

THE CIRCULAR ECONOMY- WHAT IS IT AND WHAT DOES IT MEAN FOR YOU?

Arcadis Briefing Paper

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The concept of the Circular Economy has been around for a number of years now and has become an increasingly familiar term in the fields of sustainability, waste management and economics.

It is popular amongst both the private and public sector bodies and could well move from being an interesting theory to a regulatory necessity in the European Union in the not too distant future.

However it is often misinterpreted and can stand for different things by different people who may focus on only a small part of the overall concept.

This briefing paper sets out to explain some of the basics about the Circular Economy, namely:

- Where does it come from?
- What principles is it based on?
- How are some organisations seeking to embed circular principles in their own organisations?
- What implications does the circular economy have for your organisation?

These are the questions answered in this paper. Additionally, we create a link between theory and practical application.

What Does Circular Economy Mean?

In the late 1970s, architect Walter Stahel came to the insight that the current linear economic model is not sustainable. This was based on the fact that if people continued to increase their consumption it would lead to major problems in the future, as highlighted by the Club of Rome in their report “Limits to Growth” published in 1972. They concluded that the current economic production model was not sustainable due to increasing demand for raw materials and worldwide accumulation of waste. Stahel had the idea to close material cycles and reform the economy. The concept of closing the cycles has been studied and further developed in concrete business cases in the years. Eventually, it resulted in the concept of the circular economy which, for the purpose of this briefing, can be defined as:

The circular economy is a concept in which growth and prosperity are decoupled from natural resource consumption and ecosystem degradation. By refraining from throwing away used products, components and materials, instead re-routing them into the right value chains, we can create a society with a healthy economy, inspired on and in balance with nature.¹

Currently, we are confronted with products that were not designed and produced for re-use. If we want to re-use such products, we must take a circular approach with raw materials that were used before recycling the products or components as a raw material again. This must focus on realising the highest possible value of the material, as this requires the least effort and/or energy. Recycling is often more energy-efficient than extracting new raw materials through mining or agriculture.

The Ellen MacArthur Foundation (EMF) makes the two cycles transparent in the diagram shown in Figure 1. The organic materials cycle is on the left side of the model whilst the technical materials cycle is on the right.

The circular economy model discerns four technical cycles:

1. Maintaining product
2. Re-using/redistributing (used) product
3. Upgrading/ remanufacturing product
4. Recycling product.²

In the smallest cycle, the product/material retains the highest value, as it can be applied longer in accordance with its original purpose. In the longest cycle, the value or residual value of the product is lowest and a different application must be found.

