



cradle to cradle
approach to architecture

CRADLE TO CRADLE APPROACH TO ARCHITECTURE

Case Study – A Park 20/20 workplace born from theory of cradle to cradle
Architect in focus - William McDonough born in 1951

Hypothesis – Cradle to cradle: Approach for Gen next.

Objective –

- Understanding the theory of cradle to cradle
- To find out whether the philosophy of cradle to cradle could really be translated to architectural practice.
- Critical analysis of the theory

Focus of study -

- Cradle to cradle - case study and certifications

Synopsis – From painting cave walls to classical architecture, gothic to renaissance architecture, idealist to beaux art, modernist to post modernist architecture, from minimalism to brutalist architecture we have come to an age where we explore Sustainability. Sustainability is the capacity to endure. For humans, sustainability is the long-term maintenance of responsibility, which has environmental, economic, and social dimensions. Sustainability in simple terms means using methods, systems and materials that won't deplete resources or harm natural cycles. It identifies a concept and attitude in development that looks at a site's natural land, water, and energy resources as integral aspects of the development. It also integrates natural systems with human patterns and celebrates continuity, uniqueness and place making" With the decrease in resources and the increase in carbon emissions; environmentally conscious design techniques in the field of architecture are emerging really fast. Judging the green inventions/ techniques is becoming increasingly difficult. The need of the hour is to look at these proposals closely and see whether they really work!

Cradle-to-cradle design, offers a framework in which the effective, regenerative cycles of nature provide models for wholly positive human designs. Within this framework we can create economies that purify air, land, and water, that rely on current solar income and generate no toxic waste, that use safe, healthful materials that replenish the earth or can be perpetually recycled, and that yield benefits that enhance all life. Over the past decade, the cradle-to-cradle framework has evolved steadily from theory to practice. In the world of industry it is creating a new conception of materials and material flows.

Just as in the natural world, in which one organisms "waste" cycles through an ecosystem to provide nourishment for other living things, cradle-to-cradle materials circulate in closed-loop cycles, providing nutrients for nature or industry. This model recognizes two metabolisms within which materials flow as healthy nutrients. The field of architecture controls the URBAN picture, the way the buildings are, the way the infrastructure is. If we built responsibly, if we built with the desire to cradle life then we would end up living in a world that we think is utopian.

Conclusion – After the research on this paper I've started to believe that Cradle to cradle design approach is achievable. It might be difficult to be realized in short term but it is a compelling idea that shouldn't be given up on.

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HOW THE THEORY OF CRADLE TO CRADLE IS IMPORTANT TO THE FIELD OF ARCHITECTURE

According to the U.S. Green Building Council, in the United States alone, buildings account for 72% of electric consumption, 39% of energy use, 38% of all carbon dioxide emissions, 40% of raw materials use, 30% of waste output (136 million tons annually) and 14% of potable water consumption. We as architects are responsible for this.

We as architects create the built environment. We can make a difference by making different choices. From a life-cycle perspective products from only three areas of consumption — food and drink, private transportation, and **housing — together are responsible for 70-80 per cent of the environmental impacts**. Both housing and mobility are interdependent key elements of the built environment. Achieving sustainability of the built environment is not only a local but also a global challenge. It depends on overcoming major hurdles illustrated by the following numbers:

- 1.8 billion people are expected to suffer from fresh water scarcity by 2025, mostly in Asia and Africa.
- 1.6 billion people are without access to modern energy.
- Each year, 2 million people globally die prematurely due to indoor and outdoor air pollution.
- Currently, 1 billion people are slum dwellers, lacking clean water and sanitation.

