

Cradle to Cradle pays off!

COMPANIES OF THE C2C LEARNING COMMUNITY ABOUT THEIR EXPERIENCES AND LESSONS LEARNED

Colophon

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Companies of the C2C Learning Community about their experiences and lessons learned.

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This booklet is available through: www.agentschapnl.nl/cradle-to-cradle or www.theterrace.nl/en/publications

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Ministry of Infrastructure and the
Environment



NL Agency
Ministry of Infrastructure and the
Environment

theterrace 

Management summary

This booklet is about the results of one and a half years of dedication of the Cradle to Cradle Learning Community. A total of seventeen companies took part. In the course of 10 sessions a wide range of

topics was handled, from internal support to the closure of cycles. The participants unanimously concluded that:

Cradle to Cradle pays off for profit, people and planet!

The most important learning experiences from the Learning Community are as follows:

1. A **Learning Community** is a very **suitable instrument** for **accelerating** sustainable development. By sharing experiences, learning from dilemmas, and collectively undertaking new projects and activities.
2. The companies taking part in the Learning Community recognize the importance and the **necessity** of placing sustainability high on the social agenda. There are also clear economic and financial reasons for choosing sustainability. C2C offers a **profitable perspective** for business development that focuses on future opportunities.
3. **Sustainable purchasing** can only be successful if we do more than simply look for the lowest price for a particular product or service. The 'Total Cost of Ownership' (TCO) perspective delivers higher yields in the long run, both financially and in terms of sustainability. Since C2C products often remain the property of the producer, TCO even delivers **lower costs**. Raw materials and components do not have to be produced all over again.
4. The **marketing** of C2C varies per company. In every case however, the **yield is positive**, particularly with respect to free publicity and attracting new customers. In today's world, there is a need for genuinely inspiring stories about sustainability; stories that demonstrate how sustainability in practice actually works.
5. The choice and implementation of C2C cuts through every layer and department of the organization. It is an integral challenge for the company. The **internal support** is **strengthened** because C2C appeals to personal values.
6. In the **design** and choice of materials for products, it is crucial to determine the cycle (technical or biological) for which the product and its components are intended in advance. This makes it **easier** to close the loops.
7. One major challenge in relation to the **closure of cycles** is the use of return systems. One option for the producer is to retain ownership of the product after sales, offering the buyer a **residual value** when the useful life of the product has ended.
8. C2C also requires behaviour change of individuals within (departments of) **organizations**. It is **more than** a technical innovation or local change.
9. **C2C** pays off because it means **successful business**.

Foreword

In late 2008 the NUTEC Cradle to Cradle trade fair was held in Germany. Front-runners within the field of C2C got the opportunity to meet. A number of companies came up with the idea of exchanging their knowledge and experience of C2C. Mutual consultations showed that many companies were facing the same issues and dilemmas in relation to this new concept. They all appreciated the attractiveness of C2C and the opportunities it represented, but they also had many questions about how to put the concept into practice. This was the area in which most support was needed.

Contacts were established with Agentschap NL (formerly 'SenterNovem') and the Ministry of VROM (currently: Housing, Spatial Planning and the Environment) to see if they could support launching such an initiative. Eventually this led to the idea of creating a 'Community of Practice', also known as the 'Learning Community'.

Conversations with companies actively engaged in C2C and leaders in the field of sustainability soon demonstrated there was a strong desire to set up a Learning Community. "A far-reaching sustainable innovation of this kind cannot be achieved alone," was a frequently heard comment. Cooperation in the chain and with other "like-minded" companies is a vital condition for success in this field.

And so this is what happened.

So far the Learning Community has met on ten occasions. Each session was facilitated by the participating companies; their learning questions on C2C played a central role. The essence of the Learning Community is sharing insights about the topics handled in this booklet. These themes are extremely diverse, ranging from marketing to internal support, from sustainable purchasing

Pierre Hupperts, CSR expert and partner of The Terrace



"In the Learning Community, the learning questions of the companies themselves are central. Their needs determine the content and format of the sessions."

Anne-Marie Bor, moderator and consultant eco-innovation at Agentschap NL



"C2C calls for creativity from the chain partners. If we are to realize a positive environmental impact, we need a different way of thinking."

to organizational change. All these areas are part of sustainable innovation implied by C2C. An important conclusion of the Learning Community is that C2C pays off - in every sense of the word. C2C is beneficial for profits, people and the planet.

The structure of this booklet follows the ten Learning Community sessions in chronological order. This allows the reader to follow its development over the course of time.

It was our privilege to facilitate and organize the Learning Community. We use the word 'privilege' deliberately because it produced ten fascinating sessions. We watched the 17 participants grow from an extremely diverse and somewhat disconnected set of individuals into a group that was able to share and discuss all the relevant issues in a companionable, familiar and professional

way. Producing excellent results, as witnessed by this booklet. The learning and mutual cooperation will certainly continue after this publication. The companies involved decided to carry on with the Learning Community.

In this way, they remain true to the task they set themselves at the first meeting of the Learning Community; in their view the greatest challenge is the continuous focus on the "sense of urgency".

Our thanks to Katja Hansen and Douglas Mulhall of EPEA for their substantial contribution and support to the Learning Community in the sounding board group.

May 2011,

Pierre Hupperts
The Terrace

Anne-Marie Bor, Ireen de Nijs
Agentschap NL

Ireen de Nijs, consultant eco-innovation at Agentschap NL



"Companies can learn a huge amount from one another, especially if they come from different sectors."

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Introduction

Cradle to Cradle

An improbable joint venture between an American architect and a German chemist led to the publication of a book in 2002, which gave a new impulse to the way we think about sustainable development. In “Cradle to Cradle: Remaking the Way We Make Things” Michael Braungart and William McDonough present a concept which lifts our ideas about sustainability to a higher level.

The traditional way of thinking about sustainability was established in the seventies when people started to realize that our current production and consumption system is damaging the environment. In the nineties, designing methods such as eco-design and measuring techniques such as LCA were developed with the aim of minimizing the environmental damage caused by human activity.

However, according to Braungart and McDonough, we should not just be looking for ways to make things “less bad”. Carrying on with the traditional ‘Cradle to Grave’ production model will still lead to huge quantities of waste and pollution being produced. McDonough and Braungart propose “starting out by doing the right things”. This new perspective is rapidly gaining ground among the current leaders in sustainability.

MBDC is the owner of the Cradle to Cradle trademark; EPEA has the right to use this trademark and assists companies in the certification process. The C2C Product Innovation Institute is licensed to certify products in accordance with the third version of the Cradle to Cradle certification chart, which is currently in progress.

Further readings

EPEA: www.epea.com; www.epea-hamburg.org

MBDC: www.mbdc.com

C2C Product Innovation Institute: www.c2ccertified.com

On the basis of the **Cradle to Cradle innovation framework** companies started making products with surplus value; products that have a positive effect on people, the environment and society. This innovation framework is helping us to find sustainable product solutions using the **3 ‘guiding principles’ of C2C:**

1. **Waste = food:** this principle envisages an infinite cycle in which products are designed and produced in such a way that they ultimately produce new products, or can be reintroduced to the biological or technological cycle;
2. **Use renewable and inexhaustible energy sources,** such as the sun;
3. **Celebrate diversity;** greater diversity leads to a more resilient ecosystem;

The realization of C2C concepts requires a considerable amount of creativity, financial resources, and cooperation between the right partners. The 3 ‘guiding principles’ provide shared goals for this purpose. Maintaining the C2C philosophy and implementing it in an organizational process is an on-going, step-by-step development. To obtain a clear structure and direction, a **roadmap** is often used to help us plot a path towards a future-oriented objective.



1. Sense of Urgency

An opportunity not to be missed

At the first meeting of the Learning Community, the planning and themes of the current and subsequent meetings were discussed. One particular theme was not initially on the list but added by the companies themselves, and it was selected as the subject of the first session: the urgency of Cradle to Cradle and sustainability. Several members had just attended the annual **Club of Rome International** meeting, which was held in 2009 in Amsterdam. Climate change, the scarcity of raw materials, the depletion of fossil fuels and the endless wastage of raw materials in the 'throw-away economy' were just some of the **arguments** for placing the **urgency** of C2C high on the agenda.

According to the **WWF "living planet" report** (2010) current energy sources are being used up 50% faster than they can be generated. Our ecological footprint shows we will need 2.8 'planet Earths' in 2050. From 1970 to 2007 the abundance of species on the planet shrank by 30%, and in the tropics by as much as 60%. As the world population grows, the demand on the means of existence and for a luxury life style grows with it. And this is happening at a time when there is already a serious shortage of materials.

All companies taking part in the Learning Community share the sense of urgency and see the necessity for change.

KNOOPS | THE NETHERLANDS' FIRST C2C PRINTING ESTABLISHMENT

Eco printing

www.drukkerijknoops.nl

Knoops Eco Printing prints according to the Cradle to Cradle principle, so that a naturally clean and transparent printing process is applied. The choices for Cradle to Cradle arose from a constant drive to be innovative and open to change. With C2C Knoops seeks to distinguish itself from

other printers in terms of sustainability. The company wants to remain a leader and maintain its position over competitors. Knoops depends on its suppliers, of ink and paper for example, for its business operations. One important step was therefore for the company and EPEA to persuade these suppliers to adjust the composition of their products to the Cradle to Cradle criteria.

What has C2C delivered?

- Cradle to Cradle put Knoops on the map as an innovative company in the field of sustainability. Other companies regularly consult Knoops. C2C makes it easier to explain your business and business philosophy to third parties, and makes clear what you stand for.

