis is that fully sustainable artificial grass field project from the beginning to the end can be 17,7 % more expensive.

We can also clearly see a problem in information flow. The hard work in production and R&D of the manufacturers can truly not be seen in the eyes of a customer. The most critical comment was: “the knife has not really turned into developing yet”. A factor that makes sharing the right and truthful information forward more difficult, is the amount of it. A complete artificial grass field project includes planning, installation and maintenance, there is a huge variety of topics that this information can be shared from. It just can not be done with a simple phone call or within an offer. It requires information packages, seminars, user experiences and meetings, and obviously they must match with the marketing and pre-assumptions that are being delivered. With all of the above combined, information flow could be better, and the customers would rely more on the manufacturer and not be totally dependent about the football union.

Microplastics was a familiar topic among most of the respondents. A big result was that they averaged 8,6 (scale 4-10) in the level of importance of microplastics, which is a healthy number.

Surprisingly respondents shared the same average with the level of importance towards recycling, 8,6. Talking about these to subjects together, we can say that the result was good. From the interviews, it could be seen that all of the respondents really want to make things right according to sustainability factors, but they do not know simply how. And here again, they trust the manufacturer, supplier or the football union.

As a suggestion, a desperate need is to aim the marketing towards clear and simplified differences in the materials. Starting from the base grass, arguments for why it is the best solution, what are the negative sides and how are they being developed. Moving on to the installation, which is from the writers’ perspective in a brilliant level, anyone who wants to

know if it is possible to do in sustainable way, will get the information easily. And the main topic, microplastics that come from the filling material. Simplified information about the filling material, price differences, how much it needs to be added yearly compared to others etc. And one more mention why the writer would prefer simplicity, it is because there is so much topics around the projects and planning that if the information is not simple and easy to compare, it might make it more difficult to make the sustainable choice.

### 5.2 Usefulness analysis

Results of this thesis bring detailed information from a specific area of business in a small country. In writers' opinion, this kind of results can not be easily obtained in other way than research of thesis. What can be achieved with these results then? More detailed information of what is the opinion of the customers generally about the subjects that the case company is developing with enthusiasm. With the help of this information, case company can focus to bring the most important subjects to the knowledge of the customers. More importantly, case company know has an average number that customers are willing to invest more in a fully sustainable project.

In a nutshell, information from the research can be used to help the manufacturer provide better and more sustainable solutions to their customers, with an additional background knowledge as a starting point for the negotiations.

### 5.3 Validity and reliability

This thesis' validity builds around the industry of artificial grass field manufacturing and building. I believe that the benefit is quite narrow since it is made specifically for the case company. Although this thesis can offer benefit for others because of the sustainability, which is a huge topic and confronts every business around the world. Who knows, maybe electrical installation brings ideas for a unknown company and they obtain it also.

Reliability could be stronger, because this thesis had only 9 respondents and an extra interview. What brings the reliability forward, is that all of the respondents were carefully

picked, and they are the customers and users of these fields, so they were not just random people from the street. In a nutshell, reliability for the case company is in a brilliant level.

### 5.4 Process and reflection

Process was quite long, time consuming and difficult, but the end results are pleasing. This thesis started in spring 2022, and it is finished by Christmas 2022.

In writers' opinion, this thesis was successfully and professionally conducted, according to the instructions given by the University. What could be done different, was the formulated questions. Looking back to the day the interviews were made, there was a perfect opportunity to ask anything from the respondents. Of course, the questions were formed together with the case company and university, but from a writers perspective, the opportunity was not used to it's potential.

In other hand, what went great? From a writers' perspective, the communication, order of tasks that were done, clarity of the final thesis and the importance of the subject were all great. There are always spots to improve yourself and the whole project, but it is more important to finish a started journey than try to improve it day by day.

What the writer would have done different, is the before mentioned usage of the interviews. There would have been so much more potential to get more and other information from them, but it must be understood that this thesis had a certain purpose, and the main focus was to fulfill that. In a nutshell, some of the potential was left unused.

### 5.5 Future research

In this research the main question was how much customers are willing to pay extra for a fully sustainable artificial grass field project. We got the answer as expected, and the next questions would be more deeper, such as why this amount, and which part of the project they consider the most important when reflecting it to the sustainability factors.

Interesting research would be to ask the similar questions from the same group after one year and two years. How will the answers differentiate? Will the microplastics be even more important, or will the monetary part be the main focus after two years. This is a good starting point to consider future aspects.

Future research around the subject would be focused as following:

- Filling materials, differences and widely explained features, costs ect.
- Aspect of pricing, why are the filling materials priced different?
- User experiences in different kind of fields and filling materials
- Microplastics spread capture and repositioning back to the field

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