

inspire

embracing cradle to cradle



ROYAL HASKONING

LEADING BY EXAMPLE

Royal Haskoning is convinced of the value of Cradle to Cradle. This vision offers sustainable and creative solutions to problems that our society faces. It fits in with the way we think and what we do. But we do not own Cradle to Cradle, it belongs to everybody. That is why Royal Haskoning encourages clients and other stakeholders to contact us and to look at the development, opportunities and uses of the Cradle to Cradle vision together. The concept is widely applicable with a large range of possibilities. Varying from road construction to energy use. Cradle to Cradle looks at different ways to gain return on investment. In this way we contribute to the ecological ambitions of not only our own generation, but that of generations to come.



Cradle to Cradle: what is it?

Cradle to Cradle is a new way of looking at sustainability. Michael Braungart and William McDonough in particular are behind this vision. They set out their philosophy in the book *Cradle to Cradle – Remaking the Way We Make Things*.

The authors approach design and production from a totally different way of thinking. The current generation not only fulfils its own needs but at the same time provides future generations with more possibilities. As such, Cradle to Cradle goes much further than other interpretations of sustainability, which above all focus on making a product less harmful (cleaner, more economical, recycled as much as possible).

The Cradle to Cradle vision is modelled on nature, in which all waste is food. A leaf that falls from a tree enriches the soil. The tree gets its food from the ground to grow both new leaves and fruit. In the same way, waste in 'our' world ought to be used as food or, that is, raw material for new products. There is no rest product left that must be burnt or destroyed, nor does recycling lead to any loss of quality. Recycling becomes 'downcycling' if the waste results in a lesser product, such as pearly white A4 paper being recycled after use to make grey newspaper. When the new product is less valuable, we talk of a loss of quality. Cradle to Cradle originates in 'upcycling' – the waste has added value and is completely utilised in the cycle in order

to make a new product again. There is, for example, 'paper' made from plastic that is washed after use in order that it can be used again in its original form.

This system can only function, however, if we separate the biological from the technical cycle (metals, diluters, etc.), because technical raw materials damage biological processes and, in the opposite direction, biological products harm the quality of the technical raw materials. If waste is to be food, both need to be reprocessed in their own cycle.



Cradle to Cradle: source of inspiration for Royal Haskoning

Royal Haskoning has chosen Cradle to Cradle as a source of inspiration because the Cradle to Cradle vision fits in perfectly with the firm's mission: creating solutions for issues relating to the sustainable interaction between people and their environment.

According to Cradle to Cradle co-devisor William McDonough, a Cradle to Cradle society is characterised by the following five basic assumptions.

1. Products are made from safe and healthy materials. They are designed to be sustainable, in relation to their projected life span; they make the optimum use of materials and there is no waste left over from the production process; they are future-oriented, or flexible and adaptable in their use, and, at the end of its life, the product can be completely recycled, be it in biological or in technical cycles.
2. Use of solar energy to produce both clean energy and oxygen (photosynthesis).
3. Interdependency: using metabolisms of mass, water and energy within the development

to recapture nutrients and to eliminate the concept of waste.

4. The stimulation of a healthy ecosystem through the creation of vibrant natural habitats and a natural water cycle.
5. Strengthening of a community spirit and clarification of the mutual dependence between man and nature.

These characteristics represent a vision, which will be elaborated differently for different parties within different projects. They form a guideline; there are no concrete solutions as yet. The challenge awaiting us is the interpretation of these characteristics within the context of real projects in the areas of construction, industry, infrastructure, and government policy. We are working hard right now within Royal Cradle not only in relation to the projects at hand but also on more general concepts and solutions, so that we have the "Best Future Practices" immediately at our disposal.

Pioneers in Cradle to Cradle



In time mankind will live following the Cradle to Cradle idea. Herman Klein Entink is positive of that. But he also knows that this metamorphosis is extremely necessary. "We have no other choice", says Royal Haskoning's director of Corporate Initiatives.

