The Circular Economy
Powered by Cradle to Cradle®
Fig. 1: The pursuit of positive impacts by a Circular Economy powered by Cradle to Cradle®. Efficiency means doing things right but only effectiveness means doing the right things. (Source: EPEA)
The scarcity of resources is already threatening many industries. Only if a company solves this problem can it pave the way into a fertile future. The Circular Economy powered by Cradle to Cradle® is a sustainable and profitable alternative to a linear economy which is threatened by scarce resources and population growth. The Circular Economy powered by Cradle to Cradle® (C2C) is an innovation platform for creating positive impacts by improving quality and decoupling growth from primary raw materials. It is a step forward from the linear economy which is leading to economic volatility and systematic imbalances.

The economic concepts supporting Cradle to Cradle® were developed by the chemist Prof. Michael Braungart and scientists at EPEA, then further developed with architect William McDonough. The underlying concept was awarded the U.S.E.P.A. Presidential Challenge Award, The Oce van der Grinten Prize for Economics, the B.A.U.M. award, and many others.

The concept is designed to create positive impacts for the economy, the environment, and human culture. It mimics nature by eliminating the concept of waste.

- Products and processes are designed to become productive for a biological or technical cycle.
- By focusing on customer benefits, the product design ensures that at the end of the cycle the material is recovered at high residual value for next use.
- However, C2C is not only about materials; it equally focuses on accelerating cost-effective renewable energy and improving organizational resilience through diversity. This holistic approach generates added value across the organizational spectrum.

Experience in business, government and institutions demonstrates that a Circular Economy powered by Cradle to Cradle® motivates management and employees, improves perception of their organizations, and leads to sustained value which otherwise would not be captured.

Added value for companies, institutions and governments

- The Circular Economy powered by Cradle to Cradle® has an enormous potential for innovation and savings, with a solid track record of enterprises and governments generating positive impacts by upcycling to new designs or re-designs of processes and products. As a result, companies significantly reduce their material and energy costs and secure competitive advantages and higher yields/returns. In addition, due to more effective resource use and reuse of formerly waste products, positive environmental dividends are attained.

- For one thing, a new awareness of the Circular Economy potential is on the political agenda of the European Union, leading industrial powers, and emerging powerhouse economies such as Brazil and China.

- For another thing, leading international companies such as Kingfisher, H&M and IKEA see the benefit for solving resource volatility and significantly improving product innovation and quality. They also see it as a way to cost-effectively internalize costs which until now were externalised but are being pushed onto company balance sheets by government regulations.

- By consistently focusing on customer value the Cradle to Cradle® service approach opens completely new customer potential; for example banking high-quality materials at customer sites to improve residual value and achieve security from volatile prices. This ultimately reduces investment costs for the customer and manufacturer.

- For example, the leading carpet manufacturer, Desso, recognized the problem of poor air quality and created by re-design of its main product consisting of 100 percent recyclable material the carpet which cleans the air. The realignment of the product range increased the EBIT by a factor of nine (from 1 to 9 percent) and increased Desso’s Europe-wide market share by 7 percent points to 23% (Stuart Crainer, London Business School: A good yarn). The improvements were achieved by Desso working with EPEA to add new functionalities to its carpets.
How to achieve continuous growth without relying on linear primary raw materials use?

» In the Circular Economy powered by Cradle to Cradle®, continuous and healthy growth is an option. The potential for accelerating growth is high if growth is redefined. The message is distinct from the traditional ‘growth is limited’ message. A new type of growth is achieved in a system which regenerates resources and uses innovation for creating more options than exist today.

» Cradle to Cradle® provides the conceptual and methodological framework that makes the circular economy work. It is driving added value for billions of Euros worth of products and systems. Leading circular economy organizations as well as the European Commission cite C2C cycles as a basis for the circular economy. C2C tools to implement those cycles are central to business success.

» Cradle to Cradle® enhances the quality and positive impacts of products and systems so they are ...

- more practical for the user,
- healthier for everyone affected by the product,
- beneficial for the economy and the environment.