¹ Circle Economy (2015), www.circle-economy.com

² Ellen MacArthur (2013), Report Towards the Circular Economy

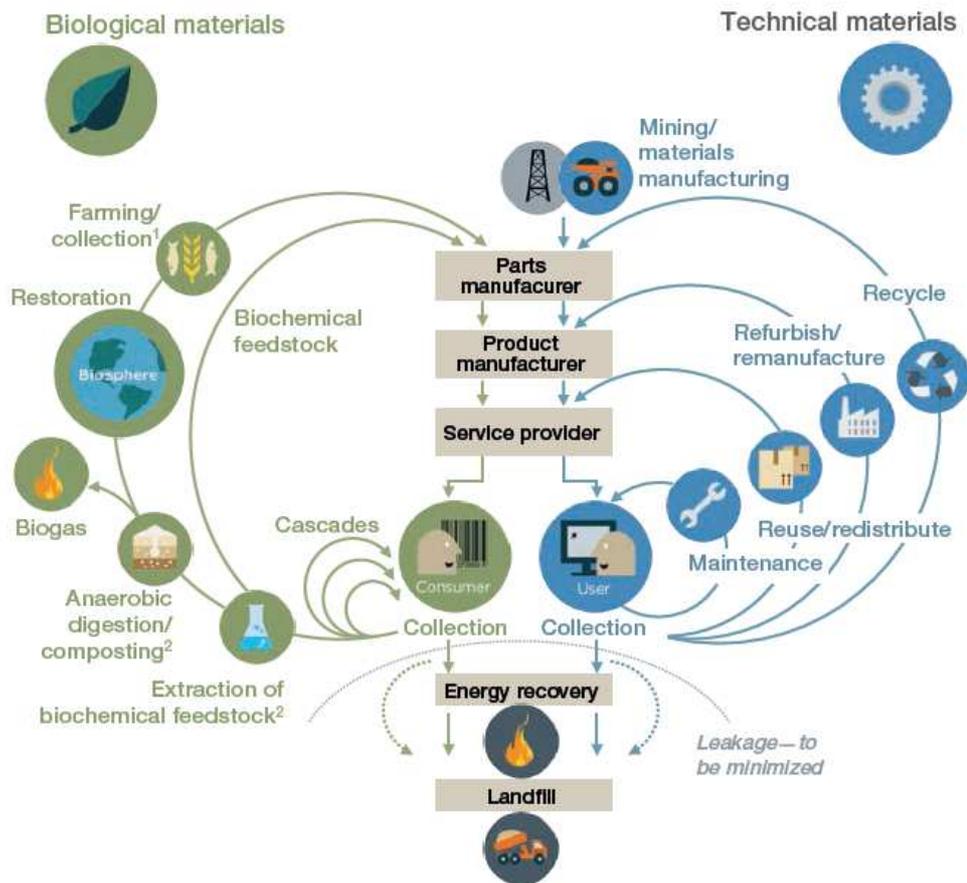


Figure 1. Visualisation Circular Economy according to EMF

The circular economy is a new economic format. The format originated from engagement of the industry with sustainability and social responsibility but it was also triggered by strategic considerations and economic necessity. Although the prices of raw materials seem to continue to decrease, the long-term trend continues to point towards cost increase. This applies to both fossil fuels, agricultural commodities and mineral resources. This increase is caused by a structural shortage.

The McKinsey Global Institute illustrates how the increase of prices for resources has completely compensated for the price decreases achieved in the entire twentieth century.³ In order to counter this shortage, extracting raw materials and resources from existing materials is increasingly important.⁴ The Flemish transition network Plan C, finally, indicates how antimony, lead and indium will run out respectively by 2020, 2025 and 2030, and how the 'leftovers' will not be in the most accessible places in geo-political terms.⁵

The circular economy is a strategy to secure natural resources for our industry, and is, therefore, considered a long-term necessity. In order to keep materials in the cycle, value must be added. The circular concept creates value in four different ways.

1. Renewable sources continuously regenerated in the course of time;
2. Quick markets allowing for optimal use and access of products and possessions;
3. Increased product lifespan by designing products that are made to last;

³ McKinsey (2011), Resource Revolution, Meeting the world's energy, materials, food, and water needs, 224 p.

⁴ Helmut Maurer (2013), Presentation Green Paper on a European Strategy on Plastic Waste in the Environment

⁵ Plan C (2014), Infographic Born in 2010, how much is left for me, <http://bit.ly/1I922AV>

4. Linked value chains that do not produce waste.⁶

The theory behind the circular economy is applied in various related movements, such as in the Cradle to Cradle philosophy, bio-mimicry, green economy and blue economy. These movements also focus on smarter and more effective use of commodities. The circular economy is a free philosophy not appropriated by a single person or organisation, not accompanied with any restrictions. This freedom also means that everyone is allowed to use the term. At the same time, it requires a critical perspective on products and services that commit to it.

Building Blocks of the Circular Economy

The steps in the technical cycle were identified to arrange products in the circular order. However, the circular economy goes further than just products. Rather, it is an economic concept. This concept consists of four building blocks that companies must apply to come to a circular economy: Product Design, Business Models, Reverse Networks and Enabling Conditions.

For each building block, a number of research and development problem definitions were prepared that may contribute to a more circular business process.

1. Product Design

This building block involves improvements in choice of materials and product design. Potential ways to realise such changes include standardisation and modularisation of components, pure material flows and design for straight-forward disassembly. The implementation of this building block makes the production process of organisations more efficient.

