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THE PROCESS OF GREENING CYCLE AS METHOD OF
OPERATIVE ENVIRONMENTAL MANAGEMENT IN
OFFICE-BASED BUSINESS

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TIIVISTELMÄ

Nimeke: Vihertämisen kiertoprosessi operatiivisen ympäristöjohtamisen menetelmänä toimistoperustaisessa liiketoiminnassa

The Process of Greening Cycle as Method of Operative Environmental Management in Office-Based Business

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Yhteiskunnan rakenteen muuttuminen tuotekeskeisestä yhteiskunnasta palvelu- ja edelleen tarveyhteiskunnan suuntaan on saanut ympäristötyön leviämään perinteisten ja ympäristökuormaltaan mittavampien teollisuudenalojen lisäksi sekä palveluliiketoimintaan että toimialasta riippumattomasti toimistoihin. Yksittäisen toimiston aiheuttamasta suhteellisen pienestä ympäristökuormasta kasvaa jo Suomen mittakaavassa suuri kokonaismäärä.

Toimistoperustaisen liiketoiminnan kannalta ympäristötyöhön motivointi voi olla haasteellista ilman sitä tosiasiaa, että ympäristövaikutuksiin ovat usein sitoutuneet myös suurimmat ylimääräiset kustannukset. Markkinaohjautuvassa

yhteiskunnassa ympäristövastuullisella imagolla on kustannussäästöjen ohella suuri painoarvo niin kuluttaja- kuin yritysten välisessä kentässäkin toimivilla yrityksillä. Kuluttajat vaativat yhä enenevässä määrin osoituksia konkreettisista teoista ympäristön huomioimiseksi pelkkien puheiden ja standardien sijaan. Yrityksen sisällä strategiatason ympäristötyö ei siis ole riittävää, vaan toimintatapojen muutokseen tarvitaan operatiivista ympäristöjohtamista.

Tämän tutkimuksen tarkoituksena on tarkastella operatiivisen ympäristöjohtamisen vaikutusta toimistoperustaisen yrityksen ympäristökuorman vähentämisprosessissa. Tutkimus rajattiin koskemaan toimiston operatiivista toimintaa mukaan lukien kentällä tapahtuva myyntitoiminta. Tavoitteena oli konkreettisesti vähentää toimistotarvikeyritys Lyreco Finlandin ympäristökuormaa ja kustannuksia suoraan sekä välillisesti vaikuttamalla myös henkilöstön yksilökohtaisen ympäristöymmärryksen kasvuun.

Tutkimus suoritettiin lähityöskentelypäiviä lukuun ottamatta etätyönä. Menetelmänä käytettiin tarkoitukseen kehitettyä vihertämisen kiertoprosessia, jossa vuosi jaetaan ympäristökuormituksen mukaan osiin teemoittain. Jakoperusteena käytettiin mukaellen Brett Willsin teoksessaan Green Intentions (2009) esittämää ajatusta seitsemästä vihreästä jätteestä. Menetelmällä pyrittiin varmistamaan ympäristökuormaan liittyvän ymmärryksen kasvaminen ja siten asteittainen muutokseen motivointi jokaisen aihealueen sisällä. Henkilöstö pyrittiin alusta alkaen sitouttamaan prosessiin motivoimalla osastot osallistumaan ideointiin sekä toisaalta noudattamaan annettua konkreettista ohjeistusta. Etätyöstä johtuen yhteydenpito henkilöstöön toteutettiin säännöllisillä, kulloiseenkin aihealueeseen liittyvällä lähikoulutuksella sekä viikoittaisilla henkilöstön sähköpostiin ja intranettiin lisättävillä viherrysvinkeillä. Myös jatkuva etätukena toimiminen osavaiheiden aikana oli tärkeä osa prosessia.

Tulokset osoittavat, että ympäristöjohtaminen on tänä päivänä suurelta osin muutosjohtamista. Suorittavan henkilöstön motivointi on tärkein yksittäinen tekijä vietäessä strategista ympäristöystävällisyyttä tasolle, jossa se konkreettisesti näkyy yrityksen operatiivisessa toiminnassa. Tutkimuksen

mukaan asteittainen muutos koetaan tärkeäksi. Oman toiminnan vaikutuksen ymmärtäminen toimiston ympäristökuorman vähentämisessä toimii vahvana motivoivana tekijänä toiminnan muutokseen. Myös konkreettisten ohjeiden antaminen sekä henkilöstön sitouttaminen niiden noudattamiseen vahvistavat muutosprosessia. Vihertämisen kiertoprosessi vähentää turhia kustannuksia sekä oikein viestittynä lisää vihreän imagon uskottavuutta markkinoilla.

Tavoitteiden saavuttamisessa erityisen tärkeäksi tekijäksi nousee johdon sitoutuminen prosessiin. Lyreco Finlandin tapauksessa prosessin puolivälissä yrityskaupan myötä tapahtuneet muutokset siirsivät painopistettä pois viherryksprosessista, minkä havaittiin vähentävän muutosprosessin tehokkuutta harventuneiden koulutusten myötä.

Vihertämisen kiertoprosessi toimii konkreettisena työkaluna myös jatkossa ja varmistaa säännöllisen ympäristövaikutusten tilan tarkkailun ja kestävän kehittymisen. Ympäristötyöhön sitoutuminen myös johdon tasolla edesauttaa operatiivista toteuttamista ja auttaa pääsemään yhä parempiin tuloksiin ympäristökuorman vähentämisessä sekä kustannusrakenteen muokkaamisessa ja imagon rakentumisessa.

ABSTRACT

Title: The Process of Greening Cycle as Method of Operative Environmental Management in Office-Based Business

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The structural change of society from product-based business to service- and further to need-based business has caused the fact that work for environmental issues has spread from conventional factories and environmentally harmful production to concern services and offices as well. Almost every company has an office, so a relatively small environmental burden caused by an individual office grows remarkable already at the state level and globally even more.

Motivation to work for environmental issues in an individual office could be challenging even without the fact that wasted environmental impacts bound also wasted costs. Besides cost savings, a concretely greener image of a company has its value in the B2C- as well as in the B2B-field. Consumers and clients are more and more conscious of environmental issues and demand

concrete actions instead of speeches, good thoughts and meaningless certifications. Internal work for environmental issues at a strategy level is not sufficient, so operational environmental management is needed for changing old practices.

This research is about the effects of operative environmental management on the greening process of an office-based business. The research is outlined to concern the operative work in the office including field sales. Target was to concretely lower the environmental impacts of Lyreco Finland and to find cost savings directly by changing the operative practices in the office and also indirectly by affecting the level of environmental knowledge of the personnel. During the greening process, the aim was also to create concrete arguments for marketing as well.

The circle of greening process, which was especially created for this diploma work, was used as a method. The circle divides a year to themes and sections separated by factors of environmental impacts. Separation is based on Brett Wills' thoughts of seven green wastes (Wills, Brett. *The Green Intentions*. 2009) and follows it uneasily. The circle aimed at ensuring evolutionary growth of knowledge instead of being revolutionary in the changing process. Committing personnel to the process from its start by asking ideas from them and giving them clear directions was an important part of the research of operative management. Because of working from distance, communication with personnel was operated by frequent training days and weekly greening notes via emails and intranet. Also availability for communication was an important task because of the telecommuting.

Research results of this work show that operative environmental management in an office-based business today is mostly management of change. When the strategic environmental friendliness is taken into a concrete level, the most important individual factor is motivating the operating personnel. Research shows that evolutionary change is found being an efficient way to make a change. Also understanding one's own impact on the environmental burden and on the whole greening process clearly motivates the personnel. Results show that in the operative realization of the greening process, clear directions

of new working practices, being as concrete as possible, and committing personnel to follow them make the process more effective. The operative environmental management and the cycle of the greening process decrease the environmental burden and save costs. The concrete results could be used as believable arguments in marketing and therefore exploited in communication with interest groups.

Commitment of the management is also one of the key factors of success in the greening process. In this research, changes in the business field by a company trade took the focus of the management away from the greening process and made the process more inefficient by decreasing the amount of training days.

The circle of greening process will be used as a tool in the future, as well, and therefore it will help observe environmental impacts of a company and increase sustainable development. Commitment of management to the evolutionary environmental work helps the operating personnel lower environmental impacts, decrease costs and build a concretely greener image.

PREFACE

When I was a little girl, I sat quietly next to my grandfather, watching the campfire after a long day we've spent in the forest. I had learnt a lot from nature, but this was maybe the most important thing to understand: how to listen to the silence and smell the fresh wood around us. Later, as we came back to the city I said I would put a patch to the pipe of the factory so that all the polluting would stop. I chose my road early.

What comes to environmental perspective, much has been already done, especially in industry where consequences are quicker as well in good as it is in bad. Now, when the thinking base is changing from products to services, it is time to concentrate on the office-based business. How to affect the environmental impacts of the office-based business nowadays? There is a lot of information available and even some increase in the interest levels of markets and even employees. There is, on the other hand, also a lack of specific tools and concrete actions.

I think that a new thinking in environmental issues should be evolutionary, not revolutionary. Affecting the environmental impacts on the levels that seem to be small at first sight but need change and the change itself need management. With this diploma work I want to point out that even evolutionary little steps could start the Green Revolution.

I want to thank Lyreco Finland for being a great testing field for the greening cycle. Personnel has very creative ideas, I hope the creativity does not stop at this point what comes for environmental issues. Especially I want to thank the instructor of this work in Lyreco Finland, my sister and HR manager Susanna Mönkkönen, for being the missing link as I worked from distance.

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1 INTRODUCTION

There is a relatively major awareness about the climate change, the importance of the energy efficiency and the effects of environmental degradation. Customers are increasingly searching and demanding for products and services that leave a minimal environmental footprint. Many other interest groups, such as governments, standards, different organizations and investors, are requiring manufacturers and their suppliers to provide more efficient products, processes and environmental management standards. Their expectations for environmental responsibilities now extend to a full life-cycle management of their products, including services. It is surprising that a relatively little part of companies have devoted leadership to what is commonly called green manufacturing.

The European Union has a target called 20-20-20. It means that 20 % of emissions have to be reduced, and the use of clean energy sources has to be increased by 20 % by the year 2020. That target bounds every business environments. Over 40 % of the energy used in the capital area of Finland is used in offices, so the target really influences the office-based business as well.

Besides the green demands of the interest groups, a company is always interested in cost savings, increased incomes and new business opportunities. Companies should be actively looking for unnecessary wastes: eliminating the overuse of energy and cutting unnecessary use of material, just for example. There are also new market opportunities for manufacturers as well, such as supplying new, environmentally friendly products. The greening of manufacturing is not new or local, it is a global phenomenon. It is part of a major change in products, technologies, production processes, services and markets all over the world and business.

Lyreco is a global company that runs an office-material business. It works in 29 countries. This diploma work is done in co-operation with Lyreco Finland, all though its results can be used overall in the other offices as well.

Environmental values are very important to Lyreco. In Finland they have for example an ISO 14001 standard. They have started a new project, which is called the Green Revolution. This project aims to last for the whole year 2010. This diploma work is a part of that greening process of Lyreco Finland.

All though almost everybody is conscious of the facts of natural disasters, rising temperatures, melting glaciers and so on, people are inundated with many issues, concerns and crises. People may have hard time picking up the real issues and understanding them, so that the right decisions could be made. Lack of knowledge is a common problem also in companies. It should be remembered that though the company is interested in making business, having cost savings and getting more incomes, there are people there, who make decisions, operations and actions, which altogether make the big picture. That is why operative environmental management is needed.

1.1 Targets of the work

This diploma work aims at examining operative environmental management as a tool in Lyreco Finland during its greening process. The main task is to create an efficient system for environmental management and test it. The idea is to find ways to get cost savings and to generate cash flow: one important mission of this work is also to find new facts for building a new, concretely greener image step by step in the future. Lyreco Finland is looking for a leading place in market. The greening process and especially new levels of environmental management are one indirect way to find new tools for marketing and sales as well.

The meaning of the greening process really is to do something for the environmental impacts, on which the marketing material is based, by real actions and results. In order to influence the environmental impacts the first task is to recognize them. Afterwards the idea is to affect the seven green

wastes (Wills 2009) of the company by giving information to the employees and encouraging them to participate in the whole process.

Research for environmental change has been made relatively little, but that of changing processes in common is being made widely. Because the changing processes have quite many common characters, the same ideas could be implemented to the creation of the process of greening cycle, which is used as the method of operative environmental management in this work.

Environmental change includes some special problematic concerning the commitment of personnel and how to implement the change so that a real permanent change would remain in the structures of organization. Every member of the personnel must change his/her behavior and find new, environmentally friendly ways to work. (Onki 2002, 8)

1.2 Structure of the work

At the beginning of the work there was a survey on why and how companies use green values when searching for an edge in the competition situation and how the environmental management is closely related to the real environmental values of a company. The first part also represents the green wastes that should be affected.

The middle part of the work is about Lyreco Finland, its starting level and targets. Recognizing the main environmental impacts aims at finding the most efficient ways to affect them by using the greening process in action. The middle part also includes documentation of the research made during the process: what actions have been done and how they have been implemented.

At the end part of the work there is an analysis of how the created greening process succeeded, whether the company got any greener value stream created, or tools for marketing, and whether the brand got any greener.

