Lean equals Green?
A case study on Scania’s production system and environmental performance

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Abstract

It is said that Lean production has a potential to reduce a company’s environmental impact. The reasons for it are that Lean production is resource efficient and eliminates unnecessary steps and waste in the production. The purpose of this report is, with support of theoretical and empirical studies, answer the research question: Can the Lean concept positively affect a company’s environmental performance? Lean principles and methods focus on elimination of waste, continuous improvement and resource efficiency which can positively impact on a company’s environmental performance. Lean tools, additionally, can be expanded to comprise environmental issues. Also in this report, the incorporation of environmental work with the studied company’s production system principles and methods is favourable to its environmental performance since environmental work is being employed in every aspect of the business itself.
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1. Introduction

1.1 Background

The Lean concept is a leading paradigm and a business strategy that many manufacturing companies embrace. Lean production is known for improving efficiency in the production system since it focuses on eliminating non-value added activities in the production processes. Although Lean is appropriate to achieve greater productivity, it is said that Lean has a potential to reduce a company’s environmental impact. The arguments for this is that Lean is resource efficient and eliminates unnecessary steps and waste in the production (Dues et. Al., 2011).

1.2 Aim and Objectives

According to the Scania’s Sustainability Report (2014), it appears how the company prioritises environmental matters. The purpose of this report is, with support of theoretical and empirical studies, to examine how Scania is working with Lean, its environmental performance and answer the research question: “Can the Lean concept positively affect the company’s environmental performance?” This has led to the following objectives, presented in order to fulfil the purpose:

- Introduce the Lean production concept.
- Define Corporate Social Responsibility, environmental responsibility, ISO14000 and environmental performance.
- Relate the Lean production system to environmental performance.
- Describe Scania’s production system.
- Present Scania’s environmental performance.
- Analyse the impact of Scania’s production system on its environmental performance.

These objectives will hopefully provide a clearer picture whether Lean can reduce the environmental impact of a company and present how a global company like Scania operates when it comes to evaluate sustainability and environmental matters.
2. Methodology

In this report, aim and objectives have been realised through a literature study. For the main basis of the report, research has been obtained through theoretical and empirical studies. The theoretical study is supported by literature such as books, scientific reports and online sources from reliable institutions such as the European Union and the United States Environmental Protection Agency. The empirical result is supported by information and data from the examined company’s website, annual report, sustainability report and an interview with the Head of Scania’s production development. The gathered information was then critically reviewed, analysed and discussed in order to reach a coherent conclusion. Keywords that were used during the literature study were CSR, environmental performance, green, ISO14000, lean production and lean tools.
3. Theoretical Introduction

3.1 Lean Production

Lean production is a production system with principles originated from the Japanese automotive company Toyota (Axelsson et al., 2008). After World War II, Japan had scarce resources concerning technology, raw materials and financial assets (Modig och Åhlström, 2011). Due to the lack of resources and the economic condition in Japan, Toyota created a flow efficient way to pursue its activities (Modig och Åhlström, 2011). Hence, an order-driven production was instituted, which means that the production started when a customer placed an order (Liker K., 2004). The result of it was that a flow efficient production system was developed based on customer needs and was given the name “Toyota Production System”, abbreviated to TPS (Modig och Åhlström, 2011).

The fundamental base of TPS consists of the principles Just in Time and Jidoka. Just in Time means to deliver the right things at the right time and in the right amount, while the latter principle Jidoka is to strive for flawless processes by assuring the quality of them (Liker K., 2004). Furthermore, the production is kept slim because products are produced no more than what is needed (Axelsson et al., 2008). In the late 80’s, the interest for Toyota’s production system grew among Western scholars. The researchers’ studies and observations based on TPS became a concept and were given the name Lean (Modig och Åhlström, 2011).

The term “Lean” is originally from the mindset of utilising resources effectively to produce products with as little effort, investment in equipment, inventory etc., as possible (Axelsson et al., 2008). Lean involves being resource efficient and work with continuous improvements since its goal is to maximise the productivity (Modig och Åhlström, 2011). The principles and methods included in Lean focus mainly on eliminating waste and unnecessary activities that add no value to the customer (Liker K., 2004). Lean is not a static and definite collection of tools, but those tools proven to work best should be used since improvement-work is a central point in Lean (Axelsson et al., 2008).
3.2 Definition of Environmental Terms

3.2.1 CSR

Corporate Social Responsibility or CSR is the corporates responsibility to create a sustainable development and is defined according to EU (2011) as: “Corporates responsibility for their impact on society”. In order to fulfil CSR, companies should implement a process which weaves the social, ethical, consumer and environmental matter in the business operation and core strategy in a close collaboration with the stakeholders (EU, 2011).