» To enhance quality and add value for stakeholders, C2C promotes innovation partnerships along the value chain including manufacturing, distribution, use, disassembly, recovery and reuse.

» C2C has already provided a practical yet inspirational scientific and business model for improving quality by characterizing hundreds of products and thousands of materials for their human and environmental health attributes, as well as defining systems to safely and fully cycle materials into new products.

What is the Circular Economy powered by Cradle to Cradle®?

The link between Circular Economy and Cradle to Cradle®
Cradle to Cradle® Categories

- Philosophy e.g., a quality-based innovation platform for economy, ecology and social equity.
- Principles that are translated into measurable criteria to guide the circular economy.
- Application tools.

The three principles of Cradle to Cradle®

- Everything is Designed as a Resource for Something Else.
- Use Current Solar Income. Energy that can be Renewed as it is Used.
**Biosphere and Technosphere**

In the Circular Economy powered by Cradle to Cradle®, systems, products, components, materials and ingredients are designed for two main pathways: consumption pathways in the Biosphere where products are designed to safely enter biological systems and service pathways in the Technosphere where products safely enter technical systems to be part of future product generations.

**Biosphere Products** for consumption are designed that they or their degradation by-products generated during their use (e.g. abrasion or dilution in air, water or soil) support the biological systems they enter in the Biosphere. Those resources can be renewed through agriculture, reforestation, aquaculture or other ecosystem processes, each leading to next generations of products.

Examples of consumption products are: biodegradable textiles, cosmetics, or vehicle brake pads that wear out. However consumption products also contain inert materials like sand, which do not biodegrade but support bio-processes like soil formation. As well, metals like zinc and magnesium are usable in the Biosphere if designed for compatibility with bio systems.

**Technosphere Products** are designed to be chemically stable during use and get dismantled into Technosphere resources after they fulfill their function. The ingredients are carefully defined as resources for next generations of service products. Examples of technical resources are found in electronic appliances and personal devices. For example, it is technically possible to produce a mobile phone which works for more than 20 years, but nobody wants a product whose technology is obsolete after 2 years. The materials in the product are designed to be recovered through flexible design without loss in value and quality.
Fig. 2: Cycle of consumption in Biosphere and cycle of service in Technosphere. (Source: EPEA)
Figure 3 describes material flows in a Circular Economy powered by Cradle to Cradle®. The process often starts with design or redesign. This phase determines if a system or product will be part of the technosphere or biosphere. A biosphere product is consumed, but before that it can go through many cascades. For example a high-quality sheet of paper will be recycled to a sheet of paper with shorter fibers, then after many other steps return to the biosphere as a nutrient via composting or clean combustion in a continuous cycle. Materials and additives are designed for the biosphere.
Overcoming Challenges on the way to a Circular Economy powered by Cradle to Cradle®

Which challenges are on the way to the Circular Economy powered by Cradle to Cradle®?

» Linear economy running in circles? A growing wave of consultancies present themselves as circular economy experts, but without practical experience they often default to traditional waste management which represents the linear economy running in circles, instead of truly productive innovation.

» Rethinking business models: Finding a pathway from a linear towards a circular model which allows the company to fulfill objectives better than with a linear model. The transformation generates quick wins but might also take years to complete. To keep the right direction, practical roadmaps are used.

» Adapting supply networks: Essential circular components are often missing from a linear value chain. Desso, for example, had to develop and establish a takeback process and recycling with different partners in the course of the new product development.

» Employee motivation: A transformation from one-way to circular is often inspirational but also challenging for employees. Established target systems and processes are called into question. It is crucial to implement first successful product developments and clear positive business cases with the employees by providing them with the right skills and tools. Only demonstrable, tangible results will convince employees to share the change of the business model.

A strong and intuitive business case stands behind the Circular Economy powered by Cradle to Cradle® in the short and long-term. Every organization wants to reduce its dependence on volatile natural resources and preserve the value of secondary resources. In addition, the demands of customers for “green” products is met as an added side-benefit and a closer relationship with suppliers is established.

At a practical level, this is sometimes challenging to implement. Organizations are often not prepared to capitalize on possibilities.

