

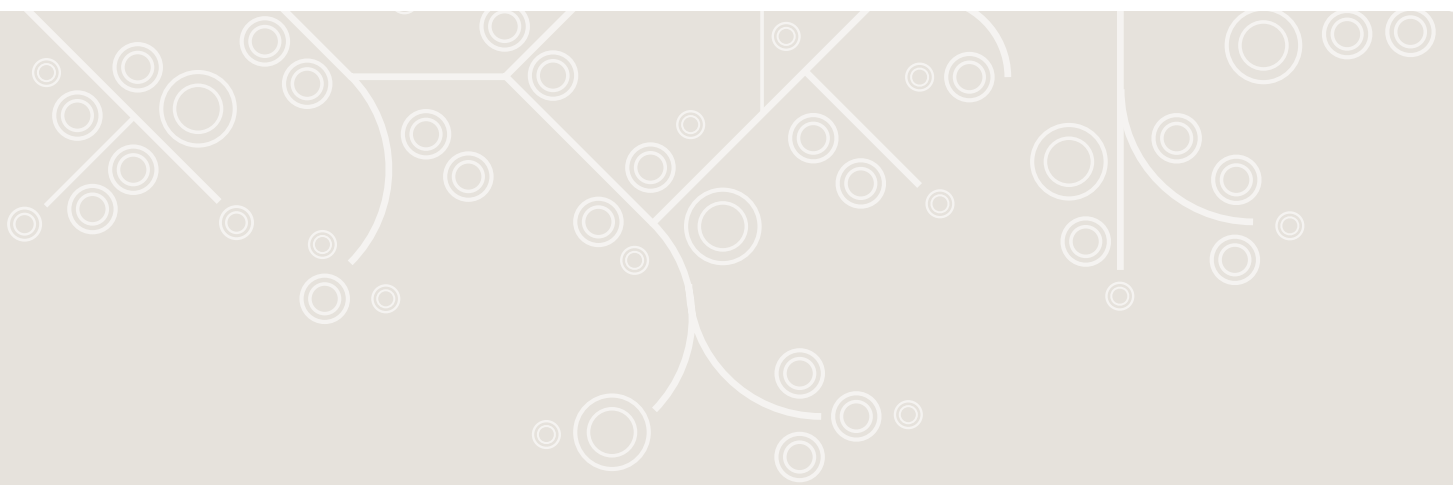
Green Business Model Innovation

Business case study compendium



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Preface

The *Business Case Studies* collection is one of the reports completed within the Green Business Model Innovation project for the organisation Nordic Innovation from august 2011 to august 2012. The work is a continuation of a previous project called *Green Business Models in the Nordic Region - A key to promote sustainable growth*, completed for the same organisation in 2010.

The purpose of this compendium is to identify next practice among front runner companies and provide insights into how companies have implemented Green Business Model Innovation.

The business case companies were identified through experts on business models and green innovation in the private sector. The experts were asked to recommend companies that they perceived as having a green business model with innovative elements. They were also asked to provide initial information on the companies and their business model. Interviews with 41 companies were conducted and business case studies completed for each interview.

The work has been made possible thanks to funding from Nordic Innovation and the others partners on the project; The Danish Business Authority, VINNOVA, TEKES, Innovation Norway and Innovation Centre Iceland. The Nordic working group which has undertaken the work of this project has representatives of the Nordic innovation agencies and experts working with framework conditions, performance and funding green growth. We would also like to thank the group of experts whom have been interviewed and participated in workshops and discussions.

The Danish Business Authority has been the project lead, and the team at the Danish Business Authority consisted of: Kristian Henriksen, Special Advisor and project owner, Markus Bjerre, Head of section, Jakob Øster, Head of section, Alexandra-Maria Almasi, research assistant, and Emil Damgaard, research assistant. In addition the consultants Casper Høgenhaven from Hoegenhaven Consult and Tanja Bisgaard from Novitas Innovation have participated in the work, as well as the consultancy COWI. Tanja from Novitas Innovation took on the project management from January 2012.

IKEA

Interviewer: Consultants COWI on behalf of the Danish Business Authority

IKEA is a global furnishing company selling Scandinavian-style home furnishings and other house goods. The company is based in Sweden and operates 230 company-owned stores across 30 countries. It serves around 410 million customers per year. To move towards a better performance on sustainability, IKEA has developed and implemented a green supply chain management solution known as IWAY. The background of IWAY can be found in IKEA's core values, as exemplified in the company founder's (Ingvar Kamrad) "The testament of a furniture dealer" from 1976, which lists 9 principles with apparent linkages to sustainability values. In a sense, IWAY is therefore seen more as a continuation and substantiation of IKEA's culture and way of doing business than a response to changes in market conditions.

The business model

IKEA's value proposition is to provide house furnishing and other house goods based on the principle that as many people as possible should be able to afford them, and such that high standards of responsible business conduct are met. This translates into the motto of offering products at a low price, but not at any price, which guides all aspects of the company's design processes; from lowering the material usage in manufacturing to the final product distribution.

IKEA's business model builds on a practical and minimalistic design philosophy with resource efficiency and environmental performance at heart. Unlike many other companies, IKEA's design process starts with the product price, based on which the product design, manufacturing processes and logistics are conceived. The strong focus on cost-minimisation through maximum resource utilisation and business process optimisation not only allows the company to produce affordable products but also facilitates innovative, social and environmental advances. While this philosophy has strong ties to IKEA's original values, the company has taken additional steps to systematise and formalise it into social and environmental standards, which are to be

met in the sourcing of materials and core services. This initiative is called IWAY and works to guide the company toward better social and environmental performance at every node of its supply chain. So far, IWAY has been fully applied to raw material sourcing and core services, but IKEA is now moving toward IWAY implementation of indirect material services too; that is, products and services which are not directly related to the company's production.

In general, the adoption and implementation of IWAY is seen by IKEA as a natural step of structuring and systemising a business approach that essentially has been part of the company since the beginning. As such, IWAY has not altered how products are being sold to the company's end consumers.

The development of IWAY has benefitted from cooperative efforts from a number of key partnerships with various organisations. Especially UNICEF and Save the Children have provided significant input to developing the IWAY guidelines on child labour and other social aspects. IKEA also continues to work on establishing strong long-term relationships with its suppliers that can support the company in the continuous development of new products and concepts. In most cases, this includes working with non-compliant suppliers to help them overcome their problems and meet the IWAY standard – a strategy that has also led to the development of new successful product lines and resource-efficient initiatives.

Benefits and impacts

IWAY and the IKEA philosophy have led to a number of environmental and social benefits. However, due to IWAY's broad coverage, it is not possible to give an overall figure or estimate that satisfactorily conveys the extent of these effects. Benefits are therefore best illustrated by way of example. For instance, to prevent the introduction of non-native biological species into new environments from shipping, the company has as a consequence of IWAY all the way up to 2008 only used specific and approved chemicals in their treatment of shipping containers. Since then, and taking IWAY further, the company has only used heat/cold or vacuum treatments of their containers. Because no chemicals are used, related health concerns are prevented, and potential chemical residues are absorbed by IKEA's products. Another example is IKEA's shift from Euro pallets to cardboard pallets or recyclable plastic pallets for product transportation. Contrary to Euro pallets, which are made of wood and take up a lot of space, the new cardboard pallets (now patented by IKEA) take less space, are lighter, and do not involve return transportation. This means more efficient shipping. Moreover, the cardboard pallets can be reused. In Denmark, for example, IKEA's used cardboard pallets are transported to Skjern Papirfabrik A/S which makes new cardboard materials that can be used in the production of new products, such as magazines and paper filers.

In terms of finances, it is core to IWAY and IKEA's design philosophy that any initiative with a social and/or environmental benefit, whether stemming from the creation of new resource-efficient products, more effective manufacturing processes, the use of alternative materials in production, or the development of new efficient distribution networks, must make "money-sense". As such, even if it is not possible to give an estimate of IWAY's financial benefit, by far the largest share of all IKEA's sustainability initiatives have proven themselves on this basis. In later years, as raw material prices have gone up, the company has also enjoyed the benefits of its minimalistic approach to product design and resource usage.

Drivers and barriers

That being said, an increase in media attention and consumer awareness of sustainability aspects, alongside a number of associated and unfortunate events for IKEA in the 80s and 90s, has increased the company's focus on the importance of systemising and formalising its corporate social responsibility. Today, the IKEA brand is also seen increasingly as an important driver for the company's continued sustainability efforts; and although the company currently does not have a strategy for marketing itself on these grounds, its credibility with regards to sustainable business conduct is being viewed as vital for staying competitive in the future.

It is generally difficult to talk about the overall barriers of implementing IWAY, as the company's has made so many efforts and initiatives on this account in such diverse environments. In some cases, for instance, obstacles in the cooperation with suppliers can be met. In others, different forms of regulation and politics have prevented the company from pushing its green business model forward.

Schüco International KG

Interviewer: Consultants COWI on behalf of the Danish Business Authority

Schüco International KG is a construction company producing aluminium housing solutions. Schüco's green solutions have doubled the size of the company, which today operates in 78 countries around the world. In 1998 Schüco began developing a green strategy for the development of their housing solutions. The first strategy focused on making houses with low energy consumption, by improving the insulation of the houses and windows. They called this strategy E. In the constant improvement of these solutions, however, Schüco reached a point where it was no longer cost-efficient to develop further reductions of the energy consumption of the houses. Instead the strategy took a new turn, and now focused on upgrading the products further by also making the houses energy producing. The new strategy was called E2, and promoted the development of houses that had solar panels not only on the roof, but also built into all shadings and parapets of the buildings. By 2011 Schüco again saw the need for taking the company in a new direction, and they expanded the strategy to the E3 concept. Under the E3 strategy Schüco began to develop mechanisms for managing and storing the energy produced in the buildings. Today the E3 strategy incorporates energy saving, energy production and energy storing, and is based on smart grids, enabling the owners of the buildings to sell excess energy back to the network.

The business model

Schüco's value proposition is to provide their customers with housing solutions that save, produce and store energy. By enabling their customers to become self-sufficient with energy, or even earn money by selling the excess energy they produce, Schüco has created housing solutions with higher value than traditional housing solutions. The value-added products have enabled Schüco to increase sales and access new, important markets.

Schüco's key activities mainly lie in the production of the housing solutions. However, Schüco also has a strong focus on advising architects about Schüco's products, in order

to adjust the solutions to the end customers' needs. Advising has always been essential to Schüco's customer relations, but with the new green products, the main focus is now on the green technology rather than construction technology, which creates new revenue streams before, during and after the building of the house.

As a result of the green business model, Schüco has changed its customer segments. Whereas only 20 per cent of the traditional solutions are sold to private customers, 80 per cent of the products developed in the E3 strategy are sold to this segment. In this way the green solutions have enabled Schüco to gain access to a new group of customers. Private customers are now more interested in Schüco's products because the energy-producing buildings have a significant impact on private household economies, making the investment in the sustainable building solutions worthwhile.

In addition to being energy efficient, the E3 houses are also produced in an environmentally friendly way and through a strong environmental and closed loop focus in their supply chain. The main resources used in the production - aluminium and glass - are all recycled, which is both beneficial for the environment and helps reduce production costs. The solar panels are also produced from recyclable materials and with a minimum use of silicone. This reduces the performance of the panels slightly, but it also minimises both their damaging impact on the environment and the cost of producing them.

Benefits and impacts

The environmental benefits are obtained from the combination of sensible use of raw materials in the production and the facilitation of reduction in energy use by the customers. Recycling the aluminium and the glass used to build houses rather than producing it from scratch substantially reduces the energy use. The solar panels are also produced from recyclable materials and with a minimum use of silicone, which reduces the damaging effect on the environment as well as the production costs. Substantial reductions in emissions of CO₂ are also obtained after the E3 houses are passed on to the customers. Home heating accounts for approximately 40 per cent of the entire energy consumption, so by creating houses that are either self-sufficient in energy or energy-producing, a significant part of a family's energy consumption can be reduced.

The financial benefits of the development of the green E3 products are substantial. The green products have doubled Schüco's total sales over the last 8 years, making the sales of the sustainable products responsible for half of Schüco's total sales. During the last 8 years the company has hired 1500-2000 new employees to handle the increased production, and the turnover in 2010 reached a total of EUR 2.38 billion.

Drivers and barriers

The main driver for Schüco's development of the E3 strategy has been to get access to the large markets and growth potential connected to environmentally friendly housing solutions. There has been a huge growth potential in this market, and this potential will still be there in the future. It is therefore essential for Schüco to maintain the constant development of their products. While the market for green solutions has increased, the market for housing based on carbon fuels has diminished, which has provided another motivation. The taxation of carbon-based fuels combined with the consumer subsidies on green energy has increased the economic benefits of focusing not only on energy savings, but also on green energy production. These government regulations have thus increased the incentive for developing green solutions, and Schüco has improved their product by using the subsidies to their customers' advantage.

Two main barriers have challenged the development of the green solutions. One of the main barriers has been to change the traditional attitudes of the industry of house construction. To overcome this barrier Schüco has focused on advising their customers about the possibilities of the sustainable solutions. Another barrier, which Schüco is still dealing with, is that their E3 houses depend on a smart grid for their customers to sell excess energy back to the network. This grid has, for instance, not been developed in Denmark, and this means that this market potential cannot be realised here yet.

Trimo

Interviewer: Consultants COWI on behalf of the Danish Business Authority

Trimo provides 'complete solutions' of steel buildings by providing both product, process and service. The complete solutions include every step in the construction and maintenance of the buildings, from concept development, design engineering, technical support, production, assembly and servicing. When the traditional Yugoslav markets dissolved in the early nineties, Trimo faced new challenges, and this caused the company to start implementing a new vision and a new corporate strategy. The key challenges to be overcome were how to get good results from the limited resources available. As a solution Trimo got engaged in the construction of facilities with a focus on innovative solutions, energy efficiency, use of renewable resources, improvement of insulating materials and intelligent buildings.

The business model

The value proposition of Trimo is to provide complete, customised solutions of steel buildings by covering all stages from ideas to production and maintenance. Trimo's complete solutions opt for environmentally and people-friendly products, with product development that always considers the complete life cycle of the product. Trimo also encourages their costumers to choose environmentally friendly construction solutions by offering implementation of additional solutions that contribute to the sustainability of the buildings. These additional solutions include products such as solar panels, noise-reducing panels and Trimo EcoEnergy that reduces building overheating in the summer with its reflectivity.

One of Trimo's key activities lies in customising the Trimo products to best fit the consumer demands. It is essential for Trimo that the focus on green solutions does not cause the prices of their products to rise to a level that is substantially higher than their competitors' solutions. It is only by securing the right balance between a green focus and affordable solutions that Trimo's green solutions can still exist in a sector where most companies compete on the price. Another key activity lies in combining the products

that Trimo offers with the service of advising their customers about the solutions that they buy. By informing their costumers of the possibilities of the Trimo solutions, Trimo encourages them to get additional solutions for their houses, creating a beneficial impact on the environment as well as a rise in demand for Trimo products.

Trimo's business partners are all involved in the development of new ideas and knowledge. Trimo develops long-term partnerships with all their stakeholders by inviting architects, researchers and staff to participate in generating new ideas. This interaction of stakeholders through close partnerships brings new perspectives and new solutions to the company, and also brings value to the stakeholders themselves. Together with suppliers and other business partners, Trimo ensures the finished life cycles of products where secondary raw materials are returned to the production process for re-use.

Customer relationships are important for Trimo, who also sees satisfied and loyal customers as their long-term partners. For this reason Trimo makes sure to listen to their customers' comments and input through personal interviews. Trimo also creates exposure to their customers by being present in a large number of countries. In this way Trimo can have an influence on new trends, opportunities and challenges. Trimo has achieved satisfaction and loyalty of stakeholders by targeting all groups relevant to Trimo, establishing relations and organising work processes, tailored to their needs.

Benefits and impacts

Trimo creates environmental impacts by reducing energy and material usage in their production, and by creating a product with less CO₂ emissions, and less need for maintenance. In this way Trimo has decreased the CO₂ footprint for their products by 3 per cent per year over the last 3 years, and for the business the CO₂ footprint has decreased by 5 per cent per year over the last 3 years. In 2010 Trimo also made a 26 per cent reduction in the municipal waste they produce compared with 2009, and 94.4 per cent of this waste was recyclable. Trimo has reduced the use of packaging material per product unit and reduced the electricity use per unit of their new products.

The economic impacts of the green business model are substantial. Comparing the total revenue of Trimo in the 10-year period before they began adopting the new green profile with the latest 10 year period shows a rise in total revenue from EUR 20 million in 1981-90 to EUR 150 million in 2001-10. Trimo estimates that 85 per cent of today's annual sales of EUR 80 million are generated by the green business model, and the green strategy has created 800 new jobs in the entire Trimo Group. The added value per employee in Trimo has also risen from EUR 31,814 Euros in 2001 to EUR 47,145 in 2007, leaving it well above the Slovene average.

Drivers and barriers

The main driver for the development of Trimo's green business model was the difficult economic situation in the Eastern European markets in the early nineties. In these times it was essential for Trimo to stay in business. Later, the company has been driven by the need and wish to expand and develop the competencies in the company. However, in the latest years of the financial crisis it has been difficult to keep the intentions of constantly developing the competencies of the company. The largest barrier for Trimo is that the short-term focus often lessens the awareness on the need for sustainable solutions. In the construction industry, competition is often on the price, and this makes it difficult to be a construction company offering solutions with extra benefits on the long term. Another obstacle is the fact that construction companies need different certificates for each of the different countries in Europe. One shared European certificate, valid in all different markets in Europe, would be a big advantage.

NatureWorks LLC

Interviewer: Consultants COWI on behalf of the Danish Business Authority

NatureWorks LLC is the world's largest manufacturer and supplier of biopolymers to customers in both the plastics and fibres markets. The company's products are used in the production of rigid and flexible packaging, food service ware, semi-durable products, fibres and nonwovens. NatureWorks grew out of a Cargill research project with the aim of adding value to agricultural commodities traded by Cargill. This eventually led to the establishment of a joint venture in 1997 with DOW Chemicals, known as Cargill DOW, and was later renamed NatureWorks. The company is based in the United States and today it employs 100 people and has business operations in North America, Europe, Japan, with sales additionally throughout the Asia Pacific, Mexico and South America. In 2011 PTT Global Chemicals of Thailand invested USD 150 million in the company to become a joint owner with Cargill.

The business model

NatureWorks' value proposition is to provide performance polymers which are manufactured from renewable resources. The innovative part of the business model is that it enables NatureWorks' customers to become more sustainable at producing what they have always produced by sourcing their raw material input from NatureWorks' low-carbon polymers, which are produced from renewable resources such as starch from corn, instead of relying on conventional petroleum-based polymers. The long-term aspiration of NatureWorks is to base its production on agricultural waste, and the company is currently also going through a Cradle to Cradle certification process of its polymer, which is called Ingeo.

The key resource in NatureWorks' business model is renewable biobased materials, such as corn or sugar cane, from which lactic acids can be produced via a patent-protected fermentation technology and used to produce polymers. The company sells its finished polymers on a price per tonne basis, which is similar to conventional petroleum-polymers. Since the 2002 start-up of its world-scale facility, as the company has increased

its capacity utilisation, prices have become more and more competitive. So far, while its products are designed to be competitive on a production cost basis, NatureWorks has chosen to charge incrementally higher prices than their conventional, fossil fuel based competitors, given its desired reinvestment economics. Also, since NatureWorks can base its production on a variety of different plants, the company can offer more stable prices on its products compared to those sold by its petroleum-based competitors. This gives NatureWorks' customers the possibility to hedge against oil price volatility.

The channel to market for polymers has been developed and optimised over decades and is generally quite long. For NatureWorks to succeed it has therefore been key to break through the traditional channels. To do this, the company has developed numerous key relationships with its customers, as well as with its customers' customers throughout the downstream market. Using these relationships, a key activity for NatureWorks has been to 'pull' the products through the chain by engaging its customers' customers, while 'pushing' the products to its direct customers. To facilitate this process, the company has established account managers for a number of important downstream players. NatureWorks also works closely with its direct customers in order to motivate and create incentives for the development of new biobased products.

Benefits and impacts

The environmental impact of NatureWorks' business model is a significant reduction in the carbon footprint of any plastic product made from Ingeo. For example, the manufacturing of Ingeo from cradle-to-polymer-factory-gate emits 60 per cent less CO₂ than PET, a conventional petroleum-based plastic, and the production process itself consumes 50 per cent less non-renewable energy as compared to PET. Targets have been set to reach 75 per cent and 55 per cent, respectively. Also, as Ingeo is sourced from plants, it essentially works to sequester carbon. At this point, NatureWorks is also able to turn many products made of Ingeo back into lactic acid from which new polymers can be made, and the company is therefore working on a take-back system for more durable plastic products. At the UNFCCC's COP15 in Copenhagen, for example, the company worked together with a Belgian carpet producer for carpeting the conference. All carpets were taken back and depolymerised back into lactic acid. For other products, such as plastic plates and cups contaminated after use with organic residuals, composting is a better option.

Financially, NatureWorks has seen a growth in product demands averaging 25-30 per cent annually over the past few years. The company's products also bring benefits to its customers; firstly in the form of price stability, as the polymers are not based on petroleum, and secondly in the form of lower environmental impact and more positive consumer image due to environmental performance.

Drivers and barriers

The main driver of NatureWorks' business model has been the provision of polymers whose feedstock is not petroleum-based, and which can be offered at competitive and stable prices by basing them on renewable and abundant crops. The company is just establishing its second manufacturing facility in Thailand, where production of polymers will be based on sugar cane and cassava; locally abundant renewable resources.

The main barrier for NatureWorks has been to break through the distribution channel. The company realised that it would not be successful by simply offering a new material in the existing market. Instead they would have to engage both their customers and their customers' customers all the way down the value chain. They did this for each product category using a push/pull strategy; i.e. by first engaging the first movers and more innovative players in the market, and then the more conventional but larger actors. In the "first mover" category, NatureWorks went to display product samples to companies at the very end of the value chain, such as Ingeo textiles to the fashion company Versace, and Ingeo packaging to the organic retailer Wild Oats. Being brand leaders, these companies could bear the initially higher prices and were willing to take higher risks; and they would consequently start demanding biobased products from their suppliers. NatureWorks would then present the value proposition of their products to their suppliers, and so on. Having first breached the market and created attention this way, NatureWorks would adopt the same strategy in the conventional market segment, i.e. displaying their products to bigger players such as Walmart. In most cases, working with the customers' customers was a delicate matter and required the establishment of very good relations to avoid problems.

Current barriers continue to be related to communication. NatureWorks is for example challenged with showing that its products do not affect the corn crop market; and ultimately that biobased polymers are not a threat to food prices; i.e. NatureWorks consumes less than one twentieth of one per cent of the global industrial corn crop, and that the starches used to produce products such as Ingeo allow the simultaneous production of feeds from the oil and protein portion of the corn crop. The establishment of a new production facility in Thailand is a step in this direction, because the polymer production will be based on locally abundant sugar canes and cassava. Another barrier is the scale on which new materials such as Ingeo are processed by manufacturers downstream of NatureWorks. While NatureWorks operates a dedicated Ingeo facility and is able to achieve close to price parity, many of its customers often campaign in and out of various plastics, incurring 'switching costs' and inefficiencies when they do this. This can result in higher costs of finished consumer products, an issue which is being addressed over time, as manufacturers throughout the supply chain increase production and achieve their own improved economies of scale. The present overall lack of an infrastructure for the collection and recycling of packaging makes some

potential customers hesitant to sign on to biopolymers. Misperceptions about food crop use, price, collection and reuse are barriers that time should be able to overcome.

