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Sustainability Life Cycle Analysis of a Logistics Company

A case study of Itella Oy

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<p>It is now globally recognized that there is a critical need for human society to be ecologically sustainable. The decline in natural resources, pollution, and climate change are only a few factors of concern regarding the future. Sustainability has been defined as one in which “environmental, economic, and social policies and innovations enable society to use resources efficiently--enhancing human well-being in an inclusive manner, while maintaining the natural systems that sustain us” (European Environment Agency, 2013).</p> <p>Logistics is defined as the management, transportation, storage and handling of products and goods from source point through production to the final point of disposal. This service is essential for society and economic growth, so much so that there is expectation of excellent logistics services, especially in developed countries. Logistics also provides a source of employment and revenue.</p> <p>Despite its many benefits, logistics also contributes to the degradation of the natural systems around us. For example, the transportation sector is responsible for almost a third of carbon dioxide emissions globally, which has a critical impact on climate change. Therefore, it is important that logistics companies try to curb these environmental impacts. Many to date, such as DHL, UPS and FedEx, have done so through such means as the use of alternative fuels, increasing energy efficiency and contributing to “climate projects”. It is beneficial to review the progress made in the logistics sector in order to know where improvements regarding sustainability can be achieved.</p> <p>As a case study, Itella Oy was assessed with a sustainable life cycle analysis developed by The Natural Step. Itella is state-owned and Finland’s largest logistics company, as well as the nation’s postal courier. The analysis showed that there has been much progress regarding sustainable development within the organization, although some aspects, such as the use of plastics within the processing stage remain unsustainable.</p>	
Keywords	sustainability, environment, climate change, logistics, SLCA

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1 Introduction

This section introduces the reader to the negative impacts human activity has on the environment and why there is a need to integrate sustainability into today's economic practices, particularly in the case regarding logistics. It also introduces general logistic practices and the sustainable counterpart "green logistics", which will clarify and give supporting reasons for the main topic of this thesis which is a sustainability analysis of Itella Oy.

1.1 Background

In the European Environment Agency's report "Towards a green economy in Europe" (2013), it is stated that there is strong scientific reason and profound global necessity to move towards a "green economy", due to the recognition that there is now a global crisis regarding not only the current economic and social states, but also in the increasing rate of consumption of resources and emissions. Modern human society will not be able to be sustained by the earth and its ecosystem unless action is taken to conserve what is still available. It is important for social responsibility to manage the way in which we interact with the environment. Sustainability in all aspects of life must be the foundation on which it is built.

A green economy is defined as "one in which environmental, economic and social policies and innovations enable society to use resources efficiently — enhancing human well-being in an inclusive manner, while maintaining the natural systems that sustain us" (European Environment Agency, 2013). Resource efficiency should be developed in order to distribute prosperity equally without decreasing the earth's resources and degrading the environment. However, resource efficiency in and of itself is not enough to achieve sustainability. The natural limits of the ecosystem must be kept in focus so that "ecosystem resilience" is not undermined and yet boosting the economy and human well-being is of equal importance. Therefore, sustainability does not have just an environmental dimension.

The above concept of sustainability--one made up of environmental, economic and social dimensions--is termed the "three pillars of sustainability" or the "triple bottom line" (UNEP/SETAC Life cycle initiative, 2011). There is co-existence and co-dependency in

sustainability, which is illustrated in Figure 1 as a nested dependencies model. The sustainability expert and author, Bob Willard (2014), illustrates the concept in this example:

If you were to ask a maritime fisherman whether the devastating collapse of the cod fishery off the east coast of Newfoundland was an environmental disaster, a social disaster, or an economic disaster, he would say, "Yes." . . . this co-dependent reality . . . shows that human society is a wholly-owned subsidiary of the environment—that without food, clean water, fresh air, fertile soil, and other natural resources, we're cooked.

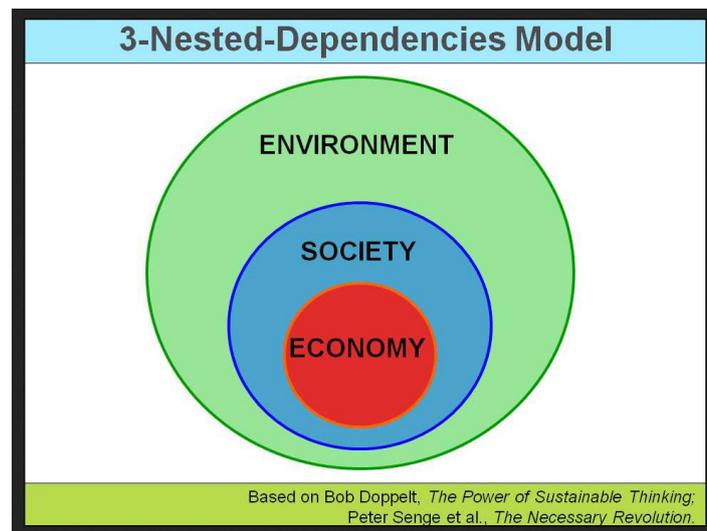


Figure 1 Three pillars of sustainability in the 3-nested-dependencies model (Willard, 2014)

This co-dependency principle requires innovative practices that keep pace with advancing targets and directives addressing the complex impacts human activity causes in these areas. (EPA Climate Change Division, Office of Atmospheric Programs, 2009) In the well-known forward of "Our Common Future", Gro Harlem Brundtland explains that the ultimate goal of sustainability is to provide economic, social and environmental stability in the long term, while considering the needs of the current and future population that will not have compromised the ability to meet those future needs. (UN Report of the World Commission on Environment and Development, 1987) This is the essence of sustainability.

1.1.1 The logistics sector in society

Logistics is the management, transportation, storage and handling of products and goods from source point through production to the final point of disposal. According to the Oxford On-line Dictionary, it is defined as "the detailed organization and implementation of a complex operation" or "the commercial activity of transporting goods to customers".

Logistics management activities usually also include network design, inventory management, supply and demand planning, as well as third party logistics service providers (Grant, et al., 2013).

In Western developed countries, there is the expectation of excellent logistics service, and has been so integrated into “daily life” that it is only noticed when there are some inconveniences to consumers or end-users. For example, the purchase of many necessities of life like food, clothing and medicine are at many times conveniently located in one place. Yet a consumer may only consider the logistical part of this commodity if some item or product is not available, perhaps due to some breakdown in the chain supply by late shipments from the vendors or merchants (Grant, et al., 2013).

Not to be dismissed is the economic and social responsibility involved in logistics operations. The European Commission Mobility and Transport sector reported that statistically, transport accounted for 4.9 % of the total Gross Value Added (GVA) in the 27 EU member states (EU-27) in 2010. In terms of social importance, in 2010 the transport and storage services sector in the EU-27 employed approximately 11.1 million people or about 5.0 % of the total work force. In 2011, private households in the EU-27 spent about 13.0 % of their total consumption on transport-related items, and total goods transport activities accounted for 3824 billion tkm (intra-EU). Road transport accounted for 45.3 %. Intra-EU maritime transport ranked second as a transport mode with 36.8 %. Of the final energy consumption in the EU in 2011, transport accounted for 33 % as seen from Figure 2 below.