2 THE NEED FOR GREENING OF COMMERCE

Customers, investors and other interest groups are demanding more and more greener options. Greening of commerce is a huge business in both business-to-customer and business-to-business fields. (Wills 2009, wvi) Consumers like to transfer the responsibility from environmental sustainability onto faceless corporations and companies, but what generates the total amount of emissions and actions against them, is consumers and clients´ personal share of what or where they buy. (Goodall 2010, 3) From a marketing point of view, environment seems to be an argument and an answer for everything.

Going green generates economic benefits in both ways: by cost savings and increasing incomes. Business benefits are numerous, and they can be grouped into six major categories (Wills 2009, wvi):

- cost savings
- increased customer loyalty and attraction
- increased employee attraction and retention
- ability to grow
- innovation and development of new technologies
- increased profit and shareholder values

All though the first kick for greening often comes from the external interest groups and the need for environmental sustainability is admitted, the company is always interested in the economic point of view: what does it cost, how much investing does it need, and what does the company get back? Companies are based from economic perspective, and they can not make decisions that raise their costs higher compared to their peers (Goodall 2010, 18). Companies aim to pursue value to their owners, and most companies require paybacks for their investments in five years or less, even at the expense of the environment. Situation is different, if they see a growing market in environmental sustainability through consumers that are looking for low-emission products. (Goodall 2010, 18)

External interest groups have also very powerful impact on the development processes of companies. Besides the 20-20-20-target of the European Union, which bounds also the Finnish government, the environmental organizations, like Friends of the Earth and Greenpeace, are strongly influencing the development of the green value streams of companies and states. (Finnish Big Ask 2010)

Any company simply can't cut emissions and make a total difference neither does it even want to do that on its own. Business leaders press governments to create targets and schemes to make a bigger impact and to get environmental responsibilities to concern others as well. (Goodall 2010, 18) The prepared climate law would impact individual companies overall as the law would demand emission reductions as well in industry, services and traffic, as in food production and so on. The European Union would supervise the compliance in the way it supervises the Emissions trading, but every state also has its own targets. The Finnish share of the reductions would be 5 % per year, if the law takes effect soon. (Heaps, Ericsson, Kartha & Kemp-Benedict 2010)

2.1 Cost savings

Cost savings are simply proved: if you use less energy, less raw materials, create less garbage and reduce transportation distances, you save money. Potential cost savings on everything, including reduced operational and administrative costs, are perhaps the most talked benefits of going green. (Wills 2009, xvii) For more, taking greener steps before the legislation and other international ways to intimidate is often cheaper. For example emission trading aims to take over new business areas and also regulations are tightening all the time. Companies are uneager to press for measures that may impose penalties or other ways to increase costs. (Goodall 2010, 18)

There are many ways, how a company could start getting cost savings. Often many solutions are already out there and can be easily modified to fit individual companies. However, picking and coming up with right solutions is rather easy and demands a shift in thinking. (Wills 2009, xvii) Expert knowledge in companies is needed, so that right solutions could be made and the discipline to get the project through could be maintained.

2.2 Increased customer loyalty and attraction

Global competition is a norm nowadays, and it is constantly harder both to attract new clients and also to keep the market share a company already has. All though it is hard actually to measure, how many clients a company has kept or attracted, there are surveys that prove the impact of green initiatives true. (Wills 2009, xvii) All though environment is very important for some customers, and one of the factors to lead the choice, the most important factor is social norms that reinforce appropriate behavior. (Goodall 2010, 27) That is how trends are born. Environment is an important factor, but effective it is when it becomes a socially appropriate reason for arguable actions, like it is now.

What all this means is that customers are voting with their choices and clients in B2B-field are asking for proves and documentation to create their own green value stream. More often the environmental system standards are not enough alone, and the interest groups of the company are demanding real operations. If the company is ready to answer their questions, it has a much better chance to reach customers from competitors and attract the ones it already has.

2.3 Increased employee retention and attraction

Keeping the best available employees is one of the main factors in competitiveness of a company. Personnel is our most important resource, outlines the Lyreco Group, too.

As in the cost associated with rehiring and retraining, keeping and attracting good employees is also a very cost-effective way of working. Globalization brings one more factor to the competition of best workers. (Wills 2009, xviii) In the future the green and sustainable values could be very high-rated reasons, how people choose their work places. It is not uncommon even now. The image of a company is created of every opinion and every connection where it is mentioned at loud. (Julkunen 2010)

2.4 Ability to grow

Successful growing by turning green is possible by many different ways that altogether make each other's' impacts stronger. By saving operations for example in energy consumption and waste disposal it is possible to lower the costs (Porter 2002, 2). If the new greener values are properly used in marketing, the incomes will grow. (Wills 2009, xix)

One green company does not make a line of business, but networking with other green companies, or with those who aim to go green in the near future, could waken a common interest for the branch. That increases demand for greener products and services compared to others suchlike. (Määttä & Pulliainen 2003, 38) It also works, if the company changes its raw materials to more environmentally friendly ones (raw materials as well as other capital goods). It is notable also that if company keeps making products in an untenable way, there are no materials left to be processed in the future, and therefore no more possibilities to grow. These choices lead to the growing of the whole market of green. (Wills 2009, xix)

Many banks and other financiers are demanding environmental responsibility as criteria for lending money, so by going green company is also increasing its ability to get financing. It is well known that looking to grow is very difficult without securing the financing first. For all these reasons, a sustainable business has to start its going green before all the other businesses have done the same, when it would be too late to grow. (Julkunen 2010; Wills 2009, xix)

2.5 Innovation and development of new technologies

Successful innovations need serious work and someone, who sees the big picture. The road from an idea to a ready-to-sell item or service is usually well organized and needs hard work from all people involved. Every change, especially if it is for a new thinking or operations, needs leading. (Apilo, Taskinen & Salkari 2007)

Going green is also a big change in the beginning and needs strong management and counseling. When organization integrates green values to its normal way of working, the new way of thinking and seeing might get innovations started by affecting operations or even developing totally new technologies. Being innovative usually gives the company some kind of benefits: increased incomes, profits for image, more publicity and so on. Being innovative with green motivation also gives the company cost and environmental savings. It also leads constantly to more savings, reduction of leading times when using less materials and effectiveness in deliveries. (Wills 2003, xix)

Concatenation of companies that are developing their green value stream drives also their individual work of lessening the environmental impacts of their products, services and/or business itself more effective. The networking of environmental managers of companies gives edges for each company as well as the whole business area or the chain of proceedings. (Apilo et al. 2007, 42-

44; Julkunen 2010) The greening process gives great values also to the customers, when the company is helping them to decrease their environmental impacts. This increases commitment of the customer which ensures that the cooperation will continue in the future. (Wills 2003, xx)

2.6 Increased profit and shareholder value

Developing operations in a durable way increases the interest of the interest groups towards the company. Sustainable way of working and the greening process increases profits of the company even 30-50 % during the first five years. These figures are possible by attracting professionally better and more productive employees, reducing the use of materials, manufacturing and operations costs, and of course increasing revenues from existing and new clients. This is proved by researches and studies, but also by true cases: hard financial results of real companies. Most sustainable companies constantly outperform the rest of the market by the Dow Jones Sustainability Index for example. Such visibility effectively captures the attention and actions of the investors worldwide. (Wills 2003, xx)

It is a comforting thought that the company does not have to be internationally or even nationally listed to get profits from greening work. Research by Bob Willard shows that the size of a greening company does not matter that much: smaller companies increased their profit even more than bigger ones. This might be a consequence from better communication between management (supporting, counseling and controlling level) and personnel (operating level). (Wills 2003, xx)

3 MARKETING POINT OF VIEW

Already in the year 1991 Michael Porter mentioned the use of environmental sustainability in marketing. "America's Green Strategy" (1991) is about how environmental issues should be used as an advantage when boosting the business. Then both business and environment would benefit. (Heiskanen 2004, 10)

From all the interest groups of the company, clients like other companies as well as customers, use most of the power. In the public administration and especially in the media the green customer is an important factor that uses his/her actions and choices to impact companies and to push the whole society to a more durable direction. Governments officially encourage people to use their power by advising them to save energy and to make durable decisions in their spending. (Moisander 2004, 293) This means that interest groups of the company build a net with each other. Laws and directions do not disappear from the field; they just act more behind the customers when the real power of the markets moves to the customers. (Linnanen et al. 1997, 14) Markets are nowadays at the point where international agreement for climate work is not fundamentally necessary, if even possible. Environmental responsibility leads to most profitable direction, so the market leaders would go to that direction. Others follow when they notice that it is profitable or soon because it is a compulsion and a lifeline for a company (Linnanen 2010).

4 ENVIRONMENTAL IMPACTS

In this diploma work and greening process that included in it, one of the target is to find tools to decrease the environmental impacts caused by office-based business. The main task of the work is to create an environmental management system that leads to decreasing of identified environmental impacts.

In the greening process and in the including environmental management system it is important first to identify the sources of environmental impacts of the company. After that the measurement of the starting level is possible. Analysis starts with deep understanding for the main business: the greening process aims to boost and to develop it, not to cause harm to it.

Life cycle assessments are an effective way to analyze the total environmental impacts of the products, services and business of the company. Creating a green value stream and developing the whole process give the most effective results for the business. This work, however, is about greening process in the office-based businesses, so also the following environmental impacts are the ones caused in the offices.

4.1 Seven Green Wastes

Green wastes and environmental impacts have been in discussion at least during the past 20 years. Actions and tips for lowering greenhouse gas emissions are mostly directed to the traditional industry or to consumers. Even though, there is some literature, which could be examined in this research. Richard Porter has considered the economics of waste (The Economics of Waste 2002) and Chris Goodall has deliberated the low-carbon life (How to live a low-carbon life 2010). Both manage the company point of view in reducing environmental emissions and are generalized to office-based

business as well. Brett Wills has considered offices in his book *Green Intentions* (2010) and that is why this diploma work follows its guidelines.

Brett Wills divides the green wastes into seven categories: energy, water, materials, garbage, transportation, emissions and biodiversity. In the following chapter they all will be introduced, but the main wastes examined closer in this diploma work are energy, water, materials, garbage and transportations. Also in the greening operations the environmental impacts of nutrition would be one topic of the information days because of the special demand for it.

4.1.1 Energy

As one of the green wastes energy refers to the energy consumption of the office (in this case). Energy is quite the main requirement of every kind of business, because it is very hard to run a business without it. An operating company or person, who acts, needs to make something to sell. It could be a product or a service, but at least the item should move from its producer to its receiver. In the office-based business the energy consumption is one of the main contributors of negative environmental impacts. This means also that energy has a major potential for improvement and savings. (Wills 2003, 39)

New, fancy offices typically consume more energy than offices in older buildings. That is mostly because of the air-conditioning. Energy costs in office-based businesses still could be only a little over 0,1 % of turnover, so the costs are not the best argument to encourage energy savings. (Goodall 2010, 212) Still, energy consumption causes a lot of carbon dioxide emissions and thus it could cause more costs in the future. Wasted costs are also needless in common, so efficiency in energy usage could save much more.

Energy usage itself is not always at fault for negative environmental impacts, but it is the fossil source of energy and the wasteful overuse of it. Beside previous arguments, it is wasteful because a company usually buys the energy from someone else and therefore controlling the production is harder. Ideal

situation would be, if the company not only uses green energy, but also provides it itself. That makes it quite an advantage, but maybe not the first investment to be made, so the first good bet is to become energy efficient with current possibilities. (Wills 2003, 39)

Energy management is a process, in which the main target is decreasing energy consumption and staying at the reached level. Constant improving is an important guideline, when developing energy efficiency systems in companies. An effective way of lowering energy consumption could also be having a special energy efficiency system. (Motiva 2011)

Becoming energy-efficient gives a company an easy start to its greening process: results are quickly shown so the motivation for going on grows. Also the decreased environmental impacts and a healthier basis for proper environmental marketing and active communication with interest groups would waken the business already at the beginning. (Wills 2003, 39-40)

4.1.2 Water

Offices are not usually very water intensive. Most water consuming actions are based on the factories or paper mills. Even though the water consumption in the office is quite low, still even the smallest overuse or carelessness affects environmental impacts and wasteful costs that could be decreased.

4.1.3 Materials

Brett Wills (Green Intentions, 2009) compares a company to a tree. A tree pulls together resources, materials and activities to produce something new. With sun (energy), carbon dioxide and water (basic materials) it makes products (like leaves) and services (cleaning the air while processing). All this

feeds its own growth. Everything is used for a reason, nothing is wasted. There are no negative impacts on the environment. (Wills 2009, 91)

With the durable way of thinking businesses can work almost like a tree. Some companies already make use of recycling services, at least because of the responsibility of the producer (Environmental ministry 2010). Besides operating on a law demanding way, recycling services creates a green value stream for the company. Trying to get operating like a tree also works for the cost effectiveness: it decreases both material and waste disposal costs.

Concept of reuse is not a new idea, but it is spreading to new areas. Solutions for eliminating the waste of materials need understanding and knowledge of life-cycle assessments. Whether it is producing products or services, co-operation between environmental management and other departments of the company is necessary. In a young company the integration is easy to implement at the beginning, but in a more matured company creation of co-operation requires will, common targets and leadership.

Materials do not only mean the materials that company needs for producing its products. It also means the materials that are needed for supportive operations, like offices. For example making and using virgin paper takes great amounts of energy. (Goodall 2010, 233) Paper consumption in offices is a big cost and it also has big environmental impacts. All though paper usage in common is moved from actual paper to an electric form via emails, ebooks, emagazines and enewspapers, total paper usage is still large and needs efficiency.