Other barriers can be found in the lack of clear government policies on biobased products; partly caused by the early stages of the biobased industry. Yet, political leadership and value commitment toward biobased products is generally needed to move early biobased industries forward, and this has so far only been the case for biobased fuels. Such a continued lack of focus and political signals will impede critical investments and the take-up of the new materials by manufacturers. In this connection, NatureWorks is lobbying for instruments such as short-term production tax credits that can support actual production and sales of biobased products, and thus help the industry reach a competitive scale. Governments could also encourage 'consumer education', for instance through putting a biobased content label in place, just like organic labelling. Belgium is an example where such a labelling scheme is in place.

Elvis & Kresse

Interviewer: Consultants COWI on behalf of the Danish Business Authority

Elvis & Kresse is a waste innovation company which makes use of waste to manufacture a range of life-style accessories that prevent landfill and save money for the waste generating partners. The business originated from when Kresse Wesling moved to London and had her first meeting with the London Fire Brigade in 2005. Here she learned about the difficulties in repairing damaged fire hoses, and about how many hoses were being discarded and going to landfill every year. Having always had a keen interest in waste and how to reuse/recycle to prevent landfill, she took home a discarded fire hose, which was used for a lot of different things. At one point, her partner Elvis' belt broke, and they used the fire hose to make a new one. The belt became instantly popular in Kresse's network of environmentally engaged people. An opportunity to help "greening" one of Al Gore's Live Earth concerts led to another opportunity for supplying belts, and although most of the money made on this account went to the associated climate change initiative, Elvis & Kresse made enough money to expand their operations. Today the company employs 2 people working full-time, and 40-50 on an outsourcing basis. 2011 sales reached around EUR 300,000 and are expected to grow in 2012.

The business model

Elvis & Kresse's value proposition is to provide its customers with fashionable and durable life-style accessories with social and environmental meaning.

The innovativeness of Elvis & Kresse's business model lies in the fact that the company manufactures their products from waste streams that traditionally are not recyclable. This brings a deeper meaning to the products as they help to solve niche waste problems. In addition, the company donates 50 per cent of all profits made on products from each of their associated waste streams to a charitable organisation associated with the waste. The company currently manufactures products from 10 waste streams, with the most important products being durable belts and bags in timeless designs (made from fire hoses, sourced from the London Fire Brigade), and reusable and compostable shopping

bags (made from used coffee sacks, sourced from the Costa Coffee chain and United Coffee). Elvis & Kresse also works with Remploy to turn parts of their own wastes into biomass for usage in biomass boilers, while other waste such as offcuts from fire hoses are used for flooring or other products such as cufflinks and key rings.

In the beginning Elvis & Kresse had no established sales or distribution networks. Products were sold on an ad hoc basis, i.e. through environmental events with most profits being donated to charities, as well as through the London Fire Brigade's online store. Elvis & Kresse also sold their products through their own online store, but in the first year only a very small number of products were sold through this channel. Some of the early waste partnerships, such as with the London Fire Brigade and a number of charity organisations, have evolved into formal arrangements that play a key role in terms of both sales and marketing. Today the company also sells its products through major retailers and boutiques, as well as high-end retailers. All products are sold on a price-per-item basis.

One of the primary customer groups of Elvis & Kresse initially consisted of people with some form of tie to the fire brigade, such as firemen themselves and their families. With around 33,000 people working actively in the UK fire fighting services, this group continues to be one of the company's three most important consumer groups. People interested in fashion are also important. Interestingly, due to the affinity between gay subcultures and firemen, and the following uptake of Elvis & Kresse products in London's Soho shops, the first fashion magazine to feature the company was "The Gay Times". The third consumer group is people with an interest in sustainability. The three groups are evenly distributed.

Elvis & Kresse have developed a special relationship with some of their customers; a group of people whom they call "brand ambassadors". The group is made up of people who started buying the company's products early on and with whom Elvis & Kresse have ongoing informal dialogues about how the company should change their products, and what they should be making next. The brand ambassadors also get samples of new products for review before they enter into actual production. Stepping further in this direction, Elvis & Kresse are just starting to organize these co-creating efforts with their customers on Facebook.

Elvis & Kresse have developed a number of key partnerships which have been pivotal for the company's success, both in terms of sourcing materials for production, but also in terms of sales. Today, for example, the company collects fire hoses directly from the London Fire Brigade across the entire UK, which prevents landfill and saves money for the brigade. This gives the London Fire Brigade, as well as the Firefighters Charity, who receives donations based on Elvis & Kresse's profits, an interest in promoting Elvis & Kresse through newsletters and other press and PR efforts. This keeps Elvis & Kresse's

own marketing efforts and costs at a minimum. Similar partnerships have been set up for each of the company's other waste streams. Some of the company's sales relations have also emerged from the company's waste partnerships.

Impact and benefits

The environmental benefits of Elvis & Kresse's business model stem from the fact that it reduces the amount of waste going to landfill. Since 2005 the company has prevented some 160 tonnes of waste from going to landfill.

In terms of finances, the business model and partnership structure have also led to large benefits; both for Elvis & Kresse, but also for their waste, charity and sales partners. The waste generating partners save money because of not having to dispose of their waste. The waste associated charity partners benefit from Elvis & Kresse's profits, and sales partners benefit from the sales of Elvis & Kresse's products in their stores, e.g. Sainsbury currently sells 1,000 of Elvis & Kresse's shopping bags every week. All involved enjoy the associated PR value from upcycling waste to products and donating money to a charity, and Elvis & Kresse gain enormous marketing value in the process.

Drivers and barriers

One of the two main drivers behind the success of Elvis & Kresse's business has been the waste partnerships. This is particularly true for the partnership with the London Fire Brigade, as they sold Elvis & Kresse's belts through their online store and generally promoted the products, which led to further sales. From this point the orders came rolling in. The other main driver behind the success of Elvis & Kresse has been the founders' personal commitment and motivation to avoid that waste goes to landfill.

One of Elvis & Kresse's main barriers was the almost immediate success of their business. When sales of their belts took off they were completely unprepared to meet the demand. Also, space for storing raw materials for new products was extremely limited and still poses a challenge for Elvis & Kresse's growth. Looking ahead towards the establishment of the Elvis & Kresse brand, another barrier was their limited knowledge about fashion, design and manufacturing. In all of these areas, Elvis & Kresse have literally relied on learning by doing. The company's partnerships have also taken a long time to develop. It has, for example, been time consuming to find the right people to speak with, and it generally requires much effort to find out exactly how the relationships are going to work. This is particularly the case as Elvis & Kresse donate 50 per cent of their profits related to each waste, which requires trust and information transparency among all involved organisations.

Van Houtum Papier

Interviewer: Consultants COWI on behalf of the Danish Business Authority

Van Houtum Papier is a family company that manufactures and provides a broad range of high-quality product solutions for better washroom hygiene and with exceptional environmental performance. Products include paper products, such as tissue and wiping paper, but also dispensers, air fresheners, mirrors, toilet brushes etc. Building on the principle of “doing things right”, Van Houtum began using recycled paper for their tissue production in the sixties, and, having their own energy plant, the company was also back then far ahead with regards to energy efficiency. Sustainability has therefore always been a cornerstone for the company. Seeing the business potential of green products, Van Houtum started working more strategically with the sustainability of their products about 6-7 years back. Initially they simply started to communicate what they were doing already. In this process Van Houtum learned about the Cradle to Cradle concept, and decided to further improve their sustainability efforts by way of Cradle to Cradle certification of some of their products. This generated additional publicity, which has been used actively to brand the company in terms of responsibility and sustainability. Today the company employs 190 people and ships products to more than 30 countries in Europe.

The business model

Van Houtum's value proposition is to provide its customers with high-quality and innovative products for better washroom hygiene and with exceptional environmental performance.

The innovativeness of the company's business model revolves around the development of a new product line consisting of paper, soap and dispensers that are all Cradle to Cradle certified. This implies that raw materials and wastes are either reused in Van Houtum's own production (or by other companies), or are biologically degradable. The production is furthermore based entirely on renewable energy. As such, Van Houtum creates value for its end-customers by helping them implement their sustainability policies through

simple and sustainable washroom solutions; i.e. by shifting to sustainable washroom products instead of using traditional products manufactured from non-recyclable materials based on fossil fuels and harmful chemicals.

The primary customer segments include large and medium sized companies (including governmental agencies), as these often find it difficult to take concrete steps towards internal sustainable behaviour. Van Houtum also helps such end-customers to better communicate their sustainability efforts and make the meaning of the sustainable washroom products visible through tiles that can be fitted in the washrooms and tell the story. This provides the customers with an image of responsibility and environmental care.

The partnership with the Environmental Protection Encouragement Agency (EPEA), a Cradle to Cradle consulting company, has been central for Van Houtum's new product line. EPEA assisted in analysing Van Houtum's chemical usage and helped to develop Van Houtum's first Cradle to Cradle production process and product certifications. Insights into customers along the value chain of Van Houtum's products also played an important role in product development, i.e. with information being gathered from when the products leave the factory to how they are used in the washrooms. Van Houtum also worked very closely with Van Berlo Communications, a PR and design company based in Eindhoven, to develop a brand and image that could differentiate Van Houtum products in the market.

The company currently sells most of its products through a network of wholesale distributors, or directly to cleaning companies which service the end-customers. Most of the company's products are therefore also sold as bulk. However, the company also engages in 3-5 year contracts directly with end-customers, with Van Houtum providing soap dispensers free of charge, and the customers agreeing to purchase Van Houtum washroom products through a distributor. Due to the sustainability aspects of the Cradle to Cradle products, this segment is becoming more and more important to the company.

Benefits and impacts

There are large environmental benefits from Van Houtum's business model. These benefits mainly stem from the company's own production processes due to its Cradle to Cradle focus, recycling activities, renewable energy use and reuse of waste. Production is now carbon free and both water and energy usage has been reduced. Also, in the Cradle to Cradle certification process, all chemicals in the production process have been replaced by bio-based or non-hazardous chemicals, which prevent damaging effects to both the environment and human health. Benefits have furthermore resulted from supplying the company's own recycled paper residue to a neighbouring cardboard mill,

with the paper residue being used in the mill's production of cardboard boxes. Some of these boxes are bought back by Van Houtum for packaging.

In terms of finances, Van Houtum's new sustainable product line still only constitutes a fairly small percentage (2-5 per cent) of the company's total sales, but it is growing rapidly. However, the margin of the products is much higher compared to the company's other products. The biggest financial benefit is nonetheless seen as the strong image value that the new line of sustainable products has created for Van Houtum, and the publicity that the company has received on this account – even in relationship to its “standard” products. Van Houtum's strong image has also generated a sense of pride among the company's employees, and generally made it much easier to find new skilled employees when hiring. So far, the business model has led to the creation of two new jobs and is expected to create another six new jobs this year in sales alone.

Drivers and barriers

The main driver for Van Houtum's green business model was the company's eye toward the uniqueness of the Cradle to Cradle concept and the increasing market potential for sustainable products, combined with the realisation that the company's production already was very far in this regard. On this basis, the company extended their already strong green business focus. One of the main steps in this process was the achievement of a Cradle to Cradle certification for their paper and soap products, i.e. by substituting some of the chemicals used in the production. This also allowed for much more effective marketing. Today, the drive for continuously seeking to develop its green business model derives from Van Houtum's aim to stay competitive by doing something unique in an otherwise very competitive market where larger competitors have a hard time duplicating the model.

The main barriers that Van Houtum experienced in driving their green business model to success have primarily been related to the question of how to market their products and thus to commercialise good corporate behaviour. In this connection, barriers associated with the company's network of distributors have been of high significance. According to Van Houtum, the distributors have typically been traditional in their thinking, and have therefore not always responded to new demands from their end-customers, who generally were much more enthusiastic about Van Houtum's sustainable product range. To overcome this barrier, Van Houtum chose an aggressive marketing strategy with the goal of making their products stand out very clearly compared to their competitors' products. This was done by naming the product line “Satino Black”, using black colour packaging, pictures of boxers and the like; implying that the customers would need to have guts to purchase Van Houtum's products and change their behaviour towards a sustainable path. The traditional distributors were initially somewhat unwilling

and incapable of selling a sustainable concept. This remains the company's greatest challenge. For this reason, Van Houtum is continuing to focus their marketing efforts more directly towards their end-customers.

Gabriel

Interviewer: Consultants COWI on behalf of the Danish Business Authority

Gabriel A/S is a supplier of furniture textiles and fabrics as well as related materials and services such as product samples, displays and fabric prints. It was founded in 1851 and employs around 70 people. The company sells most of its product on the European market and has a turnover of about DKK 240 million. The primary customers are major furniture manufacturers. Gabriel has been working actively on quality optimisation and environmental improvements for almost 20 years. In 1991, the company was the world's first manufacturer of furniture to gain the ISO 9001 quality certification, and it obtained the ISO 14001 environmental management certification in 1995. Gabriel was among the first to remove heavy metals from dyes, and has been the frontrunner in a number of other areas. Gabriel's move towards Cradle to Cradle is seen as the next logical step in the company's frontrunner strategy.

The business model

Gabriel's value proposition is to provide its customers with fabrics that can meet very high demands across a broad range of parameters, including product and environmental performance. The company's environmentally responsible business conduct is deeply anchored in the company's values and forms a foundation on which Gabriel delivers products of very high quality to its customers.

The business model's strong focus on conducting an environmentally responsible business has necessitated new and continuous production and product innovations. This focus has delivered a range of different solutions that combined fit well with the company's overall strategy. In this connection, the latest progress is the development of "Gaja", a Cradle to Cradle certified wool product, and a sound absorbing material called "SilentSolution", which is partly produced from surplus material from one of the company's own suppliers, and which itself is recyclable. The idea is that in addition to improving the company's standing with regards to higher environmental performance by turning surplus materials into raw materials for new products (or into nourishment

for nature), the company can also lower their production costs and help them obtain a competitive edge. In line with the business model, Gabriel has also obtained the European Ecolabel (the EU flower) and other recognised eco-labels on all of its textile products. These efforts have put Gabriel in a unique market position with respect to its sustainable product lines, and the company still faces no direct competition on its Cradle to Cradle certified products.

The move towards better environmental performance of Gabriel's manufacturing processes and products has not led to any significant changes in the company's market or the way that it does business, and Gabriel's relation with its customers has not changed either. As such, the company still sells its products directly to leading furniture manufacturers, and the traditional payment scheme, which is based on charging a price per product unit, remains the same. The company nonetheless regards that the move towards Cradle to Cradle is a way of expanding its future market possibilities.

Partnerships and close relationships with a number of suppliers have been important elements for Gabriel in the development of its new environmental product lines. Along with partnering suppliers, Gabriel has also strengthened its ties to the educational sector, in particular the University of Aalborg, to fill necessary gaps in the company's technical knowhow. In addition, the company established important connections with customers before launching their new products on the market, which has secured a relatively quick payback period to the investment.

Impacts and benefits

The environmental impact of Gabriel's move towards a green business model mostly occurs in the production phase of the company's products. Effects can however also be found at the end-of-life stage of their products. For example, in line with the Cradle to Cradle concept and certification, the company's Gaja products are completely compostable without any harmful environmental effects, not even from the product dyes. The use of non-harmful dyes also means that there is a beneficial environmental impact on the raw material production side of the value chain. Moreover, the company's SilentSolution products reduce the amount of wastes as well as the need for new raw materials for production. In addition to the mentioned effects, the company has in its long journey towards better environmental performance worked hard to reduce usage of key resources such as water and energy.

The company does not provide figures on the financial benefits of its new sustainable product lines, but highlights that the turnover from this source has been increasing. This has also led to the creation of new jobs, although it is difficult to draw a direct link to the company's green business model in this regard.

Drivers and barriers

One of the main underlying drivers and advantages of Gabriel's business model is the general movement towards stricter laws and regulations with regards to environmental requirements. At the moment, this particularly concerns higher standards as regards public procurement, where Gabriel is pushing for stricter provisions to keep ahead of its competitors. In the Netherlands, for example, public procurement provisions have a very strong focus on sustainability aspects, whereas requirements in many other countries are much less demanding. Hence, by raising their own standards and work to influence instruments for stronger environmental requirements, Gabriel can gain a significant competitive advantage.

One of the most important barriers that Gabriel has encountered in its move towards more sustainable product lines and manufacturing techniques is the power of old consumer habits, and the lacking 'sense of urgency' that consumers experience in shifting towards more sustainable products. Moreover, developing new products and achieving demanding product certifications can be a cumbersome and costly process. Given this context, it is hard to compete with other companies offering non-sustainable products at a much lower price. Getting the right people with the necessary skills and competences was also seen as one of the main barriers.

Trigema

Interviewer: Consultants COWI on behalf of the Danish Business Authority

Trigema is Germany's largest manufacturer of textiles and clothing. It was founded in 1919 and has since its beginning manufactured all of its products in Germany. The company employs 1,200 people and has an annual turnover of about EUR 85 million per year. With an emphasis on greater environmental performance, the company has embarked on a move to develop environmentally friendly production technologies as well as Cradle to Cradle products. Trigema's recent move towards developing Cradle to Cradle products is related to the company's commitment to corporate sustainability. However, part of the initiation was motivated by discussions between Trigema's current CEO, Wolfgang Grupp, and the scientific director of the Environmental Protection Encouragement Agency (EPEA), Michael Braungart.

The business model

Trigema's value proposition is to provide high-quality clothing products that are manufactured with emphasis on strong local community values and responsible business conduct.

The business model is built upon Trigema's overarching aim of keeping all the company's manufacturing processes within Germany to secure the jobs of its 1,200 employees, while staying ahead of the market with respect to high environmental performance. To meet this end, the company has relied on several key activities. The most important in this regard is the company's continuous development of environmentally friendly production and products. Trigema has, for instance, implemented water-recycling and treatment technologies as well as established power generators supplying the company with renewable energy. Moreover, the company received its first Cradle to Cradle certification for one of its shirts in 2006, and today it runs two complete Cradle to Cradle product lines. The Cradle to Cradle products still only make up 2-3 per cent of the company's total sales, but the long-term goal is to turn the entire company into a Cradle to Cradle company. Going forward, Trigema is looking into establishing a closed-

loop production system in the manufacturing of products based on synthetic fibres. To meet its social aims, Trigema has guaranteed jobs to all children of its employees after finishing their education.

The Cradle to Cradle products are sold directly to end-consumers as are all the company's other products. Sales go through two channels, each generating 50 per cent of Trigema's revenues; the company's online store, and the company's 46 own factory outlets which are located across Germany. Although the online store ships internationally, the primary market for Trigema relates to the German market, which is also where marketing efforts are directed. In this respect, there are two key consumer groups. This first group shows strong support of Trigema's social and environmental mission, while the other group primarily is interested in the high quality of Trigema's products.

A key resource for Trigema's business model is its ownership and organisational structure. The company is 100 per cent privately owned, and has vertically integrated its supply chain through ownership. Today the company owns around 80 per cent of its supply chain of which all operations are located in Germany. Not only does this secure German workplaces, it also gives Trigema control over most of its suppliers, which has been of major importance in its efforts to develop Cradle to Cradle products. The geographic location of the company's operations also significantly reduces the carbon footprint associated with the company's products.

Two partnerships have been pivotal for Trigema in developing its Cradle to Cradle product lines. The first was with the Environmental Protection Encouragement Agency (EPEA), which helped Trigema analyse and evaluate the raw materials and chemical compositions of the products. The other was with a supplier of a dye that could meet the Cradle to Cradle specifications. The EPEA played a key role in getting the dye supplier on board.

So far, as only Puma has been looking to go in this direction, Trigema faces no immediate direct competitors on its Cradle to Cradle products.

Impacts and benefits

The overall environmental impact from Trigema's Cradle to Cradle product line has not been measured. However, the products have led to a 100 per cent reduction in the use of harmful chemicals in the manufacturing process, including the manufacturing of the dyes. No efforts have been made in measuring how the Cradle to Cradle production lines have affected the employees' health.

So far, the sales of Trigema's Cradle to Cradle product lines amount to 2-3 per cent of the

company's total sales. This share is growing bigger every year, and the company expects that the Cradle to Cradle product line will be a very important source of revenue in the near future. Trigema's Cradle to Cradle product line has generally also led to an increased focus on better communication to consumers, and the company has now hired people to deal exclusively with this area.

Drivers and barriers

There were two primary drivers behind Trigema's move towards Cradle to Cradle production. The first was related to the company CEO's strong belief in the concept and its ability to deliver better environmental performance and a competitive advantage. The second pertains to the fact that going in that direction could help Trigema stay ahead of the market and sustain all business activities in Germany in the long run. This would help Trigema deliver on its social mission. In addition, the company's high degree of vertical integration, and thus control over most of its supplying manufacturers, has been a driver in itself, as it has made the development of Cradle to Cradle products easier from the outset.

Trigema did however face a number of barriers to developing its Cradle to Cradle products. First of all, the company had to design the product so that it would include only natural materials. This posed a specific problem with respect to finding the right type and strength of cotton. Another issue was to develop a new dye in line with the Cradle to Cradle principle. Relying on third party suppliers for dyes, finding a company that was both capable and willing to work with Trigema on developing a Cradle to Cradle product was challenging; especially as it would involve the sharing of sensitive product information with the EPEA, and otherwise require the dye manufacturer to identify all substances of the dye. In the end, the EPEA played a key role in facilitating a partnership between Trigema and the dye supplier. Lastly, Trigema faced a barrier in terms of communication, both in-house and with respect to marketing. End-customers were not compelled to purchase Trigema's Cradle to Cradle products by words such as 'organic' and 'compostable' and there was a belief that the products generally would be of a poorer quality. Moreover, even Trigema's own sales people knew little about the products. To overcome this barrier, steps were first taken to inform the sales people about the Cradle to Cradle products, and then to upgrade the product information on the web. A new website for the Cradle to Cradle products (www.trigemachange.com) was also created, explaining what the products are about, how they are different from other products, and how they were developed. The company also hired people to further advance its communication in this area, and this is still seen as the company's major challenge.

Maersk Line

Interviewer: Consultants COWI on behalf of the Danish Business Authority

Maersk Line, the global container shipping division of the A.P. Møller - Maersk Group, is the largest liner shipping company in the world with a fleet of approximately 600 vessels. The company has been running a responsible recycling policy for several years. Core to this policy is responsible ship dismantling and recycling, and Maersk Line has included a team of specialists in ship recycling. The company saw increasing potential for getting more out of the materials used for the construction of ships and saw the cradle to cradle concept as the next logical step. Some people in the organisation already knew about the concept, and some of Maersk Line's customers, e.g. Nike and IKEA, were also moving in that direction.

The business model

Maersk Line's value proposition is to provide environmentally responsible transport services, delivered to customers by the use of energy-efficient container ships. Today Maersk Line's CO₂ performance (efficiency per container moved) is approximately 10 per cent better than the industry average due to a relatively modern fleet and efficient operations. As the next step towards delivering environmentally responsible transport services, Maersk Line in 2011 ordered 20 new container ships, known as Triple-E, which are currently being constructed.

The Triple-E ships are being built with a strong focus on economies of scale, energy efficiency, and environmental performance. Going further, Maersk Line's ambition for the future is to deliver shipping services using ships that are increasingly built with a cradle to cradle mindset. With the construction of the Triple-E ships, the company has therefore also initiated the development and implementation of a so-called cradle to cradle passport system.

The innovative aspect of the cradle to cradle passport is that it functions as a materials knowledge feedback system, which provides the company with information on all

materials used in the containership construction. This information is then used to identify areas in which changes in ship design, construction and/or materials can improve ship performance and material recyclability. The cradle to cradle passport can therefore help to secure the availability of recycled high-quality steel in the future, whereas today high and low-quality steel is often mixed in the ship-breaking process. This results in steel that is unsuitable for new ship construction, and therefore necessitates production of new high-quality steel. This is a costly affair and requires the mining of virgin iron ores, which has significant environmental impacts.