According to them, **businesses have a crucial role to play** in this sustainable change and in accelerating the transition to a positive impact on mankind and the environment. New business models are needed to enable the creation of shared value for business, environment and society.

The participants in the Learning Community were keen on discussing how C2C can be accelerated and a sense of urgency promoted. They themselves are doing this in different ways. Marjan Minnesma, director of Urgenda, inspired the participants with Icon projects. These are large-scaled sustainability projects with an important symbolic function for innovation and sustainability, so that demand can be created in the market.

Stichting Urgenda believes in 'doing', delivering inspiring Icon projects such as the sustainable floating pavilion in Rotterdam and the electrically powered 'Think', a 95% recyclable car with zero CO₂ and fine-dust emissions.

During the Learning Community the companies taking part looked at areas, which support the C2C philosophy and **accelerate** the conversion to a sustainable economy. Three companies worked on an **Icon product** combining their collective knowledge of marketing, design and foodstuffs (see paragraph 2 on sustainable purchasing). Others worked on the inclusion of C2C in purchasing criteria. This led to a list of indicators which organizations can refer to when drawing up their invitations for tenders. Another collective initiative was

What has the Learning Community delivered?

- Knoops is interested to see how other companies approach C2C and integrate it into their business. The Learning Community provides an excellent platform for comparing oneself to other companies and defining benchmarks to evaluate your own particular approach.

Wessel Breeuwsma, Director KEP, Drukkerij Knoops:

"The world is changing. If one company starts with Cradle to Cradle, other companies will also benefit from investing time and energy into it."



launched to spread the word about C2C, the so-called C2C cafés (see paragraph 6 on organizational change and sales).

Companies working individually and collectively all set to work on a range of special 'Icon projects' designed to show that C2C and the closure of cycles is in fact possible. And that it can also be inspiring to other companies.

Sense of urgency learning points

- In practice companies are *willing to change* when it comes to an *innovative and distinctive concept*, which they themselves can use to create a new market.
- A more sustainable world also starts with *small steps and in accordance with the DNA of the organization*. Sustainable trading and commercial success go hand in hand!

AKZONOBEL | FACTORY OF THE FUTURE

Paint, coatings and specialized chemicals

www.akzonobel.com

www.factoryofthefuture.nl

A virtual factory embracing the C2C philosophy is the Factory of the Future model. A year and a half ago AkzoNobel formed a consortium of seven companies to develop a typical chemical factory with a continuous recycling system; a production environment based on C2C principles to create a positive footprint. As C2C guru and someone involved in the project, Michael Braungart points out: "Factories can be like trees, having a positive effect on the environment. We should celebrate the human footprint instead of minimizing it." The Factory of the Future concept shows us that factories do not have to reduce their impact, but can actually bring added value to the environment precisely because of their positive impact.

Using the computer model of the Factory of the Future, the consortium tried to shed light on both the internal processes of the factory and the processes that take place outside its doors, in other words to gain a better understanding of the chain. The challenge is not limited to designing a sustainable building or using sustainable materials. The impact of the production process on the consumption of energy and water is actually many times greater than the impact of the building. Using the Factory of the Future model in a follow-up project (2011), the impact on biodiversity will be examined alongside such things as energy and water consumption. Biodiversity can actually be supported if we design production processes in such a way that water and/or air are purified, or the fertility of the soil increased.

The Factory of the Future started out as a technical design project. Today, it also serves

a strong communication function between the various disciplines and education. The knowledge and insights gained are made available to companies in the form of a knowledge base, which can be used to train employees in new processes and products.

According to Jan Verlaan, during the development of the Factory of the Future model the *sense of urgency* became very clear: "The life span of a factory is 40 to 50 years. In practice this means we have to start now if we want to deal with the challenges that lie ahead of us. The entire chain should be examined so that a series of small steps can be taken that will ultimately have a massive impact."

- Stop talking and *start doing*, even if it is only small step to begin with.
- An *inspiring vision and mission* accelerate change.
- It is essential to draw up a *roadmap* with SMART objectives and KPI performance indicators.
- It takes time and effort for a large group to gain momentum.
Patience and perseverance are necessary virtues.

Further reading

Icon projects: www.urgenda.com

Report 'living planet': www.wwf.org

Club of Rome meeting Amsterdam 2009:

www.clubofrome.at/2009/amsterdam/index.html

What has C2C delivered?

- The development of the Factory of the Future model was the start of a very concrete and practical project. As time went by, it became clear that it could be deployed on a much wider front; it now has a clear educational function as well. The model can be applied to the development of things like bridges, residential areas, or even entire cities. Jan Verlaan explains: "When you start something together, you can end up in a different place to what you had expected. This was a very surprising outcome for everyone concerned."
- C2C pays off because it is realistic business practice.

What has the Learning Community delivered?

- There is a certain amount of risk in long-term projects to lose focus, and slow down. Participation in the Learning Community allowed us to stay focused on our objectives, and this kept us up to speed.

Jan Verlaan, Ideation manager AkzoNobel and initiator of the 'Factory of the Future' project:

"Of course we cannot go on living the way we do. I want my children and grandchildren to have a good life as well."



**FACTORY OF
THE FUTURE**

Natural design, human innovation

2. Sustainable Public Procurement

From criteria to co-creation

Businesses are confronted by the **growing demand** for **sustainable products and services**. In the B2B market in particular, there has been a rapid rise in sustainability requirements in calls for tenders. In 2005, the Dutch government decided to make Sustainable Public Procurement compulsory. Every year, the government spends more than 50 billion Euros on purchasing and contracting-out; this means they can give factories a strong impulse to develop C2C products and services. This way the government can take on the role of 'launching customer', thus encouraging the market to create a more sustainable supply. This may involve innovative C2C products which are currently too expensive, or for which the market is still too narrow. As an extremely large buyer, the government can create new markets and (at the municipal or provincial level) encourage the closure of cycles.

In the Learning Community green public procurement was discussed repeatedly. The main issues addressed were how C2C can be built into the approval criteria of tenders, and how the government can actually create space for C2C products and services through tenders.

The **C2C certification** has **six points of focus** by which products are assessed:

1. Used materials
2. Closed loops
3. Diversity
4. Energy policy
5. Water, air and soil policy
6. Social Responsibility

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SAPA POLE PRODUCTS | SUSTAINABLE PUBLIC LIGHTING

Aluminium lamp posts www.sapapoleproducts.com

Sapa first came across the C2C concept through the Aluminium Center, with which it has close connections. Without realizing it, it already took a step in the direction of Cradle to Cradle in a pilot project with the municipality of Tilburg, who were already purchasing their climate-neutral lamp posts. Sapa takes back the old aluminium lamp posts released by the municipality. They are brought to the Sapa premises, melted and re-used

to make new lamp poles. The C2C snowball has continued to roll at Sapa ever since.

A logical follow-up for Sapa is the realization of a C2C lamp post of which the choice of materials is top priority. Apart from the recycled aluminium posts from its own foundry, other materials used in the lamp posts are being subjected to critical scrutiny. The implementation of the C2C philosophy requires commitment by the entire business. It is an on-going process because of continuous new developments and findings. In

this phase of the C2C development process, Sapa is engaged in the certification process so that its products fulfil all the C2C requirements.

What has C2C delivered?

- C2C is an integral component of a sustainable policy. It affects the identity of your company and helps to build a good company image.
- C2C pays off because it enables you to demonstrate your commitment with respect to our living environment.

Cradle to Cradle points of focus in sustainable procurement

Purchasers from government and the business community could use the mentioned six points of concern to formulate **criteria** if their organization wishes to **purchase C2C**. These points are elaborated in the explanation and **C2C Procurement Mind map** set out below, drawn up by the Learning Community in cooperation with Pierre Hupperts, The Terrace, the Sustainable Public Procurement Programme of NL Agency and EPEA.

The strength lies in the cohesion, in other words, the more points of focus that are taken into account in the procurement, the better the C2C quality is expected to be. The procurement officer can decide for himself how best to apply these points of concern to his purchasing.

With regards to the most suitable contracting techniques for inclusion of these points of concern in the **purchasing process**, we refer the reader to the document “**Sustainable procurement with ambition!**” produced by the Sustainable Product Chains (DPK) expertise network.

Both government procurement officers and procurement officers from the business community, with the exception of the green-marked fields, could use the areas of concern explained in the **C2C Procurement Mind map**. These criteria are usually not suitable for procurement by governments because of the European legislation on proportionality. However, they may play a role in the functional specifications of government building/soil/water/road construction projects.

What has the Learning Community delivered?

- Above all, Sapa learned in practical lessons from the other companies in the Learning Community about things such as the certification process. Sapa received numerous tips from Ahrend about the *do's* and *don'ts* of certification.

Tanja Buijks, Marketing & communications coordinator at Sapa:

“The debate about materials is about to start. This is something you should be anticipating as a business.”