Millions of people are threatened by flooding related to climate change. The overall challenge posed by land use, construction and real estate is massive throughout societies, both at the macro and micro levels. The impact of decisions in these sectors can be immeasurably long-term. It is not possible to reach any sustainability targets if the built environment and its stakeholders are not included in the effort

ACCIDENTS, DISASTERS, CRISES. WHEN SYSTEMS FAIL WE BECOME TEMPORARILY CONSCIOUS OF THE EXTRAORDINARY FORCE AND THE POWER OF DESIGN, AND THE EFFECTS IT GENERATES. EVERY ACCIDENT PROVIDES A BRIEF MOMENT OF AWARENESS OF REAL LIFE, WHAT IS ACTUALLY HAPPENING, AND OUR DEPENDENCE ON THE UNDERLYING SYSTEMS OF DESIGN. – BRUCE MAU

As architects our role is to articulate the architectural vision, conceptualize and experiment with alternative architectural approaches, create models and component and interface specification documents, and validate the architecture against requirements and assumptions. We need to look closely at the underlying systems, understand what works and what doesn't.

CRADLE TO CRADLE asks the right questions. Question like why produce something that is toxic at the first place ?

THE CONCEPT OF CRADLE TO CRADLE

Paradigm shift from cradle to grave (produce and dump) to cradle to cradle (produce and reuse) is the need of the hour.



ONE OF THE VARIOUS PICTURES RELEASED BY NASA OF OUR PLANET

When we think of the word ENVIRONMENT we imagine landscape of lush green trees, hills and lakes but the world that we occupy is a collection of buildings, roads and infrastructure. The sad part is that we filter out materials from the first picture turn it into something toxic and use it to make the second picture. Us as architects have a major role to play in this process.

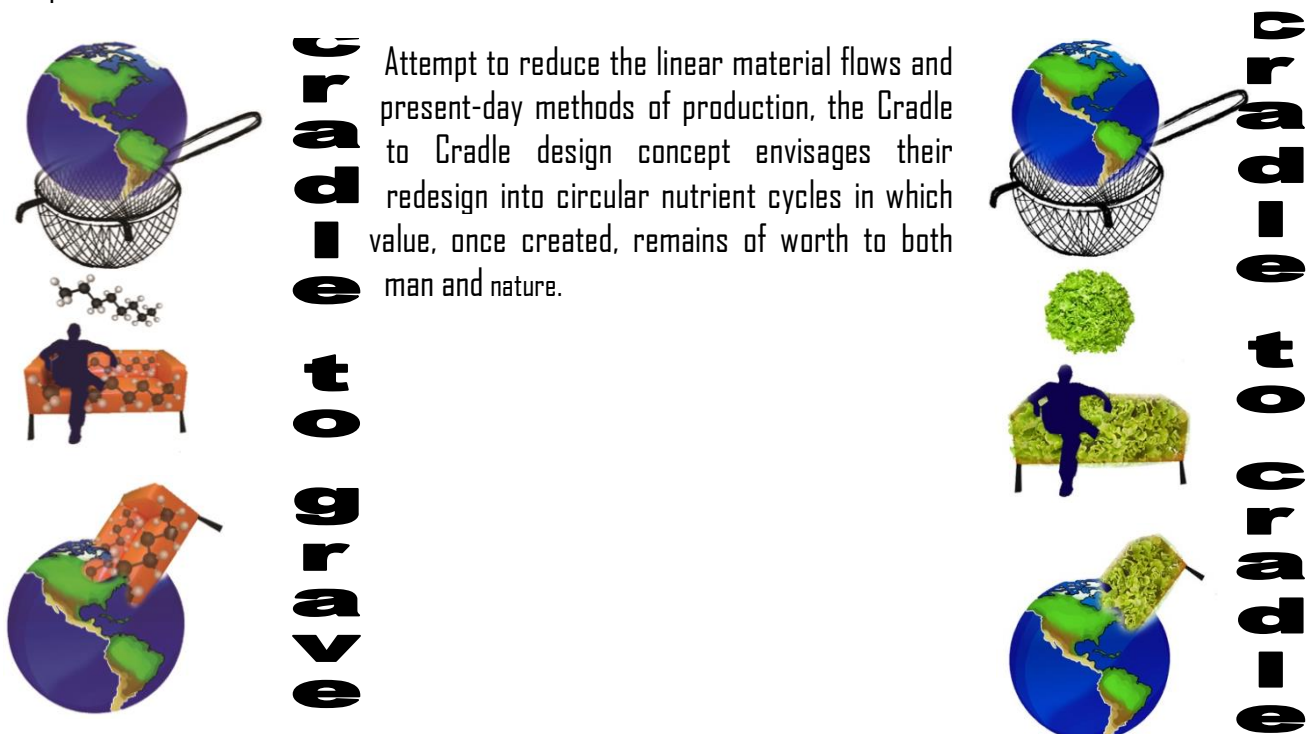
This is where the theory of Cradle to Cradle comes into play. In nature, there is no such thing as waste, no having to do without, no limitations. Using biological and technological nutrient cycles, the right materials are brought to the right place at the right time.