Royal Haskoning wants to contribute to the development of Cradle to Cradle and learning to apply it in practice. This ambition fits perfectly with the firm's vision of socially responsible enterprise. That said, according to Klein Entink: "There simply is no other way. In the coming decades, it is a requirement of the world's population to do more good things and not just less bad ones. Mankind is the user of this earth and must leave it behind in just as good a condition for the users of the next generation. Or preferably a little better."

Belief

As yet, a world following the Cradle to Cradle principle is still just a dot on the horizon; it is now a matter of finding the way to get there. "I believe that mankind is creative enough for this. We'll get there little by little. Compare it with the super-quick development of air travel. At the beginning of the last century, the Wright brothers succeeded in being the first people to fly a short distance; some 60 years later, the jumbo jet was flying. This leap forward was made possible by a few important technological findings and, above all, unrelenting perseverance and people who believed in it."

According to the director, this is also how it should go with Cradle to Cradle: "You must be convinced that this idea can be realised. Then you can work towards it. It is a process. Royal Haskoning does not have the solution in house, but we believe in the Cradle to Cradle concept. So we have decided to invest in knowledge. We are doing this in our participation in the Rotterdam Sustainability Initiative (RSI), in Royal Cradle and in ongoing projects. We apply this knowledge with one client, learn from it, and then with the next client we are another step further".

Innovative solutions

Real Cradle to Cradle solutions still do not exist. No one can erect a Cradle to Cradle bridge or building. But Royal Haskoning can help to apply Cradle to Cradle solutions in a building as much as possible, and to come up with innovative solutions together with the client. There is demand from society for Cradle to Cradle solutions, states Klein Entink. "Sustainability has taken root. In any case, mankind has no other choice. Our way of extracting, making and only partly recycling raw materials is coming to an end. If not in 50, then certainly in 100 years. We must learn to completely 100 percent recycle the earth's supply of raw materials. Make sure that nothing leaks away. Learn to manage our raw materials effectively. Nature sets us a good example. Everything is recycled. Nature works effectively and not efficiently. If a plant produces hundreds of little seeds a year and only a few of them germinate, then you cannot call that efficient. But the plant continues to exist, so it is certainly effective."

Small steps forward

Royal Haskoning has no roadmap directing us to a Cradle to Cradle society. "We want to search for the right path. Just like the air travel pioneers. And just like with them, not every attempt will be successful.

Efficient but not effective

Cradle to Cradle revolves around, among other things, the concepts of efficiency and effectiveness. We try to handle energy as efficiently as possible, but often efficient does not prove to be effective. In the case of energy, 'exergy' can be used as a standard of its effectiveness. Exergy conveys the quality of the energy. According to this, electricity and natural gas, for example, consist of 100 percent exergy. When it comes to heating, however, it is a different story. The exergy of a litre of hot water, for example, depends on two temperatures: that of the water and that of the surroundings. A flame temperature of 1,200 degrees Celsius represents around 80 percent exergy, but water of 30 degrees just three percent! Therefore, the heating of homes by burning natural gas is a good example of the discrepancy between efficiency and effectiveness. We use 100 percent exergy (natural gas), burn it (leaving just 80 percent exergy) and then we degenerate the heat of 1,200 to 30 degrees (just 3 percent exergy left over).

With better technologies, we can manage with much less fuel. Currently everyone uses an HR- or HR+ boiler. Extremely efficient, according to all experts. True enough, but it is actually an inherently bad method (the burning of natural gas in order to achieve a low-temperature heat), which we execute very efficiently. And in doing so we waste a great deal of natural gas in the Netherlands every year.

But we will learn and make small steps forward. In this way we are contributing to the development of Cradle to Cradle and learning how to apply this concept to raw materials. Together with clients who have the same ambition."