Decreasing the waste of materials will reduce the need of virgin materials in common. If the company could recycle and reuse its own products, it has a positive impact to the bottom line. It also decreases environmental impacts and costs from raw materials. Durable consuming and processing add green value stream, and a value-adding activity more likely increases incomes with content clients. (Wills 2009, 92)

Moving to the use of recycled materials is a time-taking project and has also financial impacts on planning and developing operations (Wills 2009, 92). It is

not necessary to redo all the processing systems and products. Moving even a little to a more durable way in using materials is a beginning, and even the smallest operation with minimal or non-existing demands for investments can decrease environmental impacts a lot.

4.1.4 Garbage

Why is it economical to think about waste? Waste is something that comes with consuming, and it could be both dangerous and expensive to get rid of it. Even so, waste is something people and companies do not want and they are willing and forced to pay for getting rid of it. (Porter 2002, 1-4) The amount of garbage is a very clear indicator of waste. Accumulated waste tells about wasting materials and about paying for something that is not useful (for example packaging materials like plastics), or sometimes not even necessary. Garbage also causes more and more costs for companies with rising waste disposal fees and tightening laws and regulations. A good example of the development is the reform of legislation about waste in Finland which is about to take effect in the year 2011 (Rantajärvi 2010).

Waste includes both social and private costs. Private costs are shown directly to the company because that is the cost that the waste generator pays. Social costs are often hidden, and it tells what it really costs to the society to dispose all that waste. Even the hidden social costs make indirect efforts to the company's costs as well. (Porter 2002, 2)

Garbage as one of the green wastes comprises all the things thrown away as results of actual or supporting processes of a company. Garbage as a green waste is easy to recognize and so far easier to understand. When it comes to decreasing the amount of garbage, the long known "reduce, reuse and recycle" concept is effective and well known. Most of the companies that try to decrease their green wastes, are at least sorting out the becoming wastes. Some of them have an internal recycling system. The most effective way of

decreasing the garbage is to eliminate its causing process at the beginning of it. (Wills 2009, 121-122)

By eliminating the garbage gives a company a possibility to save money on the back end (waste disposal fees) but also on the front end (by not paying for the extra material that gets thrown away at the end). Eliminating garbage gives a company an advantage in building the greener image further and that becomes a more interesting possibility for clients to create their own green value stream. Garbage is also clearly connected to the environmental impacts of a company, so eliminating garbage eliminates the associated environmental and economic costs by doing well for the environment at the same time. (Wills 2009, 122)

4.1.5 Transportation

Over the last few decades, transportation has caused one of the biggest environmental impacts. As one of the green wastes of the company transportation includes transport of humans as well as transport of materials, supplies and finished goods. External transportation is easy to identify, but also internal transportation causes environmental impacts and wasted costs. Eliminating or at least minimizing both external and internal transportation will decrease negative environmental impacts and increase economic benefits through reducing transportation cost. (Wills 2009, 145)

Environmental impacts of cars not only consist of emissions while driving. Main components of vehicles are metal, which dominates the carbon footprint. Smaller cars cause less environmental impacts because of both manufacturing (less material) and usage (less emissions). Motor manufacturers are constantly progressing at reducing average emissions from cars. (Goodall 2010, 228-229)

Criticizing the transport needs of a company might have positive impacts to other processes as well. For example, if a meeting could be handled as a

video-conference instead of person(s) flying to different parts of a country or the world a company saves environmental impacts, money and time. The other point of view is that if a company saves transportation kilometers by producing locally, it also has positive impacts on the area's labor policy. In global companies acting locally could be different because of the common directions of the whole group, but maybe even some parts of the production could be attended locally.

After identifying all the parts of the actions, which need any kind of transportation, it is easier to start changing them. Minimizing transport and its environmental impacts is possible by sourcing and producing locally, using transportation demands management, changing modes of transportation, avoiding rush hours and optimizing routes, minimizing packaging, consolidating, using technology instead of traveling, carpooling and telecommunicating. (Wills 2009, 155-160) Ways are variable, and there are lots of choices, where a company can find the best practices for itself.

Remaining transportation could be offset to get as environmentally friendly as possible. The main idea of offsetting is to make sure that if the company produces carbon dioxide emissions, it is paying to cut emissions from elsewhere. Basically it aims to make the western lifestyle carbon neutral. (Goodall 2010, 273) Offsetting does not mean direct cost savings, but it has some economic benefits as well. They are typically indirect and related closely to customer and employee perception of the environmental good the company is doing by offsetting. Offsetting could not be the only solution, but it shows environmental commitment and increases customer and employee loyalty. (Wills 2009, 163) Offsetting is a step to a better balance, and it gives signs that richer countries or companies can't cause further climate change. If the offsetting really reduces greenhouse gas emissions, it is a totally different question. Altogether they bring up awareness of climate change and therefore make it a more familiar issue within companies and consumers. (Goodall 2010, 273)

Core business is of course the most important thing in operating, and minimizing transport should not cause harm to it, even if it might be a more

effective change. Some level of transportation is necessary for operating the core business. Because offsetting often causes some costs, even on behalf of environmental wellbeing, it is still reasonable to reduce the remaining environmental impacts by arranging the needed transportation in an environmentally friendly way. There are numerous amounts of eco-friendly ways of transporting humans or materials, for example hybrid/fuel-efficient vehicles, public transport, alternative fuels, bicycles (Wills 2009, 168-169) and walking.

4.1.6 Emissions

Emissions are being managed also with previously mentioned green wastes. They have been indirectly identified, for example in looking for energy waste, because the use of electricity on-site creates emissions from burning fossil fuels. In this section emissions are identified as direct consequences of the operations in the building or emissions that are created directly by a product or a service. (Wills 2009, 173-174)

Identifying and minimizing emissions create the green value stream forward and they also give a possibility to positively affect the environment as well as the bottom line. Direct emissions often mean a heavy economic burden to a producing company by legislation, taxes, levies, fines and imago disadvantages. Government officials nowadays make sure that doing the right thing environmentally makes it easier to get financial rewards. (Wills 2009, 174)

Emission trading is an important thing to handle, if the company is causing actual emissions. Certificates from the European Emission Trading Scheme are both to offset emissions and to do business as well. (Goodall 2010, 269) This diploma work is, however, about the office-based business that does not cause direct emissions. Cars and transportation are handled separately.

As in eliminating other green wastes, the identifying part is the most important thing when minimizing direct emissions. After recognizing them it is supposed to decrease the amount of emissions by developing products and their producing processes, making sure that everything works as intended and examining the whole building and working spaces and their heating and air-conditioning operations. After all the minimizing there will always exist some emissions that could be an offset to balance the remaining environmental impacts. (Wills 2009, 188)

4.1.7 Biodiversity

Biodiversity is defined by the Canadian Biodiversity Information Network as being something that

“...encompasses all living species on earth and their relationships to each other. This includes the differences in genes, species and ecosystems.” The biodiversity allows nature to recover from change. (Wills 2009, 195)

Taking biodiversity as one of the green wastes ensures that also the ecological footprint point of view is represented. Even if a company does not cause much waste and recycle all of them and even if it does not consume much energy and produces every little bit by renewable energy sources, it still has impacts on the environment by existing. The actual building has changed the living circumstances of some species that used to live in the area. (Wills 2009, 196)

Even though this green waste represents the ecological point of view, decreasing it also gives a company cost savings just like the minimizing of other green wastes does. The biggest economic benefits in the first place come from the saving of the not-yet-destroyed biodiversity and also from not having to pay permits and applications, fees and taxes associated with the destruction of biodiversity. Idea is to finally have a positive environmental impact through regeneration. It is obvious that the end-goal is a long period

target, but having that in mind all the other decisions support it step by step in a long term. (Wills 2009, 196-197)

This diploma work deals with operative environmental management, so regenerating biodiversity during one year is not essential or even possible. Anyway, it is represented here as one of the green wastes because the separation is based on the seven green wastes introduced by Brett Wills.

4.1.8 Nutrition

The food industry is one of the most carbon-intensive businesses in the world. Both indirect and direct emissions are involved in agriculture, meat industry, dairying, transportation of food products and so on. (Goodall 2010, 190)

Nutrition is taken as one of the green wastes for two reasons. It is one part of the carbon foot print test, and so far one section of the greening of the personnel. Also it is chosen because the personnel specifically asked for it at the training days in the beginning of the year.

Nutrition and its environmental impacts are handled only as one part of the weekly greening notes, as there was not enough time for training days in the end part of the year. Nutrition affects straight the person himself/herself and it is therefore found interesting. Taking it involved as one part of the greening process, even as bonus information, strengthens the experience of personnel on their own possibilities to impact the process.

5 KEYS FOR THE GREENER FUTURE

Resistance towards change is one of the main problems in companies, where pressures to increase the bottom line are pushing personnel already to its limits and bounding the good will of greening process. Every bit of a change is experienced as a threat to one's own ability to work. Good leadership and management (more than a system) are very important, when presenting the keys for the greener future of the company.

Most of the very good ideas fail, when the new system needs a totally new behavior and revolutionary thoughts. Innovations succeed, when they offer an evolutionary road of changing behavior. A service, system or product that provides only small steps at a time could make the entirety a revolutionary one.

5.1 Motivation

Literature introduces some specific ways to implement a changing process in the organization. Recurrent means are rewarding, open communication, involving and training. Mentioned means recur also in common change management literature as well as in literature that concerns environmental change. What comes to the environmental change, there are also found some special characters such as the importance of a two-way communication and involving and committing the personnel entirely. (Onki 2002, 20)

The management has to understand that the greening work would increase incomes and cause cost savings when it succeeds properly. The personnel are the most important resource of the greening process, so encouraging them is both important and necessary. Greening process should not be taken as "one more thing to do, if the time lasts" but as a motivating system. The values and practices of the company rule the motivating practices as well.

Motivation is a behavioral phenomenon to which individuals react differently. Behavioral differences are one challenging part of leadership and management. Motivating is a complex process and a manager should deeply understand its laws especially in changing processes. (Wickham 2006, 21)

As personnel are the most important resource of greening process, management has to remember the framework for motivating individuals. Its key elements are gathered as understanding personal drives, setting clear goals, offering support, using rewards and having a positive approach to sanctioning. All those are necessary for succeeding, and for example sanctioning could not be used properly without clearly set goals. (Wickham 2006, 22-23)

Developing knowledge and know-how in some specific area in companies is not something that could be left for the responsibility of personnel or an individual himself/herself. Learning needs supporting social structures, like multiple, frequent development conversations, support for an individual learning process from the management level and also frequent possibilities of training. (Hakkarainen 2005, 10)

Giving information and training the personnel properly should be started as early as possible. The earlier involving starts, the better committing works. Personnel and especially every individual must understand the environmental impacts of his/her own work and realize the consequences of decreasing them. Sufficient training can also decrease the resistance towards change. (Halme 1997, 92-23) Participants in training are chosen for completing the big picture. A specialist gives knowledge to the group and the rest of the participants complete the knowledge of others. Reflecting one's own behavior and development is typical for this kind of training. With reflecting and estimating one's own process groups try to avoid weaknesses and boundaries of earlier operations. (Hakkarainen 2005, 10)

Measurement systems for progressing in greening process also give data for motivation: a clear sign of progress could be a good motivator in itself. Also results give the possibility to follow up the impacts of the person's own

actions. People are rarely motivated in an abstract sense so the measurement tells concretely that motivation leads somewhere (Wicham 2006, 22). Management also gets a good possibility of becoming fair: a promise that the saved money from greening work could be used to a refreshment of personnel is also a good motivator and affects the changing process. Rewards could take a variety of forms, but in common they should be appropriate for the task undertaken (Wickham 2006, 22).

