

# PILOT STUDY

IMPACTS OF THE CRADLE TO CRADLE CERTIFIED PRODUCTS PROGRAM

Van Houtum 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](http://www.c2ccertified.org/impact):



**Roy Vercoulen** led the study on behalf of the Cradle to Cradle Products Innovation Institute. Please direct comments and questions to [roy@c2ccertified.org](mailto:roy@c2ccertified.org)

**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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**The Participating Companies:** AGC Glass Europe; Aveda; Construction Specialties; Desso; Ecover; Royal Mosa; Puma, Shaw Industries; Steelcase; and Van Houtum.



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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*<sup>™</sup> 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*<sup>™</sup> 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.

## 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 Van Houtum company narrative and product analysis of the *Cradle to Cradle Certified* SILVER Satino Black hand towel, compared to a conventional, non-certified paper towel sold by the company before optimization. This identifies and describes impact improvements in the fields of business, society and the environment, related to Van Houtum's pursuit of *Cradle to Cradle Certified* product certification.

An overview of the methodology is given on page 13 with a more detailed discussion of the approach available in the supporting [Technical Report](#). The research findings (page 18) 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, Van Houtum increased renewable energy sourcing, improved the safe and recyclable content of product inputs and improved social and environmental reporting practices.

## 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 revisions<sup>1</sup> 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 Board<sup>2</sup> (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](http://c2ccertified.org/product_certification/c2ccertified_product_standard)

Products are analyzed by Assessment Bodies<sup>3</sup> 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:

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<sup>1</sup> [http://www.c2ccertified.org/product\\_certification/revisions\\_to\\_the\\_standard](http://www.c2ccertified.org/product_certification/revisions_to_the_standard)

<sup>2</sup> 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](http://www.c2ccertified.org/product_certification/certification_standards_board)

<sup>3</sup> For detail of the Accredited Assessment Bodies see  
[http://www.c2ccertified.org/product\\_certification/accredited\\_assessment\\_bodies](http://www.c2ccertified.org/product_certification/accredited_assessment_bodies)

# THE PROGRAM



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



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



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



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



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



# 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

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

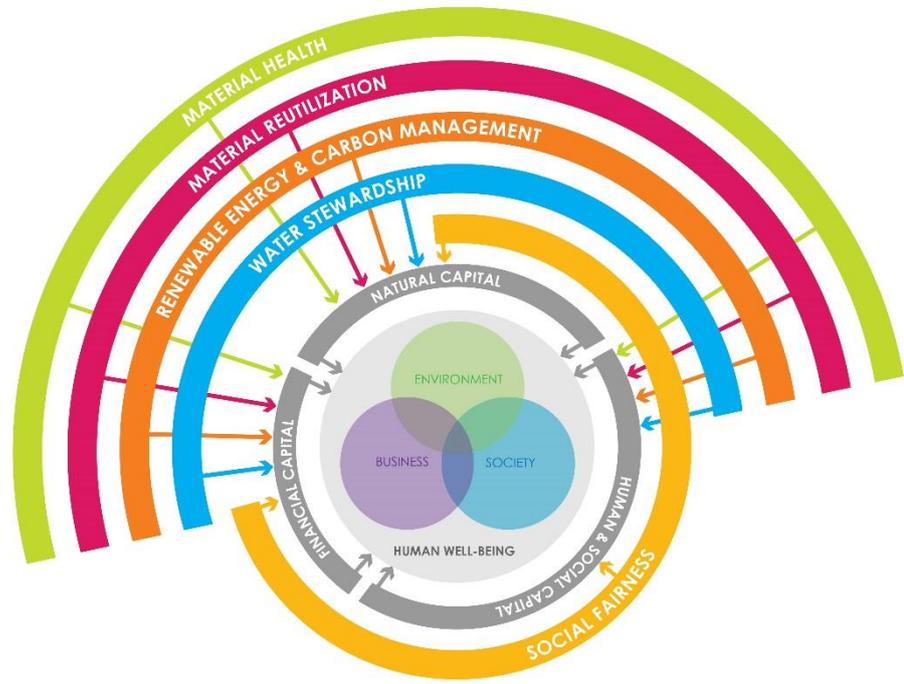
To capture the impacts of *Cradle to Cradle Certified* product certification, a conceptual framework was developed to highlight the impact areas that are affected through product optimization. Eco-effective products are considered to provide 'more good', delivering benefit to human well-being. Underpinning 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

Van Houtum is a family-owned Netherlands-based company which offers total solutions for toilet areas, from toilet paper to soap and mirrors and dispensers. Founded 75 years ago, it now counts 200 employees and has an annual turnover of over €60 million. The company has grown from manufacturing paper to complete washroom solutions across four quality lines: Satino Black, Premium, Comfort and Basic. The Satino Black line is *Cradle to Cradle Certified* BASIC to SILVER. The choice of the “black” color was a conscious decision: it is one of the few colors that can be produced in adherence to *Cradle to Cradle Certified* material health requirements, while still being considered ‘stylish’ by the company.

