

PILOT STUDY

IMPACTS OF THE CRADLE TO CRADLE CERTIFIED PRODUCTS PROGRAM

Steelcase Company Narrative



ACKNOWLEDGEMENTS

The study represents pilot research designed to contribute an initial evidence base for the *Cradle to Cradle Certified™* Products Program and stimulate thought about how the making of things can be transitioned into a positive force for people, planet and profit. While the study is not intended to provide scientific verification or demonstrate causality, it does provide an initial indication of the very significant economic, environmental and social potential of the program. More granular research, considerate of a wider sample of companies, is needed to strengthen the pilot findings. The *Pilot Study* report series is available to download at www.c2ccertified.org/impact:



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The Cradle to Cradle Products Innovation Institute is a non-profit organization, created to bring about a new industrial revolution that turns the making of things into a positive force for society, economy, and the planet. The Institute administers the publicly available *Cradle to Cradle Certified* Product Standard, currently in its third version, along with the *Cradle to Cradle Certified* Products Program to support it. It also audits the product assessments conducted by its Accredited Assessment Bodies, and issues the product certificates. The Institute is also responsible for selecting, training and accrediting these assessment bodies worldwide.

The *Cradle to Cradle Certified* Product Standard is a continuous improvement quality standard gifted to the Institute by William McDonough and Michael Braungart after eighteen years of development with the world's leading brands. It guides the assessment of a product across five quality categories — material health, material reutilization, renewable energy and carbon management, water stewardship, and social fairness. Qualifying products are awarded one of five levels of achievement — BASIC, BRONZE, SILVER, GOLD, or PLATINUM. [Learn more.](#)

Trucost Plc, a global environmental data and insight company, conducted the Pilot Study research and delivered the report.

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INTRODUCTION

Economic growth has been accompanied by serious natural resource depletion and severe pollution impacts in recent decades.

According to the Global Footprint Network, one and a half Earths are needed to support our current natural resource dependency and waste generation. And if current population and consumption trends continue, moderate United Nations estimates predict that we will need the equivalent of the resources of two Earths to support us by the 2030s.

The *Cradle to Cradle Certified™* Product Standard was established to reverse unsustainable growth trajectories by transforming the way products are designed, what's in them and where they go after use. Following Cradle to Cradle principles, products are designed from the outset to provide resource streams for new products at the end of their traditional use, or safely biodegrade into the environment – continually circulating as pure and viable nutrients that add value in the context in which they are used – and have as many positive benefits as possible. In this way, product manufacturing and product use become a positive force for people, planet and profit.

Because of these characteristics, *Cradle to Cradle Certified* products are aligned with and can demonstrate the benefits of the circular economy powered by Cradle to Cradle on a product-level and contribute to sparking the transition towards more circular systems.

The Cradle to Cradle Products Innovation Institute asked Trucost to quantify and assess the environmental, social and business impacts of its certification program across its five quality categories: material health, material reutilization, renewable energy and carbon management, water stewardship and social fairness.

The Institute also engaged a panel of scientists from Oxford, Yale and Delft universities, as well as expert stakeholders, to validate the research methods and outcomes.

THE RESEARCH

Trucost carried out in-depth analysis of twenty products; ten certified to the *Cradle to Cradle Certified* Product Standard and ten baseline pre-certification or non-certified counterparts, with the aim of identifying and quantifying the actual environmental, social and business impacts – and actual added value – of the *Cradle to Cradle Certified* Products Program.

What emerged was a promising account of impact and value achieved by ten companies undertaking *Cradle to Cradle Certified* product certification.

Across the ten companies, the economic potential of *Cradle to Cradle Certified™* product certification was evidenced through examples of higher than average sales performance, positive growth and increased profit margins, alongside significant cost savings related to water and energy efficiency improvements.

Environmental and social benefits were also evidenced through replacement of toxic and questionable ingredients by less toxic and defined alternatives, conservation of product materials in continuous product cycles, increased renewable energy use and improved energy and water effectiveness.

The study research provides an evidence base demonstrating the economic, environmental and social potential of the *Cradle to Cradle Certified* Products Program. It is not intended to provide scientific verification or demonstrate causality.

INTRODUCTION

READER'S GUIDE

This case study details the findings of the analysis of a single *Cradle to Cradle Certified* product compared to a non-certified equivalent. The document is one of ten examples intended to support the [Technical Report](#) which provides more information on the framework developed and all findings of the pilot study across a range of products and companies. This document introduces the Steelcase company narrative and product analysis of the *Cradle to Cradle Certified* SILVER Node™ chair, compared to a hypothetical polyvinyl chloride (PVC) based chair, that may have been produced had certification requirements not been considered during design of the product. This identifies and describes impact improvements in the fields of business, society and the environment, related to Steelcase's pursuit of *Cradle to Cradle Certified* product certification.

An overview of the methodology is given on page 14 with a more detailed discussion of the approach available in the supporting [Technical Report](#). The research findings (page 19) review work done by the company to optimize product performance across the five quality categories of material health, material reutilization, renewable energy and carbon management, water stewardship and social fairness, and its effect on business performance. Through product optimization, Steelcase improved material composition to remove PVC from the product and replace it with polypropylene, optimizing material health through the use of safer, recyclable materials.

Steelcase does not manufacture the Node chair (though it does manufacture other Steelcase products), and therefore the final point of manufacture (the Tier 1 manufacturer, Ventura Manufacturing Inc) is taken into consideration for review. To meet the *Cradle to Cradle Certified* Product Standard, Ventura has adopted water management principles, Principles of the UN Global Compact, and has worked with Steelcase to create a policy for exploring energy efficiency and alternative energy sources corporate wide.

THE PROGRAM

CRADLE TO CRADLE CERTIFIED PRODUCTS PROGRAM

The *Cradle to Cradle Certified* Product Standard is a multi-attribute, continuous improvement methodology that provides a pathway for companies to produce safe, recyclable and sustainable products. It is administered by the Cradle to Cradle Products Innovation Institute. The certification standard was launched in 2005, after many years of development by McDonough Braungart Design Chemistry, LLC (MBDC) in cooperation with EPEA Internationale Umweltforschung GmbH. Since the program began in 2005, nearly 200 companies worldwide have participated in the *Cradle to Cradle Certified* Products Program, with hundreds of product lines representing thousands of different products certified and millions of products sold. Companies include AGC Glass Europe, Herman Miller, Shaw Industries, Steelcase, Desso, Puma and Ecover.

The current standard is version 3.0, building on version 2.1.1 of the standard revised in 2010. It continues to be periodically revised to keep up with current research, data, and technologies. Subsequent revisions¹ are public and will be informed by five expert advisory groups and public comment periods. The process is managed by the Institute's independent Certification Standards Board² (CSB) with input from consumers, manufacturers, NGO partners, and other interested stakeholders.

Full details of the certification can be found at
http://c2ccertified.org/product_certification/c2ccertified_product_standard

Products are analyzed by Assessment Bodies³ that have been trained and accredited by the Institute. After auditing of this assessment, the Institute awards the product an overall score or level while encouraging continual improvement. Product certification is awarded at five levels (BASIC, BRONZE, SILVER, GOLD and PLATINUM), with the expectation that an applicant will optimize each aspect of their product over time. The ultimate goal is to encourage innovation and the design of products that effectively and positively impact people and the environment. Products are evaluated according to the requirements in five categories based on the Cradle to Cradle design principles.