Mindmap

Cradle to Cradle Procurement

For Government procurement officers, see the **social criteria** for sustainable public procurement on the website of the Dutch Ministry of Infrastructure and Environment

Supplier has a **corporate social responsibility (CSR) policy**, which has been communicated externally and which defines social and environmental targets. (ISO 26000)

Supplier has a **code of conduct** and/or ethics

Supplier has an externally **verified report** defining the social and environmental objectives and results

The company subscribes to **ILO and OESO** directives

Social responsibility

In addition to intended function, the product has an extra quality that contributes to the quality of life of people and the environment (**added value**)

Supplier is helping to **increase biodiversity** by means of the product design/materials/facilities used in the chain

Increase diversity

Supplier indicates how the company is working **energy-positively**

Supplier is itself **using sustainable energy** for its own production process/offices

Supplier has a plan to make the company's **energy consumption** sustainable

Supplier preferably uses **local energy sources**

Supplier supplies **products** that **produce** rapidly renewable energy

cradle to cradle points of focus for procurement by Government and the business sector

Use of rapidly renewable energy from the sun and gravity

Supplier demonstrates how its organization is **purifying** the air and waste in the **environment?**

Supplier has a **plan** indicating **water consumption** (absolute amount), the water sources and the quality of the wastewater and how this will help supplier to make a positive contribution to the surroundings

Supplier is supplying **products** that **improve** the quality of the air, soil and water

Improved air, soil and water quality

PLEASE NOTE: Government procurement officers should be extra careful with the points of focus displayed in the **green rectangles**. In view of the European legislation on proportionality, these points will not always be suitable for formulating criteria.

Stimulate local solutions

Supplier is involving **local suppliers** and **customers**

Supplier is adapting to **local needs**

Do no harm: conscious use of good-quality and healthy materials

The **composition** of the supplied products is **known** up to 100 ppm, even in the case of recycled materials

For each product, it has been **defined** for which **use** and which period of use the product has been designed and for which cycle the components are intended

The product contains no known **toxic** materials in the intended specific application. For this information, link up with knowledge/expertise/criteria from certification schemes

The impact of the product ingredients on people and the environment is known and has been tested independently. For ingredients with a prohibited impact, there is a **plan for phasing out** those ingredients

Products intended for the technical cycle contain as many **recyclable** materials as possible which are **healthy** during the period of use

Products intended for the biological cycle contain as many materials as possible that can be **biologically degraded/composted** safely under defined conditions

As many of the materials as possible in the product are recyclable or compostable or have been **recycled or are rapidly renewable**

Waste equals food: circulate materials in continuous loops

Supplier has a **plan for re-use** of the materials by the company itself or by another producer

Supplier arranges for the **return** of products

Products can be **collected separately**

Products consist of as **few components** as possible

Products consist of as few **different materials** as possible

Products are easy to **disassembly**

Products have been marked so that the materials they contain are **identifiable**

Sustainable procurement learning points

- The pooling of knowledge among companies is a good way to promote sustainable procurement. To develop sustainable products, you also need to purchase sustainably. The companies of the Learning Community already have years of experience in this regard. This *experience* is shown in a *C2C Procurement Mind map*. This allows the knowledge and experience of companies to be applied further by the government and by other companies.
- For sustainable procurement it is very important to adopt an *integral approach*. Separate tenders can be associated with one another in terms of content, so that a larger sustainability impact can be achieved. For example, by combining installation and maintenance in a single tender. This requires more and better internal cooperation and coordination within organizations.

ALBRON | THE MOST SUSTAINABLE CATERER IN THE NETHERLANDS

Catering

www.albron.nl

Albron wants to be the most sustainable large catering firm in the Netherlands. To achieve this Albron is in continuous dialogue with all its stakeholders. Albron notes that there are enough producers who would like to work on the production of honest food with its support. Albron and its logistics partner Kruidenier Foodservices are also looking into ways of making the assortment more sustainable. The good cooperation between Albron and Kruidenier Foodservices is crucial because "sustainability always involves chains" according to the director of 'more sustainable business' Henk Voormolen.

"You can do very little on your own." All those involved are concentrating on sustainability in the various parts of the production chain, including the disposal phase. For example, Albron is taking part in the reintroduction of an original Dutch breed of cattle (Blaarkop) as a superior and sustainable alternative, initiated by Kruidenier Foodservice, with a positive impact on CO₂ emissions, the use of antibiotics, nature conservation, biodiversity, and the quality of meat, dairy products and manure. The two partners are working together to develop a concept in which the products are produced and transported as sustainable as possible and the inevitable waste products are also put to optimal use.

The criteria for sustainable procurement by the government, drawn up by Agentschap NL, have put sustainability on the map in numerous organizations and companies. In recent times this has made it easier to encourage people both inside and outside Albron to think and act along similar lines in relation to making the supply chain more sustainable. There was - and is - nothing shocking about these government criteria to Albron. Albron was already taking its own measures; for example, several years ago it has already converted to biological dairy products in large packaging. At the same time Henk Voormolen says Albron is not there yet, and that more sustainable business is an on-going quest in which continuous improvements can be made. "It is a matter of starting now and pushing ahead relentlessly."

- Procurement based solely on price ruins opportunities for adopting a *genuinely sustainable approach*. It hinders the ability of companies to be innovative, and in many cases, especially when you look at the *Total Cost of Ownership* (the costs during the entire usage and disposal phase), cheap actually turns out to be expensive in the long run.

Further readings

Brochure 'Cradle to Cradle and sustainable purchasing':
via www.agentschapnl.nl/cradle-to-cradle

What has C2C delivered?

- C2C pays off because waste = food. For instance, for fear of a new BSE crisis we now seem to panic, and throw high-value products away. At 1:29 pm a bread roll is rated as high-value food, but after 1:31 pm it is useless because of the constraints set up by the government. At Albron we are constantly looking for the opportunities that actually exists to close the cycles and retain the value of products.

What has the Learning Community delivered?

- A better understanding of the significance and opportunities for C2C in food production.

|| Henk Voormolen, manager of 'more sustainable business practices' at Albron:
"Investing in People and Planet also leads to profit, in the short and long term".



3. Marketing and communication

C2C sells

Companies deploy Cradle to Cradle in different ways. C2C can be a 'next step' in the sustainability or CSR policy due to a decision to develop C2C products or services. We see this happening in companies that have engaged in sustainability issues in their organization in the past, such as Van Houtum, Ahrend, EuroCeramic and Mosa. C2C is given a position 'on top of' the mission of sustainability. However, Cradle to Cradle can also be a starting point for a rapid and complete change of direction in the organizational strategy. As in the case of DESSO, which decided to become a C2C company after a company takeover in 2007. For ECOstyle on

the other hand, its the particular usage of materials is so much associated with the company that it could well be detrimental to use the term C2C. For that reason it was decided to apply the C2C philosophy primarily to the new accommodation in the ECOmunitypark, and not to the marketing of ECOstyle's products.

There is a clear **difference** between the companies in the use of **C2C** in their **positioning**. Some are primarily interested in certifying C2C products; others want the brand and/or the business itself to be fully associated with C2C:

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VAN HOUTUM | SATINO BLACK

Toilet paper and washroom solutions
www.vanhoutum.nl
www.satinoblack.com

Satino Black was launched by Van Houtum as the most environmentally friendly toilet paper in the world. The basic idea was that there is already plenty of green. The general opinion at Van Houtum is that if you want to be noticed, you have to do things differently and demonstrate some courage. Hence, the 'Dare to be Black' campaign. The positioning is oriented towards an aura of quality and design "because what people want in the first place is a good product with the right price/quality ratio," says Nick op den Buijsch, concept manager CSR at Van Houtum. "If that product is also the most sustainable, then it

offers more added value than other, comparable products."

Van Houtum underlines the importance of quality marks. For a new, relatively unknown brand, it demonstrates that your promises are subject to guarantee. When it became known that Van Houtum had acquired C2C certification in 2009, the organization received a lot of positive media attention. The amount of *free publicity* tripled, which led to new customers and prospects.

With the introduction of this new concept it quickly became clear that the distribution channel needed help with the story. The field and sales staff of the customers (wholesalers) of Van Houtum were offered training courses, and it was decided that

communication would be directed towards the end-user as well; hereby, Van Houtum hoped to make end-users so enthusiastic about the product that they would start asking for it at their supplier– the customer of Van Houtum. Van Houtum subsequently helped the customer to implement Satino Black for the end-user.

What has C2C delivered?

- A unique position in the market, pride among personnel and other stakeholders who contributed to this success. A concept that no longer says it is 'less bad' but that it is 'good'. In other words: safe for mankind and the environment, so that future generations can enjoy their lives just as much as we do.

- Van Houtum applied four marks of quality to its Satino Black toilet paper: C2C, EU Eco label, CO₂ neutral and FSC recycled;
- EuroCeramic positions C2C alongside CSR and energy. EuroCeramic profiles its products, glazed stoneware pipes, on the basis of two arguments: longer life span and lower management costs;
- DESSO, Mosa, Van Houtum and Ahrend profile themselves as C2C companies;
- ECOstyle has C2C products, but has decided not to use the term as such.

The choices made by these companies were discussed frequently, at length in the Learning Community. The ultimate conclusion was that each company decides to take **the choice** that is the **most strategically and commercially suited to the company and**

the market in which it operates. The vision of the use of C2C is determined by the sustainability ambitions of the company, the expectations as to whether C2C will retain its position in the market, and the commercial benefits that can be achieved by using it among other things. C2C is always tailored to the specific conditions that apply, and each company chooses its **own focal points** based on:

- The market position of the company and the delivered products;
- The branding policy: does C2C fit in?
- The size and scope of the company;
- The history and commitment with respect to sustainability;
- The likelihood of commercial benefits from using C2C (deepening the existing customer base or tapping into new markets).

- C2C pays off because it is a quality concept encouraging organizations to innovate in a way that is good and safe for our society.

What has the Learning Community delivered?