*“We have analysed our complete production process and all the materials we use in order to identify the associated effect on society and the environment and determine whether viable alternatives exist. The result is Satino Black, the world's first and only toilet paper and hand towels that are authorized to carry the Cradle to Cradle label.”* Van Houtum website

## THE PRODUCT

The product selected for analysis is the Satino Black hand paper towels based on study selection criteria<sup>4</sup>. First certified in 2010 the hand towels are *Cradle to Cradle Certified* SILVER under v2.1.1 of the standard. The towels are produced in Van Houtum’s own manufacturing facilities in the Netherlands, and distributed and sold principally in the Benelux region.

FIGURE 2: SATINO BLACK HAND TOWELS



The analysis focuses on a comparison of the current, *Cradle to Cradle Certified* SILVER Satino Black hand towel, and a hand towel previously sold by Van Houtum in 2008, prior to the optimization of chemical inputs, or steps taken to meet quality category requirements.

The basic product is similar, though some inputs and processes associated with it may have changed. The analysis includes the costs and benefits across the supply chain, direct operations, transport, use and end-of-use.

<sup>4</sup> 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.

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](http://www.c2ccertified.org/impact).

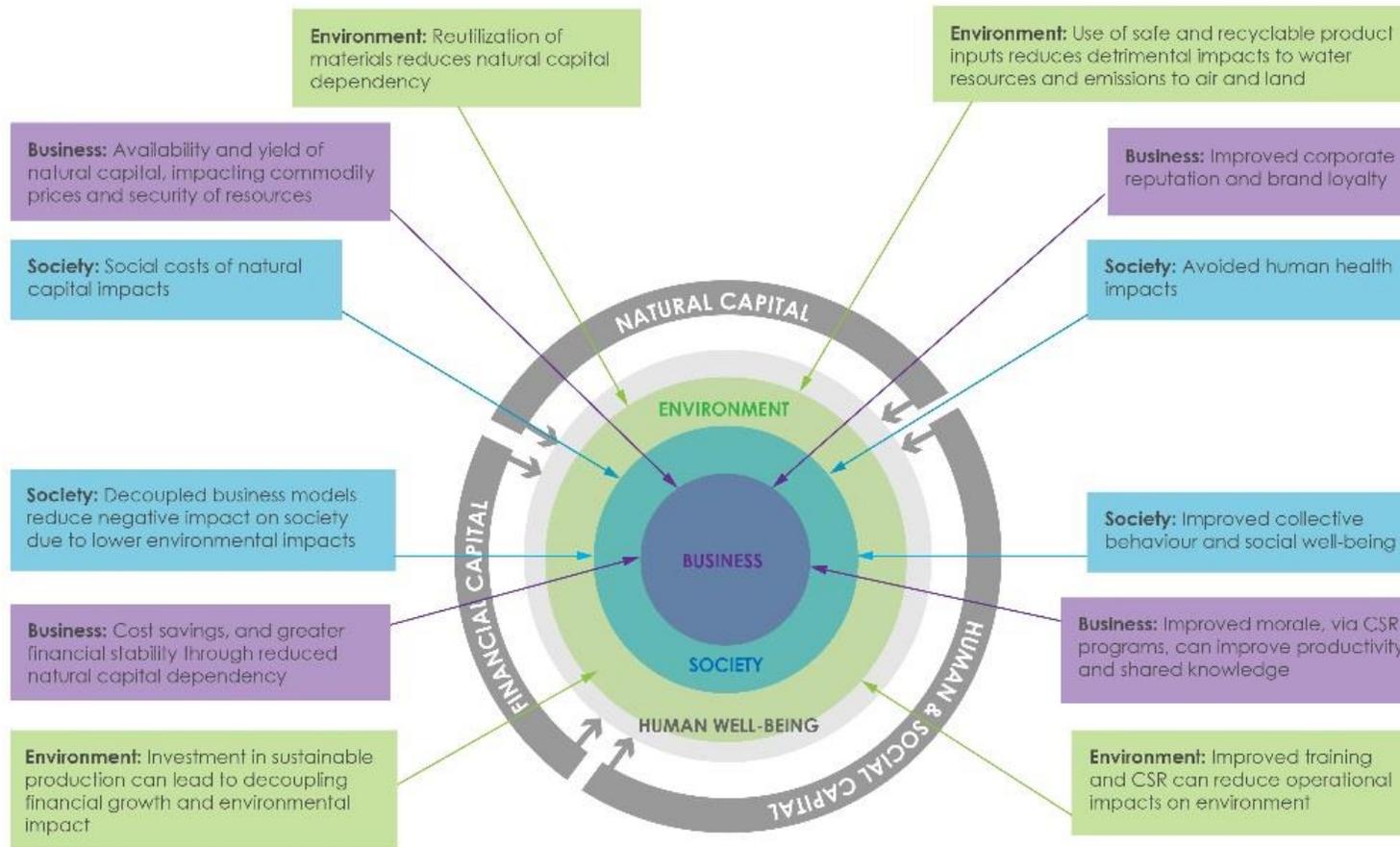
## APPROACH

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