Key partnerships have facilitated the implementation of the cradle to cradle passport system. The system has e.g. been supported by a cradle to cradle feasibility study conducted by the Environmental Protection Encouragement Agency (EPEA). This agency also helped Maersk in explaining the concept to the Daewoo Shipbuilding & Marine Engineering (DSME) shipyard in Korea, which is building the company's Triple-E ships, and otherwise plays a key role in the design, innovation and construction processes.

Although the Triple-E ships and their construction are new, the transport service is still sold to customers as traditional container shipping services. The higher recycling value of the ships, however, may significantly increase the resell value of the ships.

Benefits and impacts

The environmental benefits of Maersk Line's new Triple-E ships will occur in the use-phase and in the recycling phase. In the use-phase the company estimates that the ships will emit 50 per cent less CO₂ than the industry average on the Asia-Europe trade lane. This is achieved through advances in hull design and engine types. The ships will also lead to lower emissions of SO_x and PM. In the recycling phase, the cradle to cradle passport will ensure safe and sound dismantling and reuse of materials for the construction of new ships, which also will save on the manufacturing of new materials. In terms of finances, Maersk Line estimates that the 20 Triple-E ships will lower the cost of transporting a container by as much as 26 per cent compared to other newly built vessels on the Asia-Europe trade lane. There are uncertainties as to whether the innovation has led to direct job creation within Maersk Line, but it is likely to have had a positive benefit for the supplier. The order of the 20 ships has nonetheless created positive brand value for Maersk Line. This attention has also helped the company with the implementation of the cradle to cradle passport because of unsolicited contact from external bodies and companies. Maersk Line's affiliated recycling team estimates that Triple-E ships may have a 10 per cent higher recycling value, because of better and more profitable recycling when dismantled at the end of their life in 2030 (made possible by the cradle to cradle passport). The corresponding approximate value is USD 6 million per

ship and should be compared to the cost of implementing the cradle to cradle passport system which is estimated to be between USD 1-3 million (for all 20 Triple-E ships).

Drivers and barriers

The main drivers for constructing the Triple-E ships, and initiating the implementation of the cradle to cradle passport, has been (i) the increasing cost of steel and availability challenges in the future, (ii) increasing cost of fuel, and (iii) the increasing interest in and demand for sustainable shipping performance from customers. The company views the higher demand for the finite supply of steel as a risk which can be managed in the long run by adopting a cradle to cradle mindset in its construction of new ships.

The main barrier is that the cradle to cradle passport demands that Maersk Line can get their suppliers to share information about materials used for ship construction. There is generally an extensive material documentation task to be completed, and this puts strong demands on the company's suppliers (and their suppliers). Information is not always readily available, or has to be made available in a suitable format. Also, as this is the early stage of creating the cradle to cradle passport, not many shipping companies are making these demands, and IMO (the International Maritime Organization) has not yet signalled that this area will be a priority in the near future. A barrier has also been the associated technical and operational challenges of constructing a larger and more energy-efficient ship compared to what has been done before.

Desso

Interviewer: Consultants COWI on behalf of the Danish Business Authority

Desso was founded in 1930 in the Netherlands. Today it is a leading European manufacturer and supplier of a wide range of carpets, carpet tiles and artificial grass, with its most important markets being carpet tiles for offices, schools and universities. The background for Desso's move towards Cradle to Cradle products and production processes started when Stef Kranendijk watched a documentary on Dutch television on the Cradle to Cradle philosophy. He was immediately impressed and began investigating how to move Desso in this direction, in collaboration with Professor Dr Michael Braungart from the Environmental Protection Encouragement Agency (EPEA).

In 2007, CEO Stef Kranendijk appointed a sustainability director whose task it was to look into Desso's achievements in the area of sustainability and how to communicate these. The next challenge for the sustainability director and the rest of DESO was to implement the Cradle to Cradle philosophy in the 'DNA' of the company.

The business model

Desso's value proposition is to provide high-performance flooring solutions in unique and fashionable designs, while yielding beneficial impacts on their customers' sustainability policies and corporate sustainability strategies.

To meet its value proposition, Desso has applied a business model that builds on the Cradle to Cradle concept. The company has invested significant efforts and resources into developing Cradle to Cradle products and has taken equally important steps towards closing the loop of its manufacturing processes. The majority of Desso's commercial product range is already Cradle to Cradle certified, but the company has pledged that all products will be designed according to the Cradle to Cradle principles by 2020, and that all the company's energy needs at this time will be based on renewable energy.

About 80 per cent of the company's business is carpets and carpet tiles. The main

segments in this area include offices, schools and universities; but the company also supplies flooring solutions to the hotel, cruise ship and passenger aviation industries, as well as the consumer market. The remaining 20 per cent concern the supply of artificial turf pitches and synthetic reinforcements of natural grass to some of the world's most famous sport stadiums, such as the football temple Wembley.

Desso sells its products at a price per square metre and offers a take-back programme for the products once they reach their end of life. The company also offers to take back the customers' old carpets – even if produced by competitors (excluding PVC-backed carpets or carpet tiles). The Desso Take Back™ programme is a key activity for Desso, since the company, through its own proprietary technology, can recycle and recover raw materials from the used carpets, which then can be used to make new carpets. Based on these efforts and the Cradle to Cradle concept, the sales relationships that the company has with its customers have also changed. Today, for instance, the sales process mostly starts with questions about what the customer is doing in the area of corporate social responsibility.

The key resources supporting Desso's business not only relate to new raw materials but also to the people in the organisation. The majority of the company's employees work with the Cradle to Cradle concept, and the move towards Cradle to Cradle itself has been a major driver of continuous product and process innovation. The business model also rests on a number of key partnerships that Desso has developed over the years with its raw materials suppliers, as well as with EPEA to facilitate the move towards Cradle to Cradle.

Benefits and impacts

The environmental impacts of Desso's efforts in being a Cradle to Cradle company have been significant. Since 2011, 100 per cent renewable electricity (hydropower) has been used at all production locations. This has resulted in a 43 per cent reduction in CO₂ emissions at all of Desso's production locations between 2007 and 2011. However, by far the largest impact can be attributed to the company's material use, take-back and reuse approach to production. Desso has for instance developed a recycling technology which can separate yarn and other fibres from the carpets' bitumen or the Cradle to Cradle Silver certified EcoBase™ backing. The bitumen backing is sold as input to the road and roofing industry, while the yarn and other fibres are sent back to one of Desso's yarn suppliers. The supplier depolymerises the polymer of the yarn into monomer, which is a material from which new polymers and yarn can be made (and which is normally bought from the oil and chemical industry). 60 per cent of Desso's carpet tiles now contain Econyl® yarn (Econyl® is a yarn made from 100 per cent recycled content). Also, the company has developed products that literally have a positive effect on the indoor environment,

such as Desso AirMaster[®], the carpet that cleans the air, or reduces the need for lighting due to light reflection, such as Light Reflection Master[™].

In terms of economic benefits, Desso has grown its business substantially as a result of its focus on Cradle to Cradle. Over the last four years, for example, the company's market share of the carpet and carpet tiles market has grown from 15 per cent in 2007 to 23 per cent in 2011. Over the same period, the company's carpets profitability has increased significantly. The company's Cradle to Cradle products have also opened new markets; there has been a large increase in the supply of flooring solutions to schools and universities. Also, despite becoming Cradle to Cradle, the prices of most products have been stable. However, the company's fully recyclable EcoBase[™] carpet tile backing currently has a price premium due to more expensive raw materials. To stimulate the gradual switch to the new carpet tile backing, Desso is launching its new products with EcoBase[™]. However, the company foresees a diminishing price premium in the coming years due to increasing production capacity and materials supply.

Drivers and barriers

One of the main drivers for Desso's move towards becoming a Cradle to Cradle company can be related to an increasing competition on environmental performance in the company's most important markets. However, the actual process of going Cradle to Cradle has in itself been a driver for the company's business model. This is because it has worked as a general engine of creativity and innovation within the company, which has driven developments of entirely new, functional and successful products.

The main barriers for Desso have mainly revolved around changing its product design and manufacturing systems, getting its materials suppliers on board, as well as getting people within the company itself to support the process. To overcome these barriers, Desso has worked very closely with EPEA to prioritise efforts and make the process operational by starting with one product at a time. In collaboration with EPEA, the company has also developed a roadmap to 2020. Raw material suppliers were initially reluctant to get on board; firstly because their products already met legal requirements and were in line with EU labelling (CE and REACH); and secondly because moving to Cradle to Cradle would require them to have much more specific knowledge about their products, as well as sharing this information with Desso. For some suppliers, arrangements were made for sharing the information with EPEA only. In the process, the company also had to terminate partnerships with some of its suppliers. Within Desso, some people were also sceptical, but this was overcome through extensive training and communication. The strong commitment from Desso's management team was also crucial in getting people within Desso to back the Cradle to Cradle vision. Moreover, the company has a performance evaluation system in which key performance indicators

are included for the implementation of Cradle to Cradle to make it more visible, relevant and serious within the company.

Van Gansewinkel

Interviewer: Consultants COWI on behalf of the Danish Business Authority

Van Gansewinkel is a waste management company that has specialised in making energy and products based on waste materials. Van Gansewinkel does this by building supply cycles, where materials are re-used in closed loops. Originally Van Gansewinkel was a classic waste collecting business. The focus of the company was on collecting waste, and only to a very small degree recycling the waste materials that were collected. Recycling only happened in the cases where the procedure was relatively straightforward. Today Van Gansewinkel is a large company with more than 100 partnerships, focusing on using and reusing waste from their own or others' productions.

The business model

Van Gansewinkel's value proposition is to enable their customers to use and re-use waste materials in coordinated and cost efficient closed loops. This is achieved through a number of activities including 1) the coordination of production cycles with partnership companies; 2) organising and extracting raw materials from waste products; and 3) manufacturing products from recycled or waste materials.

Van Gansewinkel's key activities are to provide services for managing their own and their partners' production cycles. Van Gansewinkel combines the logistics of transforming waste products into raw materials with take-back mechanisms; thereby designing and managing the coordination of closed loop production cycles.

Van Gansewinkel has developed a new and unique assessment of their revenue streams. On the one hand the company is becoming a materials pooler, i.e. by having established a system of specifications of the different raw materials which are produced from waste products; and on the other hand the company is becoming a process coordinator by applying a holistic view of the production cycles. In this way Van Gansewinkel has managed to turn the company's main cost – the waste removal – into their source of revenue, and in this process they have set up production cycles that close loops between

production, use and re-use of products.

In Van Gansewinkel new customer relations have been created by eliminating the distinction between customers and partnerships. Van Gansewinkel often enters into partnerships with the companies that they develop solutions for, and their production partnerships often evolve into customer relations, since the partner company often buys raw materials from Van Gansewinkel. This creates close relations between Van Gansewinkel and their partners and customers, enabling Van Gansewinkel to receive a lot of feedback on the development of their products and services.

Benefits and impacts

The most important environmental benefit is created in the re-use of raw materials. This is promoted through the company's own productions, through partnership productions and by assisting other companies in basing their production on recycled materials. The re-use of raw materials has a large impact on energy consumption and CO₂ emissions compared to primary source production of the same materials. For instance Van Gansewinkel's supply of secondary glass for bottle manufacturers has enabled the production to be carried out at lower temperatures than if the glass was made from scratch. This has caused a 10-12 per cent reduction in the energy use in the production, and additionally, the heat generated in the production is now used for central heating, further lowering the energy use of the company. Other examples include plastic recycling, where the energy and CO₂ emissions have been reduced by about 40 per cent, and C2C office paper that is produced using 70 per cent less water than other paper productions. Overall, Van Gansewinkel gives 77 per cent of their waste materials a second life, either by turning them into new raw materials or into green energy. 56.7 per cent of this waste is used to make new raw materials which have saved the equivalent of 1.2 million tones of CO₂.

The financial benefit of the company was originally a motivation towards adopting the green business model. This caused Van Gansewinkel to make fundamental changes in the company, securing not only the survival of the company, but also its growth. Since the business has been changed completely, it is fair to say that the growth experienced in the company is directly related to the green business model. Despite of the financial crisis, sales and revenues have increased by about 10 per cent, and the growth level of the company has been around 10-12 per cent over the last 4-5 years. In the same period at least 200 people have been hired in relation to changes made in the company. However, people have also been laid off in this period, since their skills were no longer relevant for the new focus of the business. Overall, however, the company has experienced a growth in employees, and the business today employs over 5,800 people, and has an annual turnover of EUR 1.1 billion.

Drivers and barriers

The changes in Van Gansewinkel were promoted by two main drivers. One was the negative motivation of seeing the margins on the classic waste collection activities decrease, and the other was the opportunity they saw in transforming a global threat of raw material scarcity into a benefit for the company. On this basis Van Gansewinkel decided to turn their business around. They started producing secondary raw materials on specification; based on demands from customers rather than on what was easy to produce from the waste materials they had. This constituted a new way of looking at their own supply chain, transforming the waste collection business into take-back systems.

The main barriers to the transformations were found in the company itself. It was a great challenge to change the mentality throughout the company to the new focus on closed loops and constant recycling. Whereas lacking knowledge of new technologies could be solved by buying the necessary expertise from experts, the process of convincing employees to let go of old ways of thinking and grasp the new ideas was difficult.

Steelcase

Interviewer: Consultants COWI on behalf of the Danish Business Authority

Steelcase offers a wide portfolio of workplace products, furnishings and services. The company was founded 100 years ago in Michigan, the United States. Today it is still headquartered in Michigan, but operates globally with annual revenues of around USD 2.4 billion and a staff reaching nearly 10,000. Over the last decade, the amount of traditional office furniture that the company sells has been dramatically reduced, and the company has been faced with the challenge of changing its traditional ways of doing business to meet the changing nature and evolution of how people work. This has led to a new line of products and workspace concepts, along with a view towards integrating sustainability into the company's offerings.

The business model

Steelcase's value proposition is to provide workspaces that help their customers achieve their business goals, while making the working experience for the involved people as effective as possible in healthy, environmentally friendly and enjoyable environments, e.g. workspaces for well-being.

Steelcase's business model is built around the company's ability to deliver a wide range of office solutions; i.e. ranging from the supply of specific quality office furniture but going more in the direction of designing and implementing entire workspaces customised according to specific customer needs. To clarify customer needs, Steelcase provides close collaborative consulting to help customers better understand and prioritise their business needs, based on which optimal workspace solutions are designed and implemented. The move to include workspace design services with a focus on enhancing work functionality and well-being has created new revenue streams for Steelcase, and has likewise added to the company's competitiveness in the industry. One of the main activities underpinning Steelcase's business model involves dedicated research for gaining a better understanding of the changing nature of work, as well as gaining deeper knowledge of how the use of technology, design, materials, etc. affect the

users' experience, effectiveness and satisfaction in the workspace — a platform which the company calls “insight-led performance”, and which is meant to frame all new product, process and application developments. With respect to product developments, for example, this process now involves gathering specific knowledge about the material chemistry of all new products, performing life-cycle assessments, and designing the products for recycling and re-use; thus adhering to the cradle to cradle principles. Based on its insights, the company is also taking active steps to map the materials used in its existing product portfolio, with the aim of making these meet the cradle to cradle concept.

One of the company's key activities in support of its business model is to run its own research of work and workspaces. Research is also directed towards the company's material usage in order to create strategies for exiting unsafe materials used in its products. As such, the company's key resources are not only tied to safe materials for developing sustainable products, but also very much also to the company's human capital. The company's research efforts also involve a wide range of key partnerships. These include diverse players such as leading architecture and design companies, as well as research institutes and universities covering areas such as sociology, psychology and brain research.

The company's main customer segment has traditionally been comprised by very large companies, but the development of new workspace concepts has expanded the market into also including public administrations, small and medium-sized enterprises, as well as start-ups. Steelcase has also started offering shared workspaces which are optimised for collaborative work. Here companies can rent spaces on an hourly basis, or over longer periods.

Benefits and impacts

The most apparent environmental benefits from Steelcase's move towards more sustainable workspace solutions are associated with its cradle to cradle products, as well as with its office sharing concepts such as WorkSpring and WorkCafe. For instance, based on research that most people at any given company spend around 40-60 per cent of their time away from their desks, the concepts optimise the workspace in such a way that more people can work more effectively, and with higher satisfaction, in less space, and thus reduces the overall footprint of the required workspace. Also, based on its cradle to cradle products, Steelcase has initiated work to map out its use of materials. So far this has involved 650 categories of materials and resulted in a list of materials that are fit for use, and if existing products are found to be using toxic materials, the company creates strategies for eliminating those materials. More generally, Steelcase's sustainability efforts have since 2006 led to significant reductions in the company's

greenhouse gas emissions (40 per cent), VOC emissions (52 per cent), waste volumes (48 per cent), and water consumption (52 per cent).

The financial impacts of Steelcase's move towards more sustainable workspace offerings have not been quantified by the company.

Drivers and barriers

The main driver behind Steelcase's efforts to provide sustainable workspaces has been the rapid change in the way people work, as well as the company's declining sales of traditional office solutions associated with this change. Moreover, the company's ongoing efforts at developing "insights" about work and workspaces through both its research and its product and process developments have provided the company with an important internal mechanism for developing a company culture with a more sustainable view towards workspace solutions.

Being a 100 years old company, one of the main barriers has been for Steelcase to overcome its relatively conservative company culture, as well as to disseminate more innovative and sustainable values throughout the organisation. An important milestone in the process of overcoming this barrier was reached when the company embarked on developing its first cradle to cradle product in 2004, the ThinkChair. This achievement not only changed Steelcase's image inwardly toward its own employees, but also the image held by the company's customers. However, while important steps have been taken in this direction, the barrier of disseminating a sustainable culture within the company continues to be a challenge. To this end, Steelcase is directing much effort into developing a language and literacy within the organisation for better being able to handle and build capacity in the area of environmental and social performance. Such efforts also include finding people within the company who can act as champions in this respect.

SafeChem Europe GmbH

Interviewer: Consultants COWI on behalf of the Danish Business Authority

SAFECHEM was established in 1992 and is a wholly owned subsidiary of The Dow Chemical Company (“Dow”). The Dusseldorf based company with offices in Paris and Midland, MI (USA), is an innovative product and service provider for the sustainable and future-oriented use of solvents in surface cleaning and dry cleaning. It serves more than 7,500 customers across Europe and North America.

The cleaning of metal components is an important production step in a variety of industries such as the automotive, aerospace, electronics, medical engineering, watch and precision engineering industries. High-quality cleaning is necessary to produce top-quality products. Chlorinated solvents are considered by experts as the best cleaning agents from a quality and financial point of view for a variety of applications, and in some cases they are even indispensable. As they carry product-specific risks, SAFE CHEM offer tailored and sustainable solutions based on chlorinated and non-chlorinated solvents to meet the industry’s requirements.

SAFE CHEM is committed to the principles of Responsible Care®(the chemical industry’s guidelines for sustainable business), Product Stewardship and Sustainable Development.

The business model

SAFE CHEM focuses on selling a value-added, future-oriented solution instead of chemicals only. The company has a complete portfolio to manage the product-specific risks of chlorinated solvents, to optimise the cleaning process as well as the solvent consumption. The basis is a closed-loop concept: the SAFE-TAINER™ system is a double-walled safety steel container system for the easy and safe handling of fresh solvents and the take-back of used solvents for recycling, thus closing the loop. The system is connected via special accessories to a hermetically closed cleaning machine. Emissions are reduced to basically zero and all relevant regulatory, health, safety and

environmental requirements are met. After use, the solvent is either distilled and supplied back to the market as a recycled solvent or thermally recycled into energy and hydrochloric acid necessary for the production of virgin solvents.

Additional services around the whole cleaning process (such as consultancy, laboratory analyses, test kits to monitor the solvent on-site and stabiliser systems) help customers optimise their cleaning process and reduce their overall consumption of solvents, by re-stabilising the solvent in the closed cleaning equipment. The solvent's lifetime can be increased significantly and solvent consumption further reduced.

SAFECEM is continuously developing innovative concepts such as Chemical Leasing. Customers can lease the complete cleaning process for a fixed monthly leasing fee. A close cooperation with the customer allows efficient monitoring and optimizing of the entire cleaning process at customers' sites.

For almost two decades, SAFECEM has orchestrated a service alliance with qualified chemical distributors (who are committed to Responsible Care), leading manufacturers of closed cleaning machines and certified waste management companies. This ensures the recycling of the used solvents in accordance with existing laws and regulations.

From the beginning, the take-back of used solvents has been included in the customer payment. Part of the services, such as the waste take-back, is already included in the price of the fresh solvent. Additional service elements are invoiced on an itemised basis. Within the Chemical Leasing business model, a monthly leasing fee is invoiced to the customer for the entire solution. The fee is calculated on the basis of product performance (e.g. chemicals used per m² or per time unit) instead of materials used. The revenue therefore shifts from being based on the volume of sold solvents to the performance of the complete chemical product service solution.

Benefits and impacts

The SAFECEM business model contributes significantly to worker safety and the protection of the environment. It enables optimised solvent efficiency within the cleaning process.

In combination with closed cleaning equipment the SAFECEM solution leads to a 98 per cent reduction of solvent consumption compared to cleaning processes of the past in half-open machines. Even when closed-cycle machines are used, the SAFECEM solution reduces solvent consumption by 90 per cent. Life-cycle analysis also shows that the full service model cuts the environmental impact caused by photochemical oxidation, human toxicity and other environmental impact categories by 10, 25 and 70

per cent, respectively (source: Joint Research Center, 2006, Chemical product services in the European Union). Introducing the Chemical Leasing model can lead to a further reduction of solvent consumption by up to 70 per cent which comes on top of the above-mentioned impacts.

Main drivers or barriers

The main drivers for introducing the SAFECHEM business model were environmental responsibility, worker safety and effective management of the product-specific risks of chlorinated solvents. The SAFECHEM solution was designed to comply with more stringent emission regulations which were first implemented in Germany and afterwards throughout Europe in the form of the VOC directive. In combination with closed cleaning equipment or similar, the SAFE-TAINER system represents the Best Available Technology for the use of chlorinated solvents. A key factor for the successful implementation of the business model was the establishment of a “Service Alliance” with all relevant stakeholders along the value chain. The SAFECHEM solution enables the industry to use chlorinated solvents as the product of choice in a variety of applications in a safe and sustainable way.

There were two main barriers to succeeding with the business model. The first was the challenge of explaining (and convincing) customers of the benefits they would get by buying a service instead of a product. The market was highly commodity-based, and it was not easy to start selling higher value solutions, which required a longer time-perspective when evaluating pay vs. performance. This barrier was overcome through intensive market communication of the company’s value proposition and value-added sales strategies. Today, part of this task is done through CHEMAWARE - a knowledge and know-how service with input from the Service Alliance members providing information about safe and sustainable use of solvents. The second main barrier was to get the right people on board who had the necessary technical competence combined with value-added selling skills.

Eco2Distrib

Interviewer: Consultants COWI on behalf of the Danish Business Authority

Eco2Distrib is a French manufacturer of dispensing machines with the capability of dispensing a wide range of fluid consumer products. The company began to commercialise its product in 2011, starting with a number of in-store tests with the aim to study the consumers' behaviour towards the refill concept. 2012 will be the first real year of operation, starting with the deployment of the brands tested in 2011. The company currently has 20 active dispensing machines set up in retail stores in France. The company employs 7 people, 2 of whom are employed with Eco2Distrib's manufacturing partner. In 2011, revenues totalled around EUR 120,000. The primary motivation behind the development of Eco2Distrib's dispensing machine and business model was the founder's general dissatisfaction with purchasing products in packaging which is used only once, generating a lot of waste. Stores in France that allow consumers to buy a wide range of solid products, such as rice and pasta, in quantities and containers of their own choice (and avoid packaging) already existed, and this added to the interest in making a similar concept for fluids.