The aim of the Cradle to Cradle design concept is to improve the quality of products so that they

- Have an improved consumer quality for the user
- Pose no health risk for anyone who comes into contact with them
- Are of both economic and ecological benefit

The Cradle to Cradle method of production is in direct contrast to the “Cradle to Grave” model in which material flows are formed without any conscious consideration of protecting resources. Rather than attempt to reduce the linear material flows and present-day methods of production, the Cradle to Cradle design concept envisages their redesign into circular nutrient cycles in which value, once created, remains of worth to both man and nature.

The theory of cradle to cradle aims at a paradigm shift of not just making better products but making products keeping the HUMANS in mind. It is a theory that talks about the design intention. Cradle to cradle is a well defined concept covering other aspects of sustainability like life cycle assessments, carbon footprints etc.



Cradle to Cradle functions on The Principles of Green Engineering

➤ **Inherent Rather Than Circumstantial**

Designers need to strive to ensure that all materials and energy inputs and outputs are as inherently nonhazardous as possible.

➤ **Prevention Instead of Treatment**

It is better to prevent waste than to treat or clean up waste after it is formed.

➤ **Design for Separation**

Separation and purification operations should be designed to minimize energy consumption and materials use.

➤ **Maximize Efficiency**

Products, processes, and systems should be designed to maximize mass, energy, space, and time efficiency.

➤ **Output-Pulled Versus Input-Pushed**

Products, processes, and systems should be "output pulled" rather than "input pushed" through the use of energy and materials.

➤ **Conserve Complexity**

Embedded entropy and complexity must be viewed as an investment when making design choices on recycle, reuse, or beneficial disposition.

➤ **Durability Rather Than Immortality**

Targeted durability, not immortality, should be a design goal.

➤ **Meet Need, Minimize Excess**

Design for unnecessary capacity or capability (e.g., "one size fits all") solutions should be considered a design flaw.

➤ **Minimize Material Diversity**

Material diversity in multicomponent products should be minimized to promote disassembly and value retention.

➤ **Integrate Material and Energy Flows**

Design of products, processes, and systems must include integration and interconnectivity with available energy and materials flows.

➤ **Design for Commercial "Afterlife"**

Products, processes, and systems should be designed for performance in a commercial "afterlife."

➤ **Renewable Rather Than Depleting**

Material and energy inputs should be renewable rather than depleting.

ABOUT WILLIAM MCDONOUGH AND DR. MICHAEL BRAUNGART

In 1992, William McDonough and Dr. Michael Braungart published *The Hannover Principles: Design for Sustainability*. In 2002, they published *Cradle to Cradle: Remaking the Way We Make Things*, encapsulating a journey of discovery about materials as biological or technical nutrients and their use periods and their evolution. They created a framework for quality assessment and innovation: the Cradle to Cradle certified program.

The Firm : William McDonough + Partners is a design firm of architects, planners, and support staff. They designs the building to embody its founder's positive, "more good" approach, rather than pursuing "less bad" strategies.