DOING MORE



Prof. Peter Luscuere

Royal Haskoning is convinced of the value of Cradle to Cradle. This vision offers sustainable and creative solutions to problems that our society faces. Professor Peter Luscuere is one of those taking the initiative within Royal Haskoning to apply the Cradle to Cradle concept. Aside from that, he is a professor of Building Services at Delft University of Technology. .

How did you come to be convinced by Cradle to Cradle?

“One and a half years ago, I had to give an introduction to a presentation by Michael Braungart, one of the founders of the Cradle to Cradle concept. I read his book and found it inspiring, but I also had some criticism. Particularly because he paid no attention to today’s energy problems and climate change. Braungart was open to my criticism. His idea is that everyone can contribute to further perfecting the concept. We are working together closely in order to translate the Cradle to Cradle concept into practice, so that it can be applied in the built environment.”

Why is Cradle to Cradle interesting for Royal Haskoning?

“The idea fits in well with Royal Haskoning’s vision as regards sustainability. We have, for example, taken the initiative to establish a Cradle to Cradle chair at Erasmus University in Rotterdam. We sponsor this chair with a number of partners, in a union called Rotterdam Sustainability Initiative (RSI). In addition, also within Royal Haskoning we are putting time and money into further developing the Cradle to Cradle concept.

We want to be the leading consultant for Cradle to Cradle in the Netherlands, with a European potency, albeit on the basis of our own abilities. We are going to apply Cradle to Cradle in our own projects with our clients. Braungart will assess in each case whether we are on the right track; he inspires and reflects. We want to distinguish ourselves from others, so we are choosing a different, slightly contrary approach.”

What is contrary about it?

“You can follow a course, be certified and then call yourself a Cradle to Cradle consultant. However, our ambition goes much further. We get inspiration from Cradle to Cradle and have Braungart reflect on what we are doing, but it is in our projects that we devise creative solutions for our clients. We also make an active contribution to Cradle to Cradle. A first joint scientific publication together with Michael was recently submitted for publication.”

What has the collaboration between Royal Haskoning and Braungart contributed so far to the Cradle to Cradle concept?

“We have looked particularly at the relationship between efficiency and effectiveness. We have fitted the concept of exergy into the Cradle to Cradle philosophy. Exergy is a measure of the quality of energy; it is the amount of work that can be obtained from energy. This is where gains can be made, because we are still wasting a lot of energy. Considered from an exergetic point of view, electricity is optimal, but the heating of buildings with gas boilers is absolutely not. An awful lot of energy is being lost. We are on totally the wrong track here. We are working with completely the wrong method. We can do much better. There are also new techniques to heat homes more effectively, for example the new E-Boiler, which supplies electricity as well as heat. It is important that we gain insight into this sort of energy wasting and then go in search of effective solutions. The Cradle to Cradle idea offers a good guideline for this.”

Applying Cradle to Cradle is considerably radical. Is it not too much trouble?

“We simply cannot continue as we have been. Consumers, producers and governments must choose a different path. It is imperative. Thanks to the scarcity of fossil fuels and especially raw materials alone in ten or fifteen years, we are facing big problems if we do not make changes.”



GOOD

Are you, like the other supporters of Cradle to Cradle, not just a voice in the wilderness?

"No. Also in business I see a great readiness to work following the Cradle to Cradle principle. The idea is widely applicable and the possibilities are endless. Everyone has been inspired by Cradle to Cradle, up to and including those at the top. But the people who have to apply it wonder: 'How do we use the principle in practice?' We will have to learn to think in cycles: biological and technical. Waste should be able to be absorbed into and preferably enrich the biosphere, but if that does not work then the technical cycle offers the solution. In this cycle, products and processes are organised such that the materials can be recycled. It is not the usual recycling, rather a system in which the producer has captured the material back from it and where all of it can be recycled into completely new products. The carpet manufacturer Desso is already busy converting its processes. There is also, in principle, no obstacle to cars which run on methanol, for example, capture the CO₂ they have emitted and then leave it at a filling station. After that, new methanol can be produced again using this CO₂ and with the help of algae and solar energy. An excellent example of upcycling."