Kingfisher’s CEO, Sir Ian Cheshire, said: “The biggest hurdle is that we need to completely rethink our business model. Companies tend to optimize the existing business model in small steps.” Their strategies, structures and business activities are deeply rooted in the linear approach for growth.

Companies are not islands; they are anchored in a complex network of suppliers and customers. In order to master the transformation towards a successful cyclical model, supply chains must be included. Without considering the whole value chain it is mostly not possible to realize the maximum potential. An example of a successful integration of the supply chain is the Carlsberg Circular Community in which the beer producer Carlsberg has collaborated with selected suppliers in order to realize the transformation to a Circular Economy powered by Cradle to Cradle®.
Since the turn of the millennium more companies are gaining a competitive advantage from re-using materials and resources to re-design products, processes and services, as well as generating cost-effective renewable energy. Improved market share and material and energy cost savings are results.

New producer responsibility rules by national and EU governments are forcing companies to deal with the issue because business-as-usual is leading to added costs. Finding conventional solutions for problems by using the „Take-Make-Waste“ linear system is costly. An enterprise which reacts faster than competitors to develop products and processes for a circular system will have an unequivocal competitive advantage.

Cradle to Cradle® design gives a positive/added value to a product or process.

In addition to smaller companies with clearly structured value chains, leading international companies like Kingfisher, H&M or IKEA are starting to use the circular economy concept. They want to solve supply chain risks and achieve significant improvements in product innovation and quality. The changeover to the Circular Economy increasingly distinguishes these companies as innovators.

The Transformation Concept – from linear to circular

How does a transformation process begin?

1. Evaluate your mission and goals, and if necessary re-state them: Start from where you want to be rather than where you are today. Do the present goals state where the organization wants to be in a few years? If they do, how to translate those into C2C intentions? “First do the right thing, then after that do it the right way.”

2. Quick Scan: A Quick Scan allows economical assessment of where you are, what you are doing right, and potential quick C2C wins. As well a rough description is co-developed on how the organization might align with the circular economy approach. Topic areas and projects are identified to demonstrate as quickly as possible the added value of the circular system. From this follows the return on investment assessment for the transition to the Circular Economy. In most cases a quick ROI is possible.

3. Motivation and Culture Screening: Transformation readiness of the leadership and employees is evaluated. Adapting to the culture of the organization and the attitudes of staff is essential for a successful transformation.

The changeover from a linear to a circular system does not take place overnight. To achieve it, EPEA decided to bring Kienbaum Management Consultants, a leading company in the field of transformation, on board as partners. Kienbaum knows that for sustainable change, not only processes and products must be changed but change must also be anchored in corporate strategy as well as in the minds of employees.
We guarantee successful transformations to a Circular Economy powered by Cradle to Cradle® by focusing on organizations and people advice.

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<th>Success Factors</th>
<th>C2C Dimension of Transformation</th>
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| Organization    | Alignment & Strategy            | ・ Reliable implementa
tion and results with the integrated management of all levers of transformation and success factors |
| RETHink READY for Change | Structures & Management          | ・ Professional and innovative transformation management |
| People          | Processes & Systems              | ・ Integrated teams with industry, C2C, and HR competence |
| Diversity Motivation/Mindset | Competences & Culture           | ・ In depth knowledge of safe and toxic material depending on the defined use |
|                 | Kienbaum Competences             | ・ A reliable set of combined tools, EPEA and Kienbaum, to enable a positive footprint |
|                 | EPEA Competences                 |                     |

Fig. 4: Cooperation of Kienbaum and EPEA
Transformation occurs in seven phases.

In the ignition phase motivation for the Circular Economy powered by Cradle to Cradle® is generated with the relevant stakeholders. The question of "why" for stakeholders comes to the foreground. A subsequent Quick Scan allows a baseline and first assessment of potential pathways from linear towards circular models. The sketching of a rough goal and the willingness to change within the company are analyzed. As well, hypotheses are formulated on how the company can move from linear to circular. In this phase, the business case is presented in greater detail.