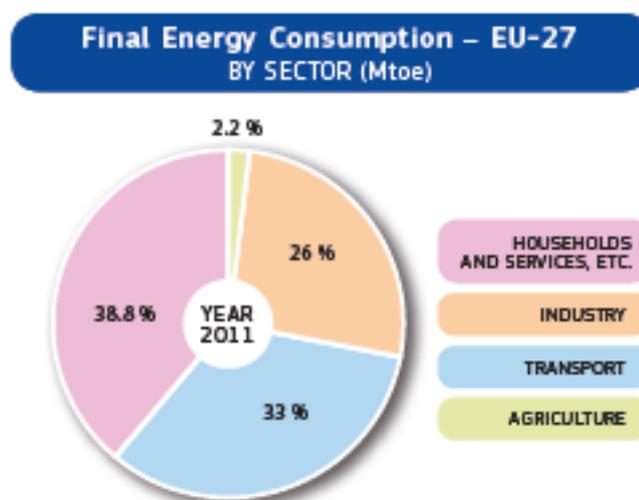


Figure 2 Final Energy Consumption EU27 by sector for 2011 (total of 1103.3 Mtoe) (European Commission, 2013)

Yet, this is not only the case in the EU. According to the Intergovernmental Panel on Climate Change (IPCC), in 2004, transport energy use amounted to 26 % of total world energy use, with the rate of energy consumption for the transport sector between the periods 1990-2002 being the highest of total end-users. Ninety five percent of transport energy comes from oil-based fuels, mostly diesel and gasoline. By mode, road vehicles accounted for 75 % of transport energy usage, with light-duty vehicles and freight trucks comprising the majority.

Mode	Energy use (EJ)	Share (%)
Light-duty vehicles (LDVs)	34.2	44.5
2-wheelers	1.2	1.6
Heavy freight trucks	12.48	16.2
Medium freight trucks	6.77	8.8
Buses	4.76	6.2
Rail	1.19	1.5
Air	8.95	11.6
Shipping	7.32	9.5
Total	76.87	100

Figure 3 World transport energy use in 2000, by mode. Source: World Business Council for Sustainable Development

Transport energy use is projected to grow by 46 %, 10 % and 5 %, for the USA, Western Europe and Japan, respectively. The sectors projected to be responsible for worldwide transport energy growth are light-duty vehicles, freight trucks and air travel. One study projected that these three sectors will be responsible for 38 %, 27 % and 23 %, respectively, of the total 100 EJ growth in transport energy that it foresees in the 2000–2050 period. Thus from these few figures we see that there is a tremendous part in global economics which logistics services plays. In its Fourth Assessment Report: Climate Change 2007, IPCC (2007) best summarized the scope of logistics as follows:

Economic development and transport are inextricably linked. Development increases transport demand, while availability of transport stimulates even more development by allowing trade and economic specialization. Industrialization and growing specialization have created the need for large shipments of goods and materials over substantial distances; accelerating globalization has greatly increased these flows.

1.1.2 Negative impacts and externalities

When externalities are considered, it is possible to characterize the indirect effect of logistics activities on society which occurs outside the market process. As a result, society members may be negatively impacted for which the cost is not incurred by the responsible party. The externalities of logistics services are various, ranging from traffic congestion, noise pollution, and contribution to climate change through the release of CO₂ and other greenhouse gases (GHG) (Sathaye, et al., 2006).

Diesel, the most commonly used fuel type in freight modes, causes significant negative impacts at the regional level (Sathaye, et al., 2006). According to the U.S. Environmental Protection Agency, gaseous components of diesel exhaust include carbon dioxide, oxygen, water vapour, nitrogen, carbon monoxide, nitrogen compounds, sulphur compounds, and low-molecular-weight hydrocarbons. Particulate matter released also includes metals and other trace elements. Diesel exhaust contributes to a number of health-effects such as acute irritation and respiratory problems, as well as contributions to acid deposition and smog (EPA Climate Change Division, Office of Atmospheric Programs, 2009).

Logistics and freight transportation contributes greatly to GHG releases and climate change. Global climate change is expected to considerably drive the hydrological cycle and increase the frequency and severity of natural disasters. Ecosystems may be disrupted. Although the contribution to stratospheric ozone depletion is negligible for freight transportation, it is worthy to note that older vehicles fitted with air conditions and refrigerators release chloro-fluorocarbons which contribute to stratospheric ozone depletion (Sathaye, et al., 2006).

According to the UN in its report, "Development Account Project: Facilitating climate change adaptation in transport through addressing the energy-environment linkage" (2013):

Globalization and liberalization of national economies are leading to a permanent increase in transport activities. With regard to road transport, the growing vehicle fleet and the related increasing fuel consumption contributes to the global warming effect by greenhouse gas emissions. The most important component of the negative effects is carbon dioxide (CO₂). CO₂ emissions depend not only on the total energy consumption of the different modes of transport, but also on the shares of the different energy sources used and their contributions to global warming. Globally, the transport sector is considered to be responsible for 23 per cent of the world CO₂ emissions from fossil fuel combustion. In the developed Organization for Economic Cooperation and Development (OECD) countries transport accounts for 30 per cent of all CO₂ emissions. The transport

sector is 95 per cent dependent on oil and accounts for 60 per cent of world oil consumption, which exposes the sector increasingly to oil price instability and supply shocks.

In address to the above facts regarding logistics and its impact as a whole on the planet's degradation, there have been numerous strategies and measures undertaken by various governments and entities to address the matters of climate change for transportation and logistics, specifically focused on abating emissions and improving logistics operations and efficiency. To evaluate the implemented measures, as the UN has explained, "there is a need to develop well-defined standard monitoring and assessment tools taking into account the latest developments in transportation. Such a toolkit, to be available to Governments, regional commissions and other interested stakeholders, must also be transparent to ensure that decisions are not biased by the specific interests of different pressure groups" (UN Development Account, 2013).

1.1.3 Green Logistics

Green logistics is the attempt to measure and minimize the ecological impact of logistic activities, which includes all the activities of forward and reverse logistics. Reverse logistics is a growing area of logistics and includes the return, recovery, and recycling of products. It can be thought of logistics in the opposite directions (Grant, et al., 2013). Green logistics means ensuring that these activities are environmentally friendly, not wasteful, and focus on reducing carbon dioxide emissions.

Grant et.al. (2013), discusses the suggestions of the World Economic Forum's argument concerning the three groups responsible for "greening" the supply chain: logistics and transport service providers, shippers and buyers as users of the services, and government and non-government policy makers. The suggestions included the following:

- Logistics and transport service providers should increase adoption of new technologies, fuels, efficient hierarchies and nodal structures, optimize efforts for synergistic networks, and enable further collaboration between shippers and carriers, as well as more environmentally friendly transportation modes.
- "Green buildings" should be encouraged among the industry by improving existing facilities through retrofitting green technologies and invest in new building technologies. Recycling and eco-friendly waste management along with collaborating with customers to encourage industry to commit to improvements for current and future technologies both individually and sector-wide actions.