Besides encouragement, change also needs its barriers. After the new ways of practice are brought to a part of a normal working system in a company, there should be consequences if they are not followed. Personnel should be aware of the effects, and the new practices should also become routines at work. (For example: Parkkinen 2010) Sanctioning should be dimensioned according to the size of a failure action. It is also important that the consequence not only includes punishment and a reason for failure but also how the performance could be improved in the future. (Wickham 2006, 23)

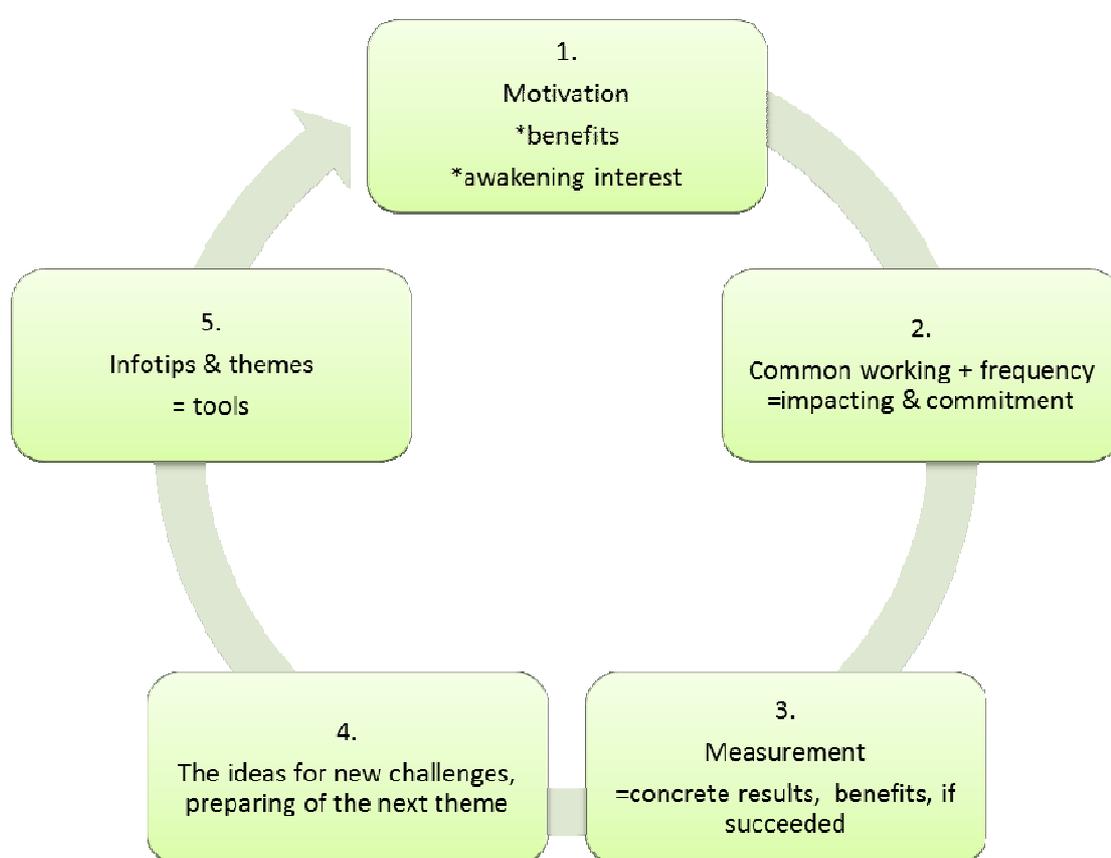
5.2 Cycle of the greening process

The research on the impacts of environmental management needed a concrete tool and a method to put the theory into operation. Picture 1 shows the greening cycle that is created and tested in this research. Committing personnel by affecting their wellbeing at work and by participating them has been the base for the developing of this cycle of the greening process. Besides the theory presented above, thoughts of Liisa Virolainen (Virolainen 2009) and psychologist Aino Kohtala (Kohtala 2010, interview) have supported the creation of the cycle of greening process as a tool of environmental management.

Cycle processes are often connected to an idea of constant improving and quality work. Cycle as a form is useful to model rounds which do not end after

one round. Also the ISO 14 000 standard requires constant improving and could be modified with a picture of the cycle process. (Motiva 2011)

With the specific cycle in mind it is easy to create a greening process to all offices. It does not bend itself to a certain market area or place, or the size of a company. The only needed factor is a strong will to make a difference and reduce environmental impacts and wasted costs.



Picture 1. The cycle of the greening process

5.2.1 Cycle at common level

What comes to the learning of one person, there are few common laws that matter: positive and negative feedback. According to several researches,

giving positive feedback makes the learning process more enjoyable and therefore more efficient. If the person in question sees the benefits of the learning process, the new ways of thinking or behaving become constant more quickly. It is also very important that the learner wants to learn. The own motivation is a very important tool for learning, especially what comes to adults. The motivation grows quickly, if there is a nice price waiting (for example Kohtala 2010, Parkkinen 2010). So the positive cycle of learning is ready to continue. This same rule fits to the learning process of the personnel of companies (Parkkinen 2010).

The construction of the process is picturing constancy at two different levels: frequency during the chosen period and frequency overall. The cycle in business world could model one year, one quarter or just one natural working period that fits. The important thing is that the process keeps going around again and again, so that going to the durable way becomes part of the normal operating business at all levels.

5.2.2 Information days and themes

An information day always starts the new greening round. The person having the responsibility of the greening process prepares the information day and the big picture of the round in question. Specific details, ways and operations are supposed to come from the personnel during the working period.

The meaning of the first information day is to wake up personnel to the issues of the topic, to give some basic information of the targets and tools used in this period. Concrete doing instead of just listening affects the learning process. People get more interested, if they can participate, so concrete common doing could be a good part of the information day: this could be a playful competition between departments or individuals, a group work, an office orienteering task with little questions to be answered... Anything that causes thinking, operations, questions and so on. The meaning is that besides co-operating,

group works also create tools for the greening process and generate the culture of making suggestions and thinking in a new way.

After a preview and tasks it is important to go through the results, discuss them and make decisions of which ones of those should be implemented. Everyone should be listened to and taken seriously enough, so that the culture of developing operations continues. Discussion after hard thinking, creating and common activities gather the information and make it clearer. The target of the information day is that after it every employee

- knows which are the targets of this period of greening
- can identify at least the minimum operations which lead to achieve the targets
- understands the meaning of the greening process of the company
- understands how he/she can affect the process and the environmental impacts of the company
- knows whom he/she could tell about his/her new ideas or thoughts during the period and
- knows what are the benefits from success or the disadvantages, if the directions would not be followed

The information days are supposed to be delightful for the personnel. Nice common working that stands out from regular operations could improve the experience on how employees find the working in the company. Also common and clear targets could waken even daily discussion on lunch hours or coffee breaks, when new ideas and learned ways of operating strengthen during the period.

5.2.3 Ways to motivate

When it is supposed to encourage personnel to generate ideas also of new saving and greening operations besides operating with already given ones, the

price motivates better than ignorance, unclearness or punishment (Kohtala 2010). Even the smallest idea should be noticed and good feedback should be given. It is important that the personnel understands that even the smallest new idea could grow significant, even innovative with its multiplicative effects.

Besides feedback spoken at loud it is effective to concretize the progress of the personnel and the company. That makes even the smallest tries notable. Price should be one that fits to the culture of the company but also something that fits to the greening process: the person that has given the best greening idea during the period gets a massage or a movie ticket, and the department that has saved most paper gets a lunch together in the restaurant and so on.

5.2.4 Common action and frequency

At the beginning of the greening process people are excited. Management level is interested and keeps motivating speeches, and new ideas come easily. Tiredness and extinction of excitement is a real threat to the process, if the enthusiasm is not kept alive. A dictator way of leading is not effective in the greening cycle; personnel are the true resource of this model. That is why an excellent, participative management style is needed during the whole period on every workday.

Besides actual pricing, a little resurrection of competitive attitude of employees works effectively, when the topic is kept in minds. Creativeness could sometimes need a little bit driving and pushing. A spontaneous note next to the coffee table could inspire a very rewarding discussion. Also public follow-up could inspire the competitiveness between departments or sections. The follow-up table in the public wall and few words at loud during the gathering could be a surprisingly effective way to motivate.

Also public follow-up tables and scales work when following the whole progress of the period or process: where are we now proportioned to the targets? It is an important thought that the latest results are proportioned to the

earlier results: this ensures that the ending of one period does not mean a slippage to the pre-shape up level.

5.2.5 Follow-up

Common, frequent gathering for example at the follow-up table works well for reaching the targets at many levels. A common follow-up moment could take few seconds in a Friday afternoon or it could be a few meaningful words in a Monday morning's gathering. Frequency is important in the follow-up system and the follow-up moment could recur more often than the actual cycle.

The meaning of the follow-up moment is to go through improving and to give feedback. Positive feedback and asking opinions from personnel ("What could we do even better?") works better than a boring noting of the current state ("You could not get anything done."). A common follow-up moment could be a good moment to honor given promises and to price from the work well done.

5.2.6 New challenges

When the period is about to end and the new theme is nearing, it is time for preparing the new information day. All though the environmental manager or some other named person bears the main responsibility, it is supposed to get ideas also from the rest of the personnel. Asking for ideas and opinions about issues that people find interesting or important strengthens their experience on their possibilities to impact the decision making process. This increases on-the-job enjoyment, and creating new ideas becomes a regular, nice part of the work.

5.2.7 Conclusion on the advantages of committing personnel to the greening process

A company gets remarkably more from inspiring and motivating the personnel than what it would invest to it. A skillful, wellbeing and committed personnel is one of the most important resources of the company, and its productiveness is worth taking care of. The process and cycle way of thinking in the greening process give the personnel constant motivation and challenges in the working environment that otherwise could consist of routine tasks.

Improved resource efficiency could also be thought from the personnel point of view. Greening process gives savings to the company with lower costs in energy consumption and waste disposal, but also costs could be cut with a decreased amount of illness absences. It has been discovered that there is a clear connection between wellbeing at work and lowered costs of days of illness. Also the incomes will increase, when the productiveness of the personnel grows. People are very creative, when they have a ricochet and a reason to act. (Virolainen 2009, 10)

6 STARTING LEVEL OF LYRECO FINLAND

Lyreco is an international company that works in 29 countries. In this diploma work, only the Finnish position is being approached. The results and directions can naturally be implemented throughout the Lyreco Group. The following chapter will present the starting point of Lyreco Finland. The present state and targets set are based on the statistics of the year 2009.

Environmental values are important to the Lyreco Group and therefore to Lyreco Finland as well. The environmental management is relying on the ISO 14001 standard being certified in the year 2009. Lyreco Finland is also certified with the 9001 standard. Environment and quality are very important values overall and special directions on waste disposal and general evaluation are being created with the principles of durable development.

The environmental issues are also being noticed in the whole Lyreco Group. The company is publishing sustainability report where it tells about new environmental goals as well as already reached achievements. In every office of Lyreco there have been started programs that point greener operations. The Group supports local programs, because one successful new way of thinking or operating could get benefits to the whole Group. All though the Group is uniform and the basic directions are common, there are differences between different countries and offices, what comes to environmental issues. In the future, it is important that the Group would create common directions also to environmental management so that the environmental point of view comes just one normal way of operating with general management, quality management and so on. With the common follow-up system it would be easy to unambiguously state reached targets and needs for change.

The Lyreco Group is also trying to spread environmental values. There are plenty of greener products (that have more remote environmental impacts during the lifecycle) in the product range of Lyreco. With these products

Lyreco is trying to encourage also its clients and customers to decrease their environmental impacts.

6.1 Location in Finland

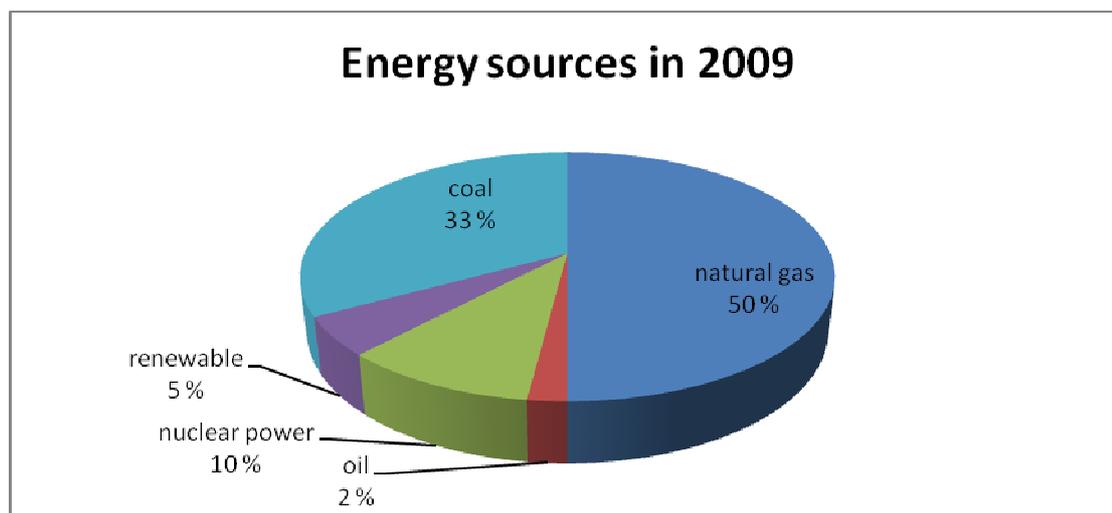
Lyreco Finland is located in Helsinki. There are many other companies in the area that have quite similar base of working as Lyreco. The area is mainly covered by offices and light industry. There is no permanent settlement in the neighborhood.

The physical position impacts the company in many different ways. The needed spaces are quite large because of the storage that lies in direct vicinity of the office, so the rent is more affordable than what it would be in the more centered area. On the other hand, the non-centered situation means that there are not good connections of public transportation for example. The employees of the office find the use of public transportation quite difficult and time-consuming from different corners of the capital area to the work place. Most of the employees use their own cars or those who are justified, use company cars. The company cars are handled by leasing, so the services and recurrences of the cars are taken care on time. This is good from the image point of view and also serviced cars work well as they are supposed to do and use therefore fewer natural resources.

6.2 Energy usage of the building

Lyreco Finland is a renter in a real estate that also includes three other companies. The real estate is made of two different buildings, which include storage spaces, offices and spaces for service work. The storage works as a central place of Lyreco logistics in Finland: the incoming goods are being unloaded, checked, stored and finally sent forward.

The owner of the real estate buys the needed energy from Helsingin Energia. The following picture (picture 2) is modeling the distribution of energy sources including heat and electricity production of Helsingin Energia in the year 2009.



Picture 2. The distribution of energy sources including heat and electricity production of Helsingin Energia in 2009. (Tolonen 2010)

55 % of the heat and electricity were produced with natural gas, 33 % with coal, 10 % with nuclear power, 5 % with renewable energy sources and 2 % with oil. That means that 90 % of the energy production is still covered with fossil energy sources. (Tolonen 2010)

The whole real estate is covering an area of 12166 m² from which the part of Lyreco Finland is 25 %: 3088, 3m². This area includes 2589,8 m² of storage space. The area of the office is 498,5m².