THE FIVE PRODUCT STANDARD CATEGORIES

The five *Cradle to Cradle Certified* Product Standard categories are designed to provide a pathway to manufacturing safe and recyclable products for our world. The five categories are summarized overleaf:

¹ http://www.c2ccertified.org/product_certification/revisions_to_the_standard

² The Certification Standards Board (CSB) is an independent review panel, tasked with updating the standard and adjudicating appeals related to product certification

http://www.c2ccertified.org/product_certification/certification_standards_board

³ For detail of the Accredited Assessment Bodies see

http://www.c2ccertified.org/product_certification/accredited_assessment_bodies

THE PROGRAM



Material Health

Material health Making products out of materials that are safe for humans and the environment



Material Reutilization

Material reutilization Designing products so all materials can return safely to nature or industry



Renewable Energy

Renewable energy and carbon management Assembling and manufacturing products with renewable energy



Water Stewardship

Water stewardship Making products in ways that protect and enrich water supplies



Social Fairness

Social fairness Treating all the people involved in the product manufacturing fairly

CONCEPTUAL FRAMEWORK

INTRODUCING THE CONCEPT OF 'CAPITAL'

The *Cradle to Cradle Certified Product Standard* is a multi-attribute standard, so a holistic concept is needed to understand how it drives change in a company's relationship with the environment, society and business. The concept of 'capital' is a useful starting point.

All companies depend on various forms of capital for their success. These capitals are stores of value that can, in one form or another, become inputs to a company's business model or be affected by its outputs (such as emissions from product processing). They are increased, decreased or transformed through the activities of the company. There are six main types as defined by the International Integrated Reporting Council (IIRC), financial capital, manufactured capital, intellectual capital, human capital, social capital and natural capital.

Financial capital is broadly understood as the pool of funds available to an organization. This includes funds raised from both debt and equity finance.

Manufactured capital includes man-made physical objects (as opposed to natural physical assets) that are used in the production of goods or the provision of services

Intellectual capital is defined by IIRC as knowledge-based intangible assets, in which they include tradable & private intellectual property such as patents, copyrights, software, etc. as well as "organizational capital" such as tacit knowledge, systems, procedures and protocols

Human capital consists of the individual's health and capabilities (knowledge, skills and experiences), as well as the motivation and capacity they have to enhance these capabilities.

Social or relationship capital is the relationships and networks together with shared norms, values, trust and understandings that facilitate co-operation within or among groups. Examples include the relationships found in families, communities, businesses, trade unions and voluntary organizations.

Natural capital is any stock of natural resources or environmental assets that provides a flow of useful goods or services now and in the future. This includes resources such as timber, fish, water and minerals, as well as ecosystem services from which humans benefit such as climate regulation.

In environmental economics literature, however, there are typically only four broad categories of capital - physical, human, social and natural capital. These two categorizations are in fact consistent. 'Physical capital' is the value stored in man-made assets, be they "financial" or "manufactured" or "intellectual", as they are related: they are mostly privately owned, and one can be converted to the other through markets. 'Human capital' includes the intellect and knowledge of humans – it resides in human minds. When owned by businesses in the form of patents, copyrights, and software it can also be classified as physical capital. 'Social capital' resides in human relationships at various levels, enabling social interaction and reducing transaction costs: without social capital, normal business would become impossible to conduct. 'Natural capital' is made by nature, not man, and includes all valued supplies of goods, services and embedded intellectual property (used in bio-mimicry) emanating from all levels of biodiversity – ecosystems, species and genes.

Together these capitals are the basis of a company's value creation. They also underpin the quality of human well-being. Natural capital, for example, underlines the need to maintain stocks of our natural assets such as rainforests, grasslands, wetlands, and mangroves. These provide flows of

CONCEPTUAL FRAMEWORK

services that benefit society, such as clean air, fresh water, climate regulation, crop pollination and protection from natural hazards. Similarly, financial capital when invested and distributed fairly allows for the creation of jobs and goods and services that ultimately benefit humans. These capitals are also interrelated and can influence each other directly and indirectly.

At present the stocks of natural, human and social capital are not recognized on a company's balance sheet and are seldom the subject of management attention, and as such are being degraded or lost. In recent years, for example, growth in financial capital has often come at the expense of serious natural resource depletion and pollution impacts, representing costs to natural capital (sub-soil assets as well as wilderness of many kinds) and human capital (human health). The impacts of this imbalance are increasingly being felt on society and business through increased healthcare costs, increased volatility in the price of raw materials and intensifying 'polluter pays' regulations, to name but a few.

SUMMARY OF THE CONCEPTUAL FRAMEWORK

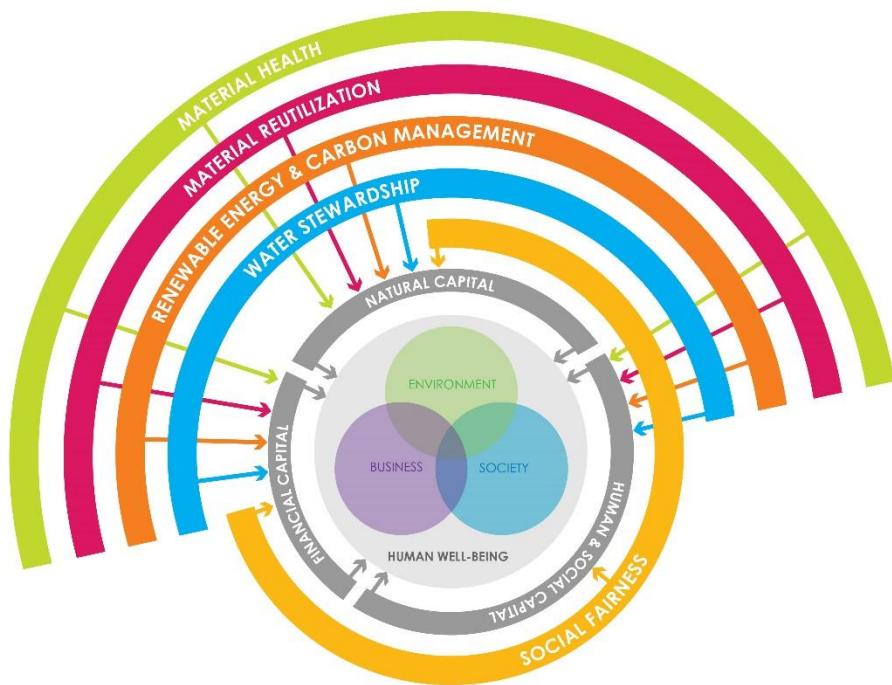
To capture the impacts of *Cradle to Cradle Certified* product certification, a conceptual framework was developed to highlight the impact areas that are affected through product optimization. Eco-effective products are considered to provide 'more good', delivering benefit to human well-being. Underpinning the conceptual framework is the principle that the manufacture of eco-effective products demands the maintenance and enhancement of *all* forms of capital upon which companies and their products rely. The five *Cradle to Cradle Certified* Product Standard categories drive change in companies by encouraging them to improve environment, social and business performance to enhance and protect all forms of capital (for more detail on the framework and methodologies, see the [Technical Report](#)).

To illustrate an example: let us consider the *Cradle to Cradle Certified* program's material health category, which encourages companies to quantify and understand their product material composition, identifying ingredients as biological or technical nutrients, and removing hazardous chemicals, while replacing with optimized 'good' inputs. The adherence to this quality category motivates companies to improve understanding of their products through detailed scientific assessment and continuously work to improve them, through ongoing optimization. By reducing and ultimately eliminating toxicity, the natural capital stock of clean air and water is maintained, which itself has a positive indirect effect on human capital through improved health.

The figure overleaf outlines the conceptual framework.

CONCEPTUAL FRAMEWORK

FIGURE 1: THE CONCEPTUAL FRAMEWORK



COMPANY

Steelcase is a leading furniture manufacturer providing products catering to the office, healthcare, education, legal and hospitality industries. Based in Michigan, USA, but with manufacturing facilities in 23 locations and retailing globally, the company employs 10,000 staff worldwide.

The company has 51 products certified to the *Cradle to Cradle Certified* SILVER level, and 5 certified to the GOLD level. These range from workstations, workstation accessories, wall systems, storage/filing cabinets, seating, fabrics for furniture and shelving. Of its total product portfolio, 90% of products sold in the Americas and 88% of those sold in Europe, the Middle East and Africa (EMEA) have sustainability certifications, including but not exclusively *Cradle to Cradle Certified*.