- What is the true cost of the product?
- What is the value of the residual flows and how can these be used for new or other products?
- How should the product be carried, packaged and marketed?
- How can the production process be optimised in both ecological and economic terms?
- What is the life cycle of the product and how can this cycle be extended?
- Which materials must be excluded in product design, not only from a functional perspective, but also in terms of health and other indirect aspects?
- How can the materials be easily identified or labelled in terms of future recycling?
- How can the product be disassembled easily to reuse different components, or recycle mono-materials?

2. Enabling Conditions

This building block focuses on the conditions enabling society to apply the circular principles. The application of circular principles requires more transparency in material flows, aligning incentives and determining industrial standards. Financing, risk management, legislation, infrastructure and education must facilitate the transition. In addition to mechanical changes, developing general consumer awareness is necessary to enable easier implementation of circular innovations. Finally, companies must also be brought into cross-sector contact (eco clustering) and willing to share general and confidential market information.

- Can legislation or subsidy be used to encourage re-use of existing materials?
- How can the diversity within the economy be leveraged for future-proofing the production process?
- Which legal and economic aspects have an impact on making the primary process circular?
- Can more extensive manufacturer responsibility be a trigger for more circular use of materials?

3. New Business Models

The transition from a linear process to a circular process requires change in the use of materials and also a change in structures of ownership, business models and responsibilities. This building block focuses on innovative business models, more specifically by changing property to performance-driven

⁶ Accenture (2014), Circular Advantage

earning models. This offers instruments for translating products designed for re-use into attractive value propositions. This perspective requires manufacturers to think differently about products and to take responsibility for products during the life cycle. The question is always how the used products can be made valuable again.

- Which business models are suitable for this product?
- Can the product be offered as a service rather than be sold as a product?
- Which optimisation options are available for collaboration in sectors or production-chains (procurement, transport, exchanging utilities such as residual energy, heat, materials, water and space)?
- How can reverse logistics be organised or guaranteed?
- How can value flows (social, natural and/or economic) be translated to allow for better charting of the benefits of the circular economy?

1. **Global Reverse Networks**

Within this building block, the focus lies on the cycle from user to manufacturer. Among others, this carries out the manufacturer responsibility forms cited under 'Enabling Conditions'. This includes, for example, return acceptance obligations, reverse logistics and other systems. This reversal can be expanded on an international scale, allowing for re-introducing materials in exported goods as waste. The purpose of reverse networks is to have manufacturers or third parties such as shared services collect materials efficiently.

- Which networks can be deployed (for example Oogstkaart.nl and third-party recycling)?
- How can the product flows be returned to the base?

From Theory to Practice – some real life examples

The theoretical principles of the circular economy are set out above. But how does the circular economy work in reality?

Arcadis works with a number of organisations in the built and natural environment to help them to apply the circular economy in a practical way. Some of these examples are outlined as follows.

Green Deal Circular Buildings

Arcadis collaborates with a number of organisations in the development of a materials passport for buildings. This partnership takes place under the flag of 'Green Deal Circular Buildings'. The purpose is to make buildings circular using pilot cases. An increasing number of organisations are developing a building passport for their buildings which helps them to gain more insight in the materials used in their buildings and the possible future developments of these materials. Often, we do not stop with an analysis of the materials used in the buildings but, additionally, will also look at the functioning of the building and the activities in the building across its whole lifecycle.

Value Circles in Urban Environments

This circular approach was applied in various Dutch cities and resulted in major social and financial successes. The model analyses the various financial flows of corporations, municipalities, insurers, schools, universities and social organisations in order to reveal hidden costs and unlock mutual benefits. This model can unlock capital to improve cities, achieving more results using the same amount of capital. By making these values transparent, it allows for successful decision making in projects, districts and cities. This new approach has given us the opportunity to develop projects for our clients that would have otherwise been impossible.