3.2.2 Environmental Responsibility

Environmental responsibility of a company can then be described by using the concept of CSR and sustainable development as “Corporates responsibility for their impact on the environment”. To fulfil this, companies should act in long term and sustainable manner from an environmental point of view. This means that companies should implement environmental work, but also use resources in an efficient and sustainable way so they do not limit the next generation needs while working on reducing the environmental impact.

3.2.3 ISO14000

More and more companies are introducing environmental management and practices in their operations. In 1996 the international standard ISO14000 was introduced to serve as a platform and structure for environmental work. ISO14000 is a collective name for the standards dealing with environmental management. These standards create an environmental management system that can be integrated with the existing business. The system serves to facilitate the work and the standards provide a model to work for continuous improvement of the environmental performance. ISO has been a major breakthrough in many companies since the standard is certifiable and provides opportunities to present environmental activities in a standardised and comparable way to various stakeholders (Borglund, et al., 2012).

3.2.4 Environmental Performance

Environmental performance within a company is related to the work of reducing spills and decreasing waste generation. A good environmental performance also comes from low emissions of hazardous substances, employing either pollution prevention techniques or end-of-pipe waste treatment (King and Lenox, 2001). According to King and Lenox (2001) environmental performance can be measured with five variables, the adoption of ISO14001, the ratio between the on-site treatment and waste generation, the total emissions of a facility, the relative emissions and waste generation of a facility based on sector and size.
3.3 Lean Production and Environmental Performance

As environmental issues are given more emphasis today, it becomes more common to manufacturing companies to strive towards sustainable production (Dhingra et al., 2012). The interest in integrating environmental responsibility with Lean has increased and more environmental initiatives are taken by innovative companies applying Lean (Florida, 1996). These companies are more likely to switch to Lean tools that are also environmentally friendly. The Lean tools that reduce resource usage are said to have a greater potential to reduce environmental impacts (Dhingra et al., 2012), but it does not mean that all Lean tools are linked to a reduced effect on the environment (Dues et al., 2011). The reason for this is that Lean is related to source reduction and is by definition unrelated to sustainability and environment (Mollenkopf et al., 2009 and King et al., 2001).

Lean can lower the cost of pollution reduction and is complementary to environmental performance. Studies show that Lean companies that have initiated environmental measures, unlike those companies that have not, provided not only better environmental performance in terms of reduced waste, air pollution emissions and resource use, but also more efficient production (Parveen et al. 2011; Dues et al. 2011; Dhingra et al., 2012). Lean is a favourable starting point for a more environmentally friendly production and benefits therefore companies that have an eco-friendly and sustainable production as objective (Dues et al., 2011).

United States Environmental Protection Agency (EPA) generated a set of Lean tools for environmentally friendly and sustainable production. According to EPA (2012) and Parveen et al. (2011) the Lean tools 5S/6S, Hoshin Planning, Just in Time, Kaizen, Kanban, Six Sigma, Total Productive Maintenance and Value Stream Mapping are some of the key tools for a positive impact on the productivity and environmental performance. Furthermore, research and development (R&D) and safety practices are also considered as tools for productivity and environmental efficiencies.
3.4 Lean Tools

3.4.1 5S/6S

5S/6S is a method that involves creating order in the workplace and is a first step to standardise work (Axelsson et al., 2008). It stands for Sort, Set in order, Shine, Standardise and Sustain. In addition, Safety is included sometimes, thereof the sixth S. The measures are there to eliminate waste that causes mistakes, errors and injuries. Although it is a simple fundamental idea behind 5S/6S, the difficulty with the method is the fifth S, Sustain, to create a habit or discipline. The fifth S is the element that gets the previous S to work by maintaining and continuously improving the workplace (Liker K., 2004).

3.4.2 Hoshin Planning

Hoshin Planning provides a method for strategic planning, allowing the management of the improvement process in order to achieve specific goals. The tool adjusts the objectives with the resources and work plans, so as to achieve them (Business Dictionary, 2016). Hoshin Planning is employed to communicate and implement goals and objectives across the organisation. Along the process, the company develops visions to support innovative thinking concerning its future path. Afterwards, based on one vision action plans are created, and consequently monitored through performance checks (Total Quality Engineering, 2015).