6.2.1 Heat consumption

The real estate is connected to the district heating net. According to the owner, the warming of the whole real estate takes 1500 MWh/year. When estimating the heat consumption, the area-based calculation shows that Lyreco's part of the heat consumption is 380 MWh/year. After calculation the part of the

storage by comparing just areas is 315 MWh/year. The part of the office is therefore a little under 62 MWh/year.

6.2.2 Electricity consumption

Electricity consumption is estimated separately to the office and storage. The estimated electricity consumption of the storage is got with following arguments: there are 167 fluorescent lamps of 58 watts and 60 special lights of 400 watts in the storage. There is also lighting at the dock when needed, basically in winter or when it is dark. Truck loading consumes electricity as well. There are also 10 computers and other office machines around that consume electricity. Next to the storage there is also room for servers that also include a cooling unit. When the apparatus are on for 10 hours in a day and there are about 20 working days in a month, the electricity consumption of the storage is overall 7000 kWh/month.

The electricity consumption of the office is caused by lighting, computers, monitors, printers and other office apparatus, phones and chargers of mobiles, kitchen apparatus and so on. The starting level of the electricity consumption of the office is based on the previous electricity bill. The electricity consumption of the office per one month is an average of 2327 kWh. This is the monthly electricity consumption of Lyreco's office in this work, all though in reality it might vary a little because of the vacation season in July.

6.2.3 Conclusion on the energy consumption

Table 1 is gathering the figures of the energy consumption of Lyreco Finland. Monthly energy consumption entirety is about 40 MWh. This means an annual electricity consumption of 490 MWh.

Table 1. Summary of the energy consumption of the storage and the office of Lyreco Finland.

Electricity	Storage (2589,8 m ²)	7 MWh/month
	Office (498,5 m ²)	2,327 MWh/month
Heat	Storage	26,25 MWh/month
	Office	5,125 MWh/month
Summary		40,702 MWh/month

In the case of Lyreco, the owner of the real estate pays the electricity bill and invoices the sum with rent, so the actual cost of electricity is not available. One estimate can be made with an average electricity price of Finland: in the year 2010 an average price for a kWh was 0,089 e/kWh (Vuorinen 2009, 87), so the electricity cost for the year 2010 could be a little over 9 960 euros, if the consumption stays at the same level. This figure does not include the costs caused by heating.

6.3 Paper usage

Paper usage in the previous year 2009 was 755 reams. Paper is used in normal actions in the office, filing and sales portfolios in the field actions. One of the biggest factors in paper usage is automatic prints that come from the Group system. Needed figures would be easily checked via Internet and most of the automatic prints are totally unnecessary. The automatic prints come regularly and cause both paper and electricity consumption.

To balance the costs caused by paper consumption Lyreco Finland uses secondary paper (not suitable for clients, but usable) for internal use. That balances also a little bit the environmental impacts, because otherwise damaged rimes would go straight to waste.

Paper consumption in the year 2009 caused CO² emissions of 5,4 tons (Climate Calculator) and a calculatory cost of 30 200 euros. Bases for calculations are presented in appendix 1.

6.4 Waste disposal

Waste disposal is organized and handled by the real estate's owner and the charge is included to the rent. Thus, the waste disposal of the company does not cause any special costs. It is difficult to impact or make changes to the external waste disposal. What comes to environmental impacts of the company and the greener waste disposal point of view, it is the internal waste disposal where the company might impact.

6.4.1 External and common waste disposal

There is a special place for waste treatment at the yard, which is in the common use of all renters of the real estate. Assorted waste is being collected by Lassila & Tikanoja. Table 2 shows the timetable of collections. Beside mixed and bio waste, pasteboard packages, wastepaper and energy waste, there is a centered collecting place for problem waste like fluorescent lamps and batteries. The problem waste is being collected when needed.

Table 2. Waste treatment of the real estate.

Waste	Collection
Mixed waste	once a week
Bio waste	once a week
Pasteboard packages	once a month
Wastepaper	once a month
Energy waste	once a month

6.4.2 Internal waste disposal

There is an alternating kitchen duty among divisions of the office. A division in turn is responsible for the internal waste disposal for a week. Also an external cleaner takes care for the waste three times a week, when he/she cleans the office and the storage.

In the restroom, there are different garbage cans for mixed and bio waste, which are emptied to the centered collecting place at the yard by the cleaner. Near the restroom, there are also places for pasteboard packages and problem waste, like batteries. Lyreco offers recycling service to the ink batteries of the printers, so the same recycling method is naturally used in the own office as well. Separate proceedings, like pasteboard packages, are supposed to be taken care of during the kitchen duty. Reality changes according to the principles: in practice, boxes and that kind of waste is just gathered for weeks, until some external factor, like survey of the management, forces emptying it. It is important for the common ambience and the way of operating that the internal waste disposal could be developed and designed at least partly by the employees.

Because there is a lack of clear recycling culture, sorting and caretaking are accumulating to persons who are interested in environmental issues and recycling in general. Nobody wants to get profiled as a garbage police. Instead, it is more efficient, if the common interest and enthusiasm would be wakened among the whole staff. Therefore the personnel would get an experience of their own responsibility and, on the other hand, possibilities of impacting the greenness and coziness of the office. Table 3 shows present practices and responsibilities for the internal waste disposal.

Table 3. Internal waste disposal at Lyreco Finland

Waste	Definition	Collecting box	Empty /transportation /internal responsibility
Mixed waste	Waste that could not be used again or recycled. Includes useless packaging material.	Mixed waste	3 times a week by the cleaner
Bio waste	Bio waste that is untoxic and decomposing.	The box for bio waste	3 times a week by the cleaner
Pasteboard packages	Recyclable pasteboard package, cardboard, cartons etc.	Roller cage near the rest room.	Person in the kitchen duty is supposed to empty the full roller cage to baling machine outside.
Waste paper	Waste paper from the office, also	Box for paper collecting that is	Person in the kitchen duty is supposed to

	incoming advertisements.	in the office.	empty the full gathering box to the baling machine outside.
		Financial management, data protection material.	L&T empties when needed
	Waste paper from the chaffcutter	Internal	To the energy waste collection spot.
Problem waste	Fluorescent lamps	Common collecting place of the real estate.	The service of the real estate takes care of problem waste.
	Batteries	Separate marked box in the office.	When full, it is supposed to be emptied to the collection place of the problem waste of the real estate.
	Ink cassettes from printers	Recycling box	Person in the kitchen duty takes the full box to the storage. When the collection box of the storage fills, it goes to the Sortti station for continued handling.

6.5 Logistics

A big part of environmental impacts of Lyreco Finland is caused by logistics. The main affecting factor is transportation of goods, which consists of incoming goods traffic to the storage (deliveries from Finland and Europe) and also outgoing deliveries to the clients. Beside the impacts caused by logistics, also the impacts from the car usage of salespersons will be handled in this section.

6.5.1 Vehicles

In the year 2009 (the comparing year of this research) there were 13 own cars and three cars offered by company in use. At the beginning of the year 2010 Lyreco Finland has 11 leasing cars, from which nine are being actively used while two are being useless in the yard for the present. Cars are mainly used by salespersons that operate in the field. Beside those passenger cars, there is also one van for deliveries. The van is also used with a leasing contract. There is also another van with a dedicated driver, which is Lyreco's term for subcontracting. This van is also counted to the environmental impacts, because it only does deliveries for Lyreco.

Furthermore six salespersons in the field and three key account managers use their own cars when needed at work. The company recommends the use of company cars, when it is possible, to ensure that the environmental load is as minimal as possible. Lots of those, who work mainly in the office, use their own cars to commutes from different corners of the capital area. The location of the office and common attitudes are the main affecting factors to this behavior. The following table 4 gathers invoiced kilometers from the year 2009. Calculation of caused emission is presented in appendix 1.

Table 4. Invoiced kilometers and caused CO² emission in the year 2009.

Year	Sales persons during the year	Invoiced kilometers, total	Caused emission
2009	9 persons	78 165 km	14, 07 tons CO ² ekv.

Also the possibility of distance working is being discovered. For example key account managers could easily work and visit their clients from home. Then the daily traffic to the office would decrease. For now, distance working does not work in action.

6.5.2 Delivery

About 50 % of deliveries are handled with two own vans. The rest 50 % are handled by DPD or Itella logistics. Those two together are called the actors of a third party. To clear the overloading or when demanding transportation is needed, Lyreco Finland uses KTK of Helsinki.

The deliveries are divided in Finland so that about 51 % of deliveries have their destinations in the capital area and the rest 49 % in other areas of Finland. In action this means that mostly all of the deliveries of the capital area are being taken care with own transport equipment and the rest of the country with DPD or Itella logistics. Also a little part of the capital area is taken care of by a third party. These are for example the areas, which are not especially dense with clients. Client density is in fact quite a challenge connecting the departments of sales and logistics with each other: how to ensure the density of clients in a certain area so that the minimum transportation volume would be achieved.

6.5.3 Length of deliveries

The average lengths of deliveries of the third party are not available, especially when they operate concurrently with multiple principals. The delivering cars of Lyreco have an average of 100 to 120 daily kilometers that include 30 to 33 deliveries. The number varies a little bit according to weeks and seasons. Because of the variety and difference between sizes of the deliveries, the average run of one delivery is about 6, 6 kilometers, but the truth is that there are many displacements from an area to another during the working day. Then the distances in the areas are short.

Short, quick distances with variable speed are the hardest way of driving, when examining the delivering system from the environment point of view. Lyreco Finland has considered if it could arrange eco-driving consulting for the personnel, but for now it is just an objective to be taken care of "in the future".

6.6 Indicators of the Green Revolution in Lyreco Finland

From the seven green wastes of Wills, table 5 gathers three (electricity, paper and traffic) for a special follow-up during the year 2010. They have been chosen because of the believable follow-up of the previous year and because they cause the biggest environmental impacts as well. Also the pointed targets consider those three green wastes. The carbon footprint test would measure the development of environmental knowledge and impacts of the personnel, which is one target of this diploma work. Chosen themes would be used as special indicators in the follow-up in the future as well.

Calculations and bases for results of cost and CO² emissions are presented in appendix 1.

Table 5. Conclusion on green wastes that are chosen for follow-up, calculatory cost and caused emissions at the starting level.

Green waste	Realization in 2009	Calculatory cost in 2009	Calculatory CO2 emission in 2009
Electricity consumption	112 MWh/year	9 960 e	24,8 tons CO ² ekv
Heat consumption	377 MWh/year	16 968,77 e	84 tons CO ² ekv
Paper usage	755 reams	30 200 e	5,4 tons CO ² ekv
Traffic (sales)	78 165 km	35 174,25 e	14, 07 tons CO ² ekv
Total		92 303,02 e	128, 27 tons CO²ekv

6.7 Targets to the Greening Process during the year 2010

Lyreco Finland has named environment as the theme for the year 2010. The project is called The Green Revolution, and it has clear targets that could be achieved for real during the year 2010. The targets of resource efficiency and especially decreasing environmental impacts are supposed to be achieved by cutting down both packaging waste (target: -5% relation of sales) and the amount of waste paper and pasteboard packages, and by savings in energy consumption and cutting of exhaust discharges. Other important targets are solving the problems caused by recycling of ink cassettes through efficient recycling counseling of clients, and affecting the safety of the office by decreasing the fire burden by emptying the garbage cans frequently.

6.7.1 Paper savings

Lyreco Finland has already paid attention to the paper consumption of the office and put targets to the reduction of paper usage. There is a gathering of the targets and paper saving actions in table 6. In the year 2009 Lyreco Finland used 755 reams of paper. The target level after the year 2010 is 600 reams, which means a reduction of 155 reams. That is -15% of the present

level and means cost savings of 6200 euros (the average cost for one used paper is 0,08 euros (Julkunen 2010)).

Table 6. Paper saving targets and actions in the year 2010.

Subject matter of savings	Saving target	Action
FSM (Field Sales Mobility)	72 reams	Giving up with paper versions of follow-up portfolios.
		Electrifying actions in common.
Printing in the office	85 reams	Double-sided printing always when possible.
		Limiting the printing just to the amount absolutely necessary.
Filing	15 reams	Electric filing, realization with PDF files and DVDs.

Savings in paper usage are one of the most important targets of the Green Revolution for the environment and also from the cost effective point of view. The main actions that are supposed to decrease paper consumption during the year were decided to be:

- reduction of the paper usage in the office by becoming aware of real printing needs
- transition to an electric filing system
- electrifying the profiles of salespersons who work in the field
- limitation of automatic prints from the Group system
- efficiency of electrifying internal post

- centralizing the possibility of printing (works also for energy saving)

These actions also work for waste reducing operations by minimizing the amount of waste paper. Also, for some reason, it is decided to exploit unsold (damaged packages and so on) paper from the storage to internal use.

6.7.2 Energy savings

The most important ways of saving energy are advising the personnel to switch the light off, when the rooms are not in use and noticing their computer using habits. The computers are supposed to be turned off at nights and weekends. During the Green Revolution, the part of the counseling work is to change the way of thinking, what comes to computers and other office machines like printers. It is not necessary to keep the machines on, when they are not actively used.