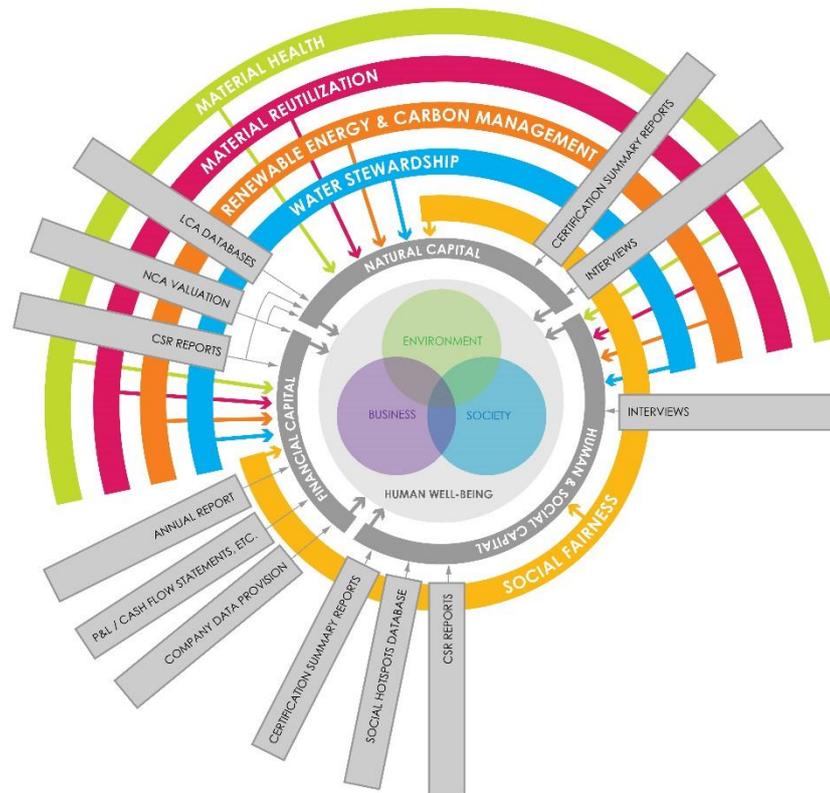


# METHODOLOGY OVERVIEW

Businesses operate within society, which is in turn 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



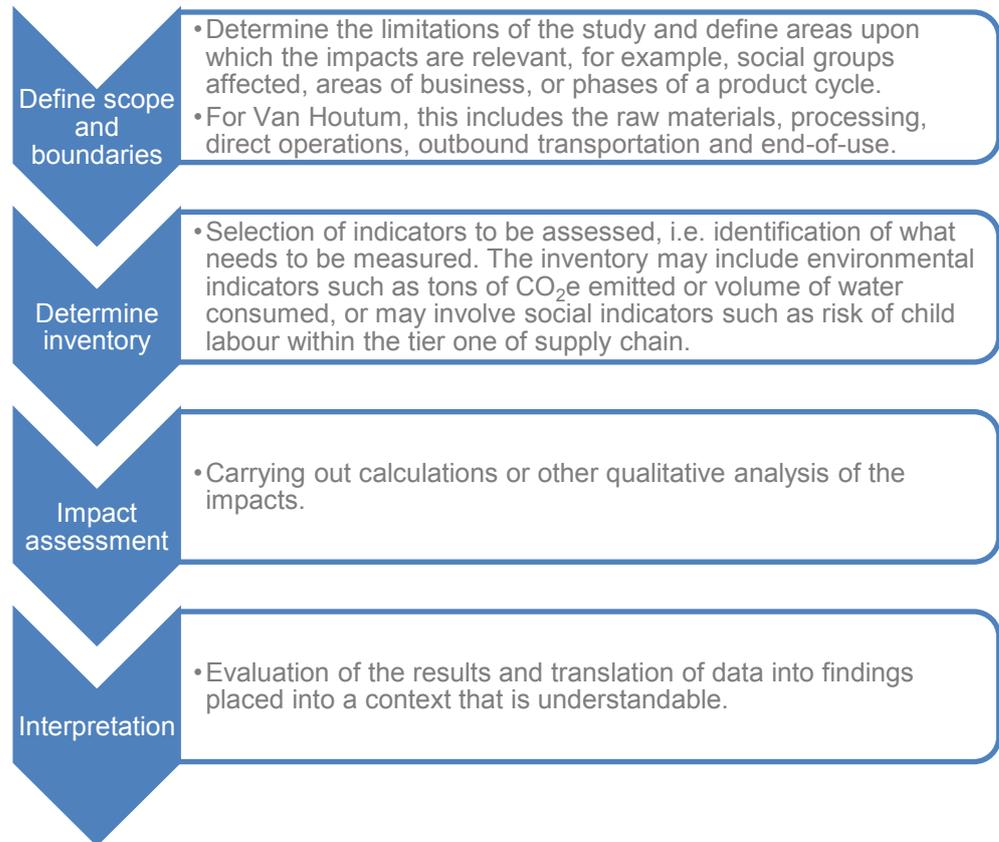
Firstly, the individual impacts associated directly with the manufacture, use and end-of-use of a particular product are compared to the equivalent product before optimization for certification. The second consideration applies to the wider context of the benefit to the company of having one or more *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.

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

# METHODOLOGY OVERVIEW

customer feedback, media responses and other anecdotal evidence of impact.

## KEY FINDINGS

This report demonstrates the business, social and environmental benefits of the *Cradle to Cradle Certified Product Standard* for Van Houtum.

Van Houtum achieved *Cradle to Cradle Certified SILVER* under version 2.1.1 of the standard for the Satino Black hand towels. A SILVER level product certified under Version 2.1.1 has at least 95% of the materials that are present in the product at a concentration of 100 ppm or greater assessed. Assessment includes identifying chemical ingredients, assessing their risk and recyclability, and ensuring strategies are in place to phase out any problematic chemicals. 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 Satino Black hand towels, with the non-certified hand towels previously produced by the company.