- When setting up and introducing the C2C roadmap, an organization can run into many different issues. The Learning Community broadens the perspective of Van Houtum with a range of areas for particular attention, so that they were then able to arrive at more deliberate and better-defined choices.
- The participating organizations elaborated spontaneously on the subject matter addressed throughout the sessions. This is a particularly strong sign, considering that the organizations brought together by the Learning Community would not otherwise have got to know one another very well, if at all.

|| Nick op den Buijsch, concept manager CSR:
“Change requires recognizable differentiation.”



C2C offers various **marketing advantages** to companies:

1. Certification and C2C story support sales

For some companies C2C certification is a necessary precondition for marketing and communication. They have to be able to demonstrate that it really is a C2C product, and that EPEA has shown this to be the case. Many companies share this sales-related advantage. But they also indicate that customers are persuaded by 'the story' they tell of how they put the C2C philosophy and the associated innovations into practice; the certificate is important as evidence, but less important than 'the story' of C2C and innovation.

2. Free publicity

A C2C product automatically generates *free publicity*. This makes it an important component of the marketing strategy of companies. Their representatives appear as speakers at conferences and seminars about sustainability to tell their 'story' to a specific target group of managers and directors (the target audience). Directly approaching municipal authorities is also very productive: the EPEA certificate gets you off to an excellent start. Free publicity was found to be a cheap and highly effective way of reaching target groups.

ECOSTYLE | ECOMUNITYPARK

Ecologically and environmentally friendly products for soil, plants and animals.

www.ecostyle.nl

www.ecomunitypark.com

Sustainability, innovation and the transfer of knowledge are important cornerstones for the family business ECOstyle. This can be seen from their intensive R&D programme in cooperation with universities, their collective focus on sustainability between sectors, and their investment in a broad international network.

For many years ECOstyle had wanted to realize an industrial estate based on a sustainability concept. The park would serve as a calling card for sustainable and socially responsible business practices. The ECOMunitypark developed out of this vision, aiming to create a diverse and fully sustainable work landscape that would return genuine benefits to mankind, the environment and society. The participating parties with their shared vision decided on integral regional management, shared facilities, innovation and authenticity.

The buildings in the estate will be laid out as a work landscape rather than a business park; 100% sustainable and ecologically sound, with modern architecture that will take all the principles of ambitious, sustainable construction into account. "Soon there will be optimal synergy between sustainable businesses in terms of knowledge, products and energy, creating added value for all the companies involved in an innovative and unusual working environment," according to Wilma de Ruiter. In the ECOMunitypark the ECOstyle organization, as one of the first companies,

3. Internal communication between producer and end-user

There is a clear difference between 'normal' products and C2C products. In the case of the former, the bond between brand and user is often short-lived, in spite of all the time, money and effort spent on marketing attempts to build up a long-lasting relationship with the consumer. With C2C products however the relationship is entirely different; as long as the user keeps the product, the bond between the producer and the customer will persist. The producer does not lose interest as soon as the consumer buys the product.

On the contrary: he remains interested until the product is back in his own hands. It is beneficial to the producer to know where the product is and where it was purchased. For product developers and marketers this releases a huge amount of new information, such as usage (wear and tear for example), moment of return (reason) and the needs of the user (possible improvements). The development and acquisition of C2C products leads to increased interaction between the producer and the consumer.

will establish itself alongside other like-minded small and medium-sized businesses and knowledge institutes who feel at home there.

What has the Learning Community delivered?

- The Learning Community delivered numerous, valuable contacts for ECOstyle in relation to materials and chain closure. Learning from one another from practice – often by trial and error – turned out to be remarkably educational. Inside the Learning Community all sorts of joint ventures were created. The focus has always been on opportunities, not on objections and obstacles.

|| Wilma de Ruiter-Van der Stroet, International Marketing Manager at ECOstyle:
"The ultimate interaction between man, nature and the economy."



Marketing and communication learning points

- Cradle to Cradle helps you to tap into *new markets* and enables the business to *adopt an innovative approach*.
- Standing out from the crowd *does not immediately lead to more orders*. Many customers appreciate the C2C product, but are not willing to switch over immediately.
- EPEA itself does not engage in *marketing and communication* about C2C. You as a company must therefore *do it yourself!*
- It is important to find the *right combination* within the company of *certification and clear communication* (and visualization) of the things organizations do in relation to C2C.
- Clients tend to be *more concerned with price than sustainability*. In *external communications* it is therefore important to *talk about C2C in combination with the life span*. The client needs to be convinced that sustainable choices are also the most beneficial in the long term (including financially).

PHILIPS LIGHTING | A GREEN MIND-SET

Lighting

www.philips.nl

www.lighting.philips.nl

Philips has long been active in the field of CSR. Way back in 1970 it established its own environmental affairs department and environmental policy. Sustainability continues to be firmly anchored in the organization thanks to the dynamic character of that department.

Maarten ten Houten, Sustainability Director of Philips Lighting, says there are several success factors for the integration of sustainability in the organization. It is important that everyone understands what sustainability means to the

organization. Training courses are offered for that purpose, both internal and to third parties, often in the form of e-learning programmes. There is a strong emphasis on internal communication. These also appeal to the personal core values of employees (health, friends/family, personal interpretation). Nevertheless there are always some who tend to take the lead with a 'green' mind-set, whereas others are more sceptical and still need to be convinced of the value of sustainability for the organization. A different approach is needed for each of these groups. One way of persuading the second group is to point out that it is possible to earn money with sustainable products - by reducing life cycle costs for example.

In a large organization we find that the level of function, age and ambition lead to different motives. The biggest challenge is the middle management. The top takes sustainability seriously, and the lower echelons are also keen to contribute. The middle management on the other hand has strict marketing and sales targets they have to meet if they want to move forward in the organization. When it comes to achieving targets, sustainability can be regarded as a risk or as a driver. This is why it is so important to encourage sustainability within the organization; one method is to use *road maps*, which include sustainable products as an integral part of the business strategy.

4. Internal support

Making C2C tangible

The members of the Learning Community perceive Cradle to Cradle and sustainability as a **challenge for the entire organization**. The management or Board of Directors can and should indicate the strategic direction, but it is crucial that C2C thinking and acting is anchored in the organization. After all, the success of C2C requires the enthusiasm and cooperation of all departments - product development, production, sales, purchasing, marketing etc. The Cradle to Cradle vision should be translated into concrete objectives and challenges for each department. The greatest success is

achieved when C2C is integrated into the core business and becomes part of the DNA of the organization.

To translate the Cradle to Cradle ambitions of the organization into practice it is essential that middle management and employees have a clear idea of what C2C means in relation to their daily tasks and responsibilities. It can imply substantial changes for employees in terms of their activities, in a way that appeals to their **personal values**. The **anchoring** of C2C in the organization implies a **cultural adjustment**.

Internal competition also seems to work well, because people want to do well in terms of the benchmarks that are set. Indicators are needed to measure performance and maintain the right balance between simplicity, effectiveness and correctness in terms of content. Philips has a Sustainability Board in which business units are rated in terms of whether they are on schedule, how they perform in comparison to one another, and how well they are keeping to the road maps drawn up.

What has C2C delivered?

- C2C provided us with a new business model.

Maarten ten Houten, Sustainability Director Philips Lighting:
“Sustainability motivates because it is very close to personal core values”



Internal support learning points

- A *good demo-project* is one way to make C2C tangible in the organization. Nothing is better for the internal support than a sustainable product that sells well. Using a C2C product for demonstration purposes works. It provides an excellent example and it is tangible. If you only talk about it you will never create internal support.
- Above all Cradle to Cradle means *doing, persevering and properly explaining* to your own people why you are doing it and how it fits into your business model.

KRUIDENIER FOODSERVICES | KEEP ON TELLING THE STORY

Food supplier

www.elkedaglekkervers.nl

Kruidenier Foodservices tackles sustainability on all fronts and is constantly looking for new, sustainable developments for her products and services. Since 2001 they have been working towards an integral policy with the right balance between People, Planet and Profit. According to Christy Kool, manager HR and quality control, responsible for sustainable business practices inside Kruidenier, you have to build sustainability into the daily processes, and keep it close to the people. Purchasers do not receive bonuses at Kruidenier for their sustainability performance because they are expected to carry sustainability in their genes. Certification based on 'GSPMZ' also means external appreciation and proof of performance in the field of sustainability.

At Kruidenier it is acknowledged that people need time to come to terms with sustainability. "You have to keep telling the story", says Christy Kool. "As sustainability manager you have to be content with small steps, and happy if people come back to you with the message that sustainability is important for the business." Kruidenier uses an internal system of pairing off managers, the baker and the butcher for example – so that they can exchange *best practices* for the sustainability of the business.

At Kruidenier some sustainability activities are seen as a kind of sport. Concrete, tangible projects, such as the 'cattle cake of green waste', which receives no subsidy, help to create an internal, positive energy. Those taking part tend to become competitive. A suitable *award* also proves to be an important stimulus when it comes

to creating a support base for sustainability. It provides a sense of external acknowledgement. The '*Lean & Green award*' awarded to Kruidenier by Connect (transport) was a great boost, and the personnel involved it proud of it.

What has C2C delivered?

- In 2008 Kruidenier contributed to the BioCom project (biodiversity compensation) initiated by the then Ministry of VROM and LNV, in which the impact of companies on biodiversity was investigated throughout the entire chain. Compensation was also considered as a way of maintaining biodiversity. C2C fits in perfectly when it comes to recycling return waste flows into feed.
- Kruidenier wants to bring back the Blaarkop. This original Dutch breed of cattle was often stationed around the medieval cities of the

5. Packaging

Conscious choices

One of the challenges in the Learning Community was the search for suitable C2C packaging. With the help of external packaging experts, the possibilities and the new, sustainable developments in this area were examined. For McDonough and Braungart, the inventors of C2C, waste is no problem since waste is, after all, food! The traditional

view of sustainable packaging is that the quantity of packaging should be minimized to reduce the impact on the environment. But Cradle to Cradle is not about eco-efficiency (doing things less badly), it is about the **eco-effectiveness** (doing it well) of the products, and therefore also of the **packaging**.