What can we expect from Royal Haskoning?

"We have taken the step to think differently. It is very important that everyone takes this step. Royal Haskoning will contribute to convincing other people of this different way of thinking. The beauty of Cradle to Cradle is that it has a positive agenda; it originates from abundance. Our fossil fuels are running out quickly. But the sun provides 10,000 times more energy than we need right now. That does not solve the energy problem in the short term, but this is what appeals to me in Cradle to Cradle; it is a vision which originates in the positive. We must do more good, rather than less bad. This means for materials and energy that we must close the cycles, biological and technical."

Royal Cradle - inspiring each other

A meeting with Cradle to Cradle founder Michael Braungart recently got Royal Cradle officially off the ground. About 50 Royal Haskoning employees, coming from all of the firm's divisions, are part of Royal Cradle. The aim is for the employees to draw inspiration from the Cradle to Cradle idea in order to look at and shape their own work 'differently'. How can they apply Cradle to Cradle in their own work? Royal Cradle hopes to come to a uniform and where possible integral approach to sustainability themes. The aim is to work on profit-making projects with respect for man and the environment. Braungart comments on all the Royal Cradle's ideas and projects; he inspires and reflects, while Royal Haskoning creates.

Business community takes part

What is special about this is that Royal Haskoning is also inviting clients to Royal Cradle. The aim is to share vision and knowledge. In this way, Royal Cradle also gets to work on concrete projects. Royal Haskoning is working, for example, with the architectural firm Mecanoo on the contest for Rotterdam's city hall. Another example is a sustainable business park that is being developed. The client concerned wants to include the Cradle to Cradle idea in its policy vision for this area.

Great energy-effectiveness contest

How the Dutch energy-economy is currently scoring on the Cradle to Cradle scale can be seen better than ever before. Particularly in the built environment there is still a long way to go. The other two branches into which the energy-economy can be split, transport and process & industry, are already further along. This can also be deduced from the percentages of improvement that are possible: transport and process & industry can work 10 to 15 and 50 percent more effectively, while in the built environment a much bigger improvement can be achieved, up to 90 to 95 percent! Therefore, the biggest item in our energy-economy has the greatest potential for improvement!



Many government bodies and companies are ready to apply the Cradle to Cradle principles. But the question is how: how do we apply the principle in practice? Royal Haskoning recognises the broad applicability and many commercial possibilities of the Cradle to Cradle idea. This can be seen in the fact that Royal Haskoning itself can deploy the principle in all disciplines in which the firm is active. The Healthy Dozen represents twelve areas of application selected by the firm.

Healthy Dozen

Royal Haskoning has selected twelve areas of application in which Cradle to Cradle products and methods offer added value.

1. Renovation and new development

For both Royal Haskoning itself and its clients, there are many Cradle to Cradle products that can be utilised in construction and design. By providing these products with information labels, employees are informed of the Cradle to Cradle effect and they also see what is needed in order to optimise this effect.

2. Healthy indoor-climate

In schools, offices and hospitals, there is much benefit to be gained from a healthy climate. Children are not only healthier but also learn better; employees are more productive and fall ill less often and patients recover more quickly.

3. Water and topsoil

In infrastructure, so-called 'dyke-pond' systems can be used as an ecological and economical alternative to leaving flood areas fallow, through a combination of fish hatcheries and aquaculture. The recovery of phosphates from wastewater, recycling to make agricultural fertilisers and the application of biological cycles are also interesting business cases with Cradle to Cradle. The use of green roofs and ditto walls in buildings contributes to water management, air quality and topsoil.

4. Introducing Cradle to Cradle elements and specifications as well as Cradle to Cradle certified materials and products into building designs and the development of land.