The results show that the optimization process has:

- Increased renewable energy use by 22%.
- Removed 'X' rated problematic inputs from the product and packaging, with 90% of non-paper inputs optimized to preferred materials.
- Improved reporting of social and environmental activities and the company has committed to the Social Charter of the European Council, the Global Sullivan Principles and the Global Compact Principles.

FIGURE 6: PRODUCT SCORECARD

 <b>SATINO BLACK HAND TOWELS VAN HOUTUM B.V.</b> Certification Standard Version 3.0						
<b>SILVER</b>		BASIC	BRONZE	SILVER	GOLD	PLATINUM
	Material Health			✓		
	Material Reutilization					✓
	Renewable Energy				✓	
	Water Stewardship				✓	
	Social Fairness				✓	



## 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 Standard<sup>5</sup>. 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.

<sup>5</sup>[http://www.c2ccertified.org/images/uploads/C2CCertified\\_Material\\_Health\\_Methodology\\_121112.pdf](http://www.c2ccertified.org/images/uploads/C2CCertified_Material_Health_Methodology_121112.pdf)

# RESEARCH FINDINGS

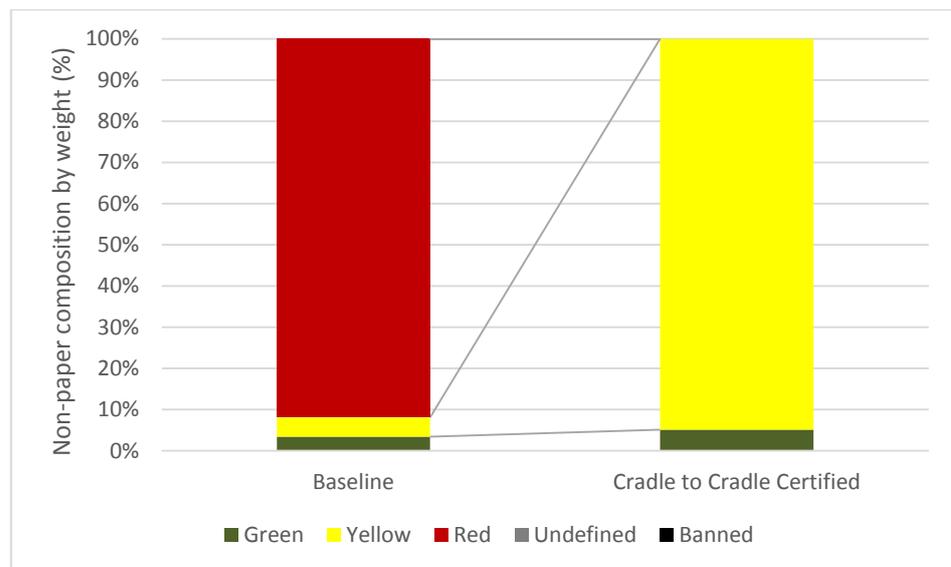
The Satino Black Hand towels achieve *Cradle to Cradle Certified* SILVER for the material health quality category. All materials have been assessed based on their intended use and impact on Human/Environmental Health, with a strategy developed to optimize all remaining problematic ingredients/materials.

Following initial analysis, three areas were particularly problematic, including the wet strength additives and trash catcher chemicals. The wet strength additive is a chemical used as an input in the production process to give paper strength when it is wet. After two years of collaboration with its suppliers, Van Houtum managed to produce a wet strength that is biodegradable.

Trash catcher chemicals are used to remove the glue present on waste paper that would otherwise contaminate the machines. Here again, Van Houtum worked with its suppliers to develop an alternative. One supplier was unable to change their product, so Van Houtum changed suppliers.

All 'X' rated chemicals are now removed from the product and packaging. The less acceptable materials are present in very small volumes, used in inks and color within the packaging only.

FIGURE 7: MATERIAL HEALTH OPTIMIZATION OF NON PAPER INPUTS



When considering the percentage contribution, 'X' rated inputs only contribute an almost trace weight of total product and the difference of composition is less apparent.

The paper-based products cannot currently achieve GOLD for material health, because of its use of recycled paper, which is too inconsistent to achieve the higher level under the *Cradle to Cradle Certified* Product Standard. Van Houtum does perform input analysis once or twice a year in order to measure the concentration of chemicals and metals in recycled paper, but due to a high variability in waste paper quality, this is not sufficient for the *Cradle to Cradle Certified* Product Standard. Van Houtum is in active discussion with the Institute to investigate solutions.

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.