16th century. In the 'fattening-up phase' they received vegetable waste from the city dwellers and grain residue from the gin distilleries as food. The manure was used to fertilize the entire dune and bulb-growing area of today. This is in fact how the bulb-growing area was created. They were already using C2C method, and they understood very well how it worked.

What has the Learning Community delivered?

- The diverse network of the Learning Community led to a huge exchange of knowledge. Christy Kool and Jan Verlaan of AkzoNobel for example had an elaborate discussion about the possibilities of whey, a by-product of cheese.
- The diversity of disciplines meant that the Learning Community could take even greater advantage of one another's experience. There was for example a very interesting discussion with ECOstyle about Blaarkop manure, and the virtues of animal versus plant manure.
- Packaging for various products and purposes was discussed with industrial designer Eveline Bijleveld of Dageraad Industrial Design.

Christy Kool, Manager P&O and quality control for Kruidenier Foodservices:
"To Kruidenier, C2C and increasing biodiversity are interrelated, which means that both are extremely important!"



It is important that a conscious choice is made as early as the design phase as to whether the packaging material is best suited for the biological cycle, or whether it can better be recycled for use in the production of some other high-value product. Various manufacturers have already started to design packaging for the **technical or biological cycle**. Numerous experiments are being carried out with recycled PET and biologically degradable plastics such as PLA. Complete chain closure however has not yet been achieved.

In the packaging field there are still **innumerable challenges**, in particular with respect to plastics, both in the technical cycle (recycling at the same level) and the biological cycle. Many of the biologically degradable packaging materials (as tested against current standards) need much more time than is normally required in a composting plant. Such packaging will therefore ultimately be rejected from the composting trajectory, to be incinerated and converted into energy. In the technical cycle as well, much can be gained by deliberate design so that recycling produces at least the same level of quality.

DAGERAAD | SHARING KNOWLEDGE

Industrial design agency www.dageraadontwerp.nl

Eveline Bijleveld became involved in the C2C Learning Community through her work as a sustainable product designer at VelopA, where she was responsible for the design of the C2C outdoor bench 'the ComeBack'.

Dageraad Industrial Design, founded by Bijleveld with her partner Maarten Kalis, is aimed primarily at sustainability. When Bijleveld decided to set to work according to the principles of Cradle to Cradle, she realized it was necessary to gather additional expertise. A designer also has an overview of the entire product chain, and is involved in many of the changes inside a company.

What has C2C delivered?

- C2C fits in well with the current tendency: "Together you get further than on your own, by sharing knowledge with one another!"

Packaging learning points

- *Balancing the technical possibilities and the economic aspects* is a challenge. A lot is technically feasible, but it must also be economically profitable.
- To arrive at a *complete solution, cooperation* is necessary. The solution must entail benefits for all parties in the chain if the new concept is to be accepted and to gain sufficient volume. This means the *right partners are sometimes one step further away* than in the traditional value chain.
- The closure of cycles requires us to consider as early as the *product design* phase, which cycle the product is intended for: the *technical* or the *biological* cycle. This has implications for the type of material used and the disassembly of the product. Materials should only be mixed if they can be separated later on.
- For some participants *LDPE foil* was found to be the most suitable packaging material. The *current biological alternatives* based on starch and PLA may limit CO₂ emissions, but they also *use more land*.

What has the Learning Community delivered?

- Because of its composition, the Learning Community possesses a lot of information, which is useful in the early phases of design and during the introduction of a C2C product. This also means the pitfalls can be recognized at an early stage. The sheer diversity of the people and companies meant that there was an on-going exchange of valuable lessons and information.

|| Eveline Bijleveld, industrial designer and owner of Dageraad Industrial Design:
“C2C design requires intensive cooperation between chain partners.”



6. Organizational change and sales

Activating the added value of C2C

Companies using Cradle to Cradle for the first time soon realize there is much more involved than being awarded a certificate. Successful implementation and application of C2C has profound effects on the organization. C2C is more than a sustainable product design – it is a philosophy, which can and must be embraced and applied by the entire organization. The implementation of **C2C** therefore **demands** innovation and, in the longer term, **integral organizational change**.

The C2C debate often focuses on the technical aspects of innovation. But more is needed. The organization itself, and all of its employees,

will have to operate differently. Organizations must learn to develop **contextual awareness**, in other words they must become aware of developments in society and be able to translate them to the business and (new) opportunities for products and services. The organization – particularly the management – must also have sufficient **self-knowledge**. How do I manage and direct people? What are my strengths? How do I adapt to new situations? C2C requires after all new knowledge and a different style of leadership in which openness and co-creation will play an important role.

AHREND | A POSITIVE SALES STRATEGY

Office furnishings

www.ahrend.com

Ahrend organizes its business operations according to the C2C philosophy. C2C fits in well with the ambition to be the most sustainable company in the sector in Europe. Three product lines received the silver C2C certificate in 2010.

In 2011 Ahrend wants to increase sales of C2C products by 50%. Many customers already buy C2C products without being aware of it. The C2C story therefore has to be communicated

more clearly and confidently to the customer.

This year a start will be made on training the sales department for that purpose. The focus of the product is no longer based purely on the properties of the product but on the benefits thereof. Cradle to Cradle is a healthy choice for you, your wallet and society at large.

In the sales strategy there is more emphasis on the consultation period. The customer must be consulted about the 'new functionality': safe and healthy products that encourage people and help them perform better.

What has C2C delivered?

- A recognition/acknowledgement of Ahrend as front runner in the field of sustainability. In March 2011 Ahrend received the Cradle to Cradle Company Award;
- More than a third of turnover is from C2C certified products. This makes Ahrend one of the absolute top C2C companies in the Netherlands.

Once this kind of awareness is in place, a business can set to work with **new forms of cooperation and skills**. The biggest change occurs in the internal cooperation between the various departments and the external cooperation with suppliers and customers. C2C innovations only succeed if there is real cooperation both inside and outside the organization.

The **sales department** must also be involved in the C2C programme from the very start. They are the ones responsible for translating C2C to the customer. Their selling argument will have to change,

focusing on the C2C story and the functional benefits it brings to the customer. It is the task of the salesperson to activate the added value of the C2C product in the market. Representatives will learn how to communicate the C2C story in a clear and confident way to the outside world. The customer is also increasingly knowledgeable about C2C and sustainability, so it is particularly important that the substance of this story is correct. New, internal sales combinations can be put to good use in this regard: take a CSR ambassador with C2C expertise with you to a sales pitch for example.

What has the Learning Community delivered?

- It is important to actively inspire and encourage. Ahrend shows great initiative in the direction of government and other partners. Ahrend in cooperation with DESSO, Mosa and Van Gansewinkel launched the 'Cradle to Cradle Café' mini-seminars for example, where topical subjects in the field of C2C are discussed.

Roel van der Palen, Business Development Manager at Ahrend:

"Cradle to Cradle pays off; for the same money you work in a healthier, safer environment."



Organizational change and sales learning points

- C2C is a *continuous learning process*: take a critical look at your own organization, propose solutions and introduce improvement programmes to help put the C2C philosophy and C2C criteria into practice.
- *Organizational change is inseparably linked to C2C* when it is applied on a large scale. The competence and skills of people in the various business units must be thoroughly scrutinised and adjusted as necessary to define a new commitment to the realization of C2C.
- Salespersons are still very much oriented toward the selling of products, but the *market is increasingly calling for a discussion partner who is thinking with them* about ways to solve their “sustainability problem”.

Further reading

Spiral Dynamics: www.spiraldynamics.org

VELOPA | MAKING C2C DISCUSSIBLE

Street furniture

www.velopa.com

VelopA's interest in C2C is based on the realization that if you want to be among the market leaders you have to take the lead in sustainability. VelopA therefore developed a sustainability policy. As a result VelopA brought the first C2C certified outdoor bench onto the market, the 'ComeBack'. The presentation of the product generated plenty of *free publicity*. For VelopA it was important that

the product had a 'good vibe' – the 'ComeBack' should convey the sense that C2C pays off.

Selling a C2C product calls for some serious adjustments in the sales department. Representatives have to learn to communicate the sustainability concept clearly to the customer. A number of steps have already been taken in this direction. Sales staff has been given sustainability training in the form of presentations and seminars. VelopA now faces the challenge of integrating the C2C concept into the sales story.

What has C2C delivered?

- C2C stimulated the internal sense of urgency. Michel Middendorp, International Sales Manager, asserts: “Cradle to Cradle pays off because it gives us a clearer insight into the philosophy of sustainability and what we can do with it as a company.”
- Sales staff has made sustainability and C2C a real topic for discussion. Externally, VelopA demonstrated clearly that it is serious about the subject.

7. C2C and LCA

The positive environmental effects measurable?

Companies and government bodies that want to implement the principles of C2C are familiar with the use of LCA as a measuring technique. As are several participants from the Learning Community. In an LCA the environmental impact is estimated from cradle to grave, throughout the entire life span of a product. The Learning Community felt there was a need for greater clarity about the measurability of C2C aspects of products and developments. Companies are looking for a **measuring instrument** for use at three important moments in their **C2C process**:

- 1) In setting goals (vision/ambition);
- 2) In monitoring the development;
- 3) In external communication.