- Shippers and buyers should keep carbon audits for raw material selections, carbon intensive processes, length and speed of the supply chain, and carbon characteristics of the use phase. Shippers and buyers should agree on additional standards and targets on packaging weight and elimination, as well as cross-industry agreements for transit. They should develop sustainable sourcing policies that consider the carbon impact of the whole sector activities and integrate carbon emissions into the business models.

1.1.4 Concepts of science behind sustainability

Sustainability refers to the capability of being maintained at steady levels without exhausting natural resources or causing ecologic damage. It also relates to the issue of consumption currently and futuristically. Holistically, it includes species and ecosystems, natural resources, energy usage, industry inputs and outputs and their technologies, population and urban growth, water and food. All these issues have logistics implications because of the impact on the natural environment (Grant, et al., 2013).

While sustainability science itself is not yet a stand-alone field or discipline of science, within the last decade research and development of sustainability has escalated. Leading scientists and researchers, as well as businesses, corporations, organizations, and various enterprises have strived to set definitions, parameters, metrics and indicators in order to not only determine the state of sustainability on a global scale, but to improve operations and processes throughout society which have taken a major toll on the environment.

Sustainability logistics and supply chain activities have been examined over the past few decades. However, these are growing rapidly due to the realization that economic and environmental sustainability requires attention due to the significance of the impact of logistics on the environment and society. Energy use and emissions are the focus of sustainability science; however it is still under-developed and under-researched (Grant, et al., 2013).

1.1.5 Life cycle assessment techniques

Life cycle assessments (LCA) have taken a major role in addressing the matters of sustainability and corporate responsibility. In this section, a literature review of LCA and various adaptations and methods will be conducted. This thesis will also relate the methods

of the so-called “sustainability life cycle analysis” (SLCA), developed by The Natural Step, a non-profit organization targeted towards increasing awareness and helping enterprises in endeavours of environmental corporate responsibility, as well as the case study of the logistics company Itella Oy, which is based in Finland.

As a result of debate over the past two decades concerning environmental responsibility in the face of climate change and decreasing resources, the International Standards Organization developed the ISO 14040 series. This series covers LCA principles and framework in order to facilitate the process of evaluating the impacts of a product or service on the environment over its lifetime (cradle-to-grave). The goal is to compare the environmental performance and impacts of products, giving stakeholders the ability to make environmentally responsible choices. (UNEP/SETAC Life cycle initiative, 2011)

The term “life cycle” refers to the equal and holistic assessment of raw material production, manufacture, distribution, use and disposal of all steps within a process or involved in the process of a final product, coined as “ecodesign”. For companies, this concept may be applied to assess environmental performance. (ISO, 2006)

ISO standards define four main phases for performing an LCA, namely:

- “Goal and scope”-Clearly defined reasons for the study are laid out. The purpose of the study and the approach taken to conduct it are made transparent. Here the functional unit and modelling approaches are defined. The system boundaries should clearly be defined in relation to the goal and scope.
- “Life cycle inventory” (LCI)-The product system or process and individual units are described, as well as the elementary flows and exchanges between product and environment, i.e., inputs and outputs to and from nature, including amounts in line with the functional unit.
- “Life cycle impact assessment” (LCIA)-Environmental impact according to the LCI and flows are evaluated by association according to impact categories and indicators. Results are given and identified with the mandatory elements of the LCIA which are selection of impact categories, indicators, characterization models , classification of impact categories and calculation of category indicator results.
- “Life cycle interpretation”- Findings as a combination of the two previous phases are interpreted as defined by the goal and scope giving conclusions and recommendations.

(UNEP/SETAC Life cycle initiative, 2011)

Different techniques allow stakeholders to draw conclusions based along the value chain, which is comprised of workers, communities, consumers and society as a whole, that aim towards increasing performance efficiency, cost efficiency, social and specifically, environmental responsibility. The various techniques of life cycle assessments yield various results according to their goals. Among such techniques is life cycle costing (LCC). Here the cost implications of the life cycle are evaluated against competing alternatives to determine the most cost-effective choice. Working environmental LCA (WE-LCA) and social or socio-economic life cycle assessments (S-LCA), examine the working environmental impacts and social consequences on humans of the life cycle of a product or process. These are used to complement an LCA and should be assessed according to the same system boundaries of an environmental LCC or LCA. (UNEP/SETAC Life cycle initiative, 2011)

While the different techniques allow stakeholders, individuals, and enterprises to assess the impact of their operating decisions, to get a broad picture as a whole, it is incumbent to define life cycle thinking in terms sustainability. Conducting an assessment in such a way forms the basis for the sustainability life cycle sustainability assessment. This provides a technique which is robust and holistic, assessing information about potential environmental impacts in a systematic way. (UNEP/SETAC Life cycle initiative, 2011)

1.1.6 SLCA

This thesis project was performed in part for Natural Interest Oy, a sustainability consultancy company which is a Finnish affiliate of The Natural Step International (TNS). TNS is a non-profit company, founded in Sweden, which developed the SLCA method based on the Framework for Strategic Sustainable Development (FSSD). (The Natural Step, 2014) The FSSD consists is a qualitative model based on:

- **“Four sustainability principles”** (related to the “three pillars of sustainability” and the “triple bottom line”) The four sustainability principles are a holistic approach to sustainability and consider that in a sustainable setting, ecological systems are not subjected to increasing use of mined materials scarce in nature, increasing emissions and waste, and physical degradation. Society is also considered in the fourth principle with the idea that people are able to meet their

needs and that future generations will have those means of meeting their needs as well. (The Natural Step, 2014)

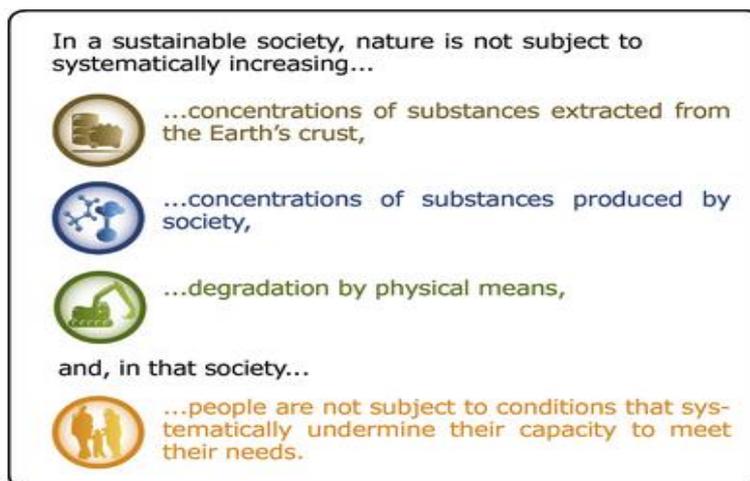


Figure 4 Four sustainability principles (The Natural Step, 2014)

- **“Backcasting”** is a management strategy for sustainable development which asks the question, “What does our vision of success look like?” It differs from forecasting in that forecasting is based off of current trends and information projected into the future, including trends that we do not want. Backcasting utilizes the ABCD method. (The Natural Step, 2014)
- The **“ABCD planning method”** consists of four steps which are repeated progressively. The first step consists of “awareness” or holistically defining sustainability within the context of the organization. The second step, “baseline mapping”, using the four principles to conduct a sustainability “gap analysis”. The fourth step, “creative solutions”, brainstorms potential solutions to the issues highlighted, and the fifth step, “decision”, prioritizes the measures needed to move the organization towards sustainability. (The Natural Step, 2014)
- **“3 Strategic Prioritization Questions”** are used to allow organizations to prioritize their actions which resulted from brainstorming. These questions also help organizations develop questions specific for their needs. (The Natural Step, 2014)
- **“The 5 level framework”** is the use of organized thinking and information to move towards sustainability. It consists of the scope of the system under study, the success of sustainability in society, strategic guidelines for organizations to follow, sustainable concrete actions towards sustainability, and which tools are available for organizations. (The Natural Step, 2014)

The approach explained above identifies the degree of sustainability in key areas of the study. The ten-steps shown here combine ISO 14040 standards for LCA with those developed by TNS.