## 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.*

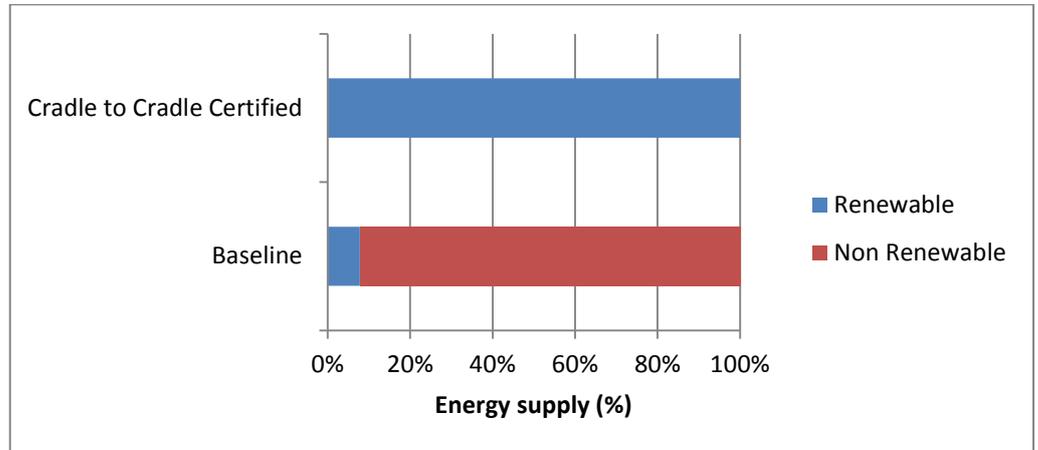
Renewable energy provides a myriad of environmental and social benefits, including avoided air pollution and climate change impacts, alongside decreased dependency on finite fossil fuel resources. It also provides business benefits from reduced risk exposure to volatile energy prices and intensifying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

Since certification, Van Houtum has implemented an ISO 50001 certified Energy Management System, and this has helped them achieve improved energy sourcing and less intensive production. Through energy management optimization, the Satino Black hand towels achieve GOLD level for renewable energy and carbon management.

Van Houtum provided company level energy consumption data, detailing the quantity of different fuel sources per year for the respective years of production before and after certification. Electricity data was given by source, and whether it was renewable or non-renewable. The quantity of energy per unit of product was calculated by determining the proportion of tons of Satino Black hand towels produced, over the total tonnage of production of all products at the site.

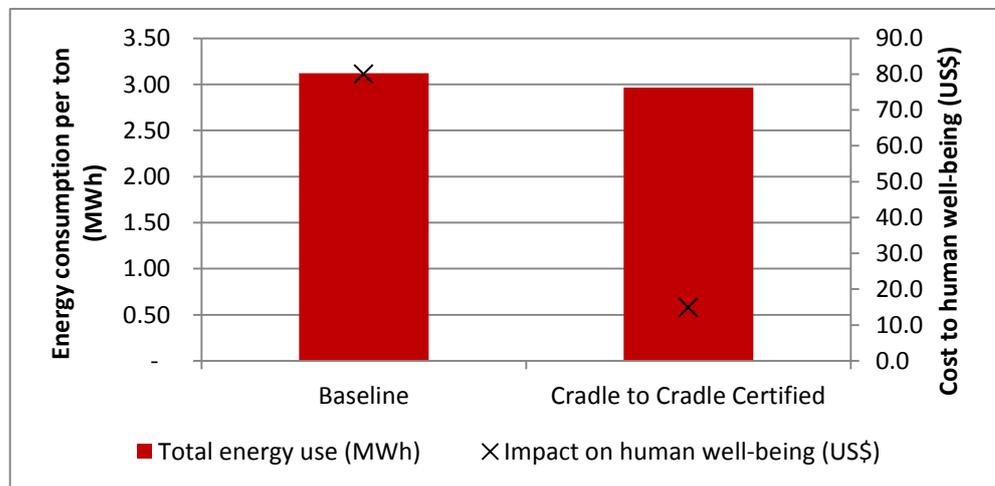
Consumption of renewable energy for manufacture of the hand towel increased from 8% in 2008 to 100% in 2012, sourcing both hydroelectricity and green gas in 2012 (allocated based on energy requirements of production of Satino Black hand towels). This offers cleaner energy in comparison to the non-certified production use of natural gas and a mix of renewable and non-renewable electricity.

FIGURE 8: PERCENTAGE RENEWABLE ENERGY USED IN PRODUCTION OF SATINO BLACK HAND TOWELS



The product is also produced with marginally less energy than previously, with 3.12 MWh required per ton of non-certified product, reduced to 2.96 MWh per ton in 2012 for the certified version. The cost to human well-being of energy use per ton of hand towels was valued, based on the indicators associated with energy generation and supply, and given in the figure below.

FIGURE 9: DIRECT ENERGY CONSUMPTION TO PRODUCE 1 TON OF HAND TOWELS



The cost to human well-being of the direct energy supply only per ton of hand towels has reduced from US\$80, to US\$15, a decrease of over 81%.



## 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.

Van Houtum has framed corporate social ethics in its sustainability report and publicly pledged to social commitments. The Satino Black hand towel was evaluated to meet the requirements for the SILVER level for the social fairness category.

Van Houtum manufactures in the Netherlands, sourcing from the Netherlands, Belgium and Germany for the majority of its supplies. The Social Hotspots Database (SHdb), a tool for risk characterization mapping of social risks in different sectors specific to the region of operation, was used to identify potential risks. The results for the sector of manufacturing (not elsewhere classified) in the Netherlands are given in Table 2. **Error! Reference source not found.** below.

TABLE 2: SOCIAL HOTSPOTS SECTOR-REGION MAPPING

Social Hotspots index risk				
Community infrastructure	Governance	Health and Safety	Human Rights	Labor rights
3	1	18	2	7

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 Netherlands 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 Netherlands. 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.