3.4.3 Kaizen

Kaizen is the Japanese term for continuous improvement. It is a practice where improvements occur with continuous changes, regardless of the size. The purpose is to eliminate waste that increases costs and does not add value to the final product. Kaizen encompasses the entire organisation, both the board of the company and employees on the shop floor. The measures within Kaizen do not only refer to the company but should also include all stages in the distribution chain, such as suppliers and transporters (Liker K., 2004).

3.4.4 Kanban

Kanban is a method to signal the need for materials in the production. If the material runs out at the workstation, then a card, for example, is sent to the workstation behind to report this. Computer-based communication, which is useful when the distance between the workstations is too big, has become more common. The advantage of Kanban is detecting bottlenecks immediately. Today, it is used as a large part of the improvement-work and to reduce the inventory costs and late deliveries (Axelsson et al., 2008).
3.4.5 Six Sigma

Six Sigma is an improvement method grounded on statistical results. The method involves measuring, analysing and improving based on the collected data. The purpose of the method is to reduce the causes of defects and variations in the production in order to make companies become more cost effective. To ensure the processes' accuracy, only 3.4 defects are allowed to occur out of 1 million possibilities (Ilenio, 2016).

3.4.6 Total Productive Maintenance

Total Productive Maintenance (TPM) is a method that intends to enhance production, preventing breakdowns, stops, defects and accidents. It gives special importance to preventive maintenance to increase the efficiency of production. TPM shares the responsibility of maintenance among workers, increasing their participation and enhancing productivity. The five main activities of TPM are; eliminate useless things in the work environment, organise everything that remains, clean and inspect, standardise the previous activities and enforce the standards (Lean Production, 2013).

3.4.7 Value Stream Mapping

Value Stream Mapping (VSM) is a method to map a product’s flow throughout the factory (Axelsson et al., 2008). It gives a perception of the company’s principles regarding material and production management but also a distinct image of capacity, throughput times and inventory turnover (Liker K., 2004). Unnecessary activities and steps that add no value to the customer can be detected easier with the help of VSM, thus, saving time and resources. In many cases, several maps are developed since one map cannot represent all the different products' value streams of the company (Axelsson et al., 2008).
4. Empirical Results

4.1 Scania’s Production System

Scania is working with Lean in the form of Scania Production System, also known as SPS. The production system was formulated internally by Scania’s employees in the late '90s and launched in the early 2000s (Scania, 2015). SPS is inspired by Toyota's production system, the principles and methods of SPS are quite similar to the Toyota Production System. What differs is how the application of methods takes place. Scania strives to mirror Toyota as much as possible, but still apply something of its own to meet the specific characteristics of the company’s culture. The reason for this, thus, is to create a distinct identity for itself. This means having its own language and values in a Swedish context, adapted on the basis of the current situation of Scania. It has been beneficial for Scania to implement SPS. The production system is a powerful and essential instrument to optimise the productivity (Frick, 2013). SPS can be illustrated as a house and figure 1 (KTH, 2013) depicts how Scania's values, principles and priorities are developed from their view.

![Scania Production System House](image)

The three core values at the bottom of the SPS house; Customer first, Respect for the individual and Elimination of waste are the basis for everything of the production system and permeate the entire organisation. Values generate principles and principles generate methods which in turn give results (Frick, 2013).

The four main principles Normal situation - Standardised working method, Continuous improvement, Consumption-controlled production and Right from me are the major components of the SPS house. The first principle Normal situation - Standardised working method implies when working accordingly to SPS, there is a normal mode where deviations...
can be noticed. This principle consists of the six sub-principles Standardisation, Takt, Levelled flow, Balanced flow, Visual and Real time. The second principle Continuous improvement involves challenging and constantly improving the Normal situation and correcting deviations so that they do not reappear (Scania, 2015). The two latter main principles resemble the fundamental principles of TPS; Just in Time and Jidoka. Consumption-controlled production means to produce only what is requested when being prompted while the last principle Right from me implies to not deliver defective products (Frick, 2013).

The common priorities can be found in the middle of the SPS house as following, Safety/Environment, Quality, Delivery and Cost. These priorities should on a daily basis occur simultaneously, i.e. work should be done safely, with good quality, no delays and to a competitive price. The order of the priorities exists to control the situation whenever the priorities conflict with each other. Safety and environment are then more prioritised than the other priorities because it is important to create a safe workplace and reduce the impact on the environment throughout the company. All of the values, principles and priorities in the SPS house are then surrounded of Leadership (Frick, 2013).