The starting point was to find a linkage with the most accepted method of measurement, Life Cycle Assessment or LCA. In other

words they wanted to further professionalize C2C by using a measuring instrument that will be accepted in 'LCA circles'.

A separate work group of the Learning Community working with EPEA experts and PRé Consultants looked into the available options. Their conclusions are to be published in a **white paper** and confirmed by an international **Sounding Board**. The aim of this paper is to provide insight into the usefulness of LCA as a measuring instrument in the development of C2C products.

At the moment this booklet went to press the white paper was still being prepared. Some aspects of C2C and LCA are already mapped out to help clarify the essential nature of the two concepts (see the table below).

What has the Learning Community delivered?

- Thanks to the Learning Community VelopA was able to sustain and enhance her C2C ambitions. The Learning Community turned out to be an excellent source of inspiration for strengthening the commitment to C2C within the company. Ton van Klooster, director of VelopA, believes it is important to take key personnel from different departments to relevant Learning Community meetings. They come back, he says, with a realization that there are numerous possibilities - and opportunities - in C2C.

Ton van Klooster, Director VelopA:

"If there is one person who can change your business it is the customer."



C2C**LCA**

What it is	<i>Innovation framework</i> , Business concept.	Method for <i>measuring</i> the environmental impact of products over the entire life cycle.
Philosophy	It is possible to design products with a positive impact on people, the environment and economic profit (the three Ps).	"All" products pollute; they all require extraction of raw materials, and there is always some form of waste left over.
Approach	<i>Eco-effectiveness</i> : develop a product with positive qualities. The process is part of the ultimate goal.	<i>Eco-efficiency</i> : do more with less. Improve the ratio between economic value and environmental impact. The aim is to measure the result, not the process.
Design aids	Use the 3 guiding principles to establish a <i>clear direction</i> .	Use <i>hot spots</i> to set priorities for improvements.
Environmental impact	Maximisation of positive effects on people, their environment and the future availability of raw materials.	LCA is used as a measuring instrument in eco-design, whereby hot spots (life cycle elements with the biggest- negative - environmental impact) are identified so that designers can set priorities for improvements.
Footprint	Develop a positive beneficial footprint.	Measure the footprint and let designers decide how to handle with it.

DSM | NEW OPPORTUNITIES**Chemical engineering and biotechnology**

www.dsm.nl

DSM has long been a leader in the field of sustainability. DSM has proved to be extremely innovative in recent years, especially in relation to chain closure. From 2004 to 2010 the company has occupied the first or second place on the Dow Jones Sustainability Index. Direct cooperation with EPEA was initiated in 2008 to achieve even better results with the Cradle to Cradle philosophy. This led to the development of five C2C certified plastics. Implementation of C2C was also an excellent opportunity to enter into dialogue with

chain partners about the innovations needed to make products sustainable.

In partnership with customers, solutions were invented to replace plastic throw-away packaging by cardboard packaging with a barrier coating. The coating, based on specially developed resins, provides an adequate barrier against moisture and fat, but it is still biodegradable. This produces an end-product of greater value than cardboard alone, which means extra added value for the cardboard manufacturer. It also reduces the consumption of plastics and the amount of (street) litter.

What has C2C delivered?

- Cradle to Cradle generates a powerful and inspiring message: by means of C2C companies can have a positive effect on the environment instead of just trying to reduce the negative impact;
- The demands placed by C2C on design are an excellent stimulus for innovation;
- Last but not least: C2C generates new business for DSM, so that this philosophy ultimately contributes to the total business result.

The (preliminary) conclusions about the use of LCA for C2C purposes are:

- 1) **Set C2C goals:** Elements of a LCA can be useful supplements to the C2C inventory in the beginning of the process. Apart from mapping out the composition of the product in the C2C inventory, LCA also serves as a check: "Do we know everything we need to know about the product?".
- 2) **C2C Monitoring:** In a C2C process LCA can assist to see if burdens are shifted when changes are made to the product or process. This issue is not examined (fully) by C2C.
- 3) **C2C Monitoring:** LCA is not suitable for indicating how much progress has been made on a C2C product. LCA measures a design

at a particular time based on current data, not the amount of progress made toward a defined C2C goal. This is why the C2C 'roadmap' for companies with its associated measurable 'milestones' remains important.

- 4) **External communication:** LCA is not suitable for communicating the C2C-ness of a product, and thus not suitable for external C2C communication. It may be useful to know internally how a C2C design scores in an LCA to put it into context with government criteria (sustainable procurement) and other communications based on LCA, such as Environmental Product Declarations (EPD, an LCA standard in industry with sector-specific product criteria; see also 'LCA learning points' in this regard).

What has the Learning Community delivered?

- Our contacts in the field of C2C were extended in the Learning Community with companies that occupy a totally different position in the business chain. This turned out to be extremely valuable when it came to obtaining a broader picture of the possibilities of Cradle to Cradle, and it also contributed to quicker results. In short it led to fertile cooperation.

Theo Jongeling, Business Manager C2C-Solutions at DSM:

"Cradle to Cradle pays because it encourages innovation from a sustainability perspective. This produces new opportunities, and it is oriented to everyone's future."



The (preliminary) conclusions about typical C2C aspects in relation to LCA are:

- 1) Even though LCA was developed to estimate **negative** effects, theoretically it can also be used to estimate certain (C2C-specific) **positive** environmental effects. Possible examples are cleaner air (delivered by air-purification carpet), cleaner water (delivered by a C2C carpet-production process) or the effect of energy-producing homes. Not all positive qualities however can be measured by
- 2) Cradle to Cradle products are often about **future solutions** in a future C2C-ideal situation. This leads to many assumptions and uncertainties. LCA always takes the **present world** as its frame of reference, so that some assumptions (based on C2C) can have a negative effect on the outcomes of an LCA. The question of energy consumption, necessary for post-use resource production

LCA. Design for disassembly, the cycle of materials and 'defined use', for example cannot be measured by LCA.

DESSO | FURTHER THAN 'NORMAL' SUSTAINABILITY

Floor coverings

www.desso.com

DESSO was taken over by NPM Capital in 2007. The new management wanted to change the course of the company to fight off the competition. DESSO wanted to shed her old-fashioned image. It was hoped that by embracing the Cradle to Cradle philosophy DESSO would differentiate herself in the market in terms of both sustainability and design.

Since 2008 DESSO is profiling itself as a C2C company seeking to have all its products

C2C certified in the future. The free publicity generated for DESSO by Cradle to Cradle meant that the marketing budget could be reduced by 50%. Instead of using traditional marketing techniques, DESSO decided to actively look for potential customers and appeal to them with the C2C story. The company takes every available opportunity to speak at congresses and seminars on sustainability. This is where the managers and decision-makers are to be found. This proactive approach has brought DESSO a number of large orders from business and government, at various ministries for example.

What has C2C delivered?

- DESSO turnover remained the same even though the European market shrank by 35% and the Dutch market by 12%.
- C2C opens many doors and has greatly improved the image of DESSO.
- In 2010 DESSO launched the AirMaster®, a carpet that actually cleans the air. The product contributes to a better quality of life, entirely in accordance with the Cradle to Cradle philosophy.

(recycling), is expected to be solvable via innovation in energy production. The same applies with respect to better management of CO₂. It is possible to include such C2C assumptions in an LCA, but they must be clearly defined in the “goal and scope definition”. They will also increase the margin of uncertainty in the results.

- 3) C2C is about **quality** and LCA as a measuring instrument is about **quantity**. The extent to which the defined qualities of a C2C product can be measured depends on the extent they can be

quantified for LCA measurement. In other words: it depends on the extent to which they can be described in a realistic way, in concrete terms and not as conceptual ideas. A LCA is primarily designed to estimate the ultimate environmental damage caused by a product, and not (for example) whether there is a particular sensitivity to certain substances (such as formaldehyde resin off-gassing from fresh furniture panels, or VOCs from new carpet tiles with a bitumen backing).

What has the Learning Community delivered?

- DESSO initiated a C2C and LCA work group, joining strength with other companies to gain a better understanding of what can and cannot be done using LCA from a C2C perspective.

Rudi Daelmans, Director Sustainability at DESSO:

“C2C pays off because it can give future generations a healthier world in which consumption is no longer a dirty word.”



Some complementing remarks:

- In a LCA, **toxicity** is based on emissions to the environment. C2C on the other hand looks at the value and toxicity aspects of the materials for next processes as well, not just emissions. LCA often omits minor substance flows, which may appear to be irrelevant, because of lack of data. Yet these minor flows can contain some highly toxic chemicals that create a substantial local risk; for that reason LCAs may be inadequate when it comes to toxicology. Toxicological information is furthermore only available for a limited number of substances. Out of the 145,000 industrially relevant chemical substances, only 5,000 are recorded in Usetox (an important toxicity method in LCA). And as a general theme, toxicity is relatively unimportant in an LCA compared to C2C (LCA: if toxicity accounts for less than 1% of the total environmental impact it is not taken into account. C2C: composition of material is known to 100 ppm).
- The **recyclability** of a product cannot be measured by a LCA. The recycling process can only be taken into account in a LCA if realistic assumptions can be made about the anticipated recycling percentage. In Cradle to Cradle, the development of concepts for change towards a future cradle of things has highest priority.
- Certainly in the case of Environmental Product Declarations the result can turn out to be 'unfavourable' for C2C products at a

EUROCERAMIC | FOCUS ON LIFE SPAN

Stoneware pipes and fittings

www.euroceramic.nl

EuroCeramic has produced and supplied C2C stoneware pipes since 2009. The pipes are manufactured in a closed chain, and all the ceramic waste (fired and unfired) is recycled. The conversion to C2C cost relatively little effort. EuroCeramic already used sustainable raw materials, and produces virtually no industrial waste. EuroCeramic often used LCA methods in the past to analyse the environmental impact of products.