THE PRODUCT

Steelcase selected the Node™ for analysis based on study selection criteria⁴. The Node chair is an educational seating unit that mainly consists of a polypropylene shell for the seat, a nylon tripod with casters, a polypropylene tray, and an acrylonitrile butadiene styrene (ABS)/polycarbonate tablet. There are various color options for each component. It achieved *Cradle to Cradle Certified* SILVER in 2011 and has pursued recertification annually. The product was not previously available at a lower or non-certified level.

FIGURE 2: THE NODE™ CHAIR



Optimization was carried out within the design and development of the product, in order to meet certification on release. Therefore no data was available on pre optimized inputs. A theoretical product was used as a basis for comparison, using the traditional material of educational seating production, PVC. Steelcase has legacy products produced with PVC, but have since been phasing this out in an effort to move the products towards the

⁴ Selection criteria included ensuring product was certified at any level, had a well understood optimization process, and data was available for the product both before and after optimization.

Cradle to Cradle Certified Product Standard; therefore PVC is considered a suitable representation of non-certified equivalent.

The analysis therefore does not explicitly capture the benefit of certification, rather the continuous improvement and material benefit of the quality categories.

METHODOLOGY OVERVIEW

This section defines the methodology used by Trucost to apply the conceptual framework to determine the impacts of certification across ten companies' products. The section provides an overview of the methodology used to assess the environmental, social and business impacts associated with the *Cradle to Cradle Certified Products Program*. Detailed methodology is provided within the Technical Report which is available at www.c2ccertified.org/impact.

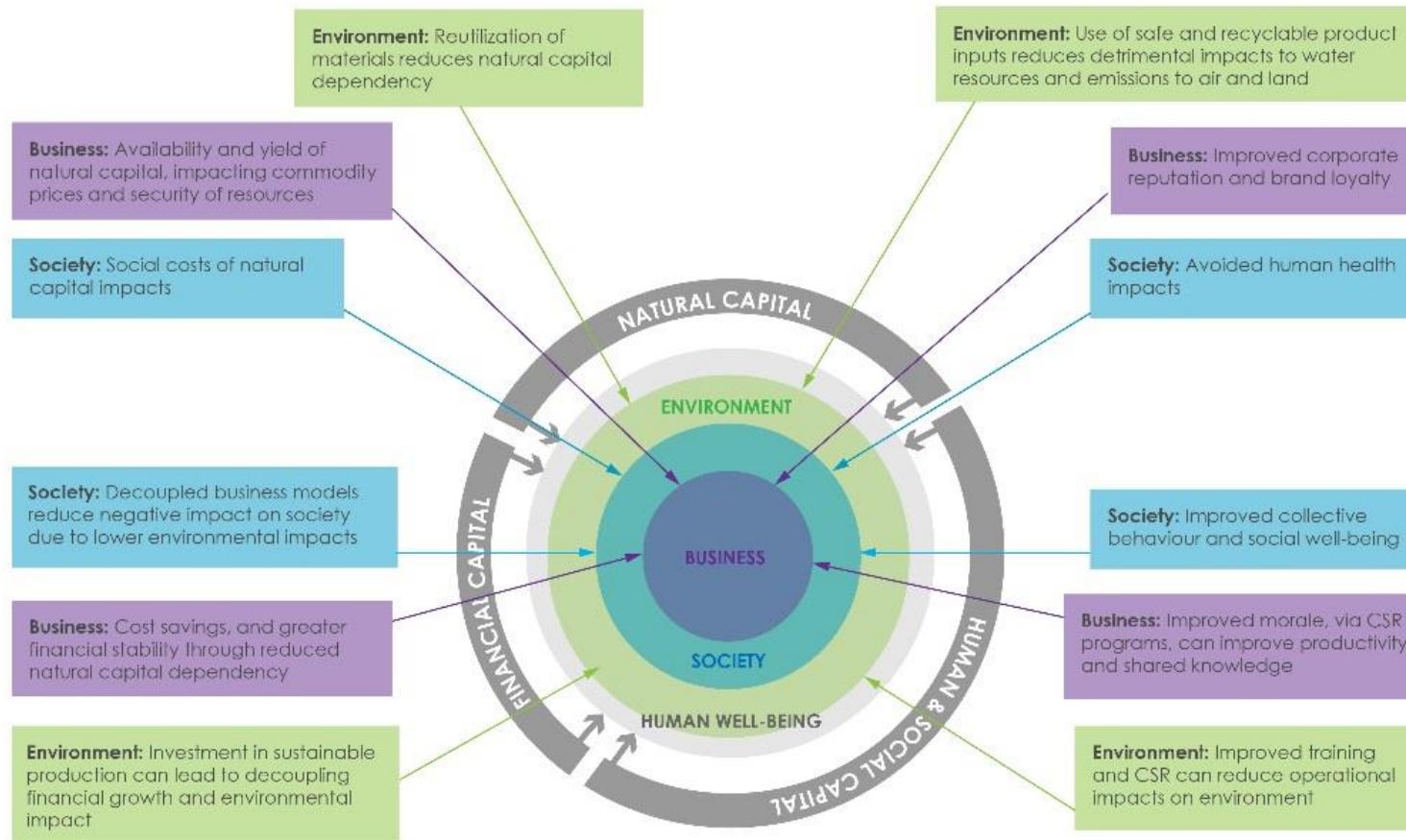
APPROACH

The impacts of product certification under the *Cradle to Cradle Certified Products Program* can be considered on several levels and across three impact fields: environmental, social and business. Environmental and social impacts may be apparent internally and externally, affecting both the company and third parties. Business impacts are directly linked to the company and operations and can be considered internal. Each of the three impact fields are given equal weighting for significance, though these will be approached in different manners. Figure 3 considers how the capitals feed into the three elements of human well-being.

An example given is the reutilization of materials. This reduces the dependency on natural capital as less resource is required. This includes not only material resource (such as wood, metal etc.) which is not required as recycled content is used in place of virgin, but also recycling often reduces the processing requirements required to convert raw material to product material (for example crude oil needs to be extracted then separated and processed into usable plastics for products – recycled plastic requires less processing to return the product material to a useable input material). This results in societal benefit through lower emissions and human health impacts due to manufacturing processes (the social cost of natural capital impacts). In turn, this impacts financial capital, directly related to business performance, through greater control of material inputs, less commodity dependency with associated price fluctuations and less external reliance on potentially scarce resource.

METHODOLOGY OVERVIEW

FIGURE 3: HOW CAPITALS FEED INTO HUMAN WELL-BEING



METHODOLOGY OVERVIEW

Businesses operate within society, which in turn is contained within the environment. While these three aspects of human well-being can be considered separately, they are also interrelated as shown in figure 3. Each type of capital flows into these three aspects of well-being, and these are identified in examples given in figure 4. Not all impacts are detailed; however, this provides some context of how the capitals each apply to the individual fields.

Figure 4 below provides detail of the source of data and approach used to capture impacts across these different categories.