Additionally, Scania is using production management tools to enhance the productivity which resembles the Lean tools Kaizen, 5S/6S, VSM, and TPM. Kaizen and 5S/6S have been used since 1998 while VSM and TPM have been introduced later (Frick, 2013).
**4.2 Scania’s Environmental Performance**

Scania weaves sustainability work throughout the whole company. It is stated in Scania’s Sustainability Report (2014) that reducing the environmental impacts is a central aspect of how Scania works. Sustainability is a fundamental approach and is integrated in every business activity in Scania. To manage and structure the environmental work, Scania is certified and complying with the ISO14001 standard. Besides being ISO14001 certified, there are national legislations, internal requirements and rules that every business unit has to follow. Employees have also the possibility for environmental training and preventive actions are taken continuously in order to avoid accidents (Scania, 2015).

Scania’s long-term priorities within environmental performance addresses environmental issues such as; using energy and water efficiently throughout all facilities and business operations, decreasing the usage of chemicals and raw materials, minimise the emission to air and water, eliminate waste and reuse more, minimise the risks of accidents and unnecessary spills and managing them in an efficient way if they occur (Scania’s Sustainability Report, 2014). In 2014, no accidents or spills causing significant damage to the environment or led to miscellaneous clean-up costs incurred (Scania’s environmental performance measures 2010-2014, 2014).

To assure continual reporting and overseeing of environmental performance in the operations, Scania has instituted an internal reporting plan which involves all business units and facilities. Environmental indicators and key figures are reported and summarised to Scania’s Executive Board (Scania, 2015). In the summary of Scania’s environmental performance measures 2010-2014 (2014), the emissions to air, water and land can be found. The air emissions refer to carbon dioxide (CO₂), nitrogen oxides (NOx) and volatile organic compounds (VOC), while the emissions to water and land concern wastewater respectively waste to landfills and other off-site disposals. Additionally, the recycling rate such as reuse of material and material used for energy recovery can also be found in the summary (Scania, 2015).
4.2.1 Greenhouse gases (GHG)

Almost all GHG emissions emitted by Scania’s operations and activities are from CO₂ which originates from the direct and indirect use of energy. No landfills, that risking leakage of methane, are being employed nor does Scania have any other operations using methane (Scania’s Sustainability Report, 2014). The total amount of CO₂ emissions from Scania’s operations between 2010 and 2014 can be found in table 1 (Scania, 2015). The total amount of CO₂ emissions per vehicle can also be read from table 1 since the amount of produced vehicles varies from year to year.

<table>
<thead>
<tr>
<th>CO₂ emissions</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total, tonnes</td>
<td>183</td>
<td>224</td>
<td>194</td>
<td>210</td>
<td>207</td>
</tr>
<tr>
<td>tonnes/vehicle</td>
<td>2.7</td>
<td>2.7</td>
<td>2.9</td>
<td>2.4</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Table 1. Scania’s CO₂ emissions 2010-2014 (Scania, 2015).

4.2.2 Emissions of NOx and VOC

New technological solutions have made it possible for Scania to enhance the painting operations. Scania has since 2004 adapted almost all the painting systems to waterborne paints except for a few applications where the waterborne paints have not been possible to substitute. The use of solvents and the VOC emissions that comes with them still remains (Scania’s Sustainability Report, 2014). Also, some NOx emissions exist due to engine testing from the R&D department (Scania, 2015). The total amount of NOx and VOC emissions from Scania’s operations between 2010 and 2014 can be found in table 2 (Scania, 2015). The total amount of VOC emissions per vehicle can also be read from table 2.

<table>
<thead>
<tr>
<th>NOx and VOC emissions</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOx, tonnes</td>
<td>62</td>
<td>67</td>
<td>46</td>
<td>47</td>
<td>47</td>
</tr>
<tr>
<td>VOC, tonnes</td>
<td>270</td>
<td>333</td>
<td>260</td>
<td>333</td>
<td>214</td>
</tr>
<tr>
<td>VOC, kg/vehicle</td>
<td>3.9</td>
<td>4</td>
<td>3.9</td>
<td>4</td>
<td>3.8</td>
</tr>
</tbody>
</table>

Table 2. Scania’s NOx and VOC emissions 2010-2014 (Scania, 2015).
4.2.3 Water usage and wastewater

Scania does not operate in areas where water is a scarce resource, neither does Scania have any operations that require a lot of water. Nearly, 80 percentage of the water consumption is being utilised by Scania’s employees, restaurants and restrooms. Almost all processes in the production have closed systems which means that the consumed water, industrial wastewater, is treated on-site in the wastewater treatment before being drained off. Only a small fraction of the wastewater goes directly to the sewage system and that is the water from the cooling towers (Scania’s Sustainability Report, 2014). The total volume of consumed water for Scania’s operations between 2010 and 2014 can be found in table 3 (Scania, 2015). The total volume of water per vehicle can also be read from table 3.