The business model

Eco2Distrib's value proposition is to provide its customers with dispensing machines that can distribute a wide range of fluid consumer products in a more efficient, convenient and environmentally friendly way.

The innovative part of the business model is that it gives manufacturers and retail stores the possibility of selling fluid consumer products, such as soap, detergents, beverages and paints, in an entirely new way; without the use of individual product packaging. For manufacturers and retailers, the solution (i) omits the manufacturers' packaging process, (ii) reduces transportation costs to retailers, (iii) removes the retailers' need for shelving products and saves valuable shelf space. The solution offers customers the possibility to buy the exact quantity required, and in a container of their own choice. Products can also be sold to consumers in convenient and more intelligent ways. In the

case of paints, for example, a consumer can tell the machine to dispense just enough paint to cover a certain number of square metres. This way, a consumer will buy only what is needed and avoid wasting surplus paints. In effect, consumers therefore pay less. The dispenser is moreover a novel instrument from a technical point of view, because it dispenses intelligently and without any forms of internal or external spills when filling up the end-user's container. As such, it requires only minimal cleaning and servicing.

The company's customer segment includes world leading companies in paints and detergents, and the company is negotiating with a major French retailer about setting up a 5 metre long dispenser capable of providing 17 different products. So far, Eco2Distrib's dispenser has been tested in 20 stores in France with great success, and the company has had experience with dispensing household cleaning products, paints, wines, vinegar, groundnut oil and oil for motors. Efforts into distributing milk, which requires additional research to avoid bacteria, soda and other fluid products are also being looked into.

Customers pay for Eco2Distrib's dispensing machines on a rental basis, typically based on 2-4 year contracts. Depending on the individual case, rental contracts are either made with the manufacturer of the fluids (who then deals with a retail store), or with the retail stores (who then bring in manufacturers of the fluids). Rental fees, which include a maintenance service, are negotiated case by case.

Apart from producing and selling the machine, other key activities include setting up the machine once the rental contract has been finalised. Eco2Distrib foresees the possibility of a new breed of retail shops based entirely on selling products in bulk and through dispensing machines rather than in individual product packaging. There are currently not many other companies in this line of business, but a small number of similar companies are moving into the arena in the UK, Italy and France.

A crucial point for the success of Eco2Distrib has been the company's partnerships. In the production of the machine, Eco2Distrib has worked closely with its electronics suppliers. Partnerships with the retailers and suppliers of the fluid consumer products have also been pivotal. Because the Eco2Distrib solution literally changes the way products are packaged, distributed and sold, setting up these partnerships has had to involve both retail and supply parties at the same time. Eco2Distrib has also set up partnerships with local companies for machine and service maintenance.

Impacts and benefits

There are large potential environmental benefits of the Eco2Distrib dispenser solution. As the commercialisation is in its beginning, the solution and actual impacts are

currently hard to quantify. Having said that, manufacturers of fluids can avoid the use of packaging, which not only produces less waste, but also makes distribution to retailers more efficient. Similarly, end-consumers can reuse their own containers several times. The company estimates that if end-consumers on average reuse their containers 10 times, this would avoid 90 per cent of the waste and raw materials that are otherwise associated with individual product packaging. In cooperation with a French governmental institute and a consulting company, Eco2Distrib also estimated their solution's CO₂ savings compared to the traditional retail model; taking a wide range of parameters into account, including raw materials used for manufacturing the dispenser, energy consumption, product transportation, the dispenser's end-of-life impact etc. Depending on product types and the amounts sold it is estimated that an average Eco2Distrib dispenser would lead to a reduction of 500-1400 tonnes of CO₂ emissions per year.

In financial terms, Eco2Distrib has had 20 dispensers in place for testing in various retail stores during 2011, and made around EUR 120,000 in revenues. The tests finished with very promising results, and Eco2Distrib expects revenues to grow significantly in 2012. By the end of 2012, the company expects four new contracts with major retailers to be in place and that 200-400 dispensers will be active. Eco2Distrib is currently also negotiating with retailers in Sweden, Belgium and Italy. Manufacturer of the fluids and retailers have also benefitted financially. Savings from avoided packaging has, for example, made it possible for retailers to, on average, sell products at 12 per cent less the original product price, and in-store tests show that sales of the manufacturers' brands have expanded considerably (between 200-500 per cent) due to better shelf visibility and a new sustainability image. The dispensing machines have in themselves moreover attracted new consumers to the retail stores.

Drivers and barriers

Eco2Distrib met a number of obstacles on their way to developing and manufacturing the dispenser. In the beginning, funds were the most important barrier, as a lack of funds limited the hiring of skilled technicians for the R&D phase which was a key resource for the development. The initiative was financed through a mixture of personal funds, bank loans and support from business angels and the French government. Also, even if everybody thought that the Eco2Distrib concept was a good idea, it was generally met with disbelief at the beginning. Producers did not believe that retailers would give space for the machine within the shelves; the retailers did not believe that manufacturers would sell their products from it; and neither of them believed that end-consumers would buy products this way and return to the store with their empty packaging. Hence, it took a lot of time for Eco2Distrib to put everybody around the same table and negotiate a deal. An important factor in this regard was the company's tests of the dispenser which they

conducted in actual retail stores to demonstrate high consumer interest in the dispenser as well as willingness to use when purchasing products. Once the partners got together, which included Henkel (a major German producer of consumer products) and Carrefour (a major French retail store), new possibilities opened. Self-service and refill from bulk are becoming a real trend in France and the projects are developing.

Other kinds of obstacles were also met, such as getting manufacturers to change their production lines (to skip the packaging process) and the incapability of retailers' IT systems to handle product sales in terms of litres as opposed to e.g. number of bottles. Today, Eco2Distrib's greatest challenge pertains to the fact that it is sometimes cheaper for manufacturers to distribute their products in cheap mass produced individual packaging than to use the Eco2Distrib solution. For instance, while Eco2Distrib's solution is profitable in the case of fluids being sold in high volume or more expensively (such as paints), the company is met with a challenge in the case of low volume and low-cost products. To meet this challenge, Eco2Distrib needs to secure a higher number of active dispensers to decrease its price and become competitive in any market, and this requires additional funds, which are not easy for the company to obtain. The company has also encountered various types of regulations which prevented Eco2Distrib to enter specific markets.

Car2Go

Interviewer: Consultants COWI on behalf of the Danish Business Authority

Car2Go, which is a subsidiary of Daimler, is a car sharing company. It employs about 100 people and currently operates car sharing in 10 cities, covering the US (Washington DC, San Diego, Austin), Canada (Vancouver), the Netherlands (Amsterdam), Germany (Olm, Düsseldorf), Austria (Vienna) and France (Lyon). The Car2Go car sharing mobility concept originally grew out of the Smart Fortwo product development, but was not applicable at the time due to a lack of appropriate technology and consumer interest. The idea was later revisited in Daimler's Business Innovation Department to conceptualise a viable business model.

The business model

Car2Go's value proposition is to offer its customers a fully flexible and convenient mobility solution for city travel. The novelty of Car2Go's business model arises from the fact that the company provides a free-floating car sharing service; that is, car sharing without rental stations and/or fixed drop points. Users are free to pick up available cars directly from the street, or book the most conveniently located car over the web, using a computer or smartphone, which provides information about the car's state of cleanliness and fuel/charge level at the same time. To end the rental, users can park in any public parking space, as long as this space is located within Car2Go's business area. No redistribution of cars has seemed necessary, and if the fuel/charge level is below a certain point, users must refuel (or recharge).

Users must be members of Car2Go to use the service. There is a membership registration fee, but no monthly subscription. Revenues are based on "pay per usage", calculated as a fee per minute which includes fuel, services, taxes, insurance, maintenance and parking. If the car is parked during the rental period, the fee per minute is lower. There is a maximum price per hour, as well as a maximum price per day, and the system automatically applies the lowest applicable fee for the customer's usage. If the number of driven kilometres exceeds a given allowance an additional fee is charged (per km).

Users who refuel or recharge cars when needed are rewarded with free driving time. The company is currently working on making it possible for its customers to use the service in other cities than their member city.

Apart from providing the service and technological infrastructure, Car2Go's key activities include operating a small number of "shops" with service counters for information, suggestions, complaints, etc. The most active users are invited to share their comments on the service and to suggest improvements. All users generally play an active role in keeping certain information about the cars up to date. For example, before driving off, they are asked to rate the cleanliness on a touch screen placed within the car. If the cleanliness is rated poor, the car is blocked for further renting and a service team is dispatched to clean it. Car2Go also uses Twitter and Facebook for communicating with their customers.

The primary customer segment of Car2Go's service consists of people between 18 and 35 years of age. This group constitutes 60 per cent of users, many of whom are students. Users generally fall within two groups, namely "first movers/early adopters" with an interest/need for flexible mobility, and those interested in sustainability. Car2Go's car sharing service, which by many is seen as a complement to public transport, currently has no direct competitors.

Key partnerships for supporting Car2Go's business model have been with city municipalities to secure parking spaces for its customers. Car2Go also works with public transport operators, i.e. creating partnerships where tickets to public transport automatically include a certain number of free minutes of Car2Go driving, or where public transport operators inform passengers about Car2Go. Car2Go is also investigating how to combine pricing models.

Benefits and impacts

The environmental impacts of Car2Go's services occur both when the transport is used, but also in the production of new vehicles. Car2Go's service is based on the Smart Fortwo, which has very high fuel efficiency and low CO₂ emissions. In cities where it is possible, i.e. Amsterdam and San Diego, Car2Go's services are based entirely on electric vehicles. Moreover, the flexibility of the service makes people drive less, but more efficiently (when needed). Overall, this reduces CO₂ from transport. Additional benefits stem from the fact that fewer cars are needed to serve a larger amount of people. This minimises the need for city space and saves resources for car production.

Financially, Car2Go is expected to be profitable by 2014. The Car2Go car sharing service has the potential of benefitting users financially too, i.e. by forgoing the purchase of their

own vehicle (along with service and maintenance fees), by using fewer taxi services, or by reselling their current vehicle. Added to this comes the value generated by higher city transport convenience.

Drivers and barriers

The primary driver for developing and implementing the Car2Go business model for Daimler was to be able to better respond to the increasing need for mobility; particularly under a number of challenging circumstances, such as growing cities, introduction of road pricing, congestion and congestion fees, high parking fees and limited parking space. This situation, combined with a growing number of households without a car, underlined a need for new, flexible and convenient mobility solutions, which from the perspective a traditional car manufacturer could only translate into a falling number of customers.

Three areas have made the Car2Go business model successful. With 9 out of 10 rentals being from A to B, the most important is the flexibility that the model offers the users. The two others are the easy and convenient rental process, and the transparency of the pricing scheme.

The most difficult thing in the development of Car2Go has been the shift from a traditional car manufacturing mindset to one that operates in terms of car sharing and rental services. In this connection, the company also met barriers because no similar solution has been developed or operates elsewhere; i.e. both in terms of knowhow, but also in terms of the risk that it would not work. Further, making it work required the company to develop a very complex technological infrastructure to manage the fleet of cars. From a sustainability perspective the company is currently prevented from only using electric vehicles because so few cities have built an appropriate electric recharging infrastructure. Other barriers to expand pertain to a lack of public parking spaces.

Siemens Building Technologies

Interviewer: Consultants COWI on behalf of the Danish Business Authority

Siemens Building Technologies is an operating division of Siemens AG. It was founded in 1998 through the acquisition of several companies, which led to an integration and combination of several decades of experience with respect to building automation, engineering services, as well as fire safety. Siemens Building Technologies is part of Siemens - Infrastructure & Cities, which is headquartered in Zug, Switzerland, employs around 35,000 people, and works to make organisations comfortable, safe, secure, as well as less costly to operate. Activities are organised globally in six Centres of Competence: the Americas, Asia Pacific, North West Europe, South West Europe, Central and Eastern Europe, and Germany. The performance contracting services facilitating energy savings solutions are a business unit (Building Automation) within the company. This part of the company offers a comprehensive range of building automation systems, as well as heating, ventilation and air conditioning solutions, to minimise operating costs. Performance contracting services have been part of the company's activities for more than 20 years and have become an established way of doing business.

The business model

The value proposition of Siemens Building Technologies' performance contracting services is to provide customers with low-risk and self-financed energy saving solutions for large buildings and ships. The energy savings lead both to less money spent on energy consumption and lower CO₂ emissions.

The solutions are sold through a four-step procedure. The first step includes an inspection of the historic and current energy consumption of the customer's establishment, based on which a preliminary analysis of the total energy savings potential is conducted. Siemens uses the preliminary analysis to prepare a business case with estimates of how much of the potential energy savings can be realised; the total costs of the project; and the savings guarantee scheme that Siemens will be able to propose. Previously, the preliminary analysis was offered free of charge, but to ensure a higher degree of

initial commitment from their customers, the cost of the analysis is today shared equally between Siemens and the customer. On the basis of the preliminary analysis, the customer decides whether to continue with the project, which leads to the second step if accepted. The second step involves a detailed and comprehensive analysis which will confirm or invalidate the preliminary savings estimate. At this point, the customer still has an option to opt out of the project at a previously agreed price. The third step starts if the customer agrees to continue. This step involves the signing of a construction contract based on the results of the detailed analysis, as well as the implementation of the project. Finally, the fourth step comprises an energy savings guarantee phase. When the guarantee phase ends, the investment is profitable for both Siemens and the customers. At this point Siemens offers to take over the establishment's energy monitoring, unless a new performance contract is signed.

The innovative part of the business model is twofold. First of all, Siemens can provide its customers with a guarantee of meeting very specific energy saving targets by basing their solutions on proven technologies and specific knowhow in the area. If these savings are not met, Siemens will pay the difference to their customers. The investment therefore only carries a very small risk for the customer. And secondly, if savings are higher than estimated, the additional benefit is shared between Siemens and the customer. This creates an incentive for Siemens to strive for over-performance, and it motivates the customer to play an active role in helping to reduce energy consumption as much as possible to reap even larger benefits. As such, the performance contract also helps to facilitate close cooperation between Siemens and its customers, which is necessary for realising energy savings.

To be feasible investments, energy saving solutions must be of a particular size. For this reason, Siemens' main customer segments include large public and private organisations. Public sector customers are traditionally found through public procurement tenders, while private sector customers are often contracted through existing contacts, i.e. via Siemens' already significant installation base of building intelligence systems. Lately, customers in the shipping industry have also been targeted. To spur interest in the energy saving solutions (from both public and private actors) Siemens engages in various activities such as holding seminars about their projects.

There are two key activities underlying the business model. The first is estimating the full energy saving potential and analysing what can be met with existing and proven technologies. The second relates to implementing the proposed solution through intelligent energy control and monitoring systems, optimisation of existing installations, and installing new technologies. Key resources comprise the human capital needed to perform the preliminary and detailed analyses. In this regard, Siemens can also draw on relevant competences and resources within the company, through an established global network of "centres of competences". Moreover, if the customer is not able to

finance the energy saving solutions by themselves, financing can be offered through Siemens Financial Services at favourable rates, as both companies have an interest in undertaking the project.

Benefits and impacts

The environmental impact of Siemens' business model is realised through energy savings on their customers' side. The amount of energy saved varies from project to project, but reductions usually lie in the range between 20 and 50 per cent. This of course translates into reduced CO₂ emissions. Since 2000, Siemens' performance contracts have facilitated a cut of some 9.5 million tonnes of CO₂.

On the economic side, Siemens has calculated an expected average reduction of 9.5 kg CO₂ per euro saved. Based on this estimate, and the amount of CO₂ reductions saved to date, Siemens' performance contracts resulted in energy savings of approximately EUR 1 billion between 2000 and 2011. Moreover, due to Siemens' experience in the field and its focus on using innovative but proven technologies to reduce energy consumption, the company currently has outstanding saving guarantees of some additional EUR 1.5 billion.

Siemens' energy saving solutions also lead to significant economic gains in terms of increasing building values. For instance, a building which has much lower operation costs than similar buildings is of much more value to potential renters. For this reason, building owners may set higher net rents, hence increasing the net revenue and financial efficiency of invested capital. In addition, energy saving solutions can increase a company's environmental image and CSR profile. Up until recently, the value derived from this source has mostly been seen as a spillover effect, but its merit and importance is increasing significantly.

Drivers and barriers

The overall driver of Siemens' energy saving solutions relates to what the company refers to as a specific 'megatrend'; namely, the ongoing population growth coupled with the increase in urbanisation and the rising demand for energy. Today, cities represent 80 per cent of the world's CO₂ emissions but only 50 per cent of the world's population. In the future, the city populations will grow, as well the need for energy, and this means a growing market for the performance contracting services that Siemens offers. Likewise, rapid technological developments make it possible to deliver solutions with higher and higher energy savings, providing a foundation for energy savings services of a more continuous nature, i.e. cycles over a 10-year period for a given building.

It is difficult to talk about general, or global, barriers to Siemens' energy saving solutions, as they offer sound investments with guaranteed payback. However, obstacles may arise from diverting interests between owners and renters of the building to which the energy saving solution is applied. The benefits of lower energy consumption will be reaped by the renters, leaving the obvious question; who should take on the investment, the owner or the renter? This clash of interests will in some cases render building owners uninterested in the energy saving project. In most cases, pay-off is also an issue. In specific cases, a payback time of as little as two years is required. Others go as high as 14-15 years. 4-8 years provide a realistic timeframe for quality performance contracts. Moreover, the shorter the required payback time of the investment, the smaller will be the scale of the proposed solution. This essentially translates into lower overall energy savings of the project and renders the investment less worthwhile. There are no apparent solutions for this owner/renter problem.

Other barriers can be that Siemens does not get to talk with decision-makers right away, and that the value proposition of Siemens is therefore never communicated to the right people within the customer's organisation. Also, barriers can arise in cases where Siemens is met by short-term rental agreements and thereby an expectation of changes within the customers' premises and buildings.

Phillips

Interviewer: Consultants COWI on behalf of the Danish Business Authority

Royal Philips Electronics of the Netherlands defines itself as a health and well-being company, focused on improving people's lives through timely innovations. The overall value proposition for Philips to its customers is to improve people's well-being while respecting the limits of natural resources. Philips is a world leader in many areas of healthcare, lifestyle and lighting, and employs over 120,000 employees with sales and services in more than 100 countries worldwide. In 2010 sales were at EUR 22.3 billion. The business model in focus here relates to Philips Lighting.

The business model

Philips provides complete lighting installations, including LED and dynamic lighting to enhance the well-being and productivity of the employees delivered as a service. This is a change in value proposition from a traditional product sales value proposition to a service rooted in the function which customers request. The service is based on a closed-loop system where the lighting systems are delivered, used and taken back for better product and environmental performance.

The business model is based on selling the service the light performs rather than the lighting system itself. The starting point for developing this model is the cradle to cradle philosophy and the wish to generate further progress in the strive for closing material loops as one of the key innovation areas in the Philip EcoVision programme. This means that Philips produces, installs, maintains, monitors and pays for usage, and take back, and to the extent possible, reuse or regenerate materials from the lighting system. In return the customer pays a service charge over the entire period agreed upon.

This means that the customer gets and pays for the function wished for - the appropriate amount of high-quality light when needed - and nothing more.

A range of innovative changes has been made to arrive at this model. The list of key

partners has been extended to include utility companies, and the key activities now include monitoring consumption. The customer relations have also changed as a consequence of the new business model, from a commodity sales relation to a trusted service partner that supplies and maintains the lighting systems. Finally the business model has an effect on the revenue stream, which has changed from a point in time payment to a continuing payment scheme.

Benefits and impacts

The environmental impacts of the green business model partly relate to the fact that the system is an energy efficient LED system, so the consumption of energy will be significantly lower than a regular lighting system. Furthermore the system is monitored and metered, which allows for optimising the system according to the needs of the customer. Finally the model solves the first and essential problem for closing materials loops - the return-logistics and finances.

The financial impacts of the green business model are both beneficial for the customers and for Philips. For the customers the main benefit is that they only get what they need and at a steady price, while at the same time reducing the down-payment needed for getting state-of-the art lighting systems installed. For Philips the main benefits are that they become a partner and service provider, with the obvious benefits of improved conditions for extending and/or expanding the business with the customer. Furthermore Philips gets access to the valuable materials in the product for re-use or for re-selling. The business model is currently being tested, so large-scale business impacts are not yet available.

Drivers and barriers

The main drivers for sustainable innovation in Philips are the belief that healthy and sustainable living requires resilient societies (social and economic preconditions) and healthy supporting ecosystems (environmental preconditions). Scarcity of resources, climate change etc. call for a long-term commitment to sustainability, and increasingly this is something that the market expects from companies. The trigger for initiating the innovation project leading to the "pay per lux business model" was a request from an architect inspired by cradle to cradle to come up with a solution matching his intent to lease everything needed for his office. The main driver for this innovation is the Philips EcoVision programme, which focuses on improving the living conditions for people, reducing energy consumption and closing material loops. Investigating opportunities and potential in a shift from selling pure products to selling services and products is a natural part of the ongoing sustainable business model innovation.

The main barriers for success with this business model, from a direct business perspective, is the short-term financial focus amongst customers, as the model only functions with a long-term total cost perspective and willingness to commit to a supplier over a period of time.

From an environmental perspective there are several barriers regarding actually closing the material loop. Philips does get back the materials, but material streams are not actual loops. There is a lack of connection between the key players, and there is a need to build trust and relationships, common business models etc. with them. Furthermore there are some technical challenges due to a lack of precise information about the actual contents of the recycled materials. Attached to this barrier is the fact that for many materials the cost of virgin materials is lower than the cost of collecting them after end of service and recover the valuable materials.

Eastex Materials Exchange / Bright Green

Interviewer: Consultants COWI on behalf of the Danish Business Authority

The Eastex Material Exchange is a web-based platform that facilitates the exchange of surplus materials between different parties. The platform grew out of a two-year project set up between six UK counties in 2004, based on local government grant funds. Initially the platform was mostly used to keep finished goods in circulation, but its usage quickly spread to cover a wide range of intermediate materials, as well as materials that would normally be regarded as waste. As the project progressed, it was decided to take the project further, and management was turned over to a community interest company with the aim to make the project self-sustained. Today, the platform is run by Bright Green and has about 12,000 members.

The business model

The value proposition of the Eastex Material Exchange is to make it possible for small and medium sized enterprises to find cheaper raw materials and equipment, or to exchange their surplus materials while contributing to lower waste generation.

The innovative part of the Eastex Material Exchange is that the platform facilitates the creation of industrial symbiosis through the Internet by exploiting the principle that one company's waste is another's raw material. This is done by providing a web-based platform where companies can find or search for other companies' surplus materials (or register their own surplus materials), which can then lead to reduced raw material expenditures, avoided waste, and an overall better environmental performance. The platform also gives detailed real-time statistical and graphic insights into waste saved by all member transactions.

The platform is free of charge to all members; a service which has mainly been financed through local government funding. Management was however handed over to a private

community interest company called Bright Green in December 2010, with the aim of making the platform self-sustained.

Today, revenues are generated by selling the platform to other local authorities looking to increase resource efficiency in their area on the basis of an annual licensing fee. So far, the platform has been licensed to various regional municipalities, and Bright Green is currently in talks with local authorities in Romania and the Republic of Mordovia. The company has also been in talks with construction companies and major British retailers for internal materials management. The platform now generates enough money to sustain operations, and all profits are spent on upgrading and redesigning the platform for better market positioning, and for allowing other user languages and revenue streams, such as through online advertising. This part of the business is still under development.

One of the key activities in getting the business model up and running has been the use of a 'coordination' team of six people who make sure that the materials listed on the platform are fit for purpose, e.g. by removing hazardous or other inappropriate materials from the site. The coordinators also played a key role in matching platform members and facilitating exchanges in the beginning, and for presenting the exchange possibility at business-to-businesses events.