Van Houtum publishes an annual corporate social responsibility report, in which social practice is a key focus. It has committed itself to the Social Charter of the European Council, the Global Sullivan Principles and the Global Compact Principles, embracing values of human rights, non-discrimination, no forced or child labor, and anti-corruption amongst others.

The two sites operated by Van Houtum for product processing are both certified according to OHSAS 18001, ensuring they meet the minimum requirements for occupational health and safety management best practice. Sustainability reporting is undertaken following the Global Reporting Initiative (GRI) guidelines. Through the GRI reporting for a third party, alongside other social activity, Van Houtum has achieved GOLD for social fairness.



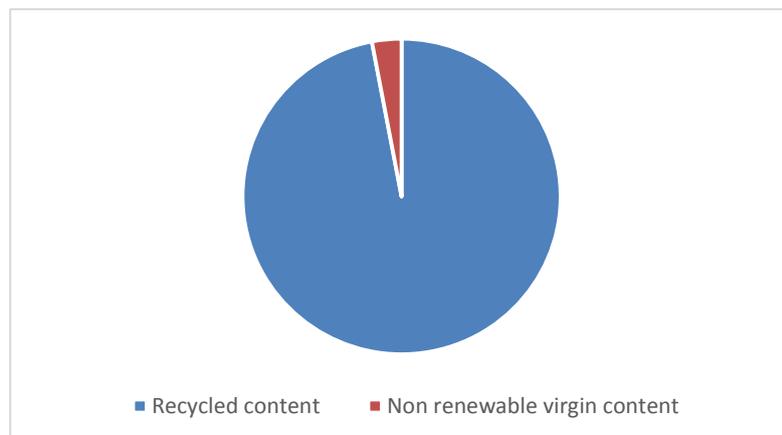
## MATERIAL REUTILIZATION

*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.

The Satino Black hand towels achieve PLATINUM level for material reutilization. Under v2.1.1 of the *Cradle to Cradle Certified Product Standard* a PLATINUM achieving product has been designed/manufactured for the technical or biological cycle and has a nutrient reutilization score  $\geq 80$ . The Satino Black hand towels are produced from 100% recycled content paper, 97% of which is post-consumer (this equates to 97% of the total content of the product produced from recycled content). The remaining 3% comprises the non-renewable chemical and glue inputs which are required for production.

FIGURE 10: RECYCLED CONTENT OF SATINO BLACK HAND TOWEL



Recycled content provides a credit, due to the displacement of virgin material required (therefore a net benefit of burdens of recycling and credits for displacement are quantified). The high percentage of recycled content within the Satino Black hand towels displaces the pulpwood that would otherwise be used for paper, and therefore the overall impact of the supply chain is beneficial – providing a benefit over the use of virgin materials

The hand towels are designed for the biological cycle, and are 99% biodegradable; however at end-of-use towels are generally included with conventional waste streams.

Van Houtum has developed a take back scheme with customers, developing contracts with those customers buying hand towels from the company, to use office waste paper from their in house use. The paper collection company transports the waste office paper to Van Houtum, and then this office paper is recycled to be used as an input into the hygienic paper, recapturing



nutrients for the technical cycle, to be used in production of new high value product.

## WATER STEWARDSHIP

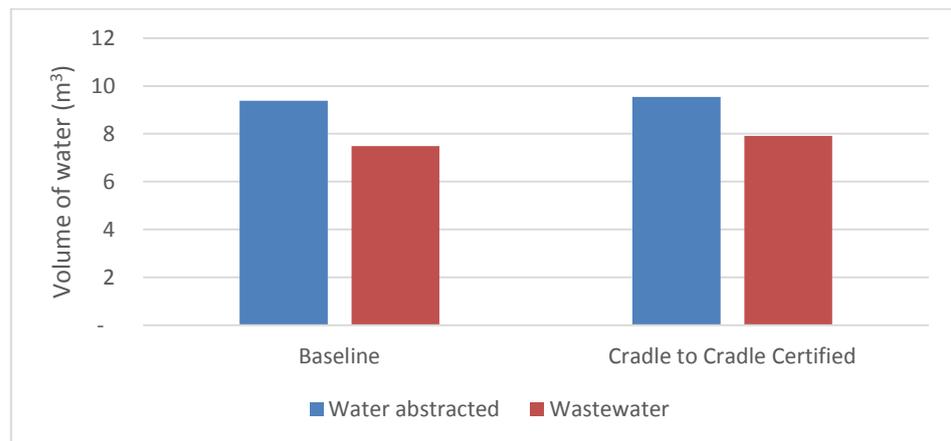
*Processes are designed to regard water as a precious resource for all living things. At each level, progress is made towards cleaning up effluent and process-water to drinking water standards.*

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

The Satino Black hand towels achieve *Cradle to Cradle Certified* GOLD for water stewardship. The water flows associated with the product have been characterized and the company has adopted the water principles.

The absolute footprint of water consumption and disposal has seen a small increase per ton of product, though only by 2%. This is not considered due to certification or change of practice. Water consumption is recorded at site level and allocated based on product weight, therefore specific cause of water increase is unclear.