1. Setting goal and scope
2. Creating a shared definition of the sustainable product system
3. Define the system boundaries and life cycle scenario for the sustainability assessment
4. Conduct an inventory analysis of the life cycle
5. Sustainability assessment – Use the sustainability principles to assess sustainability strengths and weaknesses
6. Analysis and synthesis of results – Identifying key impact areas
7. Brainstorm possible solutions
8. Prioritise solutions
9. Create an innovation roadmap
10. Measure and report progress (ongoing)

1.1.7 The science behind SLCA

Concerning the science behind the approach, illustrated in Figure 5, we see that the earth's biosphere is a closed system, highlighting that sustainability requires the natural cycles to be kept in balance. Though the science is fundamental, it is crucial in understanding sustainability.

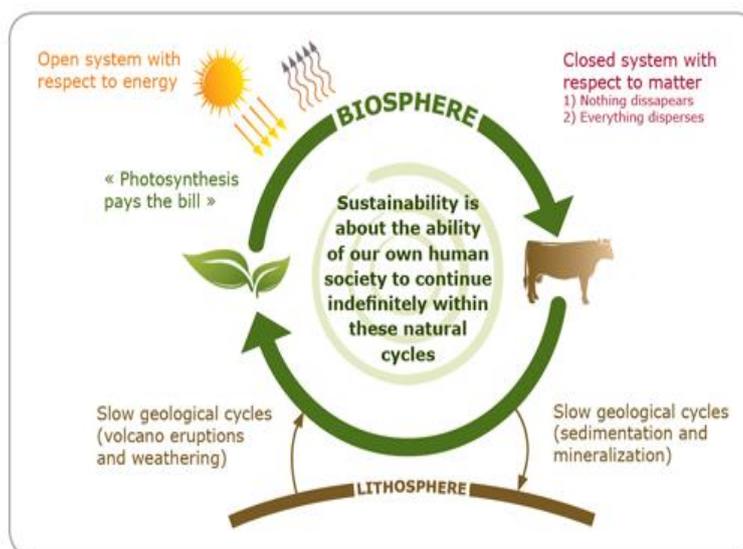


Figure 5 Science behind SLCA approach. (The Natural Step, 2014)

This illustration below represents the concept that the current state of the environment is a highly complex system in which declining resources are creating pressure on human societies to achieve sustainability, termed the “funnel metaphor. This shows that careful consideration by companies is necessary in order to sustainably meet economic and social demands (The Natural Step, 2014).

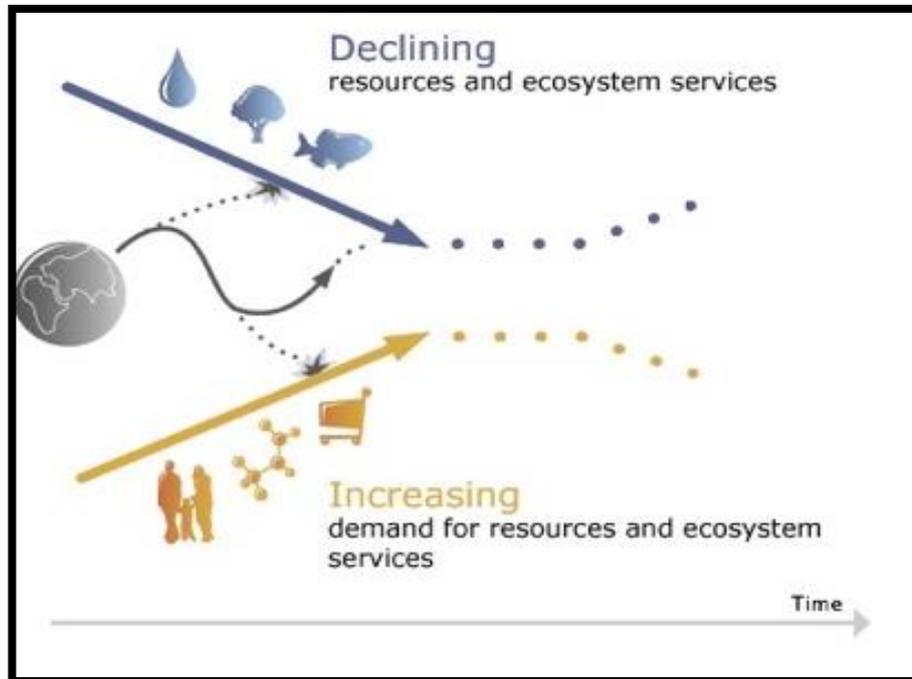


Figure 6 Funnel Metaphor. (The Natural Step, 2014)

1.2 Purpose and scope of thesis

Logistics is a fundamental element of economic and social development. However, there is scientific evidence that logistics has a direct impact on climate change and environmental degradation. These topics have been introduced in this thesis with the main purpose to study the sustainability of logistics with the focus on Finland’s largest logistics company, Itella Oy, by using the SLCA method. By doing so, this study will also attempt to answer the questions listed below.

- What does sustainability mean in concrete terms and why is it a critical component to progress?
- What principles govern how human activity should impact the world in which we live?
- What relevant role do logistics services, including mail communications, play in the economy and society?

- How are SLCA's invaluable tools in the analysis and synthesis of building in sustainability from the ground up?
- Finally, what might the future hold for logistics companies, and this case, Itella Oy?
- Are the targets currently in place sufficient for future needs?
- When we take the case of a particular logistics company and analysis its claims of responsibility, are the claims in-line with sustainability targets and is the company well situated to meet them?

1.3 Outline and methodology used in thesis

Itella Oy is state-owned and Finland's largest logistics company, and is best known as a postal courier for domestic mail inside Finland. Its operations also include many other domestic and international services such as e-communications and financing automation which make up a significant source of revenue for Finland and provide many social and economic benefits. As such, there are many impacts and externalities to the environment, economy and society. However, a comprehensive analysis of the whole of Itella's operations is beyond the scope of this study.

This project is two-fold. Firstly, the aim is to provide an introduction to sustainability through a literature review, as well introduce the current state of sustainability trends in global logistics practices by benchmarking the sustainability achievements of three other global logistics companies. This will provide a qualitative overview in which to compare the progress Itella is making alongside its competitors.