The key users of the materials exchange platform remain SMEs, but the platform can also be used by public organisations, as well as social enterprises, charities and other types of organisations. In terms of key resources, the Eastex Materials Exchange platform has benefitted greatly from local government grants as well as cooperative efforts between the different counties that were involved with the project.

Benefits and impacts

The environmental impact of the Eastex Material Exchange stems from the material exchanges occurring through the platform and thereby material reuses. It has been estimated that over a two-year period, the platform is responsible for about 7,000 exchanges, translating into more than 15,000 tonnes of goods that otherwise were likely to end up as landfill. While these statistics are based on the period between 2006 and 2008, current estimates should be in the same area due to similar levels of platform activity.

In terms of finances, the material exchange helps its members to avoid waste disposal costs, including transportation costs and landfill taxes. Allowing platform members to obtain raw materials at cheaper prices compared to what would otherwise have been the case also saves money. Over a two-year period, it has been estimated that the 15,000

tonnes of goods that are diverted from landfill and kept in circulation lead to about GBP 2.8 million in savings from avoided waste disposal costs and avoided purchases of virgin raw materials. The exchange of materials has been particularly high for electrical goods due to the WEEE directive, which makes disposal for these goods more costly.

Drivers and barriers

The main driver for pursuing the Eastex Materials Exchange was the British government's focus on improving resource efficiency. A key driver for pushing the platform forward has also been the increasing British tax on landfill which has gone up from GBP 32 per tonne in 2004 to GBP 64 in 2012, and which is set to increase further in the future. The landfill tax has also been a key source of funding for the Eastex Materials Exchange project.

There have been three main barriers with regards to setting up the Eastex Material Exchange. The first was related to educating businesses to make use of the platform and explaining its potential. This was especially difficult in relation to the country's legal requirements associated with the handling of surplus materials classified as waste, which necessitates certain and very controlled waste disposal routes. To overcome this problem, the Eastex Material Exchange got clarification from the Environmental Agency stating that as long as a surplus material is reused for its intended purpose, the legal requirements did not apply and an exchange could be made.

The second barrier was to make companies use the platform on a continued basis, which required several marketing campaigns. The third barrier has been that once companies joined as members in the material exchange and established a profitable relationship with a 'waste' partner, there would be a tendency for the companies to leave the platform. This would especially be the case for larger companies. One of the ways to keep the platform attractive for companies in this regard has been to set up the platform as a recognised and sanctioned exchange, i.e. with various legal backing, such as third-party evidence for actual transfers. A current challenge is to find viable revenue streams to keep the platform sustained.

Rantasalmi

Interviewer: Consultants COWI on behalf of the Danish Business Authority

Rantasalmi was established in 1946 and is the oldest manufacturer of log houses in the world. The company's products mainly include the design and manufacturing of private homes; but also leisure homes, public buildings, cabins, saunas and outbuildings. Rantasalmi's most important market is Finland, but half of its products are exported, primarily to Germany, France, Russia, and Japan. The company is based in Rantasalmi, Savonia, in Finland where it currently employs about 100 people. For more than a decade, Rantasalmi has been working closely with a number of other companies in the area. In 2004, Rantasalmi and its partner companies took the first step to establish an eco-industrial park to further enhance and expand the collaboration and the resulting benefits. The resulting Rantasalmi Commune Eco-industrial Park is the first planned and organised eco-industrial park in Finland. It currently comprises seven companies. Several of the companies specialise in mechanical wood processing, but members also include transport and blade maintenance services.

The business model

The value proposition of Rantasalmi is to provide log houses in timeless stylish designs, constructed from solid quality logs with a focus on meeting high environmental standards. The business model employed by Rantasalmi to deliver its value proposition is to apply novel and practical designs; specially developed log solutions, and enhance environmental performance through ongoing participation in the Rantasalmi eco-industrial park of which the company is a founding and active member.

The novelty of Rantasalmi's business model lies in the establishment, partaking and contribution to the Rantasalmi eco-industrial park. Whereas many industrial parks primarily focus on exchanging surplus materials, i.e. where one company's waste is another company's raw material, the members of the Rantasalmi Commune Eco-industrial Park also collaborate on exchanging labour and sharing equipment, logistics and storage when needed. In fact, the eco-park was established to build on, enhance

and expand the member companies' existing partnerships under a more formalised framework, which could increase the companies' and the region's competitiveness and environmental performance. For Rantasalmi, some of its main suppliers of e.g. windows, doors, staircases, and of blade and transport services, are also members of the eco-park. In addition, Rantasalmi has developed several log products for its construction. Among these is for example the company's Ekorex solution which is fire-safe, and gives houses good insulation as well as clean and natural indoor air. At the moment Ekorex is the only structural solution that has been issued the right to use the cooperation logo of the Finnish Allergy and Asthma Federation.

Rantasalmi sells its houses to end-consumers; typically based on a standard construction contract stating a fixed price for the product. This happens through a number of key partnerships with smaller external sales companies. These sales companies function as Rantasalmi's contact point with the customers, and their role is to secure building contracts with end-customers. Depending on the market country, the marketing of the Rantasalmi houses is also sometimes undertaken by the sales partners. When a contract is signed, construction is typically subcontracted to construction partners; except in Finland where Rantasalmi undertakes construction itself.

Rantasalmi's construction contracts can take many different forms. Normally, however, the contract specifies a fixed price to be paid by the end-customer. Part of the revenue then goes to the sales office responsible for securing the contract, and to any distributors and constructors involved in the building of the house.

Rantasalmi's participation in the eco-park has not lead to any significant changes in the company's customer relationships, or its market segments. However, the eco-park has given Rantasalmi the potential to develop stronger relationships with some of its main suppliers.

The company considers marketing to be a key activity for reaping the full benefit of its partaking in the eco-industrial park, i.e. to increase sales because of a good environmental image. So far, this potential has not been fully harnessed.

Impacts and benefits

The environmental benefits of the Rantasalmi eco-industrial park follow from the exchange of both surplus materials and equipment between the partaking companies. As such the beneficial environmental impacts can be attributed to production as well as waste streams. Rantasalmi and other companies, for example, provide surplus wood waste to the Suur-Savon Sähkö energy company. These are used for power production which provides energy for heating and electricity for both the companies and the

residents in the area; thus avoiding the burning of fossil fuels.

There are also financial advantages of the exchanges made through the Rantasalmi eco-industrial park; e.g. stemming from increased materials efficiency and saved costs on electricity and heating. Another benefit is that, as companies can “rent” each others’ idle equipment or workforce, the companies in the eco-industrial park become more resilient to fluctuations in the market.

Drivers and barriers

The main driver behind the establishment of the eco-park was the ability to enhance market positions by gaining a competitive advantage, both in terms of financial benefits, but also due to a stronger environmental image which could be used in better marketing. Since the companies in the eco-park were already collaborating, it was seen as an opportunity to formalise and expand the partnerships within a planned and organised eco-industrial park.

Generally, there have not been many barriers to the establishment of the eco-park. This is partly due to the fact that the participating companies were already cooperating to a great extent. As such, creating a formal framework for collaboration in the form of an eco-industrial park was seen as a natural extension of the already ongoing activities. The main issue pertaining to the establishment of the park was more related to the work required to agree and set up the formalities and rules that would regulate the exchange of surplus materials, equipment and labour between companies. However, there are two barriers which seem to prevent Rantasalmi from reaping the full benefits of the eco-park. The first barrier is that the company is still accumulating resources for running a marketing campaign that can highlight the benefits of its products, with a link to being part of an eco-park. The second relates to the fact that the eco-park itself is a bit “ahead of its time”. I.e. since many customers already consider log houses as “green products”, the extra value of being produced by a company within an eco-industrial park is not thought to bring significant extra environmental image value. Also, in some markets consumers are less likely to see green as a purchasing argument. Rantasalmi nonetheless expects that these adversities will change in the near future.

E.ON

Interviewer: Consultants COWI on behalf of the Danish Business Authority

E.ON, is the holding company of the world's largest investor-owned electric utility service provider based in Düsseldorf, North Rhine-Westphalia, Germany. E.ON is one of the major public utility companies in Europe.

Sweden is one of the 30 countries that E.ON's operates in. Their main activity in Händelö has always been heat production. Today, however, E.ON is engaged in many other productions as well, through the company's cooperation with other industries in the area, such as the nearby ethanol production plant, which E.ON supplies with steam. The cooperation is organised around a cluster of eco-industries situated in Händelö, close to the city of Norrköping in Sweden. This cluster facilitates the companies' use of each other's by-products, by taking advantage of the synergy effects between energy companies and the process industry.

Around twenty years ago, E.ON produced heat for the households of Norrköping entirely by burning fossil fuels, and was only involved in heat production. Since then, E.ON has changed the process of heat production by increasingly basing it on waste and biomass burning, and has gradually begun to focus on their production of other products, such as steam. Through the eco-industry cluster, also called the industrial symbiosis, E.ON has over the last 10 years been part of the development of an interlocking system of cycling of materials. The figure below shows how the companies in the symbiosis all take part in the reuse of waste and by-products produced in the other companies' productions, minimising waste and energy consumption.

The business model

The value proposition of E.ON is to provide its users with low-cost heat with an environmental profile. This is done in two ways; firstly by supplying heat that is produced from waste products easily available in the area; and secondly by not only selling E.ON's main product, heat, but also its by-products, such as steam. In this way E.ON manages

to reduce costs on input materials and increase revenues from the production while creating a green image to attract the costumers at the same time.

The partnerships formed in the industrial symbiosis have great importance for E.ON's business model. Through the large network of partnerships, and their location close to each other, it has become possible to collect and distribute by-products between the companies. An essential aspect of the partnerships has been the close and informal communication that exists between the members of the industrial symbiosis. This has created a close network between the partners of the symbiosis, and it facilitates the constant development of the concept behind it, as well as its workings.

The key resource used in the production is the waste, including both household waste and waste from the other productions in the symbiosis. The change from fossil fuels to waste products has increased the need for maintenance of the machinery, which is run much harder when the heat production is made from waste products like recycled wood waste and old tires. On the other hand it has enabled E.ON to take advantage of materials that are left over from other productions. An example of this is the wood material which the nearby paper production and saw mill produce, that would otherwise have been left in the forest unused. Now it constitutes the biomass in E.ON's heat production.

Benefits and impacts

The environmental benefits of the green business model mainly lie in substituting fossil fuels with waste and biomass. Whereas the heat production was entirely based on fossil fuels 25 years ago, today 95 per cent of the fuel used in the production consists of waste and biomass. The heat production facility is under constant improvement, and in the newest kettle inaugurated in May 2011, the CO₂ emission is further reduced by 30 per cent.

The economic impact of the green business model mainly arises from the saving on input materials. By basing the heat production on the waste products that the surrounding companies wish to get rid of, E.ON's material supply has become much cheaper than when the production was based on fossil fuels. The reduced costs have been very profitable for E.ON, but with the decreasing demands for heat energy following from the still better insulation of houses, it will be difficult to maintain the large profits in future.

Drivers and barriers

The main driver causing E.ON to change away from heat production based on fossil fuels came from the consumers' demands. Especially large companies expressed clear

demands for carbon free fuels, in order to set up certified 'green buildings'. Combined with taxes on fossil fuels and subsidies for biomass, the incentive to switch from fossil fuels to waste and biomass was very strong. The demand for bio based heat production was also a driver for the development of the industrial symbiosis. Initially, however, the industrial symbiosis was helped along by the municipality's agenda of reserving the area around E.ON's plant at Händelö for industries that could benefit from and contribute to the industrial symbiosis. For instance, the municipality would only sell the land within easy reach of the steam E.ON produces to companies that could use the steam in their production. Another important driver in the development of the industrial symbiosis has been the informal environment between the business executives of the companies involved in the symbiosis. The fact that Norrköping is a small town, where people know each other well, and know that they are going to do business together in the long term, creates an environment of trust where ambitious strategies can be pursued. Even though Svensk Biogas is today in direct competition with E.ON, the companies still work together, knowing that none of them can now do business without the other.

The main barriers for the symbiosis have been the lack in willingness from the involved companies to take risks. In the beginning it was difficult to see the opportunities that the cooperation could create, and it was difficult to see the opportunities in fuels with lower carbon emissions, especially since the investments required were substantial. For E.ON as a company, the biggest challenge right now is that future buildings will consume much less energy. Many houses will become able to manage their own energy supply, for instance through solar panels, and E.ON will need to develop new ways of looking at customers and suppliers in order to stay in business.

Yalumba

Interviewer: Markus Bjerre, the Danish Ministry of Business and Growth

Company

The Yalumba Wine Company (the trading name of S. Smith and Son Pty Ltd) is an South Australian wine company, employing 200 people locally, and 600 internationally (including those employed by its sister companies, Samuel Smith & Son Pty Ltd and Negociants). Its activities include grape growing, winemaking, packaging, distribution, marketing and sales. Established in 1849 it is reputedly Australia's oldest family owned winery. The wine firm is located in the Barossa Valley of South Australia and is the tenth largest Australian wine company by total wine production.¹

Yalumba has received international attention for its holistic approach towards environmental practices in its supply chain management with significant focus on sustainability, carbon emissions reduction, increasing biodiversity and exploring interpretations of sustainable viticultural and winemaking practices (including organic production).

It was the first wine company in the world to receive the Climate Protection Award from the US EPA 2007 and is the only company to be accredited a sustainability license by the South Australian EPA.

Yalumba's environmental management system is ISO certified and is continuously focusing on reducing and monitoring its lifecycle impacts that may result from its business activities.

The company has developed a programme of sustainable winemaking, which includes land stewardship, product stewardship, waste management, climate change adaptation and mitigation, and environmental citizenship. The aim of environmental citizenship is to effectively communicating Yalumba's mindset, approach and commitment to

¹ Reference: <http://www.winebiz.com.au/statistics/wineriesstable29.asp>

sustainable winemaking to its stakeholders so that they will be effectively engaged.

The business model

Yalumba provides its customers with quality wine produced from an intensive focus on sustainability throughout the entire value chain. The company is using supply chain management working closely with its suppliers to help and encourage them to minimise their environmental impacts through adopting clean technology and best practice procedures. The company also takes an active part in the local community.

The company keeps innovating by constantly evaluating and revising its production processes, supplier channels, packaging etc. to find the best solutions to a sustainable wine production and to encourage their customers to dispose the product packaging in a responsible manner.

Environmental benefits and impacts

Yalumba is very focused on minimising its materials use, carbon emissions and waste from packaging. They attempt to use alternative fuels, such as biodiesel, and renewable energy, such as solar power. In addition, Yalumba has developed its own specialised LCA, which is now used as standard for LCA in the New World wine industry.

Economic benefits and impacts

Yalumba seek to balance its concerns for the environment and its social relations while still ensuring sufficient cash flow and profitability by producing a persistent above average return to shareholders.

Main drivers

The winery's targeted focus on sustainability started with an in-house PhD thesis on the environmental impact of the company's organisational culture. This led to the recognition that Yalumba could achieve the greatest impact from strengthening their efforts on the social aspect of sustainability - by changing people's minds and behaviour.

Main barriers

The greatest barrier has been people's lack of awareness about what it means to act in a sustainable way.

Royal Mosa

Interviewer: Emil Damgaard Grann, the Danish Business Authority

The Company

Royal Mosa (or in Dutch: Koninklijke Mosa) is an international and innovative manufacturer of high-quality ceramic products like floor and wall tiles, facades and other ceramic building solutions. The Dutch company was incorporated in 1883 and all of its factories are still located in Maastricht in The Netherlands as it is a part of the company's sustainability philosophy to keep the factories in home country. Mosa is owned by the Dutch Egeria investment group, but is a completely independent company. Mosa has received several internationally recognized design awards including the Red Dot Design Award and aims at the professional architectural market on an international basis, but with main focus on Northwestern Europe. The company is convinced that the future lies solely with sustainable products which are manufactured in a responsible manner and do not pose health risks.

The business model

Royal Mosa provide its customers with innovative high-quality ceramic products produced with high emphasis on design and sustainability through implementing the cradle to cradle philosophy.

The company's innovation is thus reached by having a special Mosa design team with people directly from the design team working closely together with architects in developing new collections. The adoption of the Cradle to Cradle philosophy led to Mosa constructing the first Cradle to Cradle certified tile in the world in 2009. Mosa have now received the Cradle to Cradle Silver certification for 99% of its product range. As Mosa focus their business model on the professional markets, the two main focus groups are architects and corporate companies. In some countries, they also focus on housing companies.

Mosa Tiles have also committed to continue to develop and implement Cradle to Cradle principles within the company's products and processes. As a part of this process Mosa have initiated pilot projects regarding partnerships about a tile takeback-mechanisms with architects, general contractors, tile fixing companies and end-users and other actors in the construction industry.

The Cradle to Cradle philosophy differentiates between a biological cycle and a technical cycle. In the biological cycle, products are produced from natural materials, which serve as food for organisms at the end of their use. However, as many products are not compostable and they are primarily suited to the technical cycle, Mosa has succeeded in making specific adjustments in the recipes of their products, making them unhazardous to the environment. Mosa's tiles have also been labeled by EPEA as: "designed for the technocycle, but safe for the biocycle". Mosa use Lifecycle analysis to determine their products' lifecycle impact on the environment and where to reduce that impact.

The company's ongoing investments in sustainability and Cradle to Cradle have made sure that there is no premium price for Cradle to Cradle products, which ensures the position as a market leader.

Environmental benefits and impacts

Mosa have made significant impacts regarding materials and recipes as their tiles do not release any harmful compounds and do not damage the environment should they be dumped after use, and they are also recyclable. Through a modernisation programme Mosa have succeeded in reducing their CO₂ emissions with 48 percent as well as their particulate emissions with 91 percent. Mosa have also succeeded in closing a cooling water cycle resulting in a reduction of more than 60 percent of groundwater consumption. Besides making efforts to use as little energy as possible Mosa have also shifted to almost entirely using sustainable energy.

Economic benefits and impacts

On short-term the company has in general broken even as a result of its green business model innovation. It is expected that the new activities will constitute a larger share of the turnover in the future and the companies now also benefits from being a more sustainable company and are better prepared for the future. Furthermore the new business model has led to the creation of five new jobs.

Main drivers

The initial driver or motivation for Mosa was a general wish to become more sustainable as well as a wish to keep their production in the Netherlands because they inherited the company from their ancestors who founded it there in 1883.

In Mosa's case the CEO and the whole top management team were driving forces of enabling the Cradle to Cradle philosophy. It is stated that if you want to change your company it involves real and enthusiastic involvement of the top management as it is important for the motivation of the project teams that they know that they are working on something that really matters for the company and is supported by the top management.

A driver for Mosa was also a belief that only sustainable companies will survive in the long run and that they would like to be a profitable company in the future as well.

Main barriers

Mosa still see Cradle to Cradle as relatively unknown. There is much emphasis on CO₂, but the public are not wholly aware of the whole shortage of resources and the impact materials besides CO₂ have on the environment. It is believed that if people knew this they would have more appreciation for the C2C-concept. Also the financial crisis has resulted in some of Mosa's potential consumers to have a more short-term approach and only look at the price.

Mosa have furthermore experienced problems related to the public tendering processes in The Netherlands, where a C2C company with an actual better product can risk being excluded from the bidding process as there are no equal products to compare it to, which here is a prerequisite.

It has as well been a challenge to redevelop the products to live up to the C2C standards. It took more than two years of extended research and product development as well some out-of-pocket investments for tests, research and consultancy.

It has also proven difficult to make really valuable technical cycles, which Mosa are still working on and requires a lot of investment. This process needs involvement of all relevant actors and also requires almost accurate scientific calculations of the best solutions for creating sustainable products.

Biototal AB - Nutrients for the green sector based on waste- and by-products

Interviewer: Mattias Lindahl, Linköping University, on behalf of VINNOVA

The company

Biototal are a creative and fast-growing company focusing on environmental technologies in the green sector. The company bases their business on the production and sale of various waste- and by-products that have been transformed into valuable plant nutrients for the green sector, e.g. local agriculture. One example is bio-fertilizer, a product from the production of biogas that can be utilized as a supplement to costly artificial fertilizers. Biototal aims to become one of the world leaders in the management and evaluation of different agriculture and forestry by-products.

The business model

The business model is based on both life cycle thinking as well as a recycling perspective. Biototal are focused on productification of waste and by-products into valuable bio-fertilizer products. They act as a link between actors (often municipalities) that have waste and by-products (e.g. bio ash, digestate from biogas production, sludge from municipal wastewater treatment, separated human urine and plant materials) and actors (often farmers) that need nutrients for things such as agriculture, parks or golf courses. Their knowledge about their final customers is high. They also focus on reducing the transportation needed between their providers of waste and by-products and the users of their products.

Depending on the type and quality of the waste or by-product, Biototal get paid or need to pay; the same goes for the resulting product, i.e. depending on its quality, the

customer either needs to pay or gets paid.

Environmental benefits and impacts

- Their business model enables, from an environmental perspective, an increasingly important reversal of nutrients from consumers back into food production.
- Replace artificial fertilizers, resulting in gives reduced:
 - » extraction of finite resources (such as potassium and phosphorus) used in artificial fertilizers.
 - » carbon dioxide emissions from the manufacture of artificial fertilizers.
- Environmentally-certified farmers can use Biototal's bio-fertilizer products to increase profitability and improve their capability to compete with farmers using artificial fertilizers.
- Reduced need of transports (implies less use of finite resources and less emissions), since they work to have short distances between the generator of the waste or by-product and the user of their products.
- The fact that Biototal starts to use waste and by-products that today would alternatively end up at landfills implies that increased demands are placed on improving the quality of these waste and by-products. This could e.g. imply that the water treatment plant improves their processes regarding treatment of heavy metals or capturing of nutrients.

Economic benefits and impacts

- Actors with waste and by-products - Get paid or at least have a lower cost for disposing of their waste and by-products.
- Users of Biototal's products - Artificial fertilizers are getting more expensive, and with Biototal's bio-fertilizers they can cut their cost since their solutions are cheaper, and as mentioned earlier, sometimes they even get paid using the fertilizer. For many users, the cost reduction is approximately 25% compared to an artificial fertilizer alternative.

Main drivers

- The owners have the drive to decrease the environmental impact and to contribute to more sustainable development.
- Artificial fertilizers are becoming increasingly expensive. At the same time, the number of potential sources of waste and by-products (e.g. from biogas production and water treatment plants) and the amounts that could be used for producing bio-fertilizers have increased.

Main barriers

- The major obstacle they have lies with authorities and their rules regarding waste, since there are many rules that create obstacles for those trying to transform a waste into a product.
- Transportation - Bio-fertilizers are normally more bulky and heavy, which means that they require e.g. larger storage areas and also other types of machinery for spreading. This implies an obstacle since this requires investments.
- Bio-fertilizers smell more than artificial fertilizers, and this can sometimes be a problem.
- One barrier is also the farmers' customers, e.g. those buying their grain or meat. They fear that their customers (consumers) will become afraid, that the use of bio-fertilizers will increase, as will the risk for heavy metals in the food. This is not a problem, however, since e.g. heavy metals can be easily measured and controlled.