It is a shared vision with

- ✓ **MBDC** (McDonough Braungart Design Chemistry) helps clients integrate the Cradle to Cradle framework into their products, operations and organizations. MBDC provides services which evaluate the eco-effective performance of individual products and Cradle to Cradle consulting, which provides the vision, process and tools for expanding quality and enhancing industry leadership using the Cradle to Cradle framework.
- ✓ **EPEA** (Environmental Protection and Encouragement Agency) was founded by Michael Braungart in 1987. EPEA has worked with clients in the EU and beyond to apply the Cradle to Cradle methodology to the design of new processes, products and services. Their portfolio ranges from product optimization to policy making, planning and administrative procedures.

EPEA's Braungart and Douglas Mulhall recently published their Cradle to Cradle Criteria for the Built Environment (which you can order from this site). According to Bill McDonough: "We think it's wonderful that an environmentalist and a scientist have, in their language and from their perspective, put forth criteria that relate to the characteristics of a Cradle to Cradle approach to buildings."

THE DESIGN PROCESS: CRADLE TO CRADLE

The process is principle-driven design and looks at the unique characteristics of each place and project as a source of inspiration and innovation. The foundational principles brought to each project derive from their vision of the future: a delightfully diverse, safe, healthy and just world—with clean air, soil, water and power—economically, equitably, ecologically, and elegantly enjoyed.

The projects are team led those pursuit place-specific, high-performance designs. The collaborative design approach begins with a detailed analysis of each site, program and community, identifying the economic, environmental and social forces that will give form to the design solution. This information is then synthesized with unique characteristics having broader criteria for habitat creation, watershed protection, mobility, energy production, material health and recapture, and indoor environmental quality.

For each project, a different design framework is created which is built upon clearly articulated principles (what is valued), short, medium and long-range goals (what projects hope to accomplish), and specific design strategies (how goals will be achieved). This framework establishes the project's direction and serves as a reference point throughout the building's lifespan—it establishes priorities and focus by asking the right questions at the right time.

The design teams begin with clients and their communities and extend to the multidisciplinary consultants with whom they collaborate from the earliest stages of the project.

CASE STUDY : INFORMATION ON PARK 20/20



Park 20|20 is the first full service Cradle to Cradle working environment in The Netherlands. In Park 20|20 a unique level of sustainability is created together with a human centered design approach to realize the cleanest, most inspiring and productive working environment to date.

Sustainability is achieved through implementation of the Cradle to Cradle philosophy. By taking a human centered design approach every aspect of Park 20|20 is geared to energize and empower employees through inspiring ergonomic architecture and techniques, integrated landscaping and a high level of facilities to accommodate the combination of professional and private life. Continuing research is underway to ensure that all measures result in improved productivity. Park 20|20 will radically change and improve the way individuals and organizations work and will set forth it's users as leaders and promoters of sustainability and employers of choice. The increased productivity and energy savings will have a positive influence on company results.



Through the use of MBDC Certified materials the main building materials of Park 20|20 can be endlessly recycled. A central, integrated energy system using sustainable energy sources and energy optimized design of the buildings will ensure the reduction of CO2 emissions and clean air in the buildings. Insulation and the positioning of the buildings will lower energy use and noise levels. A central water management and -treatment facility allows the use of rainwater for sanitary uses and the filtration of sewage water, thus reducing the waste and water usage of the Park. Active waste management through the Park management organization, centralized transport management using economies of scale will all play their role to make Park 20|20 a top example of a sustainable working environment that is both effective and economically viable

The Master plan

- ✓ It is a combination of unique tailor-made buildings
- ✓ Consists of buildings forming a circle around a car-free high quality public area
- ✓ With water, green, promenades, inspiring places offers a welcome break from the workplace
- ✓ Has car and bicycle parking, located under the offices, Incorporates a private entrance/ exit for the 24/7 secure parking

Offices 89,000 sqm

Parking Places 1,400 sqm

Amenities 3,700 sqm

CRADLE TO CRADLE CERTIFICATION

Certification permits an organization to tangibly and credibly demonstrate its efforts to design eco-effective products.