Secondly, a case study of Itella's Mail Communications and Logistics services will be made with the SLCA method. Additionally, a brief comparison of this particular SLCA method will be assessed against the sustainability life cycle method developed by the United Nations Environment Program, and limitations of this study will be highlighted for transparency. Finally, conclusions and recommendations will be purposed, followed by a brief look at the future of Itella. The SLCA method used in this thesis has been developed by The Natural Step (TNS), an internationally recognized, non-profit sustainability organization (For more information, see The Natural Step, n.d.).

The methodology of the literature review was to give an over-view of sustainability parameters and definitions according to scientific and political authorities such as the European Environment Agency and United Nations Environment Programme, as well as an over-view of the non-profit, sustainability organization, The Natural Step, and its affiliate, Natural Interest Oy. Benchmarking was conducted of current industry best practices of green trends appearing in current logistic practices. Three global logistics companies were assessed across the four sustainability principles which are used as the basis in the SLCA.

Itella's operations and current corporate responsibility, as well as current achievements for environment and social responsibility, was reviewed through online research, thus providing the data for the SLCA. The SLCA was then carried out using Ouro software which was developed by Nativalab™ using the SLCA questionnaire from The Natural Step. An interview was conducted with head of Corporate Responsibility in Itella about various data gaps. The results were then reassessed, analysed and interpretations made. From the results and current situation of Itella a forecast was made regarding Itella Oy's sustainability path.

1.4 Itella Oy - Background and Introduction

Itella Oy was originally Finland's national postal service, founded in 1638, and through the years it evolved into the stated-owned enterprise known as Finland Post Group Ltd in 1998. The parent company changed its name to Itella Corporation in 2007 as it expanded into international markets. Itella has advanced its operations to include postal services/mail communications, logistics, e-commerce services and financial administration processes.

Today, Itella operates in 11 countries with personnel of 26,000 employees as of 2013. Itella has four business groups, Itella Mail Communications, Itella Logistics services, Itella Logistics Russia and OpusCapita. Itella Mail Communications provides delivery services for letters, direct mail, parcels, newspapers and magazines in Finland, as well as globally through the use of partners. Various types of publications include newspapers, magazines, customer magazines, leaflets and bulletins, with up to 95 % of newspapers and magazines being delivered directly to homes. In 2013, it was reported that nearly 3 billion deliveries a year on average are made, with a staff of 16,700, comprising 56 % of net sales.

Itella Logistics provides service logistics solutions in 8 countries and in 2013 accounted for 32 % of Itella's net sales. Its aim is to support logistics for road, sea and air freight, warehousing and other contract logistics. All forms of logistics services are covered, including transport services, forwarding, contract logistics and IT-based logistics solutions. In 2013, road, air and sea shipments were 780,000 with a staff of 6,700.

In Itella's home market (Nordics, Baltics and Russia) road transport is comprised of Itella's own fleet, while throughout Europe help may be acquired from partner companies in local areas. Air and sea freight utilizes a partner network providing global coverage, as well as combining global air and sea services with logistic services such as warehousing, distribution and terminal services. Itella Logistics provides other companies the option to outsource their warehousing by offering 45 warehouses (approx. one million sq. meters of floor area).

1.4.1 Environmental goals (2020)

As part of corporate responsibility, Itella has committed itself to the UN Global Compact principles in the areas of human rights, labor, environment and anti-corruption (UN Global compact, 2014). Itella has also developed what it calls, "Our vision for 2020". A key goal in Itella's vision is its environmental program called "Itella Green", which is designed to cut CO₂ emissions by 30 percent by the target year. The primary methods for reaching its goal are to improve energy efficiency and use renewable energy sources with lower emissions, with the aim of directly decreasing its carbon footprint while simultaneously improving processes. This target is applied to all of its activities: transport, buildings, subcontracted transport, voluntary compensation for emissions, and providing carbon-neutral products. Since February 2011, as part of its effort to reduce carbon dioxide emissions, Itella has been financing certain certified climate projects namely in Africa, India, and South America, so that, according to its claim, "that while the delivery of one letter generates 20 grams of carbon dioxide, we make sure that a corresponding amount is cut from emissions somewhere else", allowing 100 % carbon neutral services from the customer's perspective.

2 Examples of logistics companies' best green practices

2.1 Benchmarking

The current trends in logistic services have taken on “green measures.” As part of the standardization process, benchmarking is used to measure performance using an indicator in which industry bests or best practices are identified and used to compare one’s own performance. Benchmarking may be divided into two categories, informal and formal. Informal is an unstructured approach which compares the experience of other organizations not following a defined approach. (Mann, et al., 2010)

Using the informal benchmarking method mentioned above, this thesis reviewed the sustainability and corporate responsibility activities for three global industry leaders in logistics, namely DHL, UPS and FedEx. Their whole range of services, processes and achievements was reviewed for highlights of best practices in sustainability which are given in the tables below. They were measured against the four sustainability principles.

The information used for benchmarking was accessed online from the company sites. These companies regularly publish sustainability reports as part of the corporate responsibility strategy. Best practices and sustainability achievements were published in the reports which were assessed against the four sustainability principles regarding resources consumed, environmental impacts, and social impacts. In order to make relative comparisons between the companies, “quick” facts of about each regarding founding date, revenue and number of countries in which it operates were given. The main achievements regarding sustainability are listed in the tables below.

2.1.1 UPS- United Parcel Service Inc.

Below are a few facts regarding when UPS was founded, its size and in how many countries it operate. UPS is one of North America’s largest couriers.

- Founded in 1907 as a messenger company in the US.
- Now is a multi-billion-dollar corporation global commerce company
- World’s largest express carrier and package delivery company specialized in transportation, logistics, capital and e-commerce services
- Operating in more than 200 countries and territories worldwide
- 8.8 million daily customers

Table 1 Benchmarking of UPS

Four Sustainability Principles	Sustainability actions and measures highlights
Natural resource consumption 	<ul style="list-style-type: none"> • Renewable fuels • Advanced green technology vehicles • Denewable energy for facilities
Pollution of environment 	<ul style="list-style-type: none"> • Greenhouse Gas reduction strategy
Physical degradation of environment 	<ul style="list-style-type: none"> • Carbon neutral shipping • Actively engaging with public sector and non-governmental organizations regarding climate change, water management
Social and Economic 	<ul style="list-style-type: none"> • ~400,000 employees • Invested US\$3.1 billion for employee compensation and benefits • recognized by CR Magazine as one of “100 Best Corporate citizens” • GRI A+ application level, sustainability reporting, awarded the 2012 EPA supply chain leadership award, diversity, community safety • skilled employees trained to manage environmental impacts

2.1.2 DHL

DHL was chosen to be benchmarked in this study due to its widely known brand. DHL also operates in Finland.