5. Energy-positive buildings and construction sites

There are already many technologies available that enable buildings to produce energy instead of just using it. By applying





several technologies and integrating them into the building design and its surroundings, the ultimate aim is to have the building generate more sustainable energy than it itself uses.

6. Road construction
A sound barrier with integrated air-cleaning vegetation and street lighting powered by solar and wind energy: the combination of the ability to actively clean particulate matter and for energy extraction through a biodiversity-stimulating solution.
7. Ports and containers
A great deal of effort is being made here to reduce noise pollution, energy use and contamination. Does the Cradle to Cradle approach enable us to leave a 'positive' footprint behind here, using, for example, air-cleaning coatings on storage sheds, containers and enclosures; by recovering lifting energy when letting down loads; or by applying other technologies already mentioned?
8. Transport and the electrical loading and recycling of electrical vehicles
Electric vehicles are an interesting alternative especially in inner-city areas. Their use on a large scale, in combination with wind and solar energy, offers interesting possibilities.
9. High-voltage corridors
Can these lines, hundreds of kilometres in length, be equipped with specific wind turbines and solar-energy collectors so that we can leave a positive footprint behind here too?
10. Rules and regulations
Assisting governments to adjust legislation and thereby removing obstacles that stand in the way of Cradle to Cradle measures.

Businesses initiate Cradle to Cradle chair

This spring, Erasmus University Rotterdam established a Cradle to Cradle chair. It is being occupied by the great professor Dr Michael Braungart, one of the founders of Cradle to Cradle.

The chair is an initiative of the Rotterdam Sustainability Initiative (RSI) Foundation, a group of market parties with a common vision on the need for and application of Cradle to Cradle. The participants are Royal Haskoning, Royal BAM Group, Dutch property developer OVG, the Dutch Ministry of Housing, Spatial Planning and the Environment, Rijksgebouwendienst (the Dutch Government Building Agency), Cisco, Desso, TenneT and the municipality of Rotterdam.

The chair's official name is 'Cradle to Cradle in relation to sustainable system innovations and transitions in theory and in practice'. Braungart provides teaching and research to the university. In addition, in collaboration with Delft University of Technology he is researching the possibilities for applying the Cradle to Cradle concept in the built environment.

Braungart is working on this with Peter Luscuere. Alongside his position in Royal Haskoning's Building Services division, Luscuere is also a professor of Building Services at Delft University of Technology. Braungart is researching administrative and managerial processes in relation to Cradle to Cradle: gaining insight into structural sustainable innovations and transitions in management, organisations and businesses. Luscuere is leading a more technically oriented research programme into exergy and the application of biological cycles in the built environment.

11. Marketing
All measures and solutions described here must be able to pay for themselves. It is up to us to get the business cases clear for our clients. For this, it is essential to quantify and substantiate the results of applying the Cradle to Cradle ideas and solutions, and Royal Haskoning in fact uses this information as a marketing tool.
12. Exergy
For us, exergy is the best instrument to enable us to assess both the efficiency and effectiveness of energy conversions. This tool has been developed by Royal Haskoning and Delft University of Technology. It is actually an addition to Cradle to Cradle that quantifies the difference between efficiency and effectiveness and that which links them. Assessing their effectiveness ultimately leads us to select better technologies (particularly in the built environment), which make it possible to reduce energy use and CO₂ production substantially.

How Cradle to Cradle is my project?

Royal Haskoning would be delighted to assist organisations in the development of sustainable projects following the Cradle to Cradle philosophy. This enables Royal Haskoning to assess the sustainability of the projects, against the following criteria: what can be improved (ecology), what is it worth (economy) and what does it contribute to society (Corporate Social Responsibility) and are the problems not just being moved elsewhere in other words is it fair (equity)? The clients' ambitions also count for a lot in this process. This is the only way to find the best solution for a client.