ChargeStorm AB - Intelligent charge stations for electric vehicles

Interviewer: Mattias Lindahl, Linköping University, on behalf of VINNOVA

The company

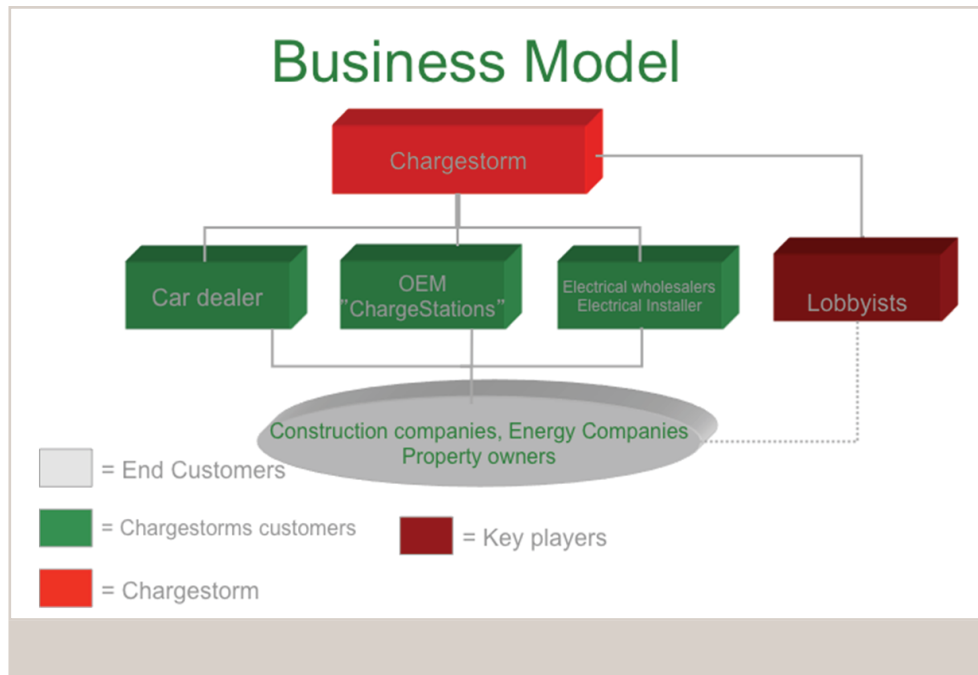
ChargeStorm was founded in 2009 by Patrik Lindergren, Stefan Gabrielsson and Ragnar Gustafsson, who still own the company. They all have extensive knowledge in and experience with embedded product development, data communication, provisioning systems and billing systems. Their vision originates from knowledge about telecom and data communication network management and provisioning standards, and the possibilities of combining these in the latest technology in the charging infrastructure. ChargeStorm was awarded the World Wide Fund for Nature (WWF) prize "Climate Solver 2011". WWF concluded that the climate effect from using their products would reduce the emissions of CO₂ by 21 million tonnes per year by 2021².

The business model

ChargeStorm want to make the process of using and charging the vehicle easy for the electric vehicle owner. They are a Cleantech company, developing products for the charging infrastructure and targeting the vehicle market. Their products enable the operator to provide an intelligent management and service network for provisioning and billing of the service. The ChargeStorm solution is used by energy companies, real estate companies and enterprises providing parking spaces for electric vehicle charging. The figure below shows the relationship between the actors involved in ChargeStorm's business model. In more detail, the ChargeStorm system solution provides; User-friendly charging for electric vehicle owners; Modern administration features for grid

² www.climatesolver.org/show.php?id=1413823 (Visited 2012-02-01).

and real estate owners; Secure and stable grid function for real estate owners and energy providers; Patented solution that protects business-critical electrical equipment.



ChargeStorm's system is built up with focus on three interlocking problems - grid capacity, a growing need for charging stations, and consumers' desire for easy, convenient charging. Their main system component, the brain of their NanoGrid technology, is the Charge Grid Controller (CGC). The CGC protects the local grid from overload by organizing, managing and helping prioritize electrical usage among grid users. Other important components are the Charge Controller Unit (CCU), which acts as the brain of the charge station, and the Charge portal that is used for administration. One CGC and one or more CCUs constitutes a NanoGrid. The NanoGrid ensures a secure and stable real estate grid. The NanoGrid solution offers priority access for business-critical equipment in the real estate if too many electric vehicle chargers are connected to the real estate grid.

Environmental benefits and impacts

Transport-related CO₂ emissions constitute a substantial part of total emissions. Decarbonising the transport sector is one of the most difficult challenges in the transition to a low-carbon economy. Electrification will play an important role in reducing carbon emissions from transport systems. While most manufacturers now have electric and hybrid vehicles in their line-ups, their mass-market breakthrough is expected to take years or even decades. One threshold to overcome is of course cost vs. range for electric

vehicles; another is the provision of an appropriate charging infrastructure.

The NanoGrid charging station offers an intelligent response to the need for distributed and cost-competitive charging for electric vehicles based on existing infrastructure. This kind of enabling solution provides an important part of the equation for faster electrification of transports. If the growth rate of electric vehicles could be accelerated, and its market share achieved three years earlier than projected, intelligent charging stations like NanoGrid could contribute to the reduction of 21 million tonnes of CO₂ in 2021, according to WWF's calculations. Additionally, the user-friendly features of the system could easily stimulate an increasing demand for renewable energy, thereby further reducing carbon emissions.

Economic benefits and impacts

ChargeStorm's NanoGrid technology increases the possibility to build a cost-efficient charging infrastructure, making it possible for the infrastructure owner to get a better return on investment (ROI). Their technology delivers an intelligent way to reduce peak-hours energy problems, and thus give the opportunity to charge up to 8 times more vehicles than many alternative solutions. With the NanoGrid technology, infrastructure providers can offer a premium service to charge higher prices for faster charging or non-green energy charging. The impact of building infrastructure based on ChargeStorm's NanoGrid technology will increase the chances that the introduction of electric vehicles will be successful and lower CO₂ usage.

Main drivers

Plug-in electric vehicles are just about to enter the market on a large scale (estimated to happen in 3 years), and the demand for vehicle charging stations is set to increase. Independent sources estimate that two or more charging stations will be needed for each electric vehicle on the road. In Sweden alone, Elforsk³ has forecast the electric vehicle fleet will number 600,000 by the year 2020, implying the need for 1,200,000 charging stations in Sweden.

Main barriers

The market for electric vehicles, however, has yet to take off and is still small. In 2010, there were less than 1,000 registered electric vehicles in Sweden.

³ Elforsk AB, established in 1993, is jointly owned by Swedenergy (a non-profit industry and special interest organisation for companies involved in the supply of electricity) and Svenska Kraftnät (the Swedish national grid operator).

Econova AB - Making use of residual and secondary products from industry and society

Interviewer: Mattias Lindahl, Linköping University, on behalf of VINNOVA

The company

Econova AB. Privately-owned company founded in 1959. Originally built forest roads for the forest industry. In the 1980´s the company started production of soil improvement materials using residual fibers and bark from the forest industry. Today´s Econova is the Nordic region´s leading garden company, one of Sweden's largest independent traders of bio-fuel and a major actor in recycling waste products.

The business model

Econova's business model is to make use of secondary and residual products from industry and society. The material is processed into useful products such as bio-fuel or soil. Econova create links between waste producers and the recycling industry.

Environmental benefits and impacts

Benefits: less use of non-renewable resources, less landfill, less use of fossil fuels.

Impacts: Mainly from transporting and processing organic materials. Diesel used in trucks, machines etc.

Economic benefits and impacts

Less cost for raw materials (i.e. composted residual wood fibers replacing peat, lime, and commercial fertilizers). Waste handling at low cost for the waste producer since their processed materials can become valuable raw materials for other industries or valuable products.

Main drivers

Legislation such as electricity certificates, carbon trading, prohibition of landfill, and landfill tax. Increased environmental awareness. Increasing interest in Home & Garden.

Main barriers

Prior to 2000/2001, landfills were an inexpensive way for industries etc. to dispose of waste. Since then, landfill tax, prohibition of landfills for organic material etc. have been introduced, creating more economic drivers for recycling. Clearly, the government/authorities have an important role to play.

HTC Sweden AB - HTC Superfloor - grinded floors

Interviewer: Mattias Lindahl, Linköping University, on behalf of VINNOVA

The company

HTC Sweden AB is a rapidly growing company, founded in 1987 in Söderköping, Sweden, by Håkan and Gunn Thysell. HTC is today the world's leading grinding technology company. They are the global market leader in the development and manufacturing of professional floor grinding machines and diamond tools. The head office is located in Söderköping, Sweden with subsidiaries in the USA, Germany, the UK and France. Through subsidiaries and distributors, HTC offer a global product supply of machines, tools and concepts.

In addition to grinding machines and tools, HTC Sweden AB invented a revolutionary cleaning and maintenance solution called Twister™ that was launched 2005. The Twister business unit of HTC has operated as a separate legal entity - HTC Cleaning Technology AB - since January 1, 2012.

The business model

Concrete is one of the most common construction materials of our time. HTC is now taking concrete to the next level with their polished concrete floor, the HTC Superfloor™. HTC Superfloor® is a revolutionary flooring concept with a technology that makes concrete more than just strong and hard-wearing. The technology is as simple as it is ingenious. HTC's machines and diamond tools grind and polish concrete floors to remove the surface paste and expose the stronger concrete beneath. The result of this process is a stronger, more durable, shiny and beautiful polished concrete floor: i.e., dirty, hard-to-clean grey concrete floors are transformed into brilliant, easy-to-clean, environmentally-friendly and durable polished concrete floors. This also implies that no extra coverings,

e.g. carpet or a top coating, are required, and that the need for maintenance during the floor's life cycle is very low. To summarize, a polished concrete floor is:

- Easy to clean
- Modern and elegant
- Unbeatable durability
- Environmentally friendly
- Economical

Development and sales of Green Floor Concepts - In addition to promoting their flooring solutions to contractors who purchase HTC's hardware (Grinding Machines/Utilities), the company also promotes solutions to end users, architects and structural engineers. HTC have built a network of Certified HTC Superfloor Contractors to ensure the quality of the work carried out. The Certified Contractors also help them to promote their concept. To build a strong brand, HTC have also participated in TV programs, where they can promote their flooring concept by demonstrating their method.

HTC has, through their close contact with their customers, received good knowledge of the response from the market. Through this, they have been able to change and improve both their machines and tools, as well as their processes and concepts. For example, their Twister cleaning system was invented as a response to market demands to be able to clean floors in an environmentally-friendly way. With Twister, it is also possible to ensure and guarantee the long life of the HTC Superfloor.

Environmental benefits and impacts

The HTC Superfloor concept is to refine construction concrete, and thus avoid the use of a top coat, thereby reducing manufacturing and transportation. Concrete is composed of pure natural materials. The coatings that are often applied to the concrete have an adverse effect on the environment. HTC Superfloor uses as much as 30 times less energy than traditional flooring solutions. The floor is also much more durable than comparable solutions, e.g. epoxy coating solutions, and this implies less need for maintenance and repair, something that results in a lower environmental impact.

Furthermore, the floor is easier to clean than comparable floors, which implies reduced consumption of chemicals and other consumables.

Economic benefits and impacts

The HTC Superfloor concept is to refine construction concrete and save on top coat material costs, which makes it an extremely economical option for all types of business activities. Compared with traditional methods for concrete floors such as epoxy, for example, HTC Superfloor offers unbeatable durability. The processed construction concrete has an unlimited lifespan, i.e. the same as the lifespan of the building. The initial investment is the same, or lower, than for traditional flooring solutions, but the low maintenance cost and the longer life make HTC Superfloor the most lucrative investment option for an industrial floor but also in most other environments. The life cycle cost is about 60% less than for traditional flooring solutions.

Main drivers

Since 2006, HTC has successfully built the value proposition around HTC Superfloor based on four Unique Selling Propositions (USPs); Economics, Environmental Sustainability, Simplicity, Quality. Based on those USPs, HTC have successfully won business within hospitals, governmental and municipal organizations, international retail chains and international cleaning contractors.

Main barriers

The scepticism towards new innovations or applications that can replace old methods is high; this is especially true within the construction industry, known for being in general old-fashioned. This implies that it has been quite time-consuming and hard to get the HTC Superfloor concept accepted within industry. Furthermore, a lot of companies make huge profits based on their traditional flooring solutions, and they have a lot to lose and are therefore active in protecting their own products.

HTC Cleaning Technology AB - Twister™ Diamond Impregnated Floor Maintenance Pads

Interviewer: Mattias Lindahl, Linköping University, on behalf of VINNOVA

The company

HTC Sweden AB is a rapidly growing company, founded in 1989 in Söderköping, Sweden, by Håkan and Gunn Thysell. Today, HTC is the global market leader in development and manufacturing of professional floor grinding machines and diamond tools. The head office is located in Söderköping, Sweden with subsidiaries in the USA, Germany, UK and France. Through its subsidiaries and distributors, HTC have a global product supplier of machines, tools and concepts.

In addition to grinding machines and tools, HTC Sweden AB invented what it considers a revolutionary cleaning and maintenance solution called Twister™, launched in 2005. Since January 1, 2012, the Twister business unit of HTC has operated as a separate legal entity - HTC Cleaning Technology AB.

The business model

Twister™ is a patented daily floor cleaning and maintenance system consisting of floor cleaning pads prepared with billions of microscopic diamonds which clean and polish the floor mechanically instead of by using chemicals. Twister can be used on the most common floor surfaces such as terrazzo, natural stone, concrete, vinyl, linoleum, ceramic tiles, epoxy and wood and is available in five different colours. It comes in sizes ranging from 4" to 28", and is suitable for all standard cleaning machines available on

the market. Each colour of pad indicates a different size of diamonds and is to be used for different applications and surfaces, from upgrading of a worn floor to daily cleaning and maintenance.

Environmental benefits and impacts

Twister is the first cleaning system ever to be recommended by the Swedish Society for Nature Conservation for its contribution to heavily reducing the need to use floor cleaning chemicals.

Compared to traditional ways of professional floor cleaning based on neutral cleaning detergents, polishes, waxes and harsh chemicals for periodic floor maintenance, Twister is used without chemicals and with eliminated need for periodic floor maintenance. This means a huge environmental benefit.

According to a report from the Swedish Society for Nature Conservation, approximately 7,200,000 litres of cleaning detergent used in traditional daily floor maintenance could be saved by only using Twister on natural stone floors only in Sweden. Since Twister also works perfectly on every other type of floor except textile, the potential chemical reduction worldwide is enormous.

Economic benefits and impacts

Implementing and using Twister as the standard solution for floor cleaning and maintenance delivers different economic benefits and impacts for the service provider (cleaning contractor) and floor owner.

Cleaning Contractor (e.g.) - Using Twister pads for daily maintenance compared to a traditional pad are cost neutral. The savings for the cleaning contractor comes from the elimination of detergents and elimination of or extended time between periodic maintenance such as stripping and resealing using floor coatings. The logistical cost is also lower, since chemicals are no longer needed and the number of pads used is reduced because Twister pads last three times longer than traditional pads. Also, there is a high, often hidden cost for cleaning contractors combined with un-chargeable work for adjusting quality failure on provided services when using traditional cleaning pads and detergents. There is also a high amount of personnel absence within the cleaning industry due to heavy, manual cleaning and periodic maintenance, sometimes using quite harsh chemicals such as strippers and heavy detergents in order to get floors cleaned. Twister drives the use of cleaning machines reducing the manual cleaning methods, and at the same time removing the need for and handling of chemicals.

Floor Owner (e.g.) - Having floors cleaned with Twister results in a cleaner and more even floor appearance than before, and the need for purchasing services such as periodic maintenance from cleaning contractors can be reduced and, in most cases, even eliminated. Huge savings for the floor owners comes from increased space availability (especially important for hospitals and retailers) and better return on investment for floor investments, as Twister brings back old and worn floors to new standards and prolongs the lifetime of installed floors. Many floors today are replaced simply because they are really dirty. Consumers today, especially the younger generation, are becoming more aware of and interested in the store where they make their purchases having an official environmental policy that covers how the store actively contributes to lowering the operation's environmental impact. Here, Twister can also be used for creating competitive advantage and to help strengthen the environmental policy of the floor owner.

Main drivers

Since 2006, HTC has successfully built the value proposition around Twister based on four unique selling propositions (USPs); Economics, Environmental Sustainability, Simplicity, Quality. Based on those USPs, HTC have successfully won business and implemented Twister within hospitals, governmental and municipal organizations, international retail chains and international cleaning contractors.

Main barriers

Historically, the traditional cleaning industry has been "owned" by chemical manufacturers and been based on the use of chemicals. The chemical manufacturers have not only delivered their products, but also educated the cleaning industry in how to use chemicals for more than 40 years. This has resulted in a standard of how floors shall be cleaned and maintained that is hard to break through. The cleaning industry is also reluctant to change, and the employee turnaround is high. A lot of companies and people today make a huge profit based on the complexity involved in chemical based cleaning - what, when and how to use a chemical together with which standard cleaning pad.

Envac Optibag AB - Optical separation of bags with source separated household waste

Interviewer: Mattias Lindahl, Linköping University, on behalf of VINNOVA

The company

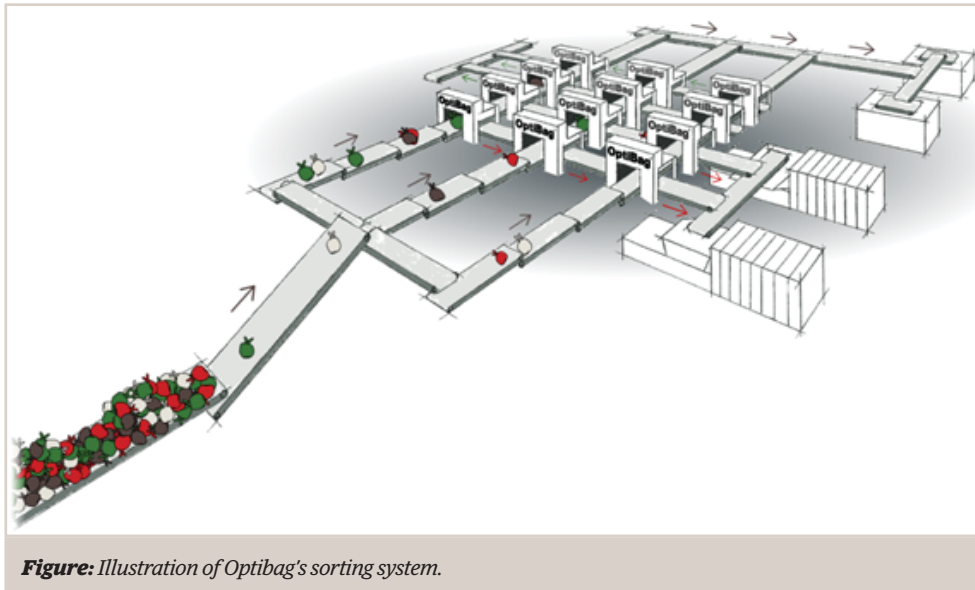
Envac Optibag AB is an engineering company with resources in development, marketing, sales, and project management, as well as after-sales service of plants for optical sorting of household waste. Their competitiveness is based on their concept sales, reference objects and high reliability, along with the application of implementation knowledge. Their profitability is based on an efficient project organization, use of effective and high-quality production resources, and internationalization. The company has 13 employees and a turnover of approx 8 M Euro/ year.

The business model

Envac Optibag AB is a leading supplier of optical sorting systems for household waste. They deliver turnkey solutions with a performance guarantee. Their business model is based on their in-house developed optical sorting technology for source-separated household waste in different coloured bags. Their focus is on optical sorting solutions of household waste for the European market.

Environmental benefits and impacts

An important environmental benefit is that this system implies less transport. Only one bin/container is used for all fractions. Furthermore, existing vehicles can be used. The system has also flexibility for handling future fractions.



Since the system makes it easy for all inhabitants to source separate waste, it implies increased efficiency and higher quality material than achieved with other methods sorting blended waste.

Economic benefits and impacts

There is no need for separate trash cans and sorting, which saves money. The costs for transporting the different fractions are the same and can be done with the same vehicle, also saving money.

Main drivers

Main drivers for the company have been European directives and national environmental targets and laws.

Main barriers

Conservative decision makers and lack of investment budget money results in investment in old manual equipment, but spread out over more years.

Plantagon International AB

- Urban Industrial Vertical Farming Technologies

Interviewer: Mattias Lindahl, Linköping University, on behalf of VINNOVA

The company

Plantagon have developed vertical greenhouses for the urban environment as a way of managing the growing challenge of providing food to the earth's growing population. They estimate that about 40 to 60 percent of an urban consumer's food budget goes to pay for transportation and storage costs. Vertical greenhouses can deliver fresh, healthful organic produce directly to the consumer at a lower price. The concept is simple and appealing in these days of awareness: fresh, ecological and cheap vegetables. No middle hands, no yesterday's food. The company was established in January 2008 after six years of planning and financing. Today, the company is active in Sweden, the US, Singapore, Australia, China and India.

Environmental benefits and impacts

Modern agriculture, not least the field production of vegetables, uses a multitude of pesticides or different chemicals in the production system. Many products will meet their consumer after a global tour by boat, by road or by air, leaving climate gases in traces and chemicals on plates. Urban farming is safer, more local and with less/no input of unnatural pesticides. The market for fair trade, organic, and eco-labelled products is getting stronger. It is clear that values that are added to food brands are reflected in their price. It will of course take time until all in the market understand eco-certified products. Urban farming aims to support the market with products that do not need to be transported. If products are grown in closed urban agricultural systems using the best available environmental techniques, risks for both plants and consumers will be

minimized. If properly controlled, Urban Agriculture will result in less spoilage (food) since locally-produced crops can be sold and consumed a relatively short time after harvesting.

Main drivers

By 2050, up to 80% of the earth's population will reside in urban centers. Until then, the human population will increase by about 3 billion, applying conservative estimates. Already today we have claimed 80 percent of the world's arable land. As more and more people move to ever-expanding cities, we will push farms further away from population centers. The inevitable result is longer transportation routes, increased reliance on petroleum-based fertilizers, and more high-intensity monoculture farming on the remaining agricultural land. Soon, there will be very little farmable. If food is to be consumed and produced in the same inefficient way as today, we will need further arable land the size of Brazil by 2050. Over 70% of the land area suitable for farming is used for crop production (sources: FAO and NASA). Most of this production is for fodder for animals, and not for human food. This is happening at a time when grazing on natural land is more and more rare, even though it produces both biodiversity and a landscape with high nature values.

An effective land-use solution that embraces the market and the infrastructure is the only solution. Urban modern farming needs a new workforce with new employment opportunities in production and in local logistics. Urban farming helps urban areas make use of abandoned lots and buildings. Growing crops in a controlled environment has benefits such as: no animals to transfer diseases to plants through untreated waste; no massive crop failures as a result of weather-related disasters; and less likelihood of genetically-modified "rogue" strains entering nature. In addition, without herbicides, pesticides, or fertilizers agricultural runoff is not of the same importance as if it is produced in rural water catchments where people and grazing animals are bound to one fresh water source. In urban agriculture, water from production is close to water treatment plants, which reduces the risk for contaminated water bodies.

PolyPlank AB - Core Plugs

Interviewer: Mattias Lindahl, Linköping University, on behalf of VINNOVA

The company

The company's history since its inception in 1994 has been a journey driven by environmental awareness, creativity, research and long-term thinking. The foundation is the use of a unique, simple, well-defined and extensively evaluated total solution process to transform plastic waste and wood fibres into a cheap, moisture and termite-resistant composite that primarily is formed into boards that can be easily handled with traditional carpentry tools. Furthermore, since the material is coloured during manufacturing, no further repainting of the surface is required. These boards are then used in Polyplank's in-house developed solutions, e.g. shields, railings, trellises, sorting houses and noise reduction walls.

Polyplank is mainly focused on customers in the public and private construction and real estate sector. This is because customers from this sector have most clearly seen the benefits of the company's offerings. They also have a business in producing core plugs for paper mills.