FIGURE 4: ALIGNMENT OF QUALITY CATEGORIES



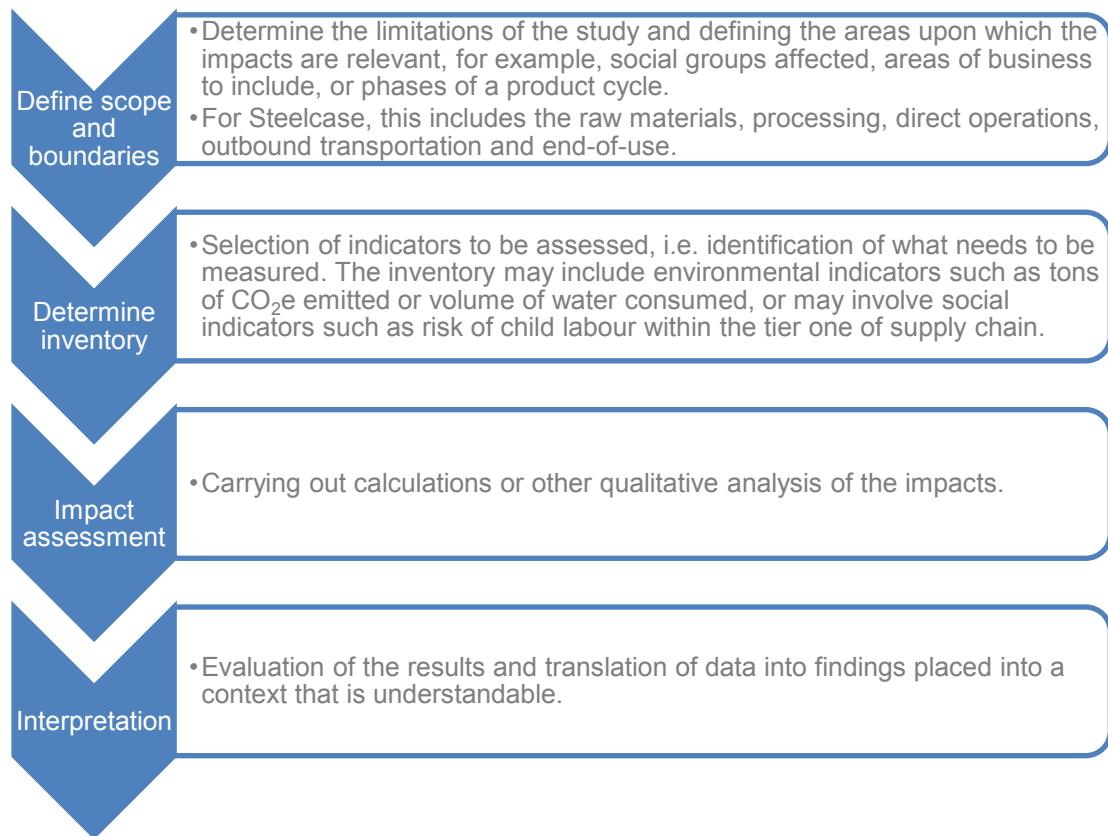
Firstly, the individual impacts associated directly with the manufacture, use and end-of-use of a particular product are compared to the equivalent hypothetical product without optimization for certification. The second consideration applies to the wider context of the benefit to the company of having one or more *Cradle to Cradle Certified* products.

Environmental, social and business drivers associated with each of the quality categories were identified, quantified and evaluated across product-use phases using a combination of quantitative and qualitative analysis.

The methodology is framed around four steps, given in figure 5.

METHODOLOGY OVERVIEW

FIGURE 5: METHODOLOGY OVERVIEW



Each step is considered in relation to the *Cradle to Cradle Certified* Product Standard quality categories and the three areas of environment, business and society in which the ultimate implications for human well-being exist.

The individual steps may be more or less significant for different scenarios, but are always appropriate to consider. Complex quantitative work may involve several steps within the impact assessment stage if numerous calculations are required, whereas qualitative information may be more directly understandable with less analytical processing required.

For the environmental impact analysis, interpretation includes the valuation of indicators. Valuation of environmental impacts estimates the value of natural goods and services in the absence of market prices to allow direct comparison with financial performance and appraisal of potential profit at risk. By applying valuation, the impacts are more aligned with the Cradle to Cradle philosophy, placing the impacts into context, for example by accounting for scarcity of water in the region it is consumed and the localized impacts of air pollution at the point at which it is emitted.

Valuations were derived from academic journals, government studies and established environmental economics techniques. The way in which these are applied depends on the environmental indicator. Greenhouse gases, for example, have the same impact wherever they are emitted. Values for other pollutants and water use depend on local biophysical and human geography, and so require a technique called benefit transfer to apply a value estimated in one location to another.

METHODOLOGY OVERVIEW

For the social and business evaluations, qualitative interviews were carried out to determine company trends and patterns that had been noted, but not evidenced through quantitative data. These took into account the staff and customer feedback, media responses and other anecdotal evidence of impact.

RESEARCH FINDINGS

This report demonstrates the business, social and environmental benefits for Steelcase of continued optimization of products under the *Cradle to Cradle Certified Product Standard*.

In 2011, Steelcase achieved *Cradle to Cradle Certified SILVER* for version 2.1.1 of the standard for the Node chair (with work surface). A SILVER level product certified under Version 2.1.1 has 95% or greater of the materials that are present in the product at a concentration of 100 ppm assessed. Assessment includes identifying chemical ingredients, assessing their risk and recyclability, and ensuring strategies are in place to phase out any problematic chemicals apparent. All materials have been characterized as either a part of the biological or technical cycle, with a material reutilization score of greater than 50 (see material reutilization below), and energy requirements for production have been characterized, with a strategy developed for using solar income for product manufacture.

Trucost compared the environmental, social and business impacts of the Node chair, with the non-certified hypothetical chair which could have been produced had Steelcase not incorporated *Cradle to Cradle Certified Products Standard* requirements.

The results show Node:

- Without toxic banned inputs has an 25% better defined material input than a PVC equivalent,
- Has better sourcing of energy from cleaner fuel mix.
- Has saved almost 2 gallons of water consumption per chair

FIGURE 6: PRODUCT SCORECARD



**NODE™ CHAIR
STEELCASE, INC.**

Certification Standard Version 2.1.1
Renewal date 04 January 2015

SILVER	BASIC	BRONZE	SILVER	GOLD	PLATINUM
	Material Health				
	Material Reutilization				
	Renewable Energy				
	Water Stewardship				
	Social Fairness				

RESEARCH FINDINGS



MATERIAL HEALTH

Product ingredients are inventoried throughout the supply chain and evaluated for impact on human and environmental health according to the Material Health Assessment Methodology for the Cradle to Cradle Certified Product Standard⁵. The criteria at each level build towards the expectation of eliminating all toxic and unidentified chemicals and becoming nutrients for a safe, continuous cycle.

Toxic product materials contribute to irreversible environmental costs such as biodiversity loss and human health damage including cancer, endocrine or hormonal disturbances and respiratory diseases. They may also inhibit opportunities to recycle product materials at the end of their typical use leading to toxic waste costs to our land, oceans and biodiversity. Permanently removing toxic materials from products means safer materials for nature, human well-being and future product manufacturing.

The material health quality category gives a material health ‘rating’ to each material in the product, based upon robust analysis of toxicity including consideration of both the hazard and the risk associated with their relative routes of exposure during the intended (and likely unintended) use and end-of-use product phases. Other material specific factors are also included such as recyclability or biodegradability. A description of these ratings is given in table 1.

TABLE 1: MATERIAL HEALTH RATING DESCRIPTION

Material assessment ratings	Explanation
A (Green)	The material is ideal from a Cradle to Cradle perspective for the product in question.
B (Green)	The material largely supports Cradle to Cradle objectives for the product.
C (Yellow)	Moderately problematic properties of the material in terms of quality from a Cradle to Cradle perspective are traced back to the ingredient. The material is still acceptable for use.
X (Red)	Highly problematic properties of the material in terms of quality from a Cradle to Cradle perspective are traced back to the ingredient. The optimization of the product requires phasing out this ingredient or material.
Grey	This material cannot be fully assessed due to either lack of complete ingredient formulation, or lack of toxicological information for one or more ingredients.
Banned	This material contains one or more substances from the Banned list and cannot be used in a certified product.