**FIGURE 11: WATER AND WASTEWATER CONSUMPTION PER TON OF PRODUCT**

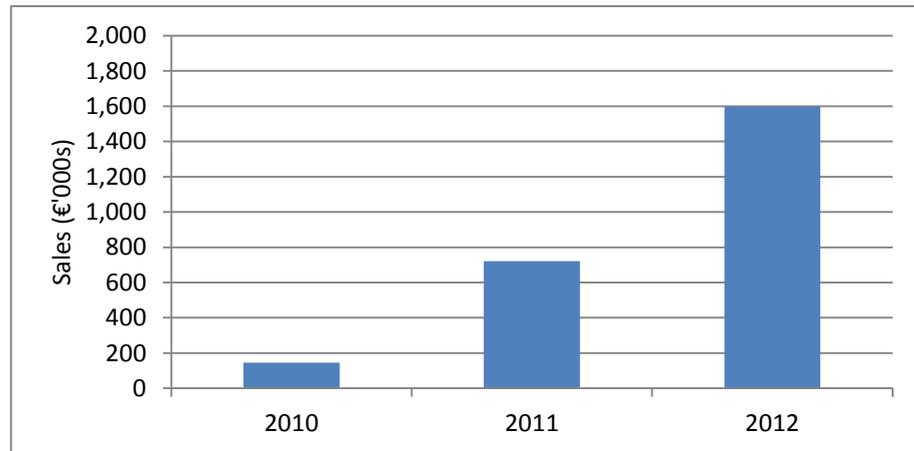


## BUSINESS IMPACTS

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

Sales data is sensitive and cannot be shared, but the general trend for Van Houtum has been positive since certification, against an industry trend which has fluctuated. **Error! Reference source not found.**<sup>2</sup> shows that Satino Black sales have almost tripled between 2011 and 2012, showing strong growth since launch in 2010.

FIGURE 12: SALES OF SATINO BLACK SINCE CERTIFICATION



Van Houtum considers *Cradle to Cradle Certified* to provide it with a competitive advantage. Van Houtum has benchmarked its *Cradle to Cradle Certified* products against the market leader and validated the data through an external party in order to be able to make the business and environmental case for its products.

*"The result in the business is absolutely positive. The whole approach has given us a unique, differentiating market position. It results in a healthy, stable growth of our Satino Black business. There is a crisis in our market place, but our Cradle to Cradle Certified Satino Black business is constantly growing."* Van Houtum: Innovation Stories

The *Cradle to Cradle Certified* Product Standard has also helped to drive companies down the supply chain to improve their sustainability. Suppliers are highly engaged and support the *Cradle to Cradle* concept. Suppliers are now going to Van Houtum with innovation ideas of their own, promoting *Cradle to Cradle* design down to the supply chain also. An example of this is a glue supplier, initially phased out as it could not meet *Cradle to Cradle Certified* material health requirements for its input product. This supplier then returned to Van Houtum 2 years later, having developed a new glue product able to meet requirements.

There has been great interest in *Cradle to Cradle Certified* products from Van Houtum clients. The environmental impact of customers using Van Houtum *Cradle to Cradle Certified* products can be illustrated by calculating the difference with other tissue suppliers. If customers deliver their own recovered paper as a raw material this saves another 2 kg of CO<sub>2</sub> emission, based on Van Houtum's own calculations. This is determined due to localized transportation of material for recycling, in comparison to export for recycling likely to be undertaken otherwise. This can be communicated through customers own corporate social responsibility reporting.

The cost of inputs required to produce products can be reduced through movement towards a circular economy. The Ellen MacArthur Foundation (2014) highlights that through maximized re-use of materials and waste elimination, economies will benefit from substantial net material savings. The report iterates that for fast moving consumer goods, the full value of circular opportunities globally could be up to US\$ 700 billion per annum. Van Houtum has improved supply chain security by taking back waste paper from

*"There is a crisis in our market place, but our Cradle to Cradle Certified Satino Black business is constantly growing."*

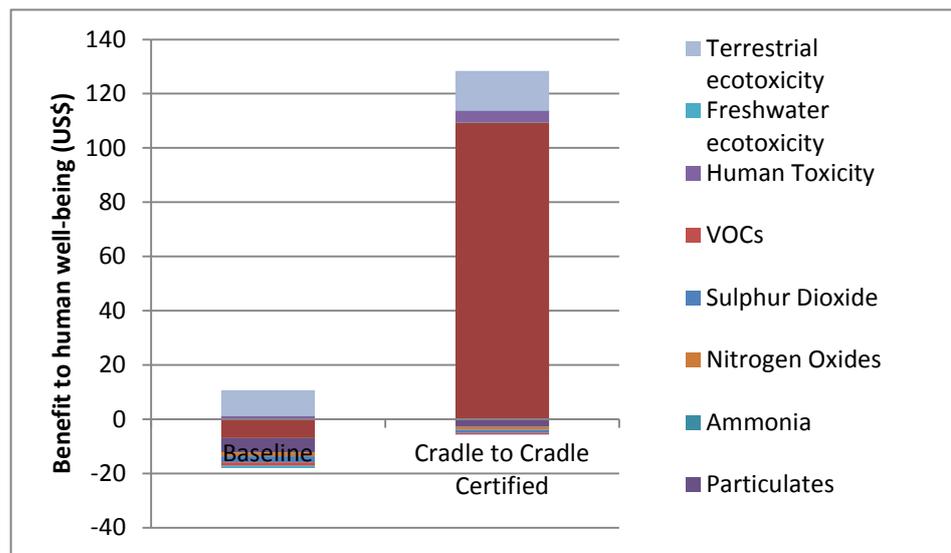
Van Houtum,  
Innovation  
Stories

customers and reutilizing it in the production of hand towels. Future opportunity exists to gather more granular financial data to determine financial cost savings of such a system, though this is not available at present.