Cradle to Cradle Certification is a multi-attribute ecolabel that assesses products for their :

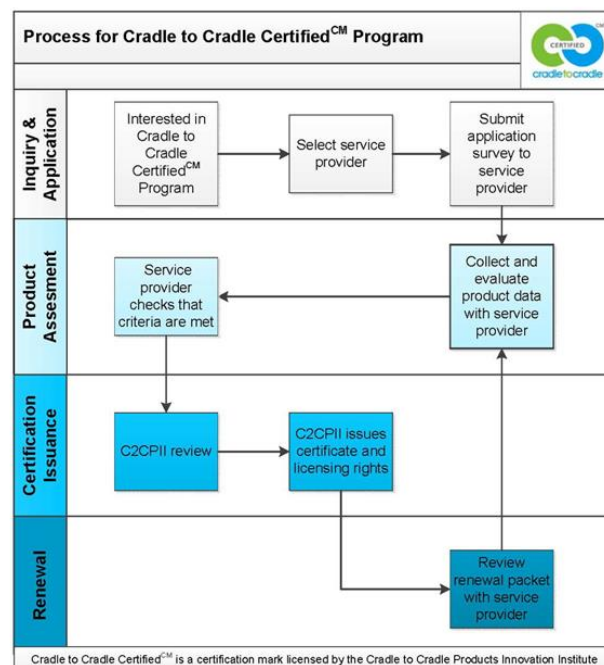
- ingredients' human and environmental health
- characteristics,
- their recyclability or compostability, and
- their manufacturing characteristics.

Criteria - A certified product must meet requirements in five categories:

- ✓ **Material Health** (impact on human and environmental health)
- ✓ **Material Reutilization** (recyclability/compostability and recycled/renewable content)
- ✓ **Renewable Energy Use**
- ✓ **Water Stewardship**
- ✓ **Social Responsibility**
- ✓ Products can be certified at four levels (Basic, Silver, Gold or Platinum) to reflect a progression of achievements in all the criteria categories.

Results

- ✓ External verification of a product's recyclability and safety for human and environmental health
- ✓ Expert assessment of toxicity hazards of all product ingredients throughout the supply chain
- ✓ Defined trajectory for optimizing product design and manufacturing processes



General description of certification levels for cradle to cradle:

BASIC

- All chemicals in product identified down to 100ppm level (0.01%)
- No PVC, chloroprene, or related chemical at any concentration
- All materials and chemicals assessed for toxicity to human and environmental health
- Strategy developed to optimize all remaining problematic chemicals
- All materials defined as technical nutrients to be recycled or biological nutrients to be composted

SILVER

- All requirements met at BASIC level
- Halogenated hydrocarbon content <100ppm
- Toxic heavy metal content (Pb, Hg, Cd, Cr+6) < 100ppm
- Material Reutilization score ≥ 50
- Quantify the energy required for manufacturing (final assembly)
- Characterize energy sources and develop strategy for including renewable energy
- Adopt company wide water stewardship principles or guidelines

GOLD

- All requirements met at BASIC and SILVER levels
- NO problematic chemicals (assessed by MBDC as RED) in product
- Plan for product recovery and closing the loop
- Material Reutilization score ≥ 65
- Use renewable energy for 50% of manufacturing (final assembly)
- Complete an audit to characterize and quantify water use
- Complete an audit of corporate social responsibility practices

PLATINUM

- All requirements met at BASIC, SILVER & GOLD levels
- Actively recovering products and closing the loop
- Material Reutilization score ≥ 80
- Use renewable energy for 100% of manufacturing (final assembly) and 50% of supply chain manufacturing
- Implemented innovative measures to improve water conservation and water quality
- Complete a third party social responsibility certification

MATERIALS WITH CRADLE TO CRADLE CERTIFICATION

Many building materials are cradle to cradle certified and the list continues to grow. A proof of the fact that cradle to cradle is not just an idea but it is something that can be achieved. Some of the products are described below.