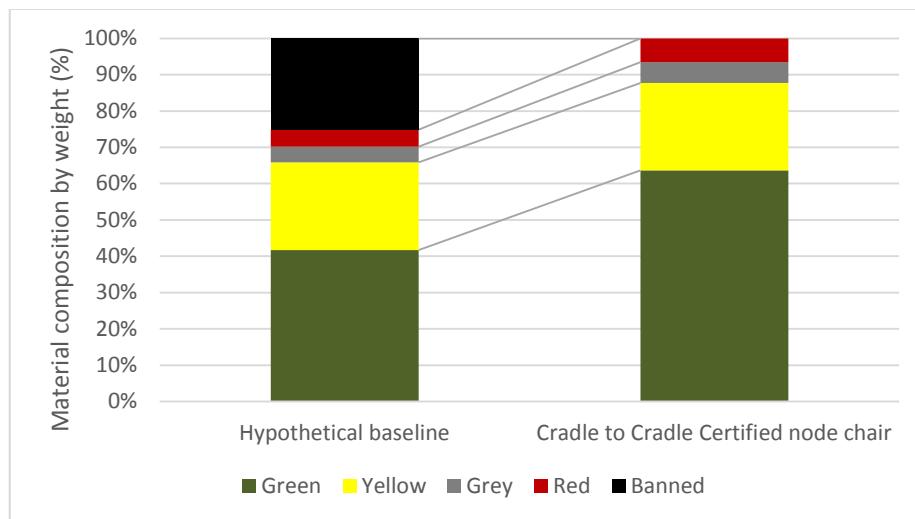
The Steelcase Node currently achieves *Cradle to Cradle Certified SILVER* for the material health quality category, meaning that 95% or greater of the ingredients by weight are identified down to 100ppm level, and all materials

⁵http://www.c2ccertified.org/images/uploads/C2CCertified_Material_Health_Methodology_121112.pdf

RESEARCH FINDINGS

are assessed based on their intended use and impact on human and environmental health.

FIGURE 7: MATERIAL HEALTH OPTIMIZATION



The principal material compositional difference between the hypothetical baseline Node chair and the *Cradle to Cradle Certified* Node chair is the substitution of Polyvinyl chloride (PVC) with polypropylene (PP). PVC makes up 25% of the product weight and is banned under the *Cradle to Cradle Certified* Product Standard, and as such, the hypothetical product would not have been suitable for certification. Node also comprises 22% greater proportion of 'B' rated materials, largely supporting Cradle to Cradle objectives for the product. Optimization is on-going for the remaining 'X' rated materials. By ensuring material inputs are safe, they are suitable for continued cycling within the technosphere, to be retained as nutrients and inputs into new products.

Monetization of the material health assessment offers opportunity for greater understanding of the impact on human well-being, but requires more granular data and further development of an appropriate methodology that is reflective of Cradle to Cradle principles. An LCA approach is not sufficient due to less focus on toxicity within LCA's than in a Cradle to Cradle context. Even when considering valuation, which brings in a localized relevance (a criticism of LCA for Cradle to Cradle purposes), further work is required to ensure all Cradle to Cradle aspects are captured.

MATERIAL REUTILIZATION



Products are designed either to biodegrade safely or be compostable as a biological nutrient or to be recycled into new products as a technical nutrient. At each level continued progress must be made towards increasing the recovery of materials and keeping them in continuous cycles.

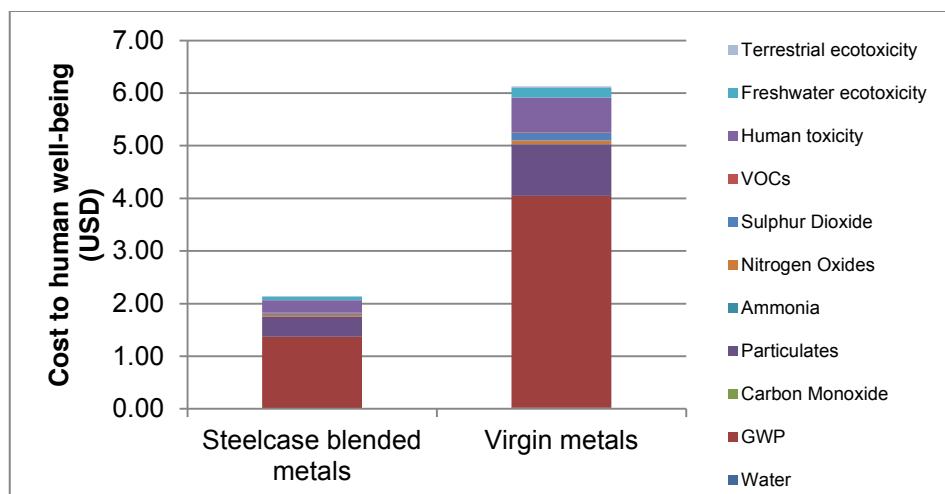
Designing biodegradable or re-useable product materials, and ensuring effective systems for recovering those materials, protects diminishing natural resources by eliminating resource loss and disposal. It also avoids adverse health and other social impacts arising from landfill or incinerated waste disposal, and provides opportunities for business to re-use or re-market product materials at the end-of-use to generate new revenue streams and improve profitability.

RESEARCH FINDINGS

Steelcase's Node is defined as a technical nutrient due to its high content of recyclable metal alloys (steel and aluminum) as well as a number of recyclable plastics (ABS/polycarbonate, Nylon-6, and polypropylene). The tripod, base, and work surface are easily separable using common hand tools. As a percentage of total product, 72% of the chair is recyclable, and 13% of the materials are from recycled content – giving the Node chair a material reutilization score of 52 and achieving *Cradle to Cradle Certified SILVER* for material reutilization.

The Node chair consists of partially recycled steel (30%) and aluminum (65%). By using metals that consist partially of recycled material rather than virgin steel and aluminum, human well-being is improved by 65%. The cost to human well-being of virgin steel and aluminum in 2012 would account for 54% of the overall impact, compared to 19% when using a blend of recycled and virgin metals. The baseline and certified products are both constructed using partially recycled metals, and figure 6 is given as reference.

FIGURE 8: STEELCASE BLENDED METAL COST TO HUMAN WELL-BEING COMPARED TO VIRGIN METAL



These metals, as well as a number of plastics (such as Nylon-6 and polypropylene) are recyclable. The Steelcase Node chair is easily separable and comes with instructions on how to dismantle it. At end-of-use, Steelcase helps businesses find recovery solutions, with options ranging from refurbishing and resale, to charitable considerations or recycling. USA specific municipal waste routes have been used for end-of-use calculations for the purposes of this study; however, due to the ease of separating individual materials, customer instructions and end-of-use assistance from Steelcase, recycling rates may be higher.

RENEWABLE ENERGY AND CARBON MANAGEMENT



Cradle to Cradle envisions a future in which industry and commerce positively impact the energy supply, ecosystem balance, and community. This is a future powered by current solar income and built on circular material flows. The renewable energy and carbon management category is a combination of these core principles of Cradle to Cradle design. The category requirements at each level of certification build towards the expectation of carbon neutrality and powering all operations with 100% renewable energy.

RESEARCH FINDINGS

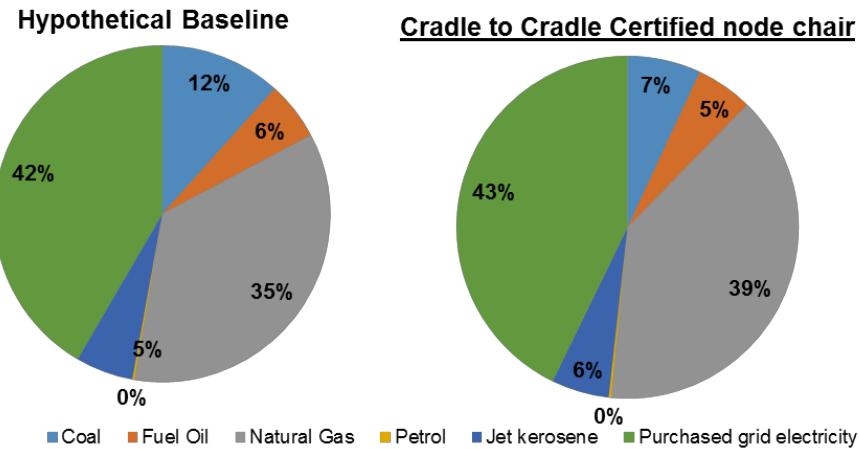
Renewable energy provides a myriad of environmental and social benefits, including avoided air pollution and climate change impacts, alongside decreased dependency on finite fossil fuel resources. It also provides business benefits from reduced risk exposure to volatile energy prices and intensifying 'polluter pays' regulatory costs.