- Founded in 1490--500 years of postal history.
- Present in 220 countries and territories

- Part of Deutsche Post DHL
- 1 million customer contacts per hour
- 2013 Deutsche Post DHL generated revenues of more than €55 billion

Table 2 Benchmarking of DHL

Four Sustainability Principles	Sustainability actions and measures highlights
<p>Natural resource consumption</p> 	<ul style="list-style-type: none"> • Reduced energy and fuel consumption through aerodynamic optimization, engine modifications, hybrid drive systems, energy efficient buildings • Use of alternative energy sources for less emissions through alternative fuels, biogas, electric vehicles
<p>Pollution of environment</p> 	<ul style="list-style-type: none"> • 16% carbon efficiency increase to-date • Developed eco-friendly reusable packing material for tall freight jointly with EcoBiz as an alternative solution to plastic stretch film
<p>Physical degradation of environment</p> 	<ul style="list-style-type: none"> • Climate projects globally such as in Nicaragua's wind power plant and in Liuaoyang City, China
<p>Social and Economic</p> 	<ul style="list-style-type: none"> • 480,000 employees • International Labour Organization • UN Global Compact • Fair compensation, good working conditions, diversity awareness training for managers

	<ul style="list-style-type: none"> • Employee opinion surveys • Health and safety strategy to reduce risks/accidents and promote health and well being
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2.1.3 FedEx

FedEx is another major North American logistics company with several operations globally. Key company facts include:

- Had beginnings in 1913 with C.J. Tower & Sons; forerunner of FedEx Trade Networks in New York
- Consists of FedEx Corporation, FedEx Express, and FedEx ground
- Leading North American logistics provider for ground small-package delivery services, US\$44 billion in revenue
- 3.9 million shipments each business day
- Operates in 220 countries and territories

Table 3 Benchmarking of FedEx

Four Sustainability Principles	Sustainability actions and measures highlights
<p>Natural resource consumption</p> 	<ul style="list-style-type: none"> • Recycle materials • Use of renewable power sources for operations • Innovative technologies in transportation fleet • Increased electric and hybrid fleet by 20 % • Route optimization
<p>Pollution of environment</p> 	<ul style="list-style-type: none"> • Use of solar power saving 4,000 metric tons of carbon emissions
<p>Physical degradation of environment</p>	<ul style="list-style-type: none"> • Conservation through suppliers and contractors regarding environmental impacts of fuels

	
<p>Social and Economic</p> 	<ul style="list-style-type: none"> • 300,000 employees • 40 % of U.S. workforce (28 % of management team) are minorities • Champion of Diversity Award • Corporate Diversity Council to maintain diversity and commitment

2.2 Conclusion of benchmarking results

These logistics companies are seeking to incorporate sustainability into their services through such measures as using alternative energy and fuel sources, increasing transportation efficiency through route optimization and better technologies. Investing in climate projects for carbon neutral shipping is part of their strategies, and all have similar goals of reducing CO₂ emissions. Of particular note, is DHL and EcoBiz’s joint development and use of reusable packing material which replaces the stretch film previously used for their tall freight transportation. This has drastically reduced their CO₂ emissions by approximately seven tonnes per year (DHL Press Release, 2011).

When comparing Itella’s sustainability achievements against the benchmarking of the other companies, it can be seen that though Itella is a smaller company and operates on a smaller level, it has made comparable sustainability achievements. Notably, while vehicles represent 80 % of total carbon dioxide emissions for Itella, to date it has decreased its emissions by 20 % which is a higher achievement than DHL’s 16 %. Table 4 below shows what the main accomplishments of its efforts in green logistics.

Table 4 Itella's sustainability achievements by 2013

Four Sustainability Principles	Sustainability actions and measures highlights
Natural resource consumption	<ul style="list-style-type: none"> • Alternative fuels such as bio-diesel and biogas

	<ul style="list-style-type: none"> • Innovative technologies in transportation fleet such as electric vehicles • Route and load optimization • Target to increase share of alternative vehicles to 40 % by 2020 • Installation of drive-style monitoring devices
<p>Pollution of nature</p> 	<ul style="list-style-type: none"> • Green buildings to cut emissions • Cut electricity and heat consumption by 4 % roughly
<p>Physical degradation of environment</p> 	<ul style="list-style-type: none"> • Mix waste represents 10 % of total • 100 % carbon neutral • International climate projects
<p>Social and Economic</p> 	<ul style="list-style-type: none"> • Significant source of employment in Finland • Employees represent nearly 90 nationalities • Member of Diversity Chapter Finland • Safe workplace development program to reduce accidents • GRI G3 of Application Level B • UN's Global Compact principles

3 Sustainability Analysis

3.1 Goal, scope and shared definition of the sustainable product system

The goal of this SLCA is to analyse Itella's operations and processes according to the four principles of sustainability of this particular life cycle analysis tool. Though Itella is a company which offers diverse products and services, the scope of this study will focus on the mail communications and logistics so that stakeholders and public can have a transparent comparison of sustainability claims and assumptions against standards and benchmarks. Due to the broad nature of logistics, this study will simplify the logistics scope in order to make comparisons.

3.2 Methodology and system boundaries of SLCA

The SLCA developed by TNS is a qualitative assessment based on a questionnaire using Ouro software developed by Nativalab™. The questionnaire has questions related to each sustainability principle divided into impact and progress questions. The impact assessment of present practices was synthesized by answering the progress questions to produce a color-coded matrix and point system. Data for the questionnaire was obtained through the company's annual report and website. An interview was also conducted with Corporate Responsibility. The analysis was performed by this author who has five years of working experience in Itella's sorting department, as well as by another employee in Itella with five years of experience also, for a cumulative experience of 10 years.

This study considers only the logistics (or transportation, storage, processing and distribution) of Itella's Mail Communication and Logistics operations, including warehousing. The term "mail" in this report is defined as the delivery services for letters, direct mail, parcels, newspapers and magazines, or generally known as "post". It includes the sourcing (where it is obtained and manufactured) of materials (referred to as "material inputs" in the questionnaire) needed for the sorting and processing of mail, but excludes postal products such as envelopes, stamps, construction of warehouses, manufacturing of vehicles and machinery in the sorting process, transportation of employees to and from work, and customer disposal of mail. This is due in part to OpusCapita, who controls those supplies and goods, which has been excluded from this study. Also, Itella at present does not significantly control customer disposal or end-of-life choices.

Explicitly, the system boundaries for mail communications and logistics are as follows: mail is received at the service points via customers or by collection of mail from various mailboxes by Itella's own fleet. From the service points, mail is transported to the sorting centers where it is processed. From the sorting center, it is delivered to the customer or to a service point again and distributed/transported to the customer. Reverse logistics

may include “customer returns” or wrongly addressed items. Warehousing may include pick-up services offered by Itella. Input for the service points, sorting centers and warehouses includes electricity, water, land use, packaging materials, employees/stakeholders. Outputs include emissions, land use, waste and recycling. System boundaries for the service points, sorting centers and warehouses also includes employees, working and safety conditions, as well as social and economic factors, i.e., wages and well-being of local communities. For transportation/distribution, the system boundaries include the fuel consumption, electricity and number of employees and working conditions. Below in Figure 7 is a flow chart of the system boundaries. The scope of logistics service is very broad; it offers many different amenities, i.e., express, overnight, to-door deliveries, but this study is limited to an broad overview of Itella workings, not individual services.