One problem what comes to energy efficiency as well as paper saving actions is the weekly automatic prints that come from the Group system.

6.7.3 Minimization of exhaust gas

What comes to exhaust gas, Lyreco Finland uses a follow-up system to find out the real amount of exhaust gas that gathers from its actions. The follow-up system is based on charged kilometers and the calculatory average consumption of fuel. Lyreco Finland tries to decrease the total use of fuel by 10 % during the year 2010 by recommending the use of company cars that facilitates the follow-up. The company cars are also well maintained and quite new, and so far they use relatively small amount of fuel by kilometer and pollute less. During the greening year the economical way of driving is discussed at training days, and an external eco-drive course is supposed to be arranged in the year 2011 for the whole personnel.

6.7.4 Recycling of color cassettes

Color cassettes that are used in printers are classified as problem waste. To improve its service and to fulfill its producers' responsibilities, Lyreco has arranged a recycling system for its color cassettes. When a client orders color cassettes for the first time, Lyreco offers a recycling box for free. The client could put all the empty cassettes to the box, and as it gets full, it is changed to a new empty one by Lyreco. Full recycling boxes are gathered to the storage of Lyreco, and when there are enough of them, they are sent to further treatment.

The greening targets of the year 2010 concern the increase of the amount of recycled color cassettes via Lyreco Finland. The next table 7 gathers the target levels compared to the year 2009. Target is that at least a half of the sold color cassettes would be returned via Lyreco Finland.

Table 7. The recycling of color cassettes: targets and realization

Year	Sold color cassettes	Recycled color cassettes	Targets of recycling [%]	Realization of recycling [%]
2009	11330	3130	-	27,63
2010	x	x/2	50	?

A way to achieve the target is to increase the knowledge of clients on color cassettes being problem waste and on Lyreco Finland offering an easy recycling service for free. Salespersons are encouraged to offer the possibility for this service to all their clients. Telling about producers' responsibility works as marketing of the greener values at the same time.

6.7.5 Conclusion on the saving targets for the year 2010

Table 8 gathers the named saving targets and therefore indicators for the greening process of the year 2010.

Table 8. Saving targets for the year 2010.

Green waste	Realization in 2009	Target to 2010/ Notable	Decrease level
Paper usage	755 reams	600 reams	-155 reams /-15 %
Energy consumption	40,702 MWh	-office stations -lightning	
Exhaust gas	78 165 km/ 14,07 tons CO ² ekv.	12, 66 tons CO ² ekv.	-10 %
Recycled color cassettes	3130 / 27,63 %	+ 50 %	

6.8 Marketing point of view

Environmental issues are very important to the Lyreco Group and they are named clearly in the strategy. Green products have been used in marketing in Lyreco Finland as well as at the Group level, but not systematically. The idea is to create a whole green campaign in the future. For example in Lyreco Germany new material for green marketing has already been done.

In the Internet, there is some information of green products in the company's own website, but for example an own site for shopping only green products is not available, a thing that one of the competitors already has. There are lots of ideas for developing green marketing as well, but big organization cause its challenges for developing process.

Communication with interest groups is one way of marketing. One target of the Green Revolution aims to create new truth-based material for marketing and communication with interest groups.

7 THE GREEN REVOLUTION OF LYRECO FINLAND

The year 2010 is about greening the office and business in general. Lyreco Finland has named the process The Green Revolution, and it is supposed to reflect the new, environmental way of thinking to the personnel, clients and other interest groups. Its meaning is to reduce environmental impacts, find all the possible wasted costs and get new tools and arguments for marketing.

7.1 Realization in action

There have been some appointments against wasted environmental impacts, which have already been done in the office of Lyreco Finland. Most of them are at a strategy level and therefore only the management is aware of them, needed actions or results, either way. The more specific explanation of what have been done is in the previous chapter (starting level of Lyreco Finland).

So all though targets for the year 2010 were set, the operating level was not clear. To find the most affecting operations and biggest wasted costs, the present level was first defined. It was mapped by identifying the green wastes from the part of energy, water, wastes, paper and also traffic and logistics. After finding the actions and machines that consume most or in another way cause lots of environmental impacts, it was easier, faster and more economical to point the operating actions to the right targets.

Lyreco Finland is a company, and its environmental impacts have to be evaluated as ones of a company. Anyway, a part of the Green Revolution in Lyreco is not only to spread the idea of environmental sustainability within the interest groups but also within the personnel of its own. The point from the beginning is to commit the personnel to the change.

7.2 The starting level of employees

Because the personnel are the most important resource of the company, it is also the key factor in the changing process. Because the operative environmental management is the main tool and framework of this diploma work, knowledge on the starting level is very important to get for the progress planning of the work.

7.2.1 Carbon footprint test

When evaluating the starting level of the personnel, discussion only might not be enough. To waken interest by actually doing something right away, the carbon footprint measurement was done in the beginning of the year. The carbon footprint test of Helsingin Sanomat (2010) was used because of its easiness and quickness. The test was supposed to calculate the carbon footprint of course, but also to be fun, to waken the interest and thoughts for the issue in question. More of the carbon footprint test and the use of it is written in the next chapter (The information days).

7.2.2 Survey on the knowledge of the running process

Also the knowledge of the personnel on the whole project, The Green Revolution, was measured at the first training day by a simple request. The whole group of participants, 19 people, answered to three questions, which were the following:

- 1) I am aware of the present project “the Green Revolution” of Lyreco Finland. Yes/No
- 2) Three biggest environmental impacts in my work are:
- 3) Name three of the main environmental targets of Lyreco Finland

Answers to the survey were quite alarming. The survey was held on March 12th, 2010, when the project had been running over two months. The answers are processed next.

Question one: I am aware of the present project “the Green Revolution” of Lyreco Finland.

58 % of the answerers did not know that there was this kind of a project going on in the company. 42 % recognized the project, but conversation exposed that the name The Green Revolution was not known.

Question two: Three biggest environmental impacts in my work are:

63 % could name three biggest environmental impacts of their own work. 16 % named only two, 11 % only one and 10% named zero impacts. The most common of the named impacts were energy consumption, paper usage, printing and cars.

Question three: Name three of the main environmental targets of Lyreco Finland

47 % could name three of the targets that Lyreco Finland has set for the year 2010. 21 % could name two targets, 5 % named one and 26 % could not name even one of the targets.

Beside the level of the knowledge of the personnel, the survey told a lot about the communication policy of the company. Even after two months of running the project, the personnel did not have a good knowledge of it. Of course, these answers, which were done namelessly, could not show the level of interest towards the subject. Anyhow, that is also a result.

7.3 Information days

Because this diploma work is mainly written as a long distance work, the days I spent in Lyreco are important for the work. Coaching employees is one of the bases of the greening process, so the training days are a way both to be in contact with them and also to give them possibilities to ask questions, to participate in the process and to give them tools to create their own ideas. During the working days in Lyreco I also got to estimate the level of the face of the process: what are the real actions that have been made? Has there been any change in attitudes?

Within one year there are five information days, according to the cycle of the greening process. One session lasts about two hours and everybody in the office is recommended to participate. Salesmen and –women are mainly working in the field, so they get the information via email or by the head of the sales department in their own meetings.

The issues handled during the information days are chosen from the basis of the carbon footprint test, so the employees could get all the possible tools for minimizing their own carbon footprint and therefore minimizing their own environmental impacts. Encouraging the personnel is one of the most important targets of this work.

Before the very first information day, there was a survey in Lyreco's office, where 15 persons, chosen by a lot, made a carbon footprint test. To discover the common level, the results were put together and Lyyli of Lyreco was created. This person reflects the average of the Lyreco personnel and she

aims to walk along during the year. The carbon footprint of Lyyli was 8750 kg large, while the average size of all those, who answered to the test of Helsingin Sanomat was a hint under 9000 kg. Table 9 gathers the results and parts of the carbon footprint test. So, the average member of Lyreco reflects the average individual in common. The main point with Lyyli was that the personnel got something to compare themselves with, besides their own development of course.

Table 9. Results and parts of the carbon footprint test at the beginning on an average member of Lyreco.

Year 2009	Total carbon foot print	Food	Transport	Waste	Consumption	Inhabitation
kg CO²	8749	1399	2745	679	3041	885
%	100	18	31	7	34	10
Target 2050 in public	5000					

7.3.1 Consuming, recycling and waste

In the carbon footprint test the consuming was the biggest factor, so consuming, recycling and wastes were the first topic. At the beginning of the session personnel was told about the common level of the environment, what carbon footprint is and how it can be estimated. Also all the factors that create the carbon footprint of an individual were shortly introduced. During the two hours some tests and group works about recycling were made where everyone was allowed to tell new ideas and how the sorting out could be arranged at work or at home in a better way. Groups were also told to plan a campaign linked in recycling that could be used in communications with interest groups.

7.3.2 Energy and habitation

Second information day was about energy and habitation. There was discussion about energy consumption methods and their impacts on environment. Lots of questions about bio fuels, power plants and regenerating energy sources were asked by the participants. It showed that an average person did not know how to get and understand all the inconsistent information from the media and government. How to pick up the right answers? In general it can be seen as resistance to change. When a consumer is afraid to pick up the right opportunity, he or she does not pick at all, because of being so afraid of picking the wrong one.

It is very important to encourage people in general to savings in energy use, so I told the participants to plan energy saving campaigns that have real potential to be implemented at work. The second part of the group work was to create energy saving advice at home. Each group got one imaginary room, so that the directions would be as specific as possible.

At the end, as there was a little time left, everyone could share the best way of saving energy that he or she had done at home. Answers were really creative and showed that the energy saving has been quite a lot in participants' minds at home. It just does not show at work! It turned out that cost savings at home are motivating enough, but someone else pays the energy bills at work. Environment itself is not important enough, or most likely, a regular consumer does not understand the real environmental impacts of the energy consumption.

7.3.4 Transport, commutes and emissions

Transport and the economical way of driving are important issues to the whole year. Salespersons, who are mostly involved in this subject, got the training and reminders in their own meetings during the year in co-operation with their

moderators and the quality manager. For the rest of the personnel information is spread via the Internet through weekly greening notes.

7.3.5 Development of the personnel and individual members

The last information day gathers the conclusion of The Green Revolution. The second carbon foot print test estimates the developing of an average employee of Lyreco Finland complemented by questions and observation.

The last training day was more like a gathering of the year. The timetable was again challenging, so the information was given to representants from each department advising them to deliver the given information to their departments during the next team meeting. That was being noticed, when the last survey was made for the information day. The survey holds following questions:

- 1) What has changed in your own work during the year? Mention three things.
- 2) What or which changes do you notice in your department? Mention three things.
- 3) Think forward! Do you have ideas or suggestions for the future, what comes to developing the environmental responsibility of Lyreco Finland?
- 4) What is your opinion of the Green Revolution of 2010?

The representants answered to the questions above on their departments' behalf. There were five representants present. The given answers are handled next so that each question is followed by a list of given answers.

Question one: What has changed in your own work during the year? Mention three things.

Double sided printing in use (mentioned in five papers), driving a more environmentally friendly car, shutting down computers when not in use, turning off lights, commuting by bicycle or by foot always when possible (mentioned in two papers), use of electric material, efficient separation of wastes (mentioned in two papers).

Question two: What or which changes do you notice in your department? Mention three things.

A concrete change in pay time which saves paper; efficient separating of wastes, sharing green values to the clients by telling of Lyreco's actions for it, bringing up green products, offering the recycling box to clients more often, turning off lights always when room is not in use, shutting down computers at nights.

Question three: Think forward! Do you have ideas or suggestions for the future, what comes to developing the environmental responsibility of Lyreco Finland?

Carless days more often, more work from distance for those who can do it; even more efficient ways to bring the strategy to the organizational level; clear campaigns for green products.

Question four: What is your opinion of the Green Revolution of 2010?

A very interesting and current subject for the theme year; would be more efficient, if the whole personnel could be more active, otherwise very well; good idea, making it happen for real was challenging because of the late

resourcing; the past year has developed the idea of saving: even the smallest doings could do a lot together; very well, more of that!

7.3.6 Conclusions on the survey

The results of the survey confirm the same that observation does in the actual office already told. The environmentally friendly behaving did not stay only at the strategy level, but it came true at least partly in the office also, besides the part of the personnel who did not involve voluntarily. Most departments noticed changes, like turning off lights and computers more often, using less paper, better efficiency in recycling and separation of wastes. The Green Revolution and therefore green products got more visibility in the field sales, which worked as marketing as well.

More efficient implementation, more results between training days and more contacts and connections to the field and clients were demanded in answers for question three. Difficulties, which late resourcing and time control bring with them, were notable risks at the beginning. Besides the little lack of activity, the process of greening cycle and the whole greening year were wished and thanked for currency, training and information.

The second carbon foot print test was also made for evaluating the development of personnel. The test was made in December 2010 and the same carbon footprint test of Helsingin Sanomat was used as in the beginning of the process. The test was updated so that waste and consumption were connected as one, "life style".

Seven members of 15 chosen returned the test, and results were gathered to show the new carbon foot print of Lyyli of Lyreco, an average member of the personnel. The following table 10 gathers the new level.

Table 10. The carbon footprint on an average member of Lyreco at the end of the year 2010.