In the Quick Scan opportunities for improvement are identified and in the analysis phase further investigated. Potentials for C2C are identified by, for instance, materials diagnostics, interviews with stakeholders, based on C2C principles, imagineering workshops, and value stream mapping. In addition, the culture and willingness to change are deeply analyzed and the business case is defined.

In the Buy-In phase, the transformation is actively pursued. C2C tools are linked with tools from the transformation domain. The transformation is communicated across all divisions and all employees are closely involved. If the employees are convinced by rapid, tangible results, a transformation will have significant success.

Kienbaum and EPEA provide a concept and partnership network that is unique in the market. By working with knowledge acquired by EPEA over decades in diverse companies and under challenging conditions, organizations will profit from the Circular Economy. The transformation expertise of Kienbaum ensures that a sustainable transformation of the company leads the enterprise into the future economy.
Security in weak market phases. The Circular Economy powered by Cradle to Cradle® is an innovation driver which helps to “crash proof” organizations. The Dutch carpet manufacturer Desso has impressively demonstrated this. During the financial crisis in 2009 Desso put on the market a carpet which cleans the air. The carpet commanded a higher value than other models on the market due to the perceived value by customers, and at the same time the carpet manufacturer increased its market share in Europe to 23 percent – in an absolute crisis period.

Security against volatility. Geopolitically induced scarcities like e.g. trade barriers are causing resource and price volatility. The Cradle to Cradle® concept is an excellent tool to mitigate risks of market and price fluctuations. A re-design of products helps to recover secondary raw materials for reuse at the same level of quality. Savings of primary raw materials are achieved at the same time.

Cost-effective internalization of externalities. Internalizing the costs of external impacts of organizations is being driven by regulations that provide financial incentives to create positive external effects, and punish negative impacts. The Circular Economy helps to strengthen positive effects and diminish negative ones.

Reputation management: Companies are pressured to maintain a positive public perception, especially regarding bigger and more well-known firms. Scandals can not only destroy the company’s image, but a loss in reputation can ultimately be of detriment to the firm’s share value. The systematic focus on a firm’s positive impact on people, environment, and organization of the Cradle to Cradle®-concept is a vital factor for a stable and honest positive image; whilst the company exercises corporate social responsibility due diligence.

Improved savings. Product innovation and improved quality lead to significant cost savings for materials which are the highest cost factors for many manufacturers. In the Circular Economy powered by Cradle to Cradle® raw materials can be used again and again or be recovered. Through their own energy production or energy savings, costs are reduced.
**Increased corporate attractiveness.** The attractiveness and value of organizations rise with Cradle to Cradle® (see M&A of the company Tarkett with the company Desso). Also motivation and productivity of employees is further increased.

**Advantage of supply chain partnerships.** Transforming product portfolios and services along the whole value chain leads to savings between companies. Additionally, the deepened relationship results in enhanced knowledge exchange and thus fosters innovation. Completely new value creation structures offer new business and service models. At the same time the motivation and productivity of employees is enhanced.

**Customer relationships redefined.** The service concept opens new customer relationships. Banking of high-quality materials with customers creates a new customer touch point without creating added costs. High-quality materials are also recovered as raw materials and through defined usage periods of the products the quantities and qualities of the materials are known and predictable. The clear focus on client value improves product portfolio and secures increased market share even in weak market phases.

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**Fig. 6: Value proposition of Circular Economy powered by Cradle to Cradle® broken down by industries. (Source: Kienbaum and EPEA)**
EPEA Internationale Umweltforschung GmbH is the award-winning developer of Circular Economy concepts powered by Cradle to Cradle® for more than 20 years and cited by the World Economic Forum as well as other circular economy leaders. The institute has know-how that is unique worldwide. The cooperation between EPEA and Kienbaum, linking the C2C knowhow and transformation expertise, enables a powerful approach in adding value to the business. Kienbaum success factors “People and Organization” and the in-depth knowledge of the dimensions of transformation makes a smooth transition possible. The companies work with a diverse range of industries, governments and institutions on value propositions to transform the economic cycle with support from a far-reaching partner network.

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