These LCAs have some disadvantages however compared to the C2C methodology, particularly in relation to raw materials. With LCA it is possible to leave raw materials used in small quantities out of the analysis. This is certainly not possible with C2C. This philosophy therefore had a far greater appeal to EuroCeramic. Thanks to the implementation of C2C, EuroCeramic now knows down to 100 parts per million what is in its products, and that these materials do no damage to man or the environment.

What has C2C delivered?

- C2C brought EuroCeramic considerable public recognition. Since embracing the C2C philosophy, EuroCeramic has frequently been asked to sit around the table as a fully fledged discussion partner with large consultancy firms. EuroCeramic observes that an increasing number of municipalities is showing an interest in vitrified clay pipes and is asking about the possibilities and the latest developments.

transient stage of development towards a “burden-free” situation. For example, ‘**off-gassing**’ materials may be ignored in an EPD even if it is a nuisance to users. In the innovation framework of C2C on the other hand, the effects of the chemicals in a material are always explicitly included.

- Certain significant **health aspects** of C2C are not measured in a LCA. Important matters such as the sensitivity of the airways or the skin, or the indoor air quality, are often not included in a ‘normal’ LCA or environmental declaration. Similar with ergonomic or aesthetic considerations, not all C2C aspects can be included in an LCA.
- **Local** aspects are not generally considered in an LCA. These may play a role in the quality of indoor air, for example.

- Summing up: we have to decide **for each product** whether, and how, C2C aspects can be made measurable using an LCA. The LCA framework is flexible enough to take us quite a long way in this regard; the Environmental Product Declaration framework on the other hand often does not. This represents a real bottleneck. Because of such limitations, a C2C product may deliver a poor environmental declaration. It is advisable to be aware of this during the C2C process to avoid unpleasant surprises at the end of the development phase (see also the conclusion on external communication in this regard).

The intention is to supplement the white paper with a ‘LCA guide’ explaining the areas of particular importance in the measurement of C2C aspects.

What has the Learning Community delivered?

- The various ways of working with certification among the Learning Community members was particularly enlightening for EuroCeramic.
- Also extremely valuable were the efforts of the Learning Community to tie C2C in with LCA methods. EuroCeramic sees a lot of potential for this kind of analysis with regard to its own products.

René van Veldhoven, plant manager at EuroCeramic:

“We know that nothing that is used in our products is damaging people or the environment.”



LCA learning points

- The paper on C2C and LCA can help to *bridge the gap* between conventional sustainability and C2C thinking. Inside companies and government bodies many (sustainability) decisions are taken on the basis of LCAs. If C2C is given a clear role in this regard, it will be possible to position it within the business processes (in strategy definition and decision-making for example).
- In the world of sustainability and Cradle to Cradle, clients and suppliers are often still searching for the 'truth'. All the different *terms and concepts* used may have a somewhat *confusing* effect.
- Genuine *C2C benefits*, such as involving safe materials *is not taken enough into account* in an *environmental impact declaration* (such as an EPD). An EPD is based on a so-called Product Category Rule (PCR) document. This sets out what is and what is not to be taken into account. As a rule several companies in mutual consultation draw up PCRs. See also www.gednet.org.
- DESSO uses LCA for internal decisions, so that they know what they are dealing with. It is therefore a tool, *not a goal in itself*. As soon as a LCA is used for commercial purposes, as in the case of EPDs, it seems to have become a goal in itself. All the aspects not found in such an LCA, such as toxicity, social aspects and effects on the indoor air quality, are then disregarded.

MOSA | NATURAL AND RECYCLABLE

Ceramic tiles

www.mosa.nl

Royal Mosa is a manufacturer of ceramic tiles and is known for her innovative and leading design.

Mosa is the only tile maker who produces its entire collection sustainably in the Netherlands. Mosa embraced Cradle to Cradle in 2007 and today some 99% of the tile collection has the silver certificate.

Mosa tiles contain only natural raw materials and are recyclable. Currently they contain between 16 and 45% of 'pre consumer' recycled material. To further enhance the recyclability of the product two things are important: the availability of suitable materials and their process ability in Mosa's

production process. To close the chain even further, a pilot project was started with waste collector Van Gansewinkel in 2010 to establish whether a recovery system for tiles from the market would be feasible.

In these return logistics 'Just in time' (a logistical method for optimal inventory control) is very important. The peaks and valleys in the material flow are a major challenge. Construction companies willing enough to sort their rubble are often defeated by the short-term need for a container on the ground, which can also be quickly removed. This means the entire organization has to be set up accordingly.

The composition of the collected material is not consistent because it may contain several types of ceramic waste. An experiment was carried out with this 'post consumer' recycled raw material; the tiles are of good quality and aesthetically pleasing. To guarantee their consistency however, an optimal composition of raw materials is currently being sought.

What has C2C delivered?

- The Cradle to Cradle philosophy supports Mosa in its ambition to play a leading role in the field of sustainability. This, alongside design and functionality, constitutes one of the three pillars of the business. In addition to it being a critical factor for staying in business in the long

- EuroCeramic observes that particularly in relation to sewerage materials, much use continues to be made of 'obsolete' LCA studies in which scarcely any attention is paid to *the life span* of a product. In the view of EuroCeramic, life span is one of the most important aspects of an LCA. The analysis of the environmental impact of a product is not worth anything if it is not related to a realistic life span. C2C also pays very little attention to life span. From the point of view of C2C this is not necessary because it works with closed chains. C2C applies a so-called defined use period, depending on the functional use of the product (when does the material become available for a subsequent use). For cost comparisons over the entire life span it is therefore important to

compare various materials and their respective life spans with one another.

- Mosa found that *data* collected in the context of C2C, such as information about modelling, raw materials, energy consumption and emissions, can serve as input for an LCA. The *LCA* is therefore of a *better quality* because it is based on actual information instead of assumptions.

Further reading

The white paper will be available from September at www.agentschapnl.nl/cradle-to-cradle

term, sustainability also calls for taking responsibility and interacting with customers. Customers are increasingly asking for sustainable products, and they are becoming increasingly knowledgeable about the subject. Professionalism and integrity on the part of suppliers is starting to bear fruit.

- Cradle to Cradle is about integral product quality. It challenges Mosa to stay innovative: to go a step further than merely follow the regulations and seek out the boundaries of what is possible in order to maintain its leading position in the market.

Dorien van der Weele, Manager Sustainability at Mosa:

"Mosa believes that in the long term there will be no place for anything but sustainable building products which can be produced and used without health risks."



0. Chain closure

Recycling and upcycling

Closing the chain is one of the most important aspects of C2C.

Waste equals food: according to the C2C philosophy all products should eventually end up as a high-value raw material for a new product. Braungart and McDonough draw a distinction between the biological cycle and the technical cycle. Products must be designed in a way that the various materials can easily be separated out again and reintroduced to one or both chains.

The Learning Community sees chain closure as one of the biggest challenges of the implementation of C2C. The rising cost of scarce raw materials is a major economic incentive for companies to take this up. Cooperation with chain partners is absolutely essential to achieving it. Cycles can only be closed if the **entire chain** is willing to contribute. At the front of the chain, agreements have to be made with suppliers about the raw materials and design of the product.

LDM | GRIP ON CHAIN CLOSURE

semi finished brass products

www.ldmbrass.com

As a producer of brass and bronze alloys LDM is well aware that the raw materials for these alloys are becoming increasingly scarce. It is therefore not surprising that sustainability sits in the DNA of the company. Not just because it is good for the environment, but for fundamental economic reasons as well. Now that the price of copper is rocketing, it is essential for the continuity of the business to get a grip on chain closure. In fact, even long before LDM adopted C2C, more than 98% of the raw materials used in the production of semi-finished products were secondary raw materials. C2C is an excellent incentive for LDM to take further steps on closing the chain.

Recovering products from end-users after use presents some serious difficulties for LDM. This is largely due to the fact that LDM makes intermediates. To change this situation LDM recently approached a number of its customers who make luxury sanitary facilities. LDM is trying to set up a closed chain with these customers. This means that after many years of use, all the brass contained in the products will be returned to LDM.

There is also a strong focus on the metal residues produced by the LDM factory. One of the long term ambitions of LDM is to process these flows of metal-bearing material herself. In cooperation with TU Delft, considerable steps have already been taken in this direction.

Complex metallurgical techniques are involved which cannot be introduced from one day to the next. LDM knows exactly what kind of approach is required however, and a very promising pilot project is currently being scaled up.

What has C2C delivered?

- Concrete changes in the material flows have not yet been realized. Before LDM started applying C2C the company was already a leader in the field of sustainability and chain closure. Clearly the final steps are the most difficult. The fine tuning of chain closure is a complicated process. LDM regards it as an evolutionary process. Just as the biological cycles of the planet took a long time to develop, it is likely that things will be no different for the cycles of technical materials.

These have to comply with C2C criteria in relation to such matters as health and safety, ease of disassembly, and maximum possible use of mono-materials. At the back of the chain you have to set up a return system with customers and end-users. Or find a way with third parties to re-use the end-product in the production process.