<table>
<thead>
<tr>
<th>Water use</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total, m³</td>
<td>519,400</td>
<td>546,000</td>
<td>511,700</td>
<td>575,700</td>
<td>534,200</td>
</tr>
<tr>
<td>m³/vehicle</td>
<td>7.7</td>
<td>6.5</td>
<td>7.7</td>
<td>7.7</td>
<td>6.5</td>
</tr>
</tbody>
</table>

**Table 3. Scania’s water consumptions 2010-2014 (Scania, 2015).**

4.2.4 Waste sent to landfills and other off-site disposals

Most of Scania’s waste is classified as hazardous waste which they send to off-site disposals and the rest is sent to landfills. In 2011, Scania redefined waste in the data collection which affected the comparability of it (Scania’s Sustainability Report, 2014). The total amount of generated waste from Scania’s operations between 2010 and 2014 can be found in table 4 (Scania, 2015). The total amount of waste per vehicle can also be read from table 4.

<table>
<thead>
<tr>
<th>Waste</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total, tonnes</td>
<td>10,000</td>
<td>12,400</td>
<td>13,600</td>
<td>13,900</td>
<td>16,300</td>
</tr>
<tr>
<td>kg/vehicle</td>
<td>148</td>
<td>148</td>
<td>203</td>
<td>168</td>
<td>198</td>
</tr>
</tbody>
</table>

**Table 4. Scania’s waste sent to landfills and other off-site disposals 2010-2014 (Scania, 2015).**
4.2.5 Recycling of residual products

Scania consumes raw materials such as cast iron, steel and small amounts of diverse metals. A lot of material waste is being either reused or recovered for energy. According to Scania, the recycling rate over the past 10 years has been quite stable (Scania’s Sustainability Report, 2014). The total amount of recycled material from Scania’s operations between 2010 and 2014 can be found in table 5 (Scania, 2015). The total amount of recycled material per vehicle can also be read from table 5.

<table>
<thead>
<tr>
<th>Material and energy recovery</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total, tonnes</td>
<td>56,100</td>
<td>70,800</td>
<td>62,700</td>
<td>74,400</td>
<td>69,500</td>
</tr>
<tr>
<td>tonnes/vehicle</td>
<td>0.83</td>
<td>0.84</td>
<td>0.94</td>
<td>0.9</td>
<td>0.85</td>
</tr>
</tbody>
</table>

Table 5. Scania’s recycling rates 2010-2014 (Scania, 2015).
5. Analysis and Discussion

Scania strives to be the leading provider of sustainable transport by integrating sustainability fully in the organisation and in its core processes. Scania’s production system likewise Lean production involves being resource efficient, working with continuous improvements and eliminating waste in order to maximise the productivity. Furthermore, it is stated that SPS is an important instrument to solely enhance Scania’s productivity. Although Lean can be a favourable starting point for companies having sustainable production as objective. Based on the literature and results; the values and principles addressing resource efficiency, elimination of waste, continuous improvement, environmental work and certain lean tools have been identified as determinants to the SPS’ impact on Scania’s environmental performance.

SPS is related to resource efficiency and by using resources in a cost-efficient way could therefore result into a positive impact on Scania’s environmental performance i.e. reduced waste generation and pollution costs. On the other hand, the efficient use of resources does not necessarily imply the sustainability of resource usage itself. The depletion of natural resources is also a concern for the environment. Resources such as water, metals and fossil fuels are object of concern from the environmental point of view. Essential resources as water and metals should also be available for the forthcoming generation. Neither SPS nor Lean consider the amount or the source of the resources, they consider only whether the resources are efficiently used or not.

Elimination of waste is one of the core values of SPS and addresses unnecessary activities, defects and steps that add no value to the customer or the final product. Incorporating this mindset from an environmental perspective, i.e. reuse and recycling of materials are contributing factors for an impact on Scania’s generation of waste, pollutions and emissions.

One of the four main principles of SPS is Continuous improvement. The principle itself implies correcting deviations so they do not reappear and to constantly improve the production system. This principle enhances Scania’s production system by improving the production management and reducing the number of defects in the production lines. The Continuous improvement principle has also an impact on Scania’s environmental work. Waste management, pollution mitigation, and prevention of emissions are constantly upgraded. In turn, this affects Scania’s environmental performance.