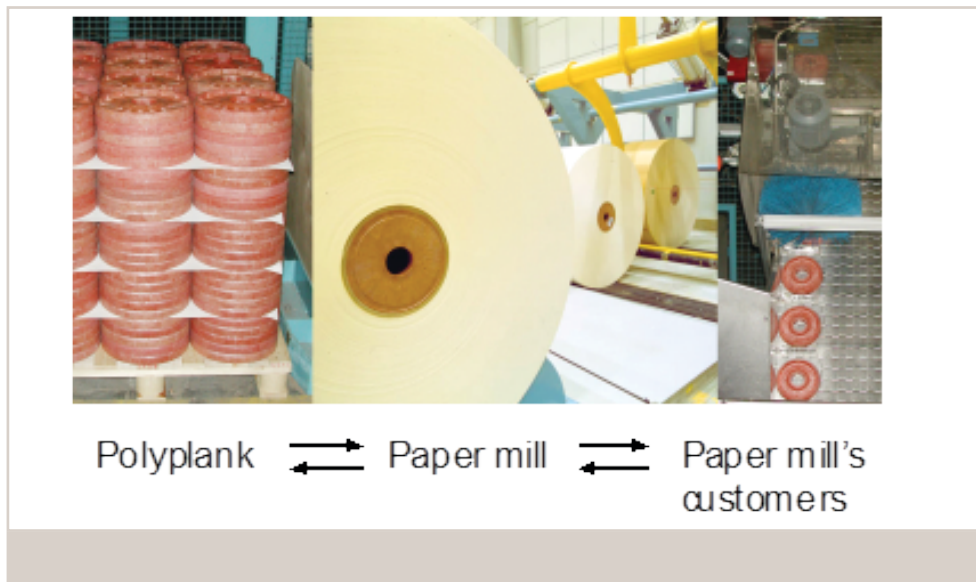
The business model

Polyplank were founded on a process technology for the production of its own unique composite. The recipe for the composite, used in their products, includes two main ingredients. The first is recycled wood fibres, a waste material from sawmills. But wood requires painting, maintenance and must sometimes be replaced when used outdoors, for instance when in contact with the ground. For wood to last outdoors it must be saturated with toxins and heavy metals - in other words, pressure impregnation.

The second ingredient is thermoplastics, more specifically recycled packages and other plastic waste products collected in the society. Today, much of the plastic that

is collected gets incinerated in thermal power stations. True, heat is produced but an excellent resource is going up in smoke. The combination of wood and plastic in the form of Polyplank enjoys the best qualities of both materials: attractive and durable, resistant to rot and good for the environment.

Based on this composite material, which in itself is 100% recyclable within their process, Polyplank produce extrusion and injection moulded and extruded products that, based on life cycle and systems thinking, are integrated into offerings. All production waste as well as returned, used products are reused in new products. The resulting material, e.g. boards, has the feeling of wood and can be worked as if it were wood: it can be sawn, drilled and screwed. In addition, since the material is coloured during production, painting is never required.



Polyplank use their boards in different system solutions, one of which are the core plugs used by paper mills. Paper mills use them to plug the cores on which paper is rolled up, and which follows the roll out to the customer. Through selling through the concept of functional sales, Polyplank collaborates closely with their customer, the paper mill, and can thus take advantage of the core plugs when the paper mill's customers send them back to the paper mill. Normally, the core plugs go back and forth three times between the paper mill and their customers before the plugs return to Polyplank.

Environmental benefits and impacts

As partly described above, the Polyplank material has several general environmental benefits, e.g. that the material requires no coating and is moisture resistant.

In order to verify their claims, Polyplank have conducted a life cycle assessment (LCA) and a life cycle cost (LCC) study together with Linköping University. In comparison with a single-use core plug of virgin plastic, Polyplank's business model/solution results in approximately 80 to 90% less environmental impact, and their cost for providing the core plug is also approximately 80 to 90% less. The largest gain with core plugs based on Polyplank material is the use of recycled compared to virgin plastics, resulting in a significantly reduced overall environmental impact. The more times the plug's material can be reused, the less the environmental impact. Polyplank's business model has increased their ability to take full advantage of their material.

Since the Polyplank core plug can be reused, the overall environmental impact per use is decreased; however, reusability puts higher requirements on quality with regards to durability. It has been confirmed that the core plug that Polyplank manufactures has sufficient quality to withstand at least five reuses, which helps reduce the overall environmental impact.

Economic benefits and impacts

The main economic benefit for Polyplank is that they get back their material and do not need to produce new raw material. The use of recycled instead of virgin plastic reduces the life cycle cost. Without the economic benefits of using recycled plastic, the question is whether or not core plugs would be made of recycled plastic, and it is therefore not surprising that the results demonstrate this.

When the paper mill does not need to consume as many core plugs, the life cycle cost per core plug is lower each time it is reused. The results show that recycling is more cost-effective than the use of virgin core plugs.

Main drivers

The main driver behind the company's business model is reflected in their initial mission "*to manufacture and market products of polymer-based composite wood. Activities shall be conducted lean and with minimal impact on the environment*". The starting point was the idea that landfills are massive ungraded commodity stocks and represent a significant resource and economic potential. At the same time, a driver was to solve the problem of increasing volumes of plastic waste in landfills.

In the specific core-plug case, an important driver was also to make an offer that could increase Polyplank's competitiveness in comparison with alternative solutions, and to do so by using the material's special features.

Main barriers

Introducing a new system like the core plug implies a major change for paper mills, since they need to build up an infrastructure to handle a take-back system from their customers.

PolyPlank AB - Polyplank Maintenance-free Building Systems

Interviewer: Mattias Lindahl, Linköping University, on behalf of VINNOVA

The company

The company's history since its inception in 1994 has been a journey driven by environmental awareness, creativity, research and long-term thinking. The foundation is the use of a unique, simple, well-defined and extensively evaluated total solution process to transform plastic waste and wood fibers into a cheap, moisture and termite-resistant composite that primarily is formed into boards that can be easily handled with traditional carpentry tools. Furthermore, since the material is colored during manufacturing, no further repainting of the surface is required. These boards are then used in Polyplank's in-house developed solutions, e.g. shields, railings, trellises, sorting houses and noise reduction walls.

Polyplank is mainly focused on customers in the public and private construction and real estate sector. This is because customers from this sector have most clearly seen the benefits of the company's offerings.

The business model

Polyplank was founded on a process technology for the production of its own unique composite. The recipe for the composite, used in their products, includes two main ingredients. The first is recycled wood fibres, a waste material from sawmills. But wood requires painting, maintenance and must sometimes be replaced when used outdoors, for instance when in contact with the ground. For wood to last outdoors it must be saturated with toxins and heavy metals - in other words, pressure impregnation.

The second ingredient is thermoplastics, more specifically recycled packages and other plastic waste products collected in the society. Today, much of the plastic that is collected gets incinerated in thermal power stations. True, heat is produced but an excellent resource is going up in smoke. The combination of wood and plastic in the form of Polyplank enjoys the best qualities of both materials: attractive and durable, resistant to rot and good for the environment.

Based on this composite material, which in itself is 100% recyclable within their process, Polyplank produce extrusion and injection moulded and extruded products that, based on life cycle and systems thinking, are integrated into offerings. All production waste as well as returned, used products are reused in new products. The resulting material, e.g. boards, has the feeling of wood and can be worked as if it were wood: it can be sawn, drilled and screwed. Painting is not needed since the material is coloured during production.

Polyplank use their boards in their different system solutions. Their current product range is mainly: Recycling stations, Separation walls, Screens, Balcony and walkway railings, Noise reduction systems. Customers are mainly in the public and the private construction and real estate sector.

A part of their systems thinking is their idea of solving problems for several stakeholders at the same time - the reason for this is to achieve more optimized solutions and more support for the execution. The focus is on organic growth and through long-term business relationships developing and marketing profitable resource-efficient products and systems based on the company's unique and environmentally favourable polymer-wood composite.

Environmental benefits and impacts

As partly described above, the Polyplank material has, depending on the application, several potential environmental benefits. Some examples are that the material requires no coating, is moisture resistant, has a long life compared to alternative materials and barely needs any maintenance during the use phase. This implies e.g. that their material in many cases can supplement pressure-treated wood.

Since all of Polyplank's materials are recyclable, they can take them back and use them in their new products. Production waste can be directly used for new products. In one of the company's offerings, they use a take-back system that has approximately an one-eighth of the environmental impact of an alternative system.

Besides the material positive environmental qualities, the company is working also

to develop new offerings and applications that enable increased direct reuse and refurbishment of already manufactured products / applications.

Economic benefits and impacts

By transforming thermoplastic and wood waste into cheap moisture and termite-resistant products, one creates raw material from waste and gains economic benefits by reducing the need for traditional building material.

For real estate owners, the main economic benefits from Polyplank's solutions occur during the use-phase, in products such as recycling stations, separation walls, walkway railings or noise reduction systems. The traditional materials that are used in those products are untreated or pressure-treated wood, but those materials have several drawbacks, e.g.; Repainting or re-oiling are required several times during the use phase; The material absorbs moisture, rots and can be tricky to replace; The boards crack.

When using Polyplank, however, these drawbacks do not apply since e.g. the material does not absorb moisture, is easy to clean and the boards retain their original colour thanks to specially selected, UV-stable inorganic pigments.

Main drivers

The main driver behind the company's business model is reflected in the initial mission *"to manufacture and market products of polymer-based composite wood. Activities shall be conducted lean and with minimal impact on the environment"*. The starting point was the idea that landfills are massive ungraded commodity stocks and represent a significant resource and economic potential. At the same time, a driver was to solve the problem of increasing volumes of plastics waste in landfills.

Main barriers

Introducing a new material is time and resource consuming, especially in a conservative sector like construction and real estate. This sector also has several strong actors that e.g. have much to lose if their materials like concrete and wood are replaced by Polyplank's material.

Qlean Scandinavia AB - Qlean Construction

Interviewer: Mattias Lindahl, Linköping University, on behalf of VINNOVA

The company

The company's mission is to sell services and products to real estate companies, property managers, power companies and industries for environmentally-friendly cleaning solutions based on ultra-pure water - the so-called Qlean method.

The company was founded in 2002 (as Servicestaden Sverige AB) with a business focused on the cleaning of facades. Today, Qlean Scandinavia AB work with the business areas Qlean Construction (cleaning and oil recovery solutions for power companies), Qlean Industry (cleaning solutions for the surface treatment industry) and Qlean Surface (maintenance cleaning of everything from residential areas to Q-branded properties).

In the Qlean method, ultra-pure water is applied with low pressure, or alternatively high pressure, depending on the sensitivity of the surface and preferences the customer. The ultra-pure water method, where salt, lime, heavy metals, ions, gases, etc. are filtered out, solves algae, moss, mold and dirt problems, but works equally well on grease and oil.

The Qlean Construction business segment solves cleaning problems for power stations and surveillance cameras. Qlean Scandinavia AB's customers are primarily energy companies throughout Sweden.

Qlean Construction was developed following inquiries from several energy companies that had problems with leaking transformer troughs in their control rooms. Because the transformers are often in a protected environment, they could not be cleaned by means of chemicals without risk. Qlean proved to be an excellent method for cleaning the control rooms of algae, dirt, oil, salt and lime. Thanks to the water's unique capacity to dissolve oil, Qlean Scandinavia AB together with their customers have developed even

more services in this area.

Today, the company operates all over Sweden with its headquarters in Linköping. As demand for maintenance washing with Qlean Surface has increased, the method will be available in several locations around Sweden in collaboration with other building exterior cleaning companies.

Qlean Scandinavia AB is continually involved in product development, for one thing to make the method even more cost-effective for their customers, but primarily to be able to apply the Qlean method to more business areas. Their product development is run to a great extent in close cooperation with Linköping University.

The business model

There are two things that Qlean Scandinavia AB cares about above all - the result and the environment! They provide a solution for their customer which is both better for the environment and saves a lot of money. When working in dangerous environments (high buildings, hydroelectric dams and power stations) safety is extremely important for them.

Qlean Construction - To power companies and industries, Qlean Scandinavia AB provide cleaning solutions and products that are designed to keep costs low while still offering quality. Most services can be done on and around transformers without having to cut power. The company is continuously developing new services and products on the request of their customers.

Within this area, Qlean Scandinavia AB performs all work on their own, sending teams with two or three people throughout Sweden and Norway. The goal for 2012 is to investigate the German market. Even though in Germany the environment is very important, this will be a challenge given the Germans' suspicion of new products and services. Having more than 50 power companies as customers in Sweden, among them E.ON, Vattenfall and Fortum, the company hopes to have sufficient evidence to show that its products and services work.

Environmental benefits and impacts

No chemicals used. No heavy transports necessary. Much less use of concrete. Most important - Qlean Scandinavia AB prevent oil from leaking into the environment!

Economic benefits and impacts

The alternatives to Qlean Construction are extremely expensive. The customer can choose to do nothing - leading to oil leaking out into the environment which is both against the law and costs a fortune to clean up. They can also choose to rebuild the pit below the transformer, which means turning off the power, digging out all the concrete and depositing it in a landfill, casting a new pit and putting the transformer back in place. The Qlean method results in about 1/10 of the cost.

Main drivers

When Qlean Scandinavia AB began development in 1998, one of the main drivers was to find a healthier way of cleaning a surface, knowing how dangerous existing chemicals were to inhale. In 2002, companies were starting to talk about making changes in their organizations towards materials and methods that were more environmentally friendly. After four years of developing a system for using deionizer water for cleaning plaster and wood, Qlean Scandinavia AB believed that it was ready to enter the market. One other main driver was to prove to customers, academics and suppliers that it not only worked, but that it was even better than existing chemicals. It took almost three years to get their first job, and there are still some academics that do not believe in them, but luckily its customers do.

Main barriers

Financing was one of the largest barriers in the beginning. It was hard to convince banks to lend them any money, and it was hard to sell the service to companies without references.

It was also difficult to find a chemist that was interested in investigating how the company's water was working; luckily, Qlean Scandinavia AB found a Professor at Linköping University who helped them with a study that resulted in a report.

Another main barrier today is industry itself. Some industries are very conservative. Many industries have large costs associated with changing their cleaning process, and Swedish law prohibits industries from discarding waste water to prevent chemicals from ending up in the water system.

Qlean Scandinavia AB - Qlean Industry

Interviewer: Mattias Lindahl, Linköping University, on behalf of VINNOVA

The company

The company's mission is to sell services and products to real estate companies, property managers, power companies and industries for environmentally-friendly cleaning solutions based on ultra-pure water - the so-called Qlean method.

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The business model

There are two things that Qlean Scandinavia AB cares about above all - the result and the environment! They provide a solution for their customer which is both better for the environment and saves a lot of money. When working in dangerous environments (high buildings, hydroelectric dams and power stations) safety is extremely important for them.

Qlean Industry - Developing Qlean Industry is one step towards commercializing a service and having business opportunities both year-round and in several countries. Most of their potential customers are international companies, which makes it easier to enter the international market.

Qlean Scandinavia AB do not sell products; rather, they lease them for a monthly fee and charge their customers for the amount of water they use. Developing a surveillance system and an easy way to change filters will make it easier for the company to ensure the quality of the water and hence the cleaning results. Having huge powers against them, i.e. the chemical industry, Qlean Scandinavia AB is not sure if they can develop this without a partner. Most likely, this business area will spin off into its own company within a couple of years.

Environmental benefits and impacts

In the SOFIQ project, the Qlean method was installed and integrated within existing cleaning equipment for cleaning printed circuit boards (PCBs) at Flextronics International AB. The main cleaning requirements were to remove fingerprints and flux. The equipment was installed directly in the washing machine, and initially it was meant to clean 1/3 of the PCBs; the remainder was to be cleaned with detergents. Today, all the PCBs are cleaned with the Qlean method. To date (2012-01-30), more than 3,000,000 PCBs have been cleaned using Qlean. Before, more than 10% of the PCBs were discarded; today, that figure is less than 1%. In the life cycle cost (LCC) calculations made in this project it was found that the Qlean method is three times less expensive than the conventional cleaning method with detergents. This is mainly due to the conventional cleaning costs for detergents and higher use of energy. In addition, the Qlean method results in much better product quality. If the cost of discarded PCBs were to be included in the LCC, the Qlean method would be even more profitable for Flextronics and its customers. Furthermore, the amount of energy used in the cleaning process was reduced by 30%. This was mainly due to the washing operation used with the Qlean method, which was conducted at room temperature instead of the normal cleaning temperature of 60 degrees Celsius. In addition, the washing time was reduced from 8 to 2 minutes. The rinse sequence that follows the washing operation was also

shortened from 7 to 5 cycles. One other environmental benefit is that no extra filtering is needed for sewage water.

Economic benefits and impacts

The industry does not only reduce their costs for chemicals; after the evaluation of 2 years of testing at Flextronics International, they also reduced their energy costs by 30% due to the much better cleaning results, and reduced the amount of discarded PCBs close to zero. One other economic benefit is that no extra filtering is needed for sewage water.

Main drivers

When Qlean Scandinavia AB began development in 1998, one of the main drivers was to find a healthier way of cleaning a surface, knowing how dangerous existing chemicals were to inhale. In 2002, companies were starting to talk about making changes in their organizations towards materials and methods that were more environmentally friendly. After four years of developing a system for using deionizer water for cleaning plaster and wood, Qlean Scandinavia AB believed that it was ready to enter the market. One other main driver was to prove to customers, academics and suppliers that it not only worked, but that it was even better than existing chemicals. It took almost three years to get their first job, and there are still some academics that do not believe in them, but luckily its customers do.

Main barriers

The main barrier today is industry itself. Some industries are very conservative, especially the automobile industry. Many industries have large costs associated with changing their cleaning process, and Swedish law prohibits industries from discarding waste water to prevent chemicals from ending up in the water system.

Today, there are no washing machines on the market that can handle their water, but one is now being developed in cooperation with Electrolux AB.

Qlean Scandinavia AB - Qlean Surface

Interviewer: Mattias Lindahl, Linköping University, on behalf of VINNOVA

The company

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The business model

There are two things that Qlean Scandinavia AB cares about above all - the result and the environment! They provide a solution for their customer which is both better for the environment and saves a lot of money. When working in dangerous environments (high buildings, hydroelectric dams and power stations) safety is extremely important for them.

Qlean Surface - To real estate companies and property managers, Qlean Scandinavia AB sell the service of clean facades and roofs. The company has customers throughout Sweden, and by introducing the concept of "maintenance" of buildings, they have managed to change their customers' attitude from only thinking about painting over graffiti to removing it by cleaning. This has increased the company's customers over the last two years.

Sweden is a large country with many actors in this area; Qlean Scandinavia AB has expanded the business area with license takers in different regions. They work full-time with Qlean Surface or have the method as a complement to their own business models. They pay a set amount of money each month, independently of how much they earn. This results in lower costs for their customers and strengthens the Qlean brand.

Environmental benefits and impacts

- No chemicals used in cleaning process.
- Most of the time Qlean Scandinavia AB use low pressure, which means no diesel engines are needed.
- No hot water is used.
- No damage to the facade surface, which means no additional repair work is necessary.
- The working environment is better - no chemicals, no hot water and no noise.

Economic benefits and impacts

- Cleaning the surface every 5-10 years (a so-called maintenance cleaning) prolongs the time between repainting for the real estate companies.

- Using the Qlean method prevents additional repair work as the method is very gentle to the surface.
- Taking away algae and moss also reduces the energy cost as moss attracts a lot of water, which cools the houses.

Main drivers

When Qlean Scandinavia AB began development in 1998, one of the main drivers was to find a healthier way of cleaning a surface, knowing how dangerous existing chemicals were to inhale. In 2002, companies were starting to talk about making changes in their organizations towards materials and methods that were more environmentally friendly. After four years of developing a system for using deionizer water for cleaning plaster and wood, Qlean Scandinavia AB believed that it was ready to enter the market. One other main driver was to prove to customers, academics and suppliers that it not only worked, but that it was even better than existing chemicals. It took almost three years to get their first job, and there are still some academics that do not believe in them, but luckily its customers do.

Main barriers

Financing was one of the largest barriers in the beginning. It was hard to convince banks to lend them any money, and it was hard to sell the service to companies without references.

It was also difficult to find a chemist that was interested in investigating how the company's water was working; luckily, Qlean Scandinavia AB found a Professor at Linköping University who helped them with a study that resulted in a report.

Due to working with water in the harsh Swedish climate, Qlean Scandinavia AB is limited to working from March - November. When indoor services are developed, they can expand the way they would like.

Stena Metall AB - Landfill Mining

Interviewer: Mattias Lindahl, Linköping University, on behalf of VINNOVA

The company

Stena Metall AB is a recycling company operating in almost 300 locations, primarily in Northern Europe. Turnover: EUR 3,000 million. 3,000 people employed. Family-owned company founded in 1939. Recycles metal, plastics, paper and hazardous waste. Has recycling companies in Sweden, Denmark, Finland, Norway and Poland. Stena Technoworld is one of the largest recyclers of electronic waste in Europe, and Stena Aluminium is a secondary Al-smelter that recycles 60,000 tonnes/year.

The business model

Local business acumen is very important. Centralised R&D.

The background of the Landfill Mining project is that over the years a lot of material that has a high value has been landfilled, mainly metals. The reason for this is:

1. Lower metal value. As an example, the price of copper has gone from USD 1,300/ton to more than USD 9,000/ton in less than 10 years. Incentives to recycle were more than 10 years ago.
2. Separation and sorting technology has greatly improved, primarily due to more powerful computers. As an example, before 1985 Eddy Current magnets (which separate copper and aluminium from other waste) were not used at their shredder plants where car wrecks were treated.

In the field of Landfill Mining (LaMin), Stena Metall AB has yet to run any commercial projects for two reasons:

1. Present landfill tax legislation requires operators to pay tax for any fraction that is not possible to recycle. Lobbying action has been ongoing for more than three years to change this legislation.
2. With the new legislation, organic fractions (mainly plastics and rubber) are not possible to re-landfill due to a limitation of a maximum of 10% organics monitored as TOC allowed in a landfill. There is a cost to send this to waste incineration plants. Stena Metall AB is presently looking into other alternatives that could generate revenue.

Environmental benefits and impacts

- Materials in dormancy, like metals and polymers, can be recycled or energy recovered.
- Areas previously occupied by a landfill could be used for other purposes.
- Environmental risks related to leachate water from old landfills are eliminated. Most old landfills do not have a sealed bottom layer.

Economic benefits and impacts

In Sweden alone there are at least 4,000 closed landfills. Assume that 20% of these fulfil all the requirements for “easy” recycling, and that the average size is 100 kton/landfill. 80,000 kton of material with a metal content of 5% and with a mix of Fe, Al and Cu representing a value of 2.000 US\$/ton represents a value of USD 80 million.

In addition, there is a value for reduced risk, increased estate value and energy/material value in plastics.

Main drivers

Reclamation of resources to reduce risk and recycle metals.

Main barriers

In addition to the two barriers mentioned previously, risks related to leachate, gas and dust handling during excavation are barriers as well. Finding buried hazardous waste in the landfill is also a risk.

Svensk Biogas i Linköping AB - Biogas made of waste material

Interviewer: Mattias Lindahl, Linköping University, on behalf of VINNOVA

The company

Linköping Biogas AB was founded in 1996 by Tekniska Verken i Linköping AB, Swedish Meats and the Federation of Swedish Farmers (LRF). In the 1980s and early 1990s, Linköping had major air quality problems in the inner city because of traffic, while the slaughterhouse industry in Linköping had problems dealing with its waste products. Linköping Biogas was therefore founded with the mission to produce biogas for inner-city buses in Linköping and deliver a quality-assured fertilizer for agriculture. At the same time, the slaughterhouse industry worked to market their organic wastes.

Swedish Biogas in Linköping AB was founded in 2003 to take over responsibility for the biogas business and the regional expansion in the form of expansion of the gas stations. In 2004, Linköping Biogas and Swedish Biogas merged into one company, now a 100%-owned subsidiary of Tekniska Verken i Linköping AB. Swedish Meats and LRF are now included as stakeholders in the form of long-term customers and suppliers.

The business model

The mission of Swedish Biogas is to operate the existing biogas production facilities and to establish new production and distribution in the region. The company has several public gas filling stations in Östergötland and its surrounding areas. They have two production facilities, one in Linköping and in Norrköping, and several collaborations with local wastewater treatment plants in the region. They also run bus depots in Linköping, Norrköping and Motala.