2010	Total footprint	Food	Traffic	Life style	Habitation
kg CO²	10 028	1947	3575	2057	2451
%	100	19	36	21	24
Target in 2050	5000				

All though the sample was smaller than before, the average carbon footprint could be calculated as well. Total average carbon footprint of a member of the personnel was now 10 028 kg CO². The share of nutrition was 19 % (1947 kg CO²), share of traffic 36 % (3575 kg CO²), share of life style 21 % (2057 kg CO²) and share of habitation 24 % (2451 kg CO²). There is still journey to go to the common target of 5000 kg CO².

Also observation in the concrete office space is one important way of finding the real operations caused from the greening year.

7.3.7 Conclusion on the information days

The participating part of the personnel was very active. They were clearly interested in their own influence and how they could make things better. Participants worked very innovatively during the group works and created very potential ideas that could make a difference also at work as well as at home.

Actions at home could not be affected more, but the ideas about office were delivered forward. Future shows, how many of them could be turned into action.

As a result, it could be noticed that the presence of an outsider influences the personnel stronger than the influence of training performed by a regular member of the office group would have done. On the other hand, long distance leadership proved to be the factor that made the changing process a little bit ineffective in action though individual working days in Lyreco's office were productive and inspiring. The real change and the overlapping of new

ways of working apparently need constant supervision and support from an inspired person that finds the changing process important.

7.4 Directions of the greening process to the personnel

Besides the change in attitudes, the greening process of the office also needs clear directions from the management level to the personnel. Because environmental responsibility is an important value to the Lyreco Group, also Lyreco Finland is supposed to develop its environmental balance. As a part of this diploma work, new behaving models and direction to operate them were created. Directions were immediately valid for the use of the personnel after training in team meetings during October 2010.

The environmental directions run coordinately with safety directions. New directions are also included to the familiarization file, so that new employees could keep the new, environmentally friendly behaving models as normal operations in Lyreco Finland. That is how the greening process directly impacts the future as well.

The next pages include the given greening directions. Directions are available in intranet and one paper version is placed in the wall next to safety directions. Everyone shows his/her commitment to the greening work by signing the paper version after training. Straight directions are concretized with simple examples among individual directions supposing them to make the directions easier to understand and implement in one's own life.

7.4.1 Paper usage: communication

- Demanding incoming commercials in an electric form. Everyone pays attention to this when connecting with interest groups. At the same time, it

is useful to mention Lyreco's greening process, which also works for marketing purposes.

- Electric or personal communication as practice in internal communication.
- Developing and strengthening the use of the Internet in communication with interest groups: newsletters, bulletins, active receiving of feedback and answering to it in the Internet.
- Transferring own advertising material to an electric form as well. That lowers material cost and also reduces the amount of money bound in advertising material. In cold contacts given materials often end up to garbage cans. Also outdated bulletins are wasted cost to a company.

7.4.2 Paper usage: Printing

Example: Within year 2010 Lyreco Finland has set a target of decreasing its paper usage by 20 % from 755 reams to 600 reams. Decrease is therefore 155 reams, and calculatory cost savings are about 6200 euros. To reach the target, every member of the personnel is supposed to observe his/her own paper using habits. Following directions work as helping advice.

- Follow-up of printed material.
- Limiting unnecessary prints.
- Every print should be criticized: is it necessary and why is it that? No automatic prints, like short-term information, own emails, menus of the day and so on.
- Getting familiar with settings of the printer and using them. Double sided printings as the constant setting.
- Prints that come to own use could be printed two or even more pages on one side.
- Choosing the right or necessary quality of prints in every work: first-class color printing is unnecessary use to second-class printing works that come for example to the person's own use.

- Printer on only when in use, because also the stand by consumes electricity, when the machine is waiting for the working command. Printer must be turned off at least for nights, weekends and holidays.
- If possible, the turned off time of a printer could be increased by printing necessary papers at one time.
- Many printers and multifunctional office machines have electricity saving set ups. Use them!
- In the future there could be quotas for individual printings (only the existing of the quotas makes the printing more conscious).

7.4.3 Electricity consumption: Machines of the office

- Concentrated printing and copying save electricity; that is why favoring multifunctional office machines is recommended. Then only one machine is waiting for working command instead of multiple ones.
- Bonus: when the printer is not placed at everyone's own desk, it usually lowers the amounts of printed papers. Also getting up and walking even few steps to the printer works as a warming up and improves effectiveness of work.
- Placing the necessary machines of the office at the coolest possible place decreases the need for cooling processes of the machines.

7.4.4 Electricity consumption: Computers

- Computers are responsible for a big part of the electricity consumption of the office. Turning it off every time for lunches, evenings/nights and weekends is necessary. Turning it on when coming back does not cause waste of time (imaginary or real), when a person could get a cup of coffee or catches up with work mates while the computer is warming up.
- Only standstill is not enough, because a big part of the overall electricity consumption of a computer is caused by a standby state.

- Taking care of the free space around the computer makes it sure that the cooling process of a computer would not have to work at maximum. That also helps with stacking of papers and (fire-) safety issues.
- Extensions with on/off functions should be placed in every working spots so it is easy to turn off the electricity consumption of a certain work place at once.
- Decreasing of the use of the elevator and favoring stairs instead.

Example: One company set an energy saving campaign in co-operation with a weight-watcher campaign: they put a list in the stairs, where everyone who climbed the stairs instead of using an elevator, could put his/her name. After one month's follow-up time the saved energy was calculated. The person, who had substituted elevator for stairs most often, got voluntary tickets to movies as price.

7.4.5 Lighting

- Lights on only when actually needed. Empty walls for example in meeting rooms, storages and halls do not need lighting.
- Quick way to improve lighting is to take away every second light from the aisle, if investments for boosting cost-efficiency of lighting by automatic sensors are not current.
- Changing glow lamps to electricity saving lamps.
- Taking care and cleaning of lamps keep lighting power better longer. The power of fluorescent lamps decreases when time goes by, so it is necessary to change lamps (and sort them properly) every once in a while to maintain good lighting at work.
- It is possible to decrease the electricity consumption of lighting and heating effectively by using venetian blinds. Most advantages could be achieved by keeping venetian blinds down but opening them at day and closing them at night, when they work as an efficient additional insulator.

- It is possible to use natural light for lighting by directing the coming light from the computer by fiddling the venetian blinds.

7.4.6 Air-conditioning and heating

- Keeping furniture away from heating batteries (the heat can spread freely).
- Taking care of the seals of windows and doors.
- Using venetian blinds as an additional insulator.
- If the windows are open, the automatic air-conditioning is off.
- Making sure that the thermostats are working properly by taking care of the fact that air can move freely.
- Placing machinery properly decreases over-heating, and at the same time it decreases the need of extra air-conditioning.
- Assuring that a heat producing machine is not placed between the thermostats.

7.4.7 Water Consumption

- Using hot water only when needed.
- Washing only full machines saves electricity as well as water.
- Rinsing of dish is not recommended, because it easily consumes more water than the machinery wash itself.
- Everyone should announce of leaking faucets.

7.4.8 Restroom/kitchen

- When replacing the coffee-maker, choosing one that is a thermos and has an automatic turn off.

- Boiling water with an efficient water boiling apparatus.
- Dish wash: Only full machines, using eco-programs, using of a timer (using night electricity with lower price, which decreases the price of the used electricity and smooth's the peak electricity use in common).
- Avoid using the drying operation. It could take four times more electricity than washing itself.
- Rinsing of dish is not recommended, because it easily consumes more water than the machinery wash itself.
- Using of permanent dish instead of disposable one is absolutely necessary both for the own personnel as well as for visitors. Permanent dish not only saves costs and waste but also works as a clear signal of durable development and greener values for visitors.

7.4.9 Waste disposal

- Everything that is thrown away tells about inefficiency and means wasted material and money.
- A clear place for waste disposal and sorting not only makes sorting easier but works also as the best measurement of waste disposal.
- Planning a good place for sorting and using it! A well plotted sorting spot has clear directions of waste disposal. Efficient sorting decreases the amount of waste that ends up to a dumping place and therefore decreases waste disposal costs.

Example: Paper and textiles which end up to a dumping place produce trice as their weight much of emissions. Besides using maiden materials instead of recycled ones consumes about five times more energy.

- If the real estate does not offer possibilities for sorting of all the kinds of waste, it is recommended to organize sorting in the company otherwise

and to transport the sorted waste to the recycling station at the same time when using the car and doing business in that direction anyway.

Example: Glass and metal could be recycled almost forever instead of placing them to a dumping place or to wilderness to harm the nature. Decomposition of a metallic can in nature takes about 300 years.

- Bio waste is sorted differently. When spreading, bio waste produces emissions that are 25 times more powerful greenhouse gases than carbon dioxide. In a dumping place it causes harm, but differently sorted bio waste and gases could be used in electricity production.
- Costs of the bio waste ending to a dumping place are definitely increasing due to public directions.
- Companies can foresee changes and take the role of a forerunner.
- Own recycling for problem wastes: batteries, energy saving lamps, fluorescent lamps and ink cartridges.
- Separated wastes, like metal, package paper, glass, paper and other possible special wastes must be noticed.
- Tidiness of the sorting place and involving personnel to the planning project commit the personnel to the greening process from the beginning.
- A recycling drive could be planned to take place for example twice a year (one after spring cleanings and another after near Christmas cleanings) → personnel can bring anything from their home, other members of the personnel can take what they need and the rest of the things could be sold at a flea market. The incomes could be used to charity, refreshment of personnel, climate issues and so on. Objects that are socially or environmentally responsible must be represented in communication with interest groups.
- Personnel could recycle their home ordered magazines by bringing them to the work place after reading.

7.4.10 Logistics and traffic

- Taking advantage of the phone, video negotiations and Internet connections with clients and other interest groups every time when it is possible instead of traveling.
- Economic and ecologic traveling and driving.

Example: Fuel consumption of an average car is about 0,089 l/km. Every used liter of fuel causes 2,3 kg emissions of CO₂. If one drives 15 000 kilometers per year, one causes 3,2 tons emissions of CO₂. If decreasing of fuel consumption is possible with changes in driving habits for example to 0,08 liters per kilometer, the same yearly amount of driving causes emissions of 2,8 tons.

- Economic and ecologic ways of commuting.

Example: Advantages of walking and bicycling compared to driving a car.

- spare of time, when there is no need to search a parking place
- one gets more exercise which also affects working positively
- decreases the burden of CO₂ emissions
- spare of money: if one changes commute of 5 kilometers from driving a car to a bicycle, one spares about 430 euros just in fuel costs (advantage consumption of fuel is 0,89 liters per kilometer and price of fuel is 1,30 euro).

- Defining possibilities of using video negotiations and consultations reduces time, money and environmental impacts by running down yearly traveling.
- As in every machine and equipment choices, it is also necessary to pay attention to actual needs when choosing a (company) car.
- At cool and cold times the pre-heating of engine lowers emissions as well as fuel consumption.
- Conditioning increases fuel consumption even up to 5 %.

- Regular care and control of the car keeps it working as supposed. Often disturbances cause the biggest auxiliary costs and consumption.

Example: A regular follow-up of wheel pressure causes cost savings: After an estimation drawdown of 0,5 bars increases fuel consumption and therefore unnecessary costs and emissions.

- Rationalization of logistics and other car usage that include optimization and route plans.

7.5 Weekly greening notes

When trying to encourage personnel to any kind of a change at work, constancy is one of the most important ways. The change must be implemented little by little, so that the new models of thinking become normal. When operating with the greening process in action, a theme of the period could be better noticed during the session.

Constancy in the greening process is important, but quite difficult to arrange when working from distance. The problem was solved by weekly greening notes, which was sent to the personnel via e-mail every Monday at 12.00. The notes followed the main area of the period and they were planned to give greening tips to the work and work place, as well as home.

The greening notes varied from interesting news to energy saving directions and to stories about Lyyli of Lyreco, who tried very hard to green her life during the year. Every once in a while the note included a preparing task for the next information day. Notes, stories and tips were light and even humoristic so that the personnel would not find the greening process for “just another `have to do´ task to go through” kind of a thing.

Weekly greening notes were given frequently excluding the summer holiday season between weeks 25-35, when the office was partly empty. The pause was supposed to make sure that every member of the personnel gets similar amount of greening knowledge via the Green Revolution training.

The following table 11 shows topics of the weekly greening notes. Notes in their long forms are written in Finnish and they are not included in this work. Notes are saved in Lyreco Finland's intranet so that the personnel could easily check the greening tips if needed in the future as well. This is also how new personnel could easily get familiar with them.

Table 11. Topics of the weekly greening notes.

Week	Theme/Green waste	Note
11	Starting level	Test your carbon footprint (www.hs.fi/testit/hiihijalanjalki)
12	Consuming	Find out your recycling possibilities and nearest local recycling center.
13		Polar the consuming from products to services
14		Recycling masterstroke!
15	<i>Bicycle campaign</i>	Maintain your bicycle!
16		Use your bicycle for commuting!
17	Energy and habitation	How much electricity does your household consume?
18		Change from glow lamps to energy saving ones!
19		Dish wash at work and at home
20		Wash your laundry effectively!
21		Share your best idea to save environment and money!
22		Leave ONE paper unprinted every day at office!
23		Wise up the future of energy consumption
24		Test yourself as an energy consumer at www.energianet.fi
36	Directions	Prices and punishments in follow-ups! Tell your ideas and impacts to directions!
37		Directions are published! Make sure you read them and sign for commitment.
38		Make sure that your workplace answers to the demands of environmental directions!
39	Logistics and traffic	How to save money and decrease environmental burden? Slimmed body as a bonus!
40		Calculate your weekly kilometers after means of transport
41	<i>Bonus info</i>	Balance your energy! See more in www.energiansaastoviikko.fi
42	<i>Bonus info</i>	Make your move! Reduce a ton! (See more at www.ilmastoinfo.fi)
43		Lyyli drives a car.
44	Nutriture	Hidden burden: impacts of logistics on nutrition chain
45		Think what you eat? Or neglect?
46		Paradox of nutrition chain
47		Avoid processed food!
48	Burden of Christmas	Tasteful gifts
49		Stop rushing! Choose services and quality over quantity!
50		Plan your Christmas logistics in time.
51		Find out right place to every waste in time.
52		Turn your New Year's resolution into a more environmentally friendly reality!