## NET BENEFIT OF 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. Due to significant increase of in house recycling of materials, and improved energy sourcing, with 100% of all energy now renewably sourced, the Van Houtum Satino Black hand towel has shown a significant improvement to human well-being – not just reducing costs of production, but through energy generation and displacement of virgin materials through recycled material use and recycling of in house waste, providing benefit to human well-being. The product prior to certification is associated with a cost to human well-being of US\$7 per ton of product, but following optimization of product, and improved onsite operations, the certified product is now associated with benefit to human well-being of US\$123.

FIGURE 13: NET BENEFIT OF 1 TON OF SATINO BLACK HAND TOWELS TO HUMAN WELL-BEING



The most significant benefit is the GWP (global warming potential) associated with the GHG emissions reduction due to improved energy sourcing, and onsite recycling of materials. While the latter is not a requirement of *Cradle to Cradle Certified* Products Program, it is considered a part of the *Cradle to Cradle* thinking and in line with the concept that 'waste = food'. 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.

Based on sales of the Satino Black hand towels in 2012, a benefit to human well-being of US\$5.7 million is apparent in comparison to production of the product before certification. If considered in a customer context, average paper towel use per day is estimated at 6.63g per person (Caitlan & Wang,

# RESEARCH FINDINGS

2013<sup>6</sup>). Based in a 240 day working day year, this equates to 1.59kg per person per year. For every person using *Cradle to Cradle Certified SILVER Satino Black* hand towels in place of the baseline product, this gives a net benefit to human well-being of 20.7¢ per year, which can become significant over an office of many hundred workers.

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 Van Houtum, and reduced cost to human well-being, Van Houtum is considered to benefit from reduced risk through improved environmental and social performance lowering dependency on natural capital

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<sup>6</sup> Caitlan, J & Wang, Y (2013) Recycling gone bad: When the option to recycle increases resource consumption *Journal of Consumer Psychology* 23, 1, 122–127

# CONCLUSIONS

***The pilot study determined that the Van Houtum Satino Black hand towels achieve higher environmental benefits on most aspects than its non-certified earlier counterpart.***

The overall environmental impact on human well-being has improved, from a cost of US\$ 7 per ton of product to a benefit of US\$ 123. This is largely driven by improvements in the renewable energy and carbon management quality category. Van Houtum now use 100% renewably sourced electricity generated using hydropower (an increase of 22%), as well as green natural gas for part of its natural gas requirements. The environmental costs of the direct energy supply only, have reduced from US\$80, to US\$15, a decrease of over 81%.

The Satino Black hand towels are produced from 100% recycled content paper, 97% of which is post-consumer. This was identical before and after certification. The high percentage of recycled content within the Satino Black hand towels displaces the pulpwood that would otherwise be used for paper, and therefore the overall impact of the supply chain is beneficial – providing a benefit over the use of virgin materials.

By phasing out problematic pigments, additional benefits are apparent for human well-being and future product use cycles through more positive product material inputs, safer production and greater re-use potential of product materials. Suppliers have been keenly engaged to achieve input optimization requirements and now approach Van Houtum with new, relevant innovation of materials, improving not just Van Houtum performance but that of the supply chain also.

The general trend for company sales for Van Houtum has been positive since certification, against an industry trend which has fluctuated. Van Houtum has performed better than the market average since certification. Customers have shown interest in the *Cradle to Cradle Certified* range of Satino Black products, with this range showing strong growth, even against industry crisis.

The *Cradle to Cradle Certified* Products Program provides a powerful continuous learning pathway to developing innovative, resource efficient and healthy business models. Such business models are best positioned for the transition to a resource efficient, regenerative economy and deliver human well-being alongside economic well-being. Van Houtum has a long term goal to implement Cradle to Cradle in all areas of its operation, and has developed a roadmap to achieve just that.

***"To us, C2C is an inspiring concept that provides direction for our future. A truly beneficial story." Van Houtum, Innovation Stories***

## ASSUMPTIONS AND DATA GAPS

Details of the key assumption and limitations of the study are summarized below:

- Different batches of recycled paper have different inputs. The assumption was made that it was the same before and after certification to discount the effect of variability
- It was not possible to include all the optimized chemicals in the supply chain analysis due to the lack of data available on CAS numbers. Packaging glue was also omitted on the basis of its low weight materiality.
- The burden for recycling is that of collection and sorting. The credit is that of displacing wood needed in primary pulp, energy differential to pulp waste paper and wood (50% less for waste paper) and a credit for biogenic carbon that is being trapped in the paper if recycled but that would be released in a very short cycle if disposed of or incinerated.
- Direct impact analysis includes energy, waste, wastewater, pollutant data and water abstraction provided by the client.
- For outbound transportation, the European average distance travelled and average mode of transport was used to derive the environmental impacts.
- For the end-of-use there is no recycling and no composting due to very low rates of these waste management routes in Europe for paper hand towels.
- Quality of waste water was calculated based on the chemical oxygen demand (COD) of effluent.



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