Even though not all Lean tools are linked to reduced environmental impacts, there are some tools that have greater potential to reduce Scania’s effect on the environment. Scania uses four Lean tools that provide a positive impact on its productivity and environmental performance; 5S/6S, Kaizen, TPM and VSM.

5S/6S eliminates waste that causes mistakes, errors and injuries through sustaining and standardising work. Expanding the 5S/6S to comprise environmental issues can boost the environmental performance. In this case 5S/6S can also target environmental waste flows and
the waste management. Performing operations in standardised ways, maintaining and continuously improving the workplace contribute not only to minimise defects and fluctuations in the production, but also to evenly decrease waste, emissions and pollutions. Additionally, sustaining the achieved improvements prevents, through routine maintenance and fast correction, leaks that can potentially damage the company’s environmental performance.

Kaizen is the Japanese term of Continuous improvement which has been already mentioned earlier. Carrying out a Kaizen process can reveal concealed opportunities for decreasing the production of waste, improving consequently the environmental performance. The Kaizen, then, can be aimed at a particular production process deemed as a major source of waste.

TPM emphasises the significance of preventive maintenance in order to optimise the efficiency in the production. Since the method divides the maintenance work among the related employees by stimulating their participation, more responsibility is given to them. Also, by following the five steps of TPM, unnecessary activities and waste are eliminated. The remaining things are being inspected, cleaned and organised as a routine. This results in that less fluctuations, damages and accidents in the production and the work environment will occur.

Value stream mapping is a tool used to analyse the product flow and understand the series of activities involved. Understanding the product flow in the value stream can expose not only the possibility of decreasing costs, enhancing flows and reducing time, but also the opportunity to make the environmental performance better. Gathering environmental information in a value stream map can help to develop future improvements on the environmental performance. This can also help expand its use to map natural resources. Energy and water usage flows, for instance, can be added to VSM, revealing also their waste streams. The actual usage of raw materials can also be matched against the materials necessarily required for the production of the product, leading to a reduction of waste.

Environment is listed as the top priority among Scania’s common priorities in the production system. This emphasises the importance of the environmental perspective within SPS and the results obtained from its environmental performance. Scania takes environmental responsibility and integrates environmental work in its business operation by complying with the ISO14001 standards, setting up environmental goals, working with their environmental priorities such as reducing waste, emissions, material, water and energy usage, recycling and reusing more and taking preventive actions to reduce risks and accidents. By monitoring and following up on the company’s environmental performance Scania can assure that every business unit works towards the company’s environmental goals and at the same time affect its environmental performance. A possible reason for Scania’s environmental work could be the environmental pressure from society, environmental regulations and restrictions set by the government, other companies, non-profit organisations and media.
When it comes to Scania’s environmental performance, GHG and NOx emissions have decreased. The use of VOC and water has been the same with a slight decrease in 2014. The recycling rate is quite steady with better results some years. Waste has increased because of the re-definition of waste, but if one only considers the years between 2012-2014 the waste rate has been the same with a decrease in 2013. Although it can be seen through the collected data that Scania’s environmental performance has improved, it cannot be said how large an impact the SPS has had on it.
6. Conclusion

The Lean concept can positively affect a company’s environmental performance. Lean principles and methods focus on elimination of waste, continuous improvement and resource efficiency which positively impact on the environmental performance. Lean tools, additionally, can be expanded to comprise environmental issues. Even though Scania’s production system intends to optimise the productivity, the incorporation of environmental work with SPS’ principles and methods is favourable to the company’s environmental performance as well. Although the collected data on Scania’s performance has improved, it is difficult to say how Scania’s production system specifically affect the environmental performance since environmental work is being employed in every aspect of the business itself. The analysis performed was mainly qualitative due to the restriction of the data collected. Numerical data previous to the implementation of the SPS would be necessary to accomplish a clear quantitative analysis of the impact of a Lean production system over environmental performance. The environmental performance before and after the SPS’ implementation could then be numerically compared. A quantitative comparison is a suggestion for further studies.

Whenever considering the environmental impact of certain activities, however, it is important to say that despite the application of Lean as a way to boost the environmental performance, the inner nature of the business itself should at least be mentioned. Scania produces engines that rely on fossil fuels, which are responsible for a great amount of GHG emissions. Eco-friendly vehicles, in general, are still being developed and Scania, additionally, should also look forward to a change of paradigm in its products.
7. References