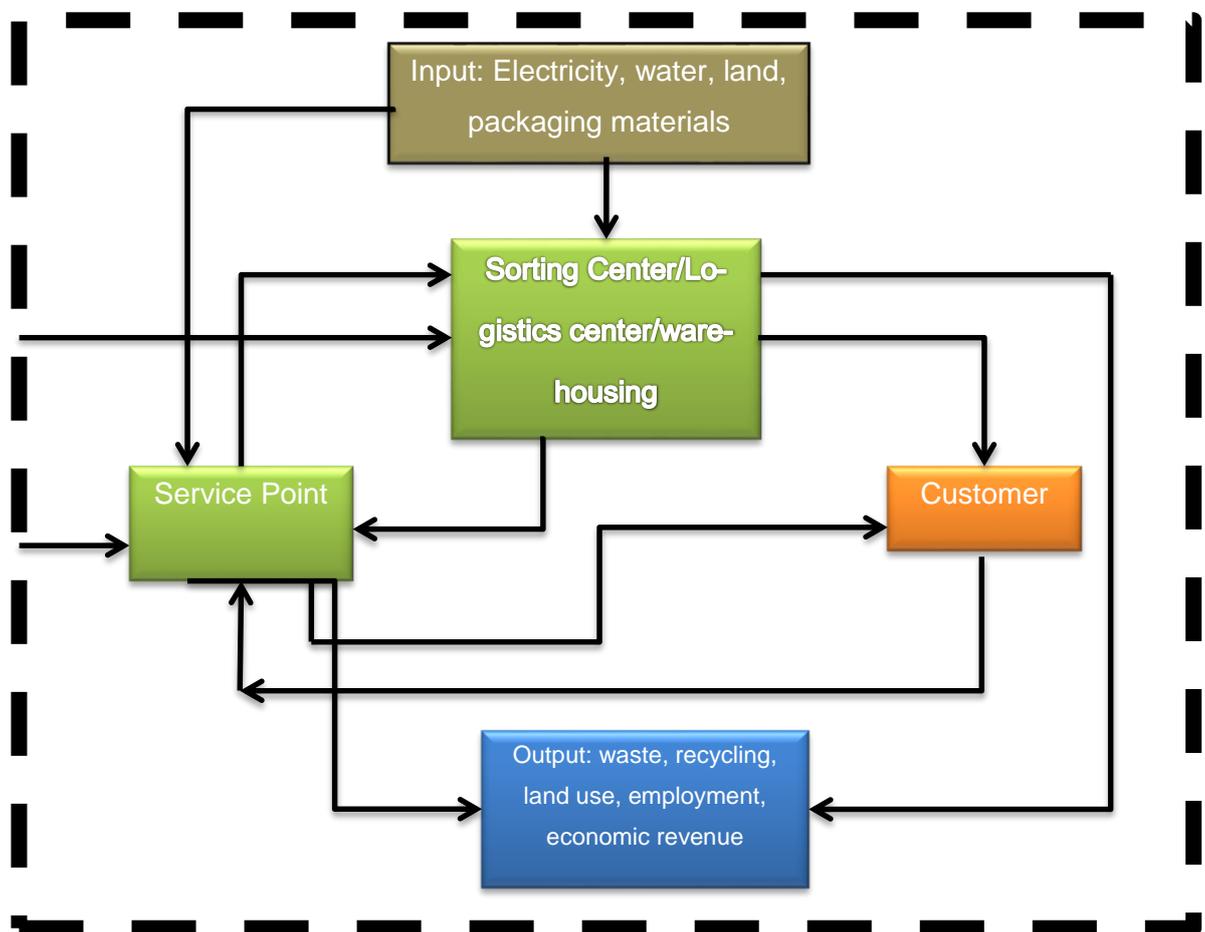


Figure 7 System boundaries for Mail communications and Logistics services including warehousing

3.3 Inventory analysis of the life cycle

The inventory analysis of the life cycle is constructed in Table 5 below. As mentioned before, due to the nature of the SLCA, people were also considered in the input and output. This referred to health and safety risks, as well as to employment provision and economic revenue and development.

Sorting and processing material inputs includes plastics (e.g. stretch film, hard plastics for containers and latches), wood for pallets, and metals for metal trolleys or carts which are used in the processing and sorting. The logistic service uses these materials through the sorting and processing steps, but part of these inputs comes from the customer, for example, when customers wrap their deliveries. Though there is little control or influence by Itella at this point with regard to customer choices of packaging materials, this does result in waste and recycling as an output for Itella.

Table 5 Inventory List

Inputs:	Outputs:
Energy	Land use
Fuel	Emissions such as CO ₂ , NO _x ,
Land	So _x PM
Packaging materials	Landfill waste
process materials: plastics,	Hazardous waste
wood, metals	Recycling
Employees	Employment
Consumers	Revenue
working conditions	

The inventory list allowed the inputs and outputs of the system to be categorized according to the SLCA questionnaire by phases which are defined in the results later. With the use of the inventory lists, the questions were optimized for the SLCA. It was essential to do this due to the large complexity of Itella's operations; this narrowed down the factors (inputs and outputs) deemed relevant to the scope of the study within the established limitations.

3.4 Itella's sustainability assessment against four principles

Itella's annual report (2013), published a type of environmental balance sheet in their environmental assessment. Here we can see their inputs and outputs, as well as carbon

dioxide emissions, waste, and recycling (Figure 8). These were transformed to help contrast their performance against the sustainability principles seen in Table 6. As mentioned before, please note that OpusCapita has been excluded from this study.

Environmental balance sheet

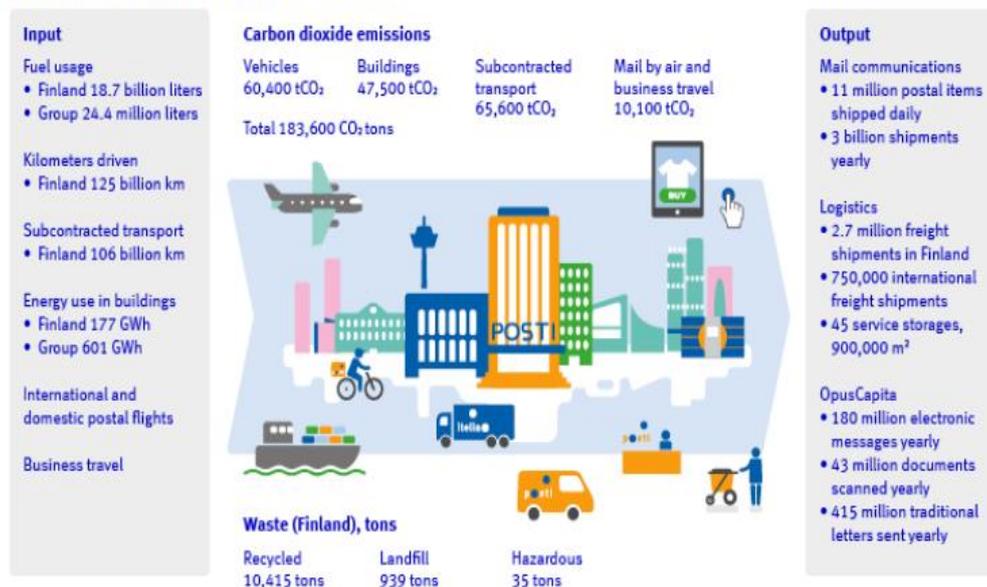


Figure 8 Itella's Environmental balance sheet (Itella Annual Report 2013, 2013)

Fuel usage is totalled at 18.7 billion liters. Carbon dioxide emissions are 183,600 tons. Waste consists of recycled waste at 10,415 tons, landfill waste at 939 tons, and hazardous waste at 35 tons. Thus, we can see that there is a large emphasis on recycling, which results in less waste being landfilled which accounts for only 10 % of Itella total waste being mixed waste.