EcoWorx Performance Broadloom Carpet

This residential Broadloom carpet from Shaw Industries is a technical nutrient that helps decrease the amount of raw materials used in manufacturing due to its recyclability in a closed-loop process. Shaw will collect and recycle used EcoWorx Performance Broadloom, at no additional charge to the customer.

TimberSIL Wood Products

TimberSIL wood treatment not only replaces the hazardous copper, chromium, and arsenic-based preservatives that were used in the past, but it also outperforms them in the areas of leaching, corrosion, and toxicity. The patented TimberSIL formulation and barrier process locks in its wood protection benefits using biological nutrients in a heat processing technique, and the wood can be safely reused or composted.

Earthtex Brand fabrics

Twitchell Corporation's Earthtex fabric is a technical nutrient that is free of PVC, emits no VOCs, and is 100% recyclable. The fabric was originally used as tenting for Pink, a Make It Right fundraiser. This same fabric is now being recycled into tote bags and other merchandise, with profits from the sale benefiting Make It Right's construction of houses.

Apart from these certain brands of the following have also been certified - Anti corrosion coating , Antimicrobial, Apparel, Apparel fabric, Athletic surfaces, Baby care , Building exteriors , Building facades, Building materials, Carpet backing , Green roof , Gutters, Carpet fiber, Cellular floor systems, Concrete additives, Curtain wall systems, Day lighting products, Electrical accessories, Expansion joint covers , Fabrics of office furniture's, Floor coverings ,Glass .

This definitely is more than just a first step towards cradle to cradle.

CRITICS OF THE THEORY OF CRADLE TO CRADLE

Schmidt-Bleek believes it to be completely out of the question that the concept can be realized on a bigger scale. Moreover, several Life Cycle Assessment (LCA) practitioners, eco-design engineers and recycling experts tell their doubts about the technical implementation of the Cradle-to-Cradle concept.

Indeed, some claims (from some C2C representatives) pretend that C2C-certified products can be either compostable, or indefinitely recyclable with minimal quality losses. According to several experts, this assertion should be re-discussed, especially because recycling conditions are much more complicated than what is defined and marketed by the C2C certification. In addition to this recycling issue, the fact that transportation criteria are not part of the certification's demand is also a potential source of discussions.

Some claim that C2C certification may not be entirely sufficient in all eco-design approaches. Quantitative methodologies (LCAs) and more adapted tools (regarding the product type which is considered) could be used in tandem.

It is safe to say that every production step or resource-transformation step needs a certain amount of energy (Newton's second law). Even the highest Cradle to cradle certification requires only 50 % of energy for production to come from solar sources.

CONCLUSION

Cradle to Cradle as a theory of design is very promising, but there are a number of critical responses possible. Arriving at a situation where such a theory could become the norm and be fully implemented seems unreal and eutopian. The idea of profitability is all well and good but it is not enough. We are as yet only at the beginning of the attempt to find and think through what Cradle to Cradle might mean to a modern society. Even though the principle may stand right up there with the wish to have a fair and just society, society isn't just and we are making a mess of things.

Many materials, even if they are Cradle to Cradle, take a long time to complete their 1st lifecycle as products, (especially in buildings) before being rereleased as raw material. We will therefore continue to need virgin materials in order to keep up production. There is a long way to go, before we can fully apply Cradle to Cradle thinking.

Cradle to Cradle cannot be realized in the short term but that does not mean we have to give up on a compelling idea. The Cradle to Cradle theory of design answers a demand for the restoration of a principle that was part of our natural world before the industrial revolution i.e. the concept of waste = food.

Cradle to Cradle as a design theory aspires to a universality that is rare, if not unique in design thinking.

It sets out a duty that could, without too much of a leap into the unknown be considered universally valid at all times, whatever you are designing, for whatever purpose, in whatever context.

The fact that we are at this moment only at the beginning of rethinking our design decisions within its framework, to stop doing so and carry on as if nothing has happened would defy sanity.

The world will not evolve past its current state of crisis by using the same thinking that created this situation -

Albert Einstein

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