In 2008, Steelcase made a notable investment in renewable energy and made a 5 year commitment to purchase all the renewable energy credits (RECs) produced by a new 10 megawatt wind farm. This investment before the plant was built, and as a sole sponsor of the farm, allowed construction to go ahead and presented Steelcase with the naming rights to the farm. At the time of analysis, this accounted for 25% of total electricity consumption.

Since analysis, in March 2014, the renewable energy commitment was increased, with investment in RECs equivalent to 100% of its global electricity consumption. This long-term commitment makes Steelcase the 15th largest 100% renewable energy purchaser in the United States according to the U.S. EPA's Green Power Partnership. The portfolio of RECs is purchased from newer projects and non-emitting sources like wind and hydroelectric energy in North America and Europe.

A change in the fuel mix between the 2011 and 2012 has resulted in a reduction in the environmental cost associated with energy use. Prior to optimization, 12% of the energy was being provided by coal and 6% by fuel oil. In 2012, both of these contributions were reduced and replaced predominantly with natural gas consumption.

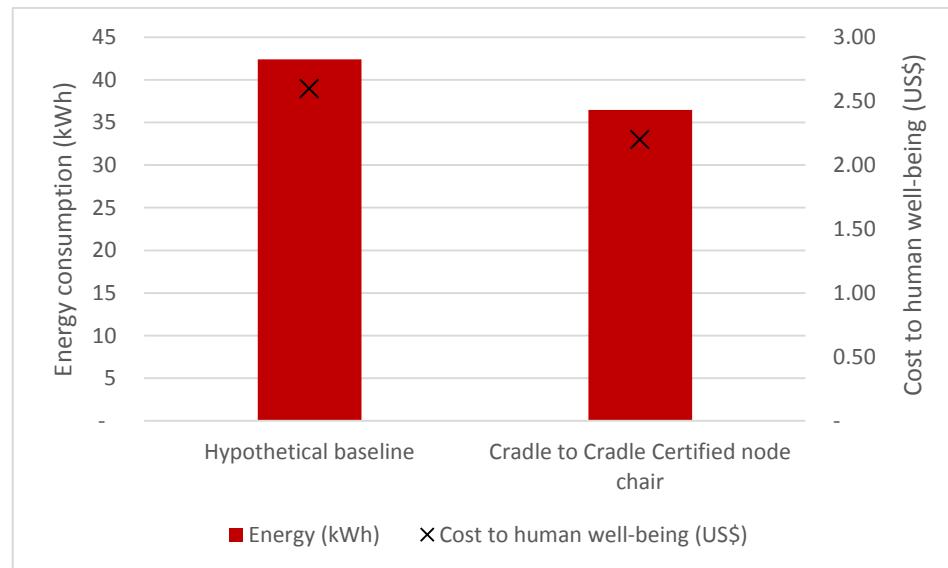
FIGURE 9: STEELCASE ENERGY SUPPLY BY FUEL TYPE FOR THE NODE CHAIR



Natural gas emits approximately 203 gCO₂e per kWh and has significantly lower GHG emissions than both coal and fuel oil. Steelcase is currently exploring energy efficiency and alternative energy sources corporation-wide and the policy put in place to do this satisfies the requirements for SILVER level for the renewable energy and carbon management. The cost to human well-being of the operational energy requirements for the Node chair shows that through this switch in fuel mix, Steelcase has achieved a reduction in cost to human well-being of \$0.40 per product.

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FIGURE 10: OPERATIONAL ENERGY CONSUMPTION PER CHAIR



In 2012, total production of *Cradle to Cradle Certified SILVER* Node chairs provided a reduction in cost to human well-being of US\$ 14,250 to human well-being, through lower greenhouse gas emissions and detrimental impacts to human health.

Alongside sourcing of renewable fuels and RECs, Steelcase is also focused on identifying innovative ways to build the energy efficiency into its products and operations, and to help customers optimize their own real estate and energy use. Further to this, Steelcase has created a program to encourage the company's suppliers to also purchase clean RECs from new wind energy facilities that came online in 2011 or later. Those partners choosing to participate will benefit from Steelcase's volume discount pricing.



WATER STEWARDSHIP

Processes are designed to regard water as a precious resource for all living things. At each level, progress is made towards cleaning up effluent and process-water to drinking water standards.

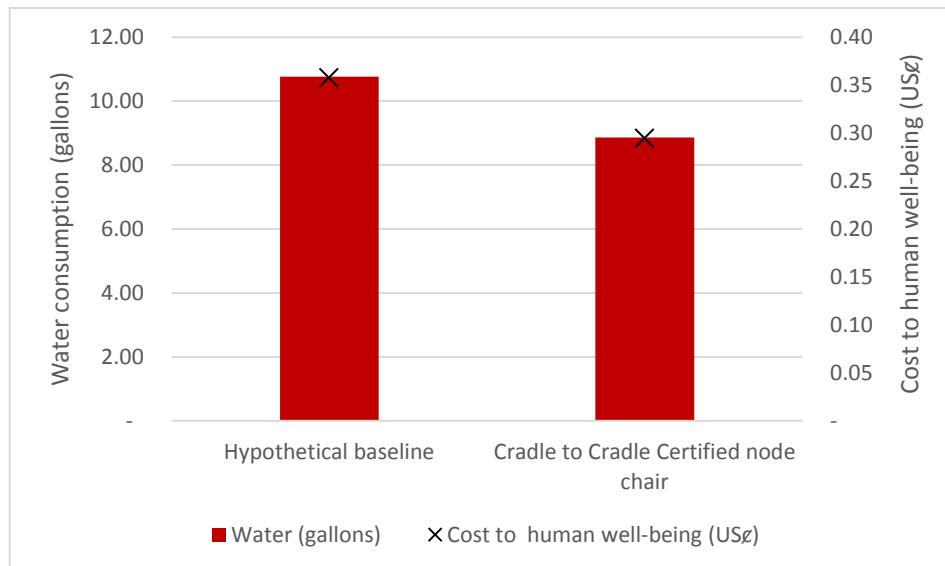
Water conservation and protection provide vital social and environmental benefits including sustenance and climate regulation, as well as underpinning essential business inputs.

As part of its certification, Steelcase's Node chair supplier adopted the "Water Management Principles of the Minister of Water, Land, and Air Protections from the Government of British Columbia" as a set of guidelines for protecting and preserving the quality and supply of water resources. These principles help illustrate strategies for protecting and preserving the quality and supply of water resources.

This has helped the Node chair achieve *Cradle to Cradle Certified SILVER* level for its water stewardship category. During the direct operational stage of the product phases, the certified Steelcase chair consumes less water than its hypothetical baseline counterpart - saving nearly 2 gallons per unit of product.

RESEARCH FINDINGS

FIGURE 11: OPERATIONAL WATER CONSUMPTION



In 2012, over 35,800 Node chairs were produced by Steelcase, resulting in approximately 68,000 gallons of water saved compared to the hypothetical baseline production. This is equivalent to nearly 1,000 bath tubs of water⁶! To place this in a customer context, Node chairs are educational seating, and an example lecture room may contain 40 Node chairs. A room equipped with this many *Cradle to Cradle Certified* Node chairs would reduce water consumption by 76 gallons, equivalent to 1,150 glasses of water⁷.