Table 6 below is the resulting transformation of the balance sheet against the four sustainability principles. Resources taken from the environment are fossil fuels used for transportation and plastics. Energy used in the buildings is from green sources. Transportation impacts the environment through emissions, while the use of Itella's service produces waste which goes to the landfills. This also degrades the environment by using land space and visually impacting by way of unsightly landfills until they closed and the land is restored. Employees and consumers are required for each phase, which results in economic stability and growth.

Table 6 Inventory list against 4 sustainability principles

Input vs. Four Principles	Transport	Processing	Use	Output
	Fuel Usage	Packaging materials	Energy use in buildings	Extraction of oil
	Kilometers driven/flown	Energy use in Building	Landfill	Emissions
	Fossil fuels	Plastics from crude oil	Energy use in Building	Landuse for landfills
	Employees and consumers			Economic and social growth/stability

4 Results and Analysis

4.1 The color coded matrix

Figure 9 below gives a visual of Itella's results. The dark green colors indicate complete sustainability in terms of the four sustainability principles, and the color spectrum ranges from dark green, light green, yellow, orange and red to indicate degree of sustainability. Warm colors, especially orange and red, signal where the system is least sustainable, and gives an indication where improvements can be made. The SLCA also gives points for each category, with 7 points being maximum sustainability.

The SLCA was divided into four phases to cover the logistics service:

- **“Phase 1”**-Material Inputs: consisted of those which were necessary to the sorting and processing steps, such as plastics, wood, metals and employees.
- **“Phase 2”**-Processing: included the operations at service points and sorting centers as well as warehouses.
- **“Phase 3”**-Packaging, distribution and retail: consisted of the transportation operations explained in system boundaries.
- **“Phase 4”**: Customer/client use: This use phase considered the qualitative analysis of safety, hazards, and accidents as well as the impact of using this service to the natural environment.

Overall, Itella scored 71/112 points, which means that approximately 63 % of Itella's operations are sustainable. As can be seen from the results matrix, Phase 4 is the most sustainable. This is due to the company's efforts to reduce emissions, use alternative fuel, and alternative energy sources. Phases 1, 2 and 3 show the least sustainable results according to the first two sustainability principles. This is due to the use of plastics, metals and fossil fuels in the sorting process, as well as not having any targets to reduce or minimize their consumption. Regarding, sustainability principle 4, Itella shows good practice in its treatment of employees and consumers. They have earned a good reputation as an employer and logistics service provider.



Figure 9 Color-coded matrix of SLCA results

4.2 Limitations

A sensitivity analysis shows the impact of uncertainty in findings. It is an important part of a life cycle evaluation, and a lack of a sensitivity analysis is evidence of a poor quality study. A sensitivity analysis also helps evaluate the reliability of conclusions and can also consider how significant the findings are for other settings. Sensitivity analyses are usu-

ally quantitative statistical analyses using various type of data treatments in which variables can be altered allowing the parameterization of base variance. This allows for meaningful conclusions and justifies findings (D. & Fox-Rushby, 2001).

In this case, the SLCA method has been compared against the type of sustainability life cycle analysis developed by UNEP termed the life cycle sustainability assessment (LCSA). The LCSA has been based on ISO 14040 standards and incorporates various types of life cycles analyses. It consists of the similar steps; however the inventory lists quantities of inputs regarding emissions and resources extracted showing elementary flows according to a functional unit. This leads to the life cycle impact assessment where indicators of environmental interventions are translated into environmental impacts. These impacts are converted into a common unit which links emissions and resource demands with damages to human health, ecosystem quality and the resource base. The interpretation is then used to identify and quantify the results of the inventory analysis.

The SLCA is practically different from the LCSA in that it is a qualitative method which analyses only practices and goals inside the scope of the study without quantification of amounts of inputs and outputs. This leads to a limitation in finding the degrees of uncertainties within the results, and no computational interpretations regarding them can be made. For example, it was noted that the amount of plastics used in the sorting and processing steps was considerably small compared to the overall operations. Table 7 below analyses the amounts used. The data was provided upon request by Itella Corporate Responsibility.

Table 7 Logistic Material Inputs (Itella Corporate Responsibility)

Logistics Factory/warehouse amounts 2013	
Materials	KG
Cardboard	500 000
Plastic	180 000
Paper	10 000

As we can see from the environmental balance sheet in section 3.4, waste was totalled at 11,389 tons, including recycled waste. The plastic used in the table above therefore

accounts for approximately 1.6 % of the waste (at final disposal and end-of-life). However, this is not reflected in the SLCA.

5 Conclusion

When considering the questions asked at the outset of the thesis, in particular, “Is Itella well position to meet its sustainability goals by 2020?” it seems that they are on a good path towards sustainability, but as with most, its practices can be improved particularly in the use of plastics in the processing and sorting phases. Though that consumption seems small, future sustainability limits or completely removes the use of substances causing harm to the planet. This author would suggest investigating in such strategies as DHL has done with its use of reusable cloth material for its tall freight to replace plastics.

Logistic services are important to society, and in this case, Itella has shown itself to be an indispensable commodity to its local community in providing this service as well as employment opportunities and revenue for the economy. SLCA is comprehensive tool which allows decision makers to set sustainability targets and goals. It considers sustainability according to modern definitions which is based on the fundamental scientific understanding of the earth and its ecosystem, as well as the society’s infrastructure and needs. It gives a robust qualitative assessment of a life cycle, and is well suited to serve as a platform for building in sustainability for organizations or as a basis for a quantitative LCA in results of interest. Here we have seen the use of the SLCA that has been assessed Itella’s logistic and mail operations, establishing where Itella has progressed as well as where it needs to focus more attention.

5.1 Future vision against trends

The following excerpts were taken from Itella’s 2013 annual report:

Letter and publication delivery volumes are decreasing with the increasing pace of the digitization of communications. We estimate that the volumes will decline by 50% by 2020. At the same time, the number of parcels transported is increasing as a result of e-commerce

By developing our electronic services, we can improve the level of service in sparsely populated and remote areas. In addition to full-service postal service points, our network of service points includes parcel terminals, pickup points, corporate customer outlets, home-delivery services,

posti.fi, the Posti mobile application, around 3,200 stamp retail locations, around 7,000 letterboxes and the Netposti electronic mailbox.

We increased the number of Posti's service points by more than 200 during the year. In addition, we opened a total of 176 parcel terminals. Our goal is to increase the number of service outlets to 1,500 by 2016 and to 1,700 by 2020. The number of Netposti users was 534,000 at the end of the year, representing an increase of 100,000 in 2013.

Regarding mail communications, with the advance of technology it is projected that postal volumes may decrease despite population growth. However, due to the growth of online shopping and internet sales, parcels and packages should increase, which will also stimulate growth economically. Itella will continue to provide employment and revenue for the economy.

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