Production at Swedish Biogas is based on various types of organic wastes and residues

from the nearby region, in both solid and liquid form. In many cases, the company is paid to take care of the organic wastes and residues. Examples of materials that they use include:

- Slaughterhouse waste
- Residues from the food industry
- Food waste from households, shops and restaurants
- Stillage water
- Grain

The waste material from the biogas production is sold as a certified bio-fertilizer, via collaboration with Biototal AB, to farmers in the region.

Environmental benefits and impacts

During combustion, biogas causes significantly less harmful emissions than gasoline and diesel. Emissions of nitrogen oxides, soot and toxic hydrocarbons are greatly reduced when a car runs on biogas compared with petrol and diesel. Furthermore, biogas is often called “carbon neutral” since no new carbon dioxide is emitted to the atmosphere. Thus, biogas does not contribute to the greenhouse effect and climate change, making biogas a fuel that currently has relatively low impact on the environment.

Also, the waste product from the biogas has a positive environmental benefit since it can replace the use of artificial fertilizers in agriculture.

Since most of the gas is used for operating busses in downtown Linköping and Norrköping, this also has a positive local environmental impact.

In 2010, Swedish Biogas sold over 11 million normal cubic meters of compressed natural gas as a substitute for as many litres of petrol and diesel.

Economic benefits and impacts

The economic benefits are several and vary a bit depending on the actor. Most of the companies' raw material suppliers previously had problems with getting rid of their waste material; now they can get paid for, or at least pay less for, getting rid of the waste. The company can earn money by taking in materials from their raw material suppliers. They can also earn money, not just from the biogas but also from the fertilizers made of the leftover material from the biogas production. However, the economic benefit from the fertilizer sales is minor.

Local customers that use the biogas can get a locally-produced fuel at a competitive price in comparison with alternative fuels.

Main drivers

As stated earlier, in the 1980s and early 1990s Linköping had major air quality problems in the inner city because of traffic, while the slaughterhouse industry in Linköping had problems dealing with its waste products.

Main barriers

Swedish Biogas have had to spend a lot of resources on developing techniques to improve the gas production process in order to make the process more productive and balanced, i.e. easier to manage and control.

One barrier is to find suitable material that can be used for biogas production, something which has become harder since more actors are interested in these types of materials. Another, related barrier is the cost of transporting the ingoing material for the biogas production - this is because the density is often quite high in relation to the potential biogas output.

Yet another barrier is building up and managing an infrastructure to distribute biogas. An historic challenge was also to increase the number of vehicles that can be fuelled with biogas. To handle this, for a short time the company had a subsidiary business with the focus on converting gasoline and diesel cars to biogas cars.

Finally, it is not economical at the moment to transport biogas long distances. This implies that the production must be quite close to the consumers.

Toyota Material Handling Sweden AB - Forklift Rental Solution

Interviewer: Mattias Lindahl, Linköping University, on behalf of VINNOVA

The company

Toyota Material Handling Sweden (TMHSE) and Toyota Material Handling Sweden Rental AB (TMHSER) are part of Toyota Material Handling Europe (TMHE). They are a leading supplier of trucks and associated switched services such as service, parts supply, rental, financing and driver training. TMHSE markets a complete line of trucks under the BT and Toyota brands, supplemented with Konecranes SMV and MAFI. They also carry out servicing on all market brands. The number of employees is about 500, of which 350 are part of the nationwide service organization.

The business model

TMHE's experience shows that most of their customers want the same things: reliability, not to tie up valuable capital and to avoid hidden or unexpected costs. As they state, a house or a plot of land, if treated and nurtured well, is likely to increase in value over time, but a forklift truck ties up capital, declines in value, can break, needs to be serviced, and one day will be sold. In addition, the forklift truck their customer uses today is not necessarily the one they will need tomorrow: business needs change over time.

Why buy a problem when you can rent a solution? Given this thinking, they have developed a business model that is based on functional sales with the goal to meet their needs at all times during their work - they call it "Rental Solution". Their rental solutions help their customers to plan their fleet, whether their customer needs a small forklift truck or a complete fleet with hundreds of trucks at various sites. A stated focus in their

business model is on supporting the customer to find the best rental solution, rather than selling a lot of forklift trucks. Therefore, they also give their customers advice on how to combine different types of equipment, different lease terms and various rental programs.

TMHS have the following main rental programs:

- Short-term rental - for temporary, insecure or emergency truck needs (1 day or more).
- Flex Rental - for a special project or for a planned conversion (normally 1-2 years).
- Long-term rental - for an extended time (normally 3-7 years).
- Outsourcing - TMHS takes over all responsibility for the customer's forklift truck fleet.

As part of their business model, TMHS have also built up an advanced take-back and remanufacturing scheme with their own workshops that enable them to refurbish used forklift trucks and place them out at new customers, e.g. as part of short or flex rental contracts.

Environmental benefits and impacts

One of the major benefits is that the focus moves from selling a lot of products to providing the best service for the customer with an optimal number of forklift trucks. This implies savings in natural resources and energy with resulting environmental benefits. In addition, a truck can be used in several companies/lifetimes.

TMHS's take-back system of used forklift trucks reduces the need for new production; this also provides savings in natural resources and energy, with resulting environmental benefits.

Economic benefits and impacts

The economic benefits are several, both for TMHS and their customers, e.g.:

- The focus is on finding the optimal number of forklift trucks for the given situation, something which is easier for TMHS to do than it is for their customers.
- The amount of capital tied up with the customer is lower.

- A used forklift truck is less valuable for a customer than for TMHS who knows how to, after e.g. some refurbishing, find a new customer.
- It is easier for TMHS, which controls a large number of trucks, than for their customer, to build up an efficient and effective service system, e.g. how and when to repair in the best, fastest and cheapest way and with minimum disruption to production.

Main drivers

There are several drivers behind TMHS's business model. One is that they realized that this business model, with an increased focus on their products' use phase, could enable them to become more profitable and also to tie up their customers in longer contracts. A rental solution normally creates a partnership with the customer - and the relationship normally lasts for many years.

Another benefit is that many of their customers have changed their demands and prefer to focus on their core business; e.g. handling goods and managing a forklift truck fleet is in this respect not core. Still another is that their competitors have also started to build up similar systems.

Main barriers

Some customers, often small actors, still want own their forklift trucks and to perform service themselves.

Some customers, sometimes very big ones such as IKEA, have a policy of owning their own trucks.

Matorka

Interviewer: Innovation Centre Iceland

The Company

Íslensk Matorka ehf. is a company that focuses on utilization of renewable energy sources in Iceland and energy-intensive food production. The conditions for energy-intensive food production in Iceland are second to none in the world due to availability of environmentally friendly energy.

The Business Model

Íslensk Matorka ehf. produces Arctic Charr and Tilapia with geothermal water and other renewable sources. The criteria of the production is to fully utilise all raw materials used, for example water and waste from the fish farming operation, by running a greenhouse business in conjunction with it.

The business model is to produce one kilo of food for each kilo of water. The company utilises waste water from geothermal electrical plants, as well as other self-sustaining operations, to provide sustainable feed and water used in its operation.

The company is thereby building new environmentally friendly industries and also offers business development consulting.

Benefits and Impacts

The company provides quality products that do not in any way have a negative impact on the environment.

Drivers and Barriers

Increasing demand for whitefish on both the North American and European markets is the driving force behind the company's entry into this field. Icelandic resources are also a driving force behind the business idea, where the company combines the production of different varieties of fish in a controlled environment using a combination of hot water, cold water and waste water.

The main barrier is that products are not well known in Europe, the company's main market. Other barriers are technical in nature, for example lack of research into different types of water quality in Iceland, as well as the combination of heat and oxygen in water. Another barrier is a lack of knowledge in this field within government establishments, universities and institutions in Iceland.

There has been minimal interest in this field of endeavour due to Iceland's previous record in aquafarming.

Hópbílar

Interviewer: Innovation Centre Iceland

The Company

Hópbílar is a coach rental company providing excellent service while bearing in mind value, safety and the environment. The company was founded in 1995 and is owned and operated by the Fridjonsson family. Its fleet consists of 41 coaches ranging in various sizes from 9 to 71 seaters, of which 8 coaches are equipped with a wheelchair elevator.

The Business Model

Since March of 2001, Hópbílar has implemented and maintained the ISO 14001 International Environmental Standard. The audit process and final audit of the ISO 14001 system was conducted in October 2004.

Hópbílar hf. has resolved to be in the group of companies that are at the forefront of environmental concern. To this effect the company has adopted a certified environmental management system that conforms to ISO-14001 standards. These standards are today an integral part of management and policy making within the company, and is the foundation of the company's business model.

Hópbílar is the first and only company in Iceland providing passenger transport services that has received this international certification. The company is also the recipient of the Conch Shell Environment Award, presented by the Ministry for the Environment. In order to ensure systematic monitoring of the company's largest environmental focus, the use of diesel fuel, a pumping station and electronic registration have been installed. About 90% of all refills take place on the company's premises.

In 2001, the owners of Hópbílar decided to implement an environmental management

system according to ISO 14001 requirements. As it is a very extensive undertaking, only three companies in Iceland have implemented this kind of system. In accordance with this requirement, all drivers have successfully completed a course in Eco-Driving. Eco-driving is a method of driving that helps reduce fuel consumption and greenhouse gas emissions. Eco-driving has been shown to improve road safety, as well as the quality of the local and global environment. The system was certified in October 2004.

Benefits and Impacts

From maintenance technicians to management, the employees of Hópbílar take great pride in offering their clients the very highest quality of service at the best possible prices. In this manner the company considerably reduces pollution and energy consumption, and provides the customer with safer service.

Drivers and Barriers

Increasing awareness in the market on environmental and safety issues, combined with improvements in cost reduction based on development projects in these fields, as well as strong leadership, are the main drivers in the business model.

There had been a lack of understanding among suppliers and some customers regarding the importance of focusing on and delivering the required criteria needed to fulfil the company's standards. The company was a pioneer in Iceland in implementing international standards within the Icelandic transport industry.

Scandinavian Business Seating

Interviewer: Innovation Norway

The group Scandinavian Business Seating (SBS) owns the Scandinavian brands HÅG, RBM and RH. SBS is the market leader in office chairs in Scandinavia, market share of around 35%. In Europe SBS is one of “top three” manufacturer of work chairs. Turnover EUR 125 million, 460 employees. Head office in Oslo, Norway, and production plants in Norway and Sweden. Sales offices around in Europe.

The green business model

The business model is a hybrid lifecycle model, green supply chain management and cradle-to-cradle. It has evolved over time. Ergonomics and visual design have always been key features of the products. Sustainability has become a way to further differentiate the products from the competition in the North European market.

- *Value proposition:* To make the world a better place to sit! SBS is offering their customers office chairs that is based on the best design and experience - including sustainability.
- *Innovativeness:* To be best in design, ergonomics, visual design , quality, sustainability . The business model targets two megatrends: health and sustainability.
- *Market segments:*The end user is office employees. Buyer of product may be professional purchasers in larger enterprises, user groups, or managers in smaller enterprises. Both private and public offices.
- *Customer relationships:* Based on branding the values and documentation of facts about the sustainability of the products. Every year SBS issues a Corporate Social Responsibility CSR report, with documentation of the sustainability of the product and manufacturing processes (including suppliers). Every product has an

Environmental Product Declaration EPD Certification, documenting the carbon footprint. Documentation follows the product.

- *Channels*: Own sale companies and an independent network of distributors and retailers.
- *Revenue streams*: Customers will pay for the office chairs the same way as they are used to.
- *Key Partnerships*: Supply chain must deliver parts and services that confirm with SBS sustainability goals, including information for EPD certification. Suppliers have also been a major contributor of knowledge to be able to produce environmental friendly products.

Product development is a key activity of the SBS business model. SBS has been a member of the Norwegian branch project "Innovation Furniture" comprising 30 furniture enterprises. Product and market developments which has been funded partly by the public agencies.

Most significant barrier to the business model is that customers buying by price, and competitors saying they are green - is ISO certified - but cannot document their sustainability. Some markets do not have much preference to sustainable products yet. Motivation for the green business model has been the differentiation strategy and proving it is a profitable business concept.

Netcyclers Oy

Interviewer: TEKES

The company

Netcyclers Oy is a private company providing an Internet service for consumers. The service allows people to acquire items they want by giving away items they no longer need. The company was founded in 2008 in Finland by two co-founders Juha Koponen and Jussi Koskinen. Currently, the company has more than 100 000 registered users, and operations in three countries: in Finland, in Germany and in the United Kingdom.

The business model

Business model has three components:

- Different models with postage companies.
- Customers pay transaction fees.
- Customers pay for premium account.

The Netcyclers service model is a certain type of collaborative consumption. The company's business model is green by nature, as it encourages people to select pre-owned items and not through items away. The service itself is free of charge and it can be accessed on the internet at www.netcyclers.fi. In the service, the items you do not need anymore can be given away, sold or swapped to other items.

The service model is innovative, and the innovativeness lies in the mass of trade. The probability that you find what you want is higher the more the service has users with different kinds of things to be offered. Patent applications have been filed for protecting the idea.

The customers of the Netcyclers internet service are both the suppliers and the customers of the supply chain. Suppliers are also companies that want to market products. The

actors of the supply chain are not involved in development of the innovation or the service itself, as they have been developed in-house.

Impacts and benefits

The business model is green by nature, and each day hundreds of items find new owners through the service. Typical items to be reused through the service include such as books, CDs, DVDs, children's sports equipment and clothes, and bicycles and some other devices such as vacuum cleaners or microwave ovens. By encouraging the reuse, the company helps to reduce the amount of waste and the need of virgin raw-materials. Reusing items is one of the most efficient ways to improve resource efficiency.

The company takes the environmental impacts into account also in its daily operations by using carbon compensation for flight, by avoiding unnecessary traveling, by promotion of employee's car free commuting, and by green office operations.

Drivers and barriers

The business has huge potential. It can get users everywhere in the world as it is internet based. However, currently the business is more national as postage fees are cheaper if the country borders are not crossed. In addition, when operating across country borders, the customs may become an issue. In Europe customers could even meet physically to change the things, but culture in US is more protective and safety-oriented.

In practice, the service has to be localized to specific markets, e.g. by localizing the language, postage and payment features.

The target users for the service are consumers. Currently, consumers that are more aware about green values have been very interested, but the service is breaking into main stream consumer space.

Currently, the company has only a few BtoB customers (mostly applied for marketing and promotion of the concept). More innovation would be needed on BtoB side, but it has been easier to start and learn from the consumer side.

For more info:

http://www.sustainable-lifestyles.eu/fileadmin/images/content/SPREAD_Koponen_Netcycler.pdf

<http://www.netcycler.com>

Annex A: Overview of Case Companies

Complete list of company interviews and the project partners responsible for conducting the interviews.

COMPANY NAME	PROJECT PARTNER
IKEA	The Danish Business Authority*
Schüco International KG	The Danish Business Authority*
Trimo	The Danish Business Authority*
NatureWorks LLC	The Danish Business Authority*
Elvis & Kresse	The Danish Business Authority*
Van Houtum Papier	The Danish Business Authority*
Gabriel	The Danish Business Authority*
Trigema	The Danish Business Authority*
Maersk Line	The Danish Business Authority*
Desso	The Danish Business Authority*
Van Gansewinkel	The Danish Business Authority*
Steelcase	The Danish Business Authority*
SafeChem Europe GmbH	The Danish Business Authority*
Eco2Distrib	The Danish Business Authority*
Car2Go	The Danish Business Authority*
Siemens Building Technologies	The Danish Business Authority*
Philips	The Danish Business Authority*
Eastex Materials Exchange/Bright Green	The Danish Business Authority*
Rantasalmi	The Danish Business Authority*
E.ON	The Danish Business Authority*
Yalumba	The Danish Business Authority
Mosa Tiles	The Danish Business Authority
Biototal AB	VINNOVA**
Charge Storm AB	VINNOVA**

COMPANY NAME	PROJECT PARTNER
Econova AB	VINNOVA**
HTC Sweden AB (Superfloor)	VINNOVA**
HTC Sweden AB (Twister)	VINNOVA**
Envac Otpibag AB	VINNOVA**
Plantagon International AB	VINNOVA**
Polyplank AB (Core Plugs)	VINNOVA**
Polyplank AB (building systems)	VINNOVA**
Qlean Construction	VINNOVA**
Qlean Industry	VINNOVA**
Qlean Surface	VINNOVA**
Stena Metall AB	VINNOVA**
Svensk Biogas i Linköping AB	VINNOVA**
Toyota Material Handling Sweden AB	VINNOVA**
Matorka	Innovation Centre Iceland
Hópbílar	Innovation Centre Iceland
Scandinavian Business Seating	Innovation Norway
Netcycler	TEKES

Note: All cases marked * have been conducted for the Danish Business Authority by COWI consultants. All cases marked ** have been conducted for VINNOVA by Mattias Lindahl, Linköping University.

Annex B: Case Study Template

The Danish Business Authority project on Green Business Model Innovation

Case Studies

Reporting Template

Name of the type of business model (innovation): _____

Company or organisation: _____

Interviewee information:

Name: _____

Position title: _____

Sector: _____

Major products/services: _____

Ownership:

Private company

Joint venture

Public-private partnership

Public corporation

Public agency

Not-for-profit company/social enterprise

NGO

Other (please specify): _____

Address: _____

Tel: _____

E-mail: _____

Website: _____

Relation of interviewee to this case: _____

1. Please describe your green business model

Please considering the following:

- *Value proposition:* What functions or solutions does your business model provide? Is it a product, process, service/functionality or a mix? If it is a mix, please specify.
- *Innovativeness:* What are your business model's innovative features and advantages?
- *Market Segments:* Who are the target users of this business model? What needs or demands is the business model innovation seeking to address? Did the innovation open up for a new market?
- *Customer relationships:* Which kind of relation do you have with the users? (No interaction besides selling your products or services / Closer relation through websites, personal services etc. / Co-creation with users) Did the innovation of your business model lead to any new relationships with the users?
- *Channels:* Where are your products/services available for the users? How does it provide users with functions or solutions? How is it being distributed and marketed? What steps did you take to commercialize your products/services? Did the innovation of your business model lead to new ways of delivering your products/services to the users?
- *Revenue streams:* Which kind of payment scheme are you applying in your business model? Did the innovation of your business model lead to a new form of revenue scheme?
- *Key Partnerships:* How do you involve your supply chain actors? Did you involve them in the development of the business model innovation? If so, why and how?

2. What has been the background behind your business model?

Please consider the following:

- *Growth Strategy:* What were the market conditions and surroundings which encouraged your business model?
- *Barriers:* Were there any market conditions that formed barriers to the business model?

- *Comparative Strategy:* Were there any competitor or competitive concepts in the market? How did this affect the development of your business model innovation?
- *Motivation:* What was the motivation or objective to develop this? Were you motivated by any external factors made by government or local authorities (regulation, taxation, rising prices etc.)?

3. How was your business model funded?

- *Financial resources:* How were the financial resources required for this business model innovation obtained? What types of financial support did you get? Did you use any government scheme? How essential was such financial support and was it enough? Have you developed any new financing formats for your business model?

Please rank the **five most important** sources of funding for your business model (1 = the most important; 5 = the least important).

Funding Sources	1 - 5
In-house revenues	
Parent firm	
Conventional bank loans	
Angel investors	
Venture capital firms	
Private equity	
Initial public offering (IPO) on a stock or secondary market	
National government	
• Loan	
• Grant	
Regional government	
• Loan	
• Grant	
City/local Government	
International public programmes (e.g. EU framework programme)	
Government insurance programme	
Private research grant	
Supportive customers	
Other (please specify)	

- *Difficulties:* What difficulties did you face in obtaining financial resources, and how did you overcome these? Did lack of financial resources affect your business model

innovation? What strategies did you use to attract funding for your business model?

4. What kind of knowledge and human resources was required?

- *Skills:* What kind of knowledge, skills and competences were critical to realise this business model innovation? Where were they obtained from?

Please rank the *five* most important sources of knowledge, skills and competences for your business model innovation (1= the most important; 5= the least important).

KNOWLEDGE AND SKILL SOURCES	1 - 5
In-house resources and training	
Recruiting experts	
University recruiting	
Foreign recruiting	
Domestic contracting	
Foreign contracting	
University partnerships	
Company partnerships	
Government/non-profit partnerships	
International partnerships	
Mergers & acquisitions	
Establishment of foreign facilities	
Other (please specify)	

- *Difficulties:* What difficulties did you face to obtain relevant knowledge and competences, and how did you overcome these? How adequate is the national training and education system for your organisation?
- *Key activities:* What are the key activities in your business model? Did the business model innovation transform the way which your (or other) organisations does business and deliver environmental performance?
- *Costs:* Did the business model innovation lead to any significantly changes in the cost structure of your organisation?

5. What have been the impacts and benefits of your business model?

Please consider the following:

- **Environmental impacts and benefits**
 - » What and how much environmental improvements does your business model bring about? (Less energy, materials, consumption, maintenance, emissions, waste. More recycling, longer product life time, etc.)
 - » Where in the value chain do your environmental improvements mainly take place?
 - » How is it measured? Do you apply a life cycle analysis?
- **Economic impact and benefits**
 - » What are the annual sales or cost savings arising from your business model?
 - » Which percentage of the company's total turnover does it generate?
 - » What is the return of investment (ROI) of your business model thus far, if applicable?
 - » How many jobs have been created (in your organisation or more widely) by this business model?
 - » Did this business model lead to better performance of your products/services?
 - » To what extent can this business model be applied throughout the economy?

6. Did you receive support from Government policies/programmes?

- Did any government (national, regional or local) policies support this business model innovation, and if so, which policies?
- Did you utilise any government programme or funding for the development of this business model innovation? If so, which programme and how was it used? Was it helpful? Was this programme specifically directed at eco-innovation or innovation more broadly? Did undertaking the application process result in any amendments to your strategy for this business model innovation?
- Do any government policies/programmes have negative impacts on your organisation's business model innovation activities? If so, which policies and how?

Please rank the **five most important** policy instruments for advancing your green business model (1 = the most important; 5 = the least important). Please also provide reasons and comments.

POLICY INSTRUMENTS	1 - 5
Regulations on harmful substances and activities	
Eco-tax, carbon tax	
Cap and trade scheme	
Removal of harmful subsidies (e.g. fossil fuel subsidies)	
R&D funding and support	
Business development funding and support	
Support for testing and demonstrations	
Standardisation of technical elements	
Performance standards, labelling, certification	
Support for networks, partnerships and matchmaking	
Public procurement	
Consumer subsidies and pricing	
Support for technology transfer	
Information brokering and advisory services	
Education and training	
Provision of enabling infrastructures	
Foresight, roadmapping, scenario development	
Other (Please specify)	

- *Future Support:* What government initiatives or support programmes/tools (i.e. not policies but more concrete support) would be most helpful to advance your organisation's eco-innovation?

7. Did other tools or instruments help to support your business model?

Did any internal or third-party measurement, benchmarking or reporting tools (e.g. environmental assessment, labelling/certification, sustainability reporting) help initiate and develop your this business model?

8. What have been the overall drivers and barriers for your business model?

Please consider the following:

- *Drivers and success factors:* What were the most decisive internal/external factors to the success of this business model? Why are they the most important?
- *Barriers:* What were the most significant internal/external barriers to your business model? Why are they the most important? How did you or are you trying to overcome them?

- *Dissemination:* What are the barriers to apply this business model to similar companies? How could these be overcome?

9. Other information

[Please attach other materials relevant to this report (e.g. website, brochure, article, report). If possible, also provide photos of the business model and the interviewee.]

Table of abstract

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Green Business Model Innovation

Business case study compendium

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