SOCIAL FAIRNESS



Social
Fairness

Company operations are designed to celebrate all people and natural systems and progress is made towards having a wholly beneficial impact on people and the planet.

Adhering to robust social fairness principles helps companies to provide healthy and safe working environments for employees and suppliers thereby maintaining a happy workforce, reducing sick days and improving performance. The *Cradle to Cradle Certified* Products Program inspires a best practice approach to social fairness that goes beyond simply avoiding human rights violations to supporting employees and suppliers in their everyday working and personal environments.

Steelcase achieved *Cradle to Cradle Certified SILVER* for its social fairness. It does not manufacture the Node chair (though it does manufacture other Steelcase products), and therefore the final point of manufacture (the Tier 1 manufacturer, Ventura Manufacturing Inc) is taken into consideration for review. Ventura Manufacturing Inc is also based in the USA and adheres to *Cradle to Cradle Certified* quality requirements. For a company to achieve *Cradle to Cradle Certified SILVER* for social fairness, corporate ethics and fair

⁶ The average bath requires 70 gallons of water according to the US EPA (2013) Water Education and Training <http://water.epa.gov/learn/>

⁷ Based on a 300ml glass tumbler

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labor statement(s) must be made publicly available and adopted across the entire company.

The final point of manufacture was mapped to the Social Hotspots Database, a tool for risk characterization mapping of social risks in different sectors specific to the region of operation. The results for the sector of manufacturing (not elsewhere classified) in the USA are given in the table below.

TABLE 2: SOCIAL HOTSPOTS SECTOR-REGION MAPPING

Social Hotspots index risk				
Community infrastructure	Governance	Health and Safety	Human Rights	Labor rights
6	5	30	7	18

Health and safety is apparent as the most significant risk for the sector-region. This is typical across all manufacturing (not elsewhere classified) in the USA according to the SHdb. The 5 risk categories are scored against a potential score of 100 per category, giving a total maximum risk of 500 for a sector region. Three categories score less than 10% risk for manufacturing in the USA. Though not a requirement for v2.1.1 of the certification standard, reflecting on social risks allows the company activity to be placed in context, and where necessary, can be used in the future to help focus further social optimization.

Ventura Manufacturing Inc has adopted the "Principles of the UN Global Compact: A Pledge for Social Responsibility and Corporate Ethics". This statement addresses fair employment practices, operating principles, diversity, business ethics, and conduct. This extends as far as the provision of safe and healthy working environments, the most significant social risk highlighted within the SHdb for the sector-region.

Several Steelcase manufacturing facilities are registered under Occupational Health and Safety (OHSAS) 18001, further strengthening protection against 'typical' risks of the sector according to the SHdb.

In addition to initiatives directly relating to the workforce, Steelcase have numerous social activities to help meet its wider aim of social value creation. Examples include community projects which encourage community growth, promote life-long learning, harbor cultural acceptance, advance arts and cultural heritage and create positive environmental contributions.

Other initiatives are more philanthropic, such as the Steelcase Foundation. Steelcase supports the Foundation's efforts to provide grants to non-profit organizations, projects and programs, focusing on the areas of human service, health, education, community development, the arts and the environment – giving particular concern to people who are disadvantaged, disabled, young and elderly as they attempt to improve the quality of their lives.

Social fairness includes many qualitative trends and quantification is not appropriate for many of the benefits recognized through *Cradle to Cradle Certified* product certification. Monetization is applied to social costs of natural capital impacts, but not currently applied to social capital impacts, and future opportunity could exist in incorporating this for a single metric approach to quantification of certification impact.

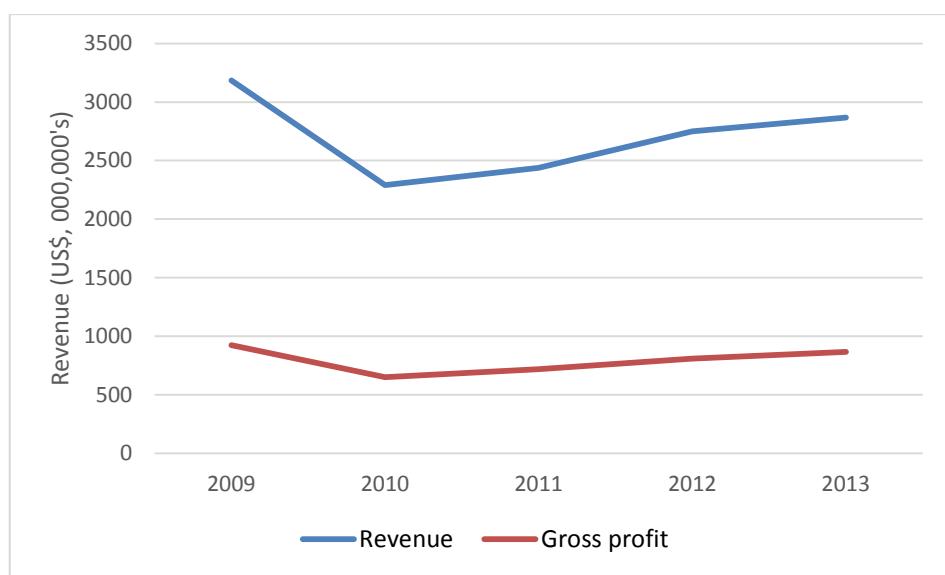
RESEARCH FINDINGS

BUSINESS IMPACTS

Business impacts were assessed by the Pilot Study to provide important economic context to the research findings.

Steelcase has seen fluctuating sales over recent years, influenced largely by the economic crisis. Outside of a slump between 2008 and 2010, sales have shown strong growth. The Node chair launch in 2010 accompanied a strong sales period for the company. Growth of 13% was seen between 2011 and 2012 (figure 12). The years prior to certification are included to provide context for the sales patterns apparent and to help identify the trends in place external to certification.

FIGURE 12: STEELCASE PROFIT AND REVENUE FOLLOWING NODE CERTIFICATION



The drive for *Cradle to Cradle Certified* products within building standards have been reflected in consumer demand and Steelcase has seen a growth in customers requesting or specifying certified products. For example, the US Green Business Council offers project teams using *Cradle to Cradle Certified* products additional credits in LEED v4, a green building rating system for the construction industry. This draws opportunity for increased customer base, as well as strengthening sales in an already developed and competitive market. There has also been particular demand around chemicals of concern with many customers developing their own restricted substances list (RSL). Customers are increasingly demanding transparency from their suppliers, which is consistent with what the *Cradle to Cradle Certified* Product Standard demands and demonstrates.

By incorporating Cradle to Cradle thinking and product certification into its portfolio, Steelcase has been able to answer customer questions and preferences, all while providing a high-quality, certified product – without an increase in price to the customer. Steelcase includes a listing of environmental certifications, including *Cradle to Cradle Certified*, in its product brochures and web pages. The *Cradle to Cradle Certified* award is also posted on its website for certified products.