Chain closure learning points

- Chain closure is something you do with the *right partners*. You have to trust one another and dare to step into a co-creation trajectory. That requires an open relationship in which you understand one another's business model, and are prepared to adjust elements of your own model. This is the only way to *discover new products, services, markets and revenue models together*.

- Embracing the C2C philosophy has brought LDM a fair amount of public recognition. The company is recognized as a very responsible and reliable partner by their customers as well as the government. LDM is also trying to spread the C2C message among students. A training programme has been set up for the local ROC to make teachers more 'C2C-wise'. This way LDM is investing in the customers of tomorrow.

What has the Learning Community delivered?

- A valuable network with many possibilities. In the future C2C companies will be increasingly looking for ways to cooperate with one another, in the construction and layout of C2C buildings for example. In that regard it is good to be establishing useful contacts. LDM also learnt a lot from the other members, especially in the field of marketing. They have gained a real appreciation for the way companies such as DESSO and Van Gansewinkel are communicating about C2C to the outside world. This helped to trigger the debate about marketing within LDM.



Hans van Dugteren, KAM manager at LDM:

"The closure of cycles is vital, especially for a company that depends on scarce raw materials."

- *Household* waste represents a major challenge to the closure of cycles. The closure of the cycle in *B2B* appears to be easier because the volumes are larger and the flows are easier to deliver in separated form.
- Chain closure can be promoted by ensuring that the *producer remains the owner* of the product. In this case the customer does not pay for ownership, but for the use of the product. By *guaranteeing residual value* on the product, you ensure that the customer comes back – and behaves like a chain partner rather than an end-user. In this way the producer keeps control over the

final phase of the product while building a sustainable relationship with the customer.

- Van Gansewinkel is increasingly involved in the *design process of products* and is asked to give advice on how to make products or business processes more sustainable. The goal of such consultation is either to prevent the creation of waste or find a way to take the product back into their cycle after the disposal phase.
- *Return systems* are a major challenge. In the early stages of C2C implementation the company keeps getting products back, which are not C2C. For some products, such as the DESSO carpets, this

VAN GANSEWINKEL | NO SUCH THING AS WASTE

Processing waste

www.vangansewinkel.nl

‘There is no such thing as waste.’ This is the motto of the Van Gansewinkel Group. Van Gansewinkel collects and recycles waste flows, and converts them into raw material or energy. They position themselves as a supplier of raw materials and sustainable solutions. The C2C philosophy works as an important source of inspiration. The company has an enormous

amount of expertise to its disposal in the field of recycling and is constantly looking for new ways to improve the recycling process, thus implementing the C2C philosophy to the fullest possible extent.

What has C2C delivered?

- Van Gansewinkel sees its revenue model changing from a ‘solver of waste issues’ to a ‘supplier of raw materials’. This is a completely different approach to the chain:

from raw material to product to the ‘waste phase’ ... and back to raw material. Today Van Gansewinkel is even selling her own compost to the market.

What has the Learning Community delivered?

- Van Gansewinkel was already involved in a number of joint ventures regarding C2C with other companies. They have worked with Van Houtum on C2C solutions for paper for

transition period can take as long as *15 years*. There has to be found a way to get these materials back and convert them into value.

- The current *tax system* puts a heavy burden on labour whereas the use of raw materials is relatively cheap. From a C2C point of view it would be more effective to spread the tax more evenly between labour and the use of raw materials. This would lead to a relative rise in the price of raw materials and would cause a substantial financial boost towards closing the gaps in the cycle of materials.
- In the food sector *legislation* leads to a number of obstacles for

chain closure. The BSE crisis led to very strict rules regulating return systems of food commodities. A lot of food finishes up in the waste incinerators as a result. Kruidenier Foodservices and Albron are investigating how *chain closure* can be achieved in the *food industry*.

- *Incineration* of the residue from waste is sometimes the only solution. In this case it is important to burn the material in as *clean a state as possible* and without any emissions of harmful substances.

example. Van Gansewinkel is also working with tile manufacturer Mosa to find ways to close the tile cycle. A pilot project for collection and processing of tile waste has been rounded off with great success. Taking part in the Learning Community has been a good way for Van Gansewinkel to meet one another on a regular basis.

Florens Slob, Marketing Manager at Van Gansewinkel Group:

“Design your packaging for the product it is intended for, but also think carefully about what will happen to that packaging after the product has been unpacked.”



Benefits of the Learning Community

Community of Practice as a 'social instrument'

What are the actual benefits of a Learning Community? What is the added value of bringing pioneers in the field of C2C together in one place?

In the Learning Community '**learning from one another**' is key. Learning about how other companies implement C2C, how they have reached that point, and about the solutions they found to tackle the various challenges faced. Leading companies use one another as sparring partners, and through the Learning Community sessions they learn to speak a 'common language'.

One success factor of the Learning Community is that the participants are not competing with one another. It was a basic principle of the selection process that no more than one company per sector would be allowed to take part. This meant an atmosphere of trust and confidence could quickly be established among the participants.

"**Learning from diversity**" is a key concept of the Learning Community. The backgrounds and ambitions of the participants are different. They have different visions and opinions about whether C2C is the best or only way to achieve sustainability, whether C2C goes beyond sustainability, or whether C2C is just one specific form of sustainability. There is also a huge variation in the size of the companies involved (from 15 to 50,000 employees); the stage in which implementation of C2C is in; and the extent to which C2C/sustainability has been incorporated in their business processes. They also differed in the scope of their ambitions; is the primary focus on certifying products, or is it an enterprise-wide strategy? Is certification being sought for existing, modified products, or are the C2C products a brand new addition to the assortment?

Other conclusions about the added value of the C2C Learning Community:

1. The **participants inspire one another** with project examples, contacts and experiences. It is both educational and enjoyable to hear what other companies are doing. Tangible, honest stories from the participants in the Learning Community had the widest appeal. Other companies are able to recognize important elements of their own situation in such stories.
2. The **examples** and experiences of other C2C pioneers can also **help the decision-making** process in your own organization. This leads to a better understanding of the decision to embrace C2C. They are also a source of inspiration. It shows how C2C can be best realized, within your own company as well as further along the chain or column.
3. **New networks** (partnerships and shared projects) are created. The members know where to find one another, and can quickly take action because they have had so many opportunities in the past to think and work together as part of the Community.

“**Cooperation in theory and practice**” is another key concept of the Learning Community. The numerous examples in this booklet show how enthusiastic the companies are about combining their strengths to find new C2C products and opportunities in the marketplace. They also discover how effective cooperation can be. During the market consultations about the refurbishment of the VROM Ministry building in The Hague for example, the members of the Learning Community suggested a number of new ideas. Together they wrote a collective letter to the Dutch Government Buildings Agency about these ideas. This initiative made it clear to them that they could exercise far more collective influence on the ultimate layout and usage of the building if they were involved in the refurbishment plans at an early stage of the process. This can lead to finding numerous sustainable solutions from which the principal can choose.

4. A **good working atmosphere** is also an important **basis** for the success of the Learning Community.
5. **Professional preparation and facilitation** of the Learning Community meetings leads to effective communication and the deployment of suppliers of expertise and contacts for the government.



Participants C2C Learning Community

Royal Ahrend N.V.

Gerard Huiskes Manager Innovation
Roel van der Palen Business Development Manager
Diana Seijs Coördinator CSR and Sustainability

AkzoNobel

Jan Verlaan Ideation Manager
Max Sonnen Sustainability Consultant

Albron

Henk Voormolen Director Sustainability

Dageraad Industrial Design

Eveline Bijleveld Conceptual Designer and
owner Dageraad

DESSO

Rudi Daelmans Director Sustainability
Nicole Shaffroth Projectleader Sustainability
Rob Kragt Marketing Manager

DSM

Theo Jongeling Business Manager C2C
Rinus van den Berg Architect Industrial Designer
Henk Bosch Competence Leader Life Cycle Assessment

ECOstyle

Wilma de Ruiters - Van der Stroet Marketing Manager

EuroCeramic

René van Veldhoven Plantmanager

Knoops Printing Establishment

Marc Geraeds Director
Wessel Breeuwsma Director KEP

Kruidenier Foodservices

Christy Kool Manager HRM and Quality



LDM

Hans van Dugteren SHEQ Manager
Leo Fliervoet Manager Raw Materials

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Philips Lighting

Maarten ten Houten Sustainability Director Philips Lighting

Sapa Pole Products

Tanja Buijks Marketing Communications Coördinator
Nicole le Sage Marketing & Communications
Leon Snoeren Business Support Manager

Van Gansewinkel

Florens Slob Manager Marketing

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Bas Gehlen Director Operations

VelopA B.V.

Ton van Klooster Managing Director
Timo Krop Manager Quality & Support



This booklet is a report on the benefits produced by the Cradle to Cradle Learning Community. Seventeen companies, leaders and pioneers in the field of C2C, came together throughout the past year and a half to learn how C2C can be put into practice.

The Learning Community met on ten occasions. Each session was held at, for and by the companies concerned, and their learning questions played a central role. Sharing their insights about the themes dealt with in this booklet constituted the essence of the Learning Community. These themes were extremely diverse, ranging from marketing to the internal support base and from sustainable purchasing to organizational change. All these subjects are part of the sustainable innovation, which C2C implies. One important conclusion of the Learning Community is that C2C pays off, in every sense of the word. C2C is good for profit, people and planet.



Ministry of Infrastructure and the
Environment



NL Agency
Ministry of Infrastructure and the
Environment

the **terrace**