Sustainability matrix

In order to assess projects, Royal Haskoning has developed a sustainability matrix. The model is scalable from molecular to biosphere level; or, in more concrete terms, from the level of the workplace to the town where the organisation is based. Furthermore, the model shows the reaction of the five aspects of sustainability (energy, water, materials, mobility and topsoil) against the ecological and economic problems which can occur for all of the five aspects. These problems are broken down into health effects, biodiversity, climate change and scarcity of raw materials. The model can be used to find solutions to these problems following the Cradle to Cradle principle.

The model can be adapted to all situations. For example, Royal Haskoning developed a specific sustainability matrix for a renovation project for a Dutch Ministry. There are ten scale levels in the matrix, from the workplace to the surroundings and town where the project is being realised.

		VALUES						
		Problems, Solutions and Ambitions			Judgment			
		Ecology		Economy		Equity		
Aspects	Nature	Biodiversity	Health Effects	Climate Change	Scarcity	Cost/benefit	PR	Corporate Social Responsibility
Energy	Problems	SO ₂ / Acid rain	NO _x	CO ₂	Fossil fuel			Not energy positive buildings
	Solutions	Solar, Wind, Environmental, Geothermal Energy and Biomass				Pay Back Time		"Net positive"
Mobility	Problems		NO _x , fine particles	CO ₂	Fossil fuel			Optimise transportation routes
	Solutions	Natural gas, H ₂ or Electrically powered transport, Public transport, Parking facilities @ train stations				Life Cycle Analysis		"Easy Access"
Water	Problems	Contaminated water			Fresh water			Cleaner discharge as intake
	Solutions	Algae, Nutrient regeneration				Real Cost of Ownership		"Green"
Materials	Problems	Waste %	Indoor Air Quality, exposure		Virgin materials			Self cleaning buildings
	Solutions	Non-Toxic, Carcinogenic or Mutagenic substances, From down cycling to up recycling				Life Cycle Costing		"Healthy"
Top Soil	Problems	Leak & Degradation, Contamination			Phosphate regeneration, Agriculture			Positive contribution to Top Soil production
	Solutions	Minimise green buildings, apply green roofs				Hard and soft costs and benefits		"Green"

Sustainability Problems, -Solutions, -Ambitions and -Judgement model, © Royal Haskoning, Prof.ir.P.G. Luscure September 13th 2009

AN EXAMPLE

The use of fossil fuels as a source of energy has SO₂ (acid rain, sulphur dioxide) as a problem for biodiversity and climate change is stimulated by the CO₂ emissions. Health suffers as a result of the NO_x (nitrogen oxide) emissions and, lastly, the fossil fuels themselves quickly become more scarce. The use of solar energy is one possible sustainable solution.

Assessment

If the plan is indeed to use solar energy, then the plan is assessed according to the above-mentioned criteria of ecology, economy and equity.

* Ecology

Is the plan CO₂ neutral; must trees be planted to offset the plan or are other inexpensive offsetting measures possible somewhere?

* Economy

How do we work following the Cradle to Cradle idea and does that make money? A business usually aims to earn back its investment in three to five years. For a sustainable project, this period can often increase to seven years. It is always problematic to manage the different financial interests of investors, facility managers and users of the premises, namely investment costs, operational costs and the cost of use. A totally different approach: lifecycle costing considers these three costs in their entirety and works on the basis of a cost recovery time of fifteen years. Several organisations, including the Rijksgebouwendienst (Dutch Government Building Agency) are extremely interested in this.

In addition to the finances, sustainable and Cradle to Cradle -oriented measures must also fit in within an organisation's PR (for example, marketing and good employment practices). An organisation benefits greatly from an honest and green image. So carrying out the project in a cheaper country like Poland might not be appropriate.

* Equity

This covers both social responsibility and justice. Although the latter is difficult to realise locally, it is applicable on a worldwide scale. An example is dumping European waste in Africa, which is not against the rules and very cheap. However, it is anything but fair!

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