Companies' business performance will be negatively affected should legislation, taxes, or other factors result in payment of these external costs

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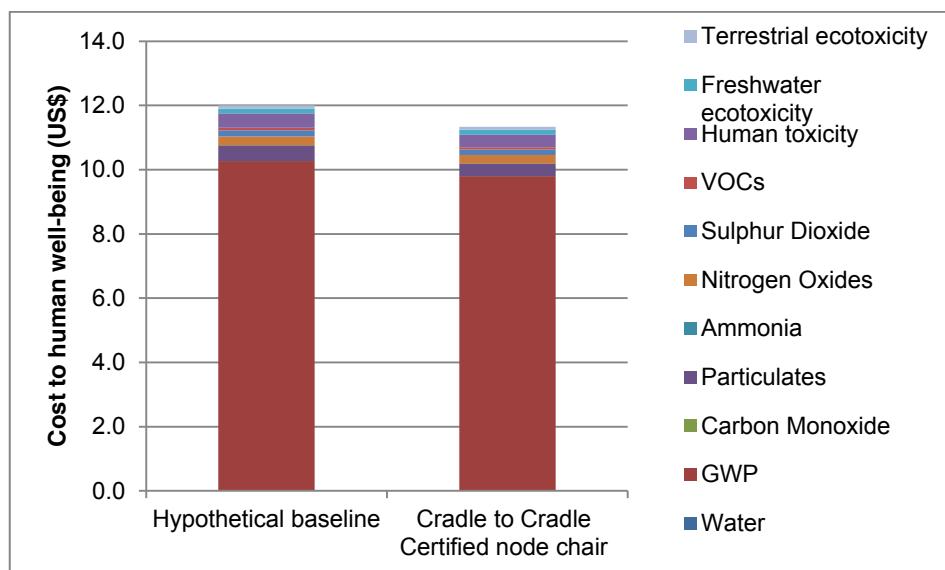
(internalization). Through the optimization steps taken by Steelcase, and reduced cost to human well-being, Steelcase is considered to benefit from reduced risk through improved environmental and social performance lowering dependency on natural capital.

NET BENEFIT TO HUMAN WELL-BEING

Combined valuation of impact on human well-being was quantified by aggregating the total impacts for each stage of the product cycle.

The Node chair has shown significant improvement to human well-being, through reduced environmental cost of US\$0.66 per chair, a reduction of 5.5% in comparison to the hypothetical baseline. When considered across the production of Node chair in 2012, this equates to a reduced cost to human well-being of US\$ 23,600.

FIGURE 13: COMPARATIVE IMPACT TO HUMAN WELL-BEING



The most significant environmental cost reduction is due to the global warming potential (GWP) associated with the GHG emissions largely from within the supply chain. It is important to note that the valuation captures the social costs of environmental impacts, but does not capture material health which may further increase the benefit.

The valuation of natural capital is currently not recognized in the market; however, increased resource demand and growing pressure on natural capital may lead to future internalization of these costs. Natural capital dependency has been linked to corporate risk; with the value of nature becoming increasingly visible as environmental events impact resource availability and lead directly to lower profitability (see the 2012 TEEB report for examples).

Companies' business performance will be negatively affected should legislation, taxes, or other factors result in payment of these external costs. Through the optimization steps taken by Steelcase, and reduced cost to human well-being, Steelcase is considered to benefit from reduced risk through improved environmental and social performance lowering dependency on natural capital.

CONCLUSIONS

"The only way to provide the best products is to ensure they are the best products for the planet."

Tammy Ayers,
Manager,
Materials
Chemistry
Strategy &
Practice, Global
Environmental
Sustainability at
Steelcase

The pilot study determined that the Steelcase Node chair is associated with reduced cost to human well-being as compared to a hypothetical non-certified PVC equivalent. Multiple benefits were apparent across the three impact fields of business, society and the environment.

Steelcase chose to pursue the *Cradle to Cradle Certified Products Program* early on as the certification aligns with the company's core strategy to achieve 'insight-led performance'. Steelcase sees *Cradle to Cradle Certified* as the only certification of its kind, and believes it is reflective of the company's commitment to materials chemistry and to embedding the Cradle to Cradle principles in its product designs.

"The certification is seen as an important element of the sustainability leadership that Steelcase is investing in and aspiring to, as well as a way to give customers assurance that Steelcase acts on its claims and that the sustainability assertions made are legitimate." Tammy Ayers, Manager, Materials Chemistry Strategy & Practice, Global Environmental Sustainability at Steelcase

Involvement in the *Cradle to Cradle Certified Products Program* has been a driver for Steelcase for increased innovation. This has particularly helped focus innovation to meet the needs of its customers. It has also helped Steelcase ensure more products are chemically tested and optimized, minimizing negative impact on the planet and society, but also increasing the number of innovations that now permeate products and operations. The phasing out of PVC and replacement with polypropylene has created safer and more recyclable products.

In addition to aligning with corporate strategy, insights, and goals, customer demand has been a growing driver for Steelcase to produce *Cradle to Cradle Certified* products. The company has seen an increase in sustainability specifications from customers, particularly around chemicals of concern with many customers developing their own restricted substances list (RSL). Consumers are also increasingly demanding transparency from their suppliers, which is consistent with what the *Cradle to Cradle Certified Product Standard* demands and demonstrates. The US Green Building Council is now offering points for use of *Cradle to Cradle Certified* products in version 4 of the LEED program, which has also been beneficial for Steelcase by driving customer demand.

Although challenging, Steelcase has seen significant benefits in adopting the *Cradle to Cradle Certified Product Standard*. From a product stand-point, for example, it drives innovation among product engineers and developers.

"What might begin as lofty goals, such as 'designing the world's most sustainable chair' become achievable as employees take up the challenge and innovate through this lens." Tammy Ayers, Manager, Materials Chemistry Strategy & Practice, Global Environmental Sustainability at Steelcase

Steelcase originally took the initiative to certify certain inputs upfront and have witnessed a trickle through of this commitment to its suppliers who have since taken on the initiative independently.

To further improve the continued cycling of nutrients to the technosphere, Steelcase was an early leader in devising a take back program. It is continuously developing mechanisms to expand the program to eventually achieve a closed loop system. The company's Phase 2 Program was inspired by *Cradle to Cradle Certified* thinking. Through it, Steelcase consultants work with customers when they no longer require the product and assist in selling used furniture on the open market, identifying a charity, non-profit

CONCLUSIONS

"The certification is seen as an important element of the sustainability leadership that Steelcase is investing in and aspiring to"

Tammy Ayers,
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Sustainability at
Steelcase

organization or alternate customer location that could make use of the furniture, and otherwise somewhere that is able to recycle and refurbish items. All solutions aim to minimize transport of the furniture in order avoid increased emissions.

In 2008, Steelcase made a notable investment in renewable energy and made a 5 year commitment to purchase all the renewable energy credits (RECs) produced by a new 10 megawatt wind farm. At the time of analysis, this accounted for 25% of total electricity consumption.

Since analysis, in March 2014, the renewable energy commitment was increased, with investment in RECs equivalent to 100% of its global electricity consumption. This is a long-term commitment and makes Steelcase the 15th largest 100% renewable energy purchaser in the United States according to the U.S. EPA's Green Power Partnership. Due to improved energy sourcing and intensity per product unit, and a reduction in water consumption between comparison years, operational environmental costs have improved. The direct operational impacts associated with the production of the Node chair has environmental cost of 32% less than a PVC alternative product.

The analysis also provides visibility to the products' biggest impacts to better inform material elimination efforts and strategies. One of the significant values in creating *Cradle to Cradle Certified* products is the program's time-bound nature, which encourages the company to continue evolving through the program, meeting milestone steps in product innovation, organizational efficiency, and designing with sustainability in mind. These are elements already important to Steelcase, and are enhanced when partnered with the *Cradle to Cradle Certified* Products Program's goal of optimizing human and environmental health.

Steelcase embraces the concept of Cradle to Cradle as part of its own sustainability strategy and highlights it on certified product brochures.

"The only way to provide the best products in the world is to ensure they are the best products for the planet. Cradle to Cradle Certified is viewed as a means to validate the progress made with our sustainability goals, and provide evidence for the promises made to our customers". Tammy Ayers, Manager, Materials Chemistry Strategy & Practice, Global Environmental Sustainability at Steelcase

ASSUMPTIONS

ASSUMPTIONS AND DATA GAPS

Details of the key assumption and limitations of the study are summarized below. These assumptions primarily relate to the environmental aspect of the study as this is where significant data analysis has been possible.

- The burden of collecting, sorting and pelletizing is presumed to be the same for all recycled plastics.
- Direct impacts include energy, waste and water abstraction data provided by the company.
- For outbound transportation an average distance from Michigan to the midpoint U.S. was applied.
- End-of-use statistics were based on US solid waste data.

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