8 AFTER THE FIRST YEAR OF GREENING PROCESS

The first year of greening process is a big step, when aiming at getting concrete impacts done. On the other hand, the biggest results are available, because there is so much to change. Though all the enthusiasm and eagerness, there is also a lot to learn, so the first year might also be important from the learning point of view, and the future will show the real results.

8.1 Development and results from follow-ups

Special green wastes were chosen for an accurate follow-up of the environmental targets of Lyreco Finland. The chosen ones were energy consumption, paper usage, emissions caused by sales, the amount of recycled color cassettes and the carbon footprint test for measuring the development of personnel.

8.1.1 Energy consumption

Divided electricity and heat consumption figures were not available at this point of the year, so the observation of energy consumption should be done in another way. Table 12 (specific settlement in appendix 2) gathers the results in the energy consumption of work stations. The first column shows the beginning state and the last column shows the state now, when all the means are in use. The follow-up is from the group follow-up system.

Table 12. Development of energy usage and cost at work stations during the year 2010.

	Beginning state, 2009	Anticipated means	Means during operating	Every means in use, 2010
Energy consumption, total	13 531 kWh/a	8 162 kWh/a	917 kWh/a	6 374 kWh/a
Costs of work stations, total	1 083 e/a	653 e/a	734 e/a	510 e/a
Savings at work stations, e		430e/a	349 e/a	573e/a

Besides at work stations, decreasing of the electricity consumption is perceived in the following actions:

- lights off clearly more often in rooms that are not in use
- centered printing, no longer own printers at every desk
- turning off the office machines for nights and weekends
- criticism in printing needs

8.1.2 Paper usage

Total paper usage decreased because of the centered printing, criticism in printing needs and double side printing. The double side printing order in printers alone saved 15 reams of paper, but it also increased the color printing by 108 %, because the centered printer is a color one.

Second hand papers, which were not suitable for clients but usable in the own office, were used in the internal use like the year before.

Salespersons moved from the basic sales files to mobility sales force, which saves prints and therefore paper usage in the future.

Internal waste disposal developed as well, when paper recycling got more efficient and did not give too much pressure for mixed waste disposal.

8.1.3 Emissions from sales traffic

Significant is the change in cars. New, smaller company cars were taken in use more widely. New car types are Toyota Aygo, Toyota Auris and Ford Focus. With the use of less polluting cars, notice of eco-driving directions and efficiency in the sales traffic, the exhaust gas emissions lowered and the charged kilometers also decreased by 7,4 %.

8.1.4 Recycled color cassettes

The last survey told that the sales department estimated the increase of clients using the recycling service of printing ink cassettes of Lyreco. Recycling boxes were offered to clients more often, and the amount of ink recycling clients increased from 115 (2009) to 235 (2010). The amount of recycled cassettes increased by 61,36 % from the years 2009 to 2010.

8.1.5 Carbon footprint

The carbon footprint test of Helsingin Sanomat that is used to measure the level of environmental awareness of the personnel changed a little bit from what it was at the beginning. The main environmental impacts were still measurable. Seven out of 15 chosen persons returned the test. Persons were not the same ones that answered earlier as the test was made nameless.

The average carbon footprint was 8749 kg CO² at the beginning, and in the end of the process it was 10 028 kg CO². Emphasis on the later test was quite the same, but the weight was moved from consuming and waste to habitation.

Sampling was quite small and gives quite a lot of value for one individual, as there was quite large dispersion in answers. Observing, surveying and interviewing the personnel gave a whole different picture of what might have

happened to the environmental awareness of the personnel from what the second carbon footprint test tells. The relatively small sampling might not reveal the real truth about answers, and so other research means should be noticed when observing the results of this greening process in common.

Reached targets cause impacts on the environment, the costs and also incomes. At the first sight of the greening process, the concrete target was to lower environmental impacts caused by the office-based business of Lyreco Finland, to save in the cost bounded wasted environmental impacts and to find new arguments for marketing. The total change in the environmental impacts could be a little different, because all of the green wastes could not be taken into account in the measurement because of the lacking information and follow-up from the previous years.

8.2 Arguments for marketing

The whole process of the Green Revolution would have been good material to communicate with interest groups. There were plans of making questions of green values to clients. The target would have been to tell about the green value stream of Lyreco Finland and spread the knowledge. Also there could have been a blog or another solution of social media as a communication channel where the development could have been published for example to challenge other companies and so on. A lot more could have been done to create the green value stream more effectively.

This diploma work is the first kick into action for a more effective and proper environmental management in the Lyreco Group. Its results could be used in marketing, especially to interest groups. There is also eagerness for a whole green campaign, and in other Lyreco countries they have also started to prepare green material and directions of their own. Also marketing material for a campaign of green products only has been started to prepare.

The Green Revolution is already included to the marketing during the process by salespersons. They have been offering recycling boxes for color cassettes more often and telling about the greening process to their clients also in usual conversation situations.

9 CONCLUSIONS

Services are a growing industry, so also their environmental impacts must be noticed. One office does not produce as much emissions as for example a paper factory, but it is the total volume that counts. Even though, a consumer is interested in the environmental impacts of one individual company. In the office-based business, the real operations and environmental activity must be wakened by environmental management.

Research shows that evolutionary steps are more effective than one revolutionary change. The cycle of the greening process worked as a tool to recognize green wastes through the year of the Green Revolution. In this research, total changes in the environmental impacts of Lyreco Finland and changes in the knowledge of the personnel served as the indicators for measuring the efficiency of the operative environmental management. The target was to concretely lower the environmental impacts, to save costs and also to affect the personal environmental knowledge of the personnel.

The measurement results from environmental awareness did not follow the results of the surveys and interviews of the personnel. The small sampling may have affected the results of the carbon footprint test, as the observing tells that attitudes and knowledge on environmental issues have improved in a year. Other indicators, as emissions caused by sales, paper usage and recycled color cassettes lowered, but the target level was still not reached.

Reasons why results from the carbon foot print test and from other surveys don't follow each other could be involved to differences in adjustment of questions. Maybe personnel is too critical to their development or changes in working habits are easier to improve at work than it is in one's own life. It also could be assumed that environmental issues could have been better arranged at home before the project at work, if the person already was interested in environmental issues.

There was notable difference between knowledge levels of members of personnel in environmental know-how. During the project the already interested ones were most active and integrated the useful information in their lives effectively. It was also encouraging that also other part of the personnel showed interest and developed their energy using habits for example. Support of the other group also pushed the lasting opposition forward. If the project wouldn't be done mostly from distance, or there could have been more trainings days arranged, it is supposable that there would have been more enthusiasm and development. As the difference between results is quite notable, it is useful to use different measurement methods in the follow-up studies in the future as well for researching different parts of change.

The training days were an important link between the personnel and research, and the lack of the training days in fall made the process less effective. Clear directions after the summer made the whole project more visible and concrete to the personnel. Research shows that the environmental directions that are comprisable to, for example safety directions, are important when the environmental work is supposed to become a normal part of working and to be transferred forward to the next personnel generation. When general laws and governmental directions do not give the push for environmental work in the office-based business, the Green Revolution and advantages that could be reached with it demand a new thinking and innovative commitment from the management especially to get the personnel involved.

Working from distance had its difficulties and challenges to the operative working in this research, as well as the changes in business by the company trade. Especially the company trade moved the interesting point, or at least the priorities of the management, from the Green Revolution to the trade, which made the long distance environmental management quite challenging.

For continuing the developing process in the future it is important to keep the training days regular. Group works involve opposition more effectively as well, and the critical members of the personnel could have really effective ideas to share. With the whole personnel and commitment of management the project could continue more effectively in the future.

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APPENDIX 1: INDICATOR CALCULATIONS – STARTING LEVEL

Appendixes present bases and calculations for indicators of the greening process. Appendix one is about the starting level, and uses values from the year 2009.

CO² emissions caused by electricity consumption

Monthly use 9,327 MWh/month = 111,924 MWh/year = 111924 kWh/year

Average emission caused by straight energy production: 221, 6 gCO₂ekv/kWh (Tiusanen 2009)

$$\begin{aligned} \rightarrow 111\,924 \text{ kWh/year} \times 221,6 \text{ gCO}_2\text{ekv/kWh} &= 24\,802\,358,4 \text{ gCO}_2\text{ekv/year} \\ &= 24,80 \text{ tons of CO}_2\text{ekv/year} \end{aligned}$$

Calculatory costs of electricity consumption

Average cost of used energy: 0,089 e/kWh (Vuorinen 2009, 87)

$$\rightarrow 0,089 \text{ e/kWh} \times 111\,924 \text{ kWh/year} = 9\,961,236 \text{ e/year} \sim 9\,960 \text{ e/year}$$

Emissions caused by heat consumption

Monthly energy use for heating is 31,375 MWh/month = 376,5 MWh/year = 376500 kWh/year

Average CO₂ emission caused by consumption of district heating (Combined Heat and Power production): 223 gCO₂/kWh (Energiateollisuus ry 2007)

$$\begin{aligned} \rightarrow 376\,500 \text{ kWh/year} \times 223 \text{ gCO}_2\text{/kWh} &= 83\,959\,500 \text{ gCO}_2 \\ &= 84 \text{ tons of CO}_2\text{/year} \end{aligned}$$

Calculatory cost caused by heat consumption

Average energy cost in 2009 is 45,01 e/MWh (Energiateollisuus 2009)

$$\rightarrow 376,5 \text{ MWh} \times 45,01 \text{ e/MWh} = 16\,946,265$$

Emissions caused by car usage of salespersons

A total of 78 165 kilometers were invoiced in the year 2009 (comparison year) by the 9 salespersons and key account managers.

Average CO² emission caused by car usage: 180 gCO²ekv/km (Mäkelä 2009)

$$\begin{aligned} \rightarrow 78\,165 \text{ km} \times 180 \text{ gCO}^2\text{ekv/km} &= 14\,069\,700 \text{ gCO}^2\text{ekv} \\ &= 14,07 \text{ tons CO}^2\text{ekv} \end{aligned}$$

Calculatory cost caused by invoiced kilometers in 2009

Calculatory cost for one kilometer in 2009 is 0,45e/km (Veronmaksajat 2008)

$$\rightarrow 78\,165 \text{ km} \times 0,45\text{e/km} = 35\,174,25 \text{ e}$$

Emissions caused by paper usage of the office

Paper usage itself does not cause emissions like the use of fossil fuels. That is why CO² emissions of paper usage are defined by lifecycle assessment.

Average emission of normal office paper: 2860 gCO²ekv/kgpaper (Rissa 2003)

1 Ream of paper weights 2,5 kg; paper usage in the year 2009: 755 reams.

$$\begin{aligned} \rightarrow 755 \text{ reams} \times 2,5 \text{ kg} &= 1887,5 \text{ kgpaper/year} \\ \rightarrow 1887,5 \text{ kgpaper/year} \times 2860 \text{ gCO}^2\text{ekv/kgpaper} &= 5\,398\,250 \text{ gCO}^2\text{ekv/year} \\ &= 5,4 \text{ tons CO}^2\text{ekv/year} \end{aligned}$$

Costs caused by paper usage:

Average cost for used paper: 40 e/ream (including paper, use of printer, ink etc.), and it gives average of 0,08 e/ark (Julkunen 2010)

→40 e/ream x 755 reams/year = 30200 e/year.

APPENDIX 2: ENERGY SAVINGS AT WORK STATIONS

The Group system gathers information automatically from every work station in use. A work station includes a computer, a possible different screen and a possible printer/fax/scanner. Table 12 gathers the total results which are significant to this research.

Table 12. Development of energy usage and cost at work stations during the year 2010.

	Beginning state, 2009	Anticipated means	Means during operating	Every means in use, 2010
Energy consumption, total	13 531 kWh/a	8 162 kWh/a	917 kWh/a	6 374 kWh/a
Costs of work stations, total	1 083 e/a	653 e/a	734 e/a	510 e/a
Savings at work stations, e		430e/a	349 e/a	573e/a

Trainings and environmental directions included information, how to save energy at the work station. Anticipated means included for example the following:

- 20 % of decrease in amount of laser printers and increase of centered printing
- Every old screen will be replaced with new LCD screens
- More laptops in use instead of table computers
- Every machine labeled with Energy star
- Energy saving decrees in use at every work station
- Optimization of printer power control
- Energy consumption has taken one criteria in acquisition

Means during the operation include the following:

- Every screen is turned off after the work day

- Every computer is turned off after the work day
- Every printer, including the centered ones, is turned off after the work day

With these means, both anticipated ones and the ones taken place during the actual use, energy consumption of the work stations decreased 7 157 kWh during the year 2010. Costs related to energy consumption of the work places decreased 573 e.