Floriade 2012 sustainably inspiring

The largest horticultural exhibition in the world takes place in the Netherlands every decade. For the 2012 Floriade event, Arcadis designed, realised and disassembled the basic park. The Floriade event was based on the Cradle to Cradle principles, taking into consideration the value of the buildings and the premises after

the end date of the world horticultural exhibition. The buildings used during the event could either be disassembled or were so versatile that they could fulfil a different function in the future. After the Floriade event, the park functions as a business estate. The circular economy philosophy was at the core of the approach taken to this project, the team looked further than one project and one moment of time, and advised the client during the complete lifecycle.



Salinization in the Delta

Salinization in the Dutch Delta is an issue requiring urgent attention. The sewer water purification systems of the District Water Board of Delfland (Westland area, The Hague, Delft and Vlaardingen) discharge purified waste water into the North Sea or Nieuwe Waterweg (the New Inland Waterway), whereas there is a shortage of fresh water in the summer. Arcadis prepared a plan for post-treatment of the waste water. If all waste water was purified and discharged into the gulf, it would fulfil 80% of fresh water demand. In order to achieve this, post-treatment using active carbon filtration is often advised. However, this carbon has to be regenerated after a few months which is an energy-intensive process. Arcadis has proposed to apply ozone technology, a cheaper and more energy efficient solution. Arcadis is successfully applying this technology within waste water purification projects in the pharmaceutical industry over a two-year pilot period.

Developing Enabling Conditions

The European Committee Directorate-General (DG) ENVIRONMENT is exploring the various forms of waste market distortions. Which legislation promotes, and which obstructs, the realisation of a waste market that respects the waste processing hierarchy, the objectives of resource efficiency and the transition to a circular economy?⁷ The DG GROWTH analysed the economic relevance of industrial symbiosis. Which sectors are most suited to symbiosis?⁸ Both Brussels DC and the committee are conducting strategic studies into how to specify the extended manufacturer responsibility in the future, both in the context of the waste phase and during the entire life cycle of the materials.^{9,10}

⁷ Arcadis and Triple E (2015, in preparation), The efficient functioning of waste markets in the European Union

⁸ Arcadis, Cambridge Econometrics, et al. (2015), Analysis of certain waste streams and the potential of Industrial Symbiosis to promote waste as a resource for EU Industry

⁹ Arcadis (2014), Etude de l'optimisation de l'outil REP and Région de Bruxelles-Capitale

¹⁰ BIOIS, Arcadis, ecologic, et al. (2014), Development of Guidance on Extended Producer Responsibility (EPR)

Second hand materials in a second-hand shop

The municipality of Houten, in the Netherlands, developed a new energy-efficient and CO2-friendly recycling shop. The new, sustainable, building was based on re-use and recycling. Stelcon plates were re-used in the walls and plot fences. These concrete plates were derived from disassembling a temporary school building in Houten. Additionally, demolition wood was affixed on the wall, mainly delivered by the Triade foundation, an organisation offering assistance and support to vulnerable people. These people sorted the demolition wood and cleared the nails and screws. Subsequently, employees of De Sluis Group in Woerden worked with Van Bekkum Construction to assemble the wood on the walls. Nesting space was created for various protected bird species, which allowed for integrating biodiversity into the design. Re-using goods resulted in double environmental gains, in particular in terms of CO2 emissions. Goods are not burned while production of new materials is minimised. Arcadis designed and managed the development of this circular project from start to end.



Industrial Symbiosis and Eco Clustering

Arcadis brought companies from the Port of Ghent (Belgium) together to explore the potential for industrial symbiosis. This resulted in specification of three business cases, respectively focusing on water purification and waste/grey water, steam and heat & finally on biodegradable waste and fermentation. Based on a KMO materials scan that Arcadis developed for the Flemish government, companies were brought together in an eco-cluster in the Olen area. This resulted in seven very practical partnerships and follow-up projects.

A new standard

As you can see from the examples gathered here, a number of organisations are already embedding principles from the circular economy into their daily operations.

The economic and societal rationale for moving towards a more circular economy has significantly increased. With all these developments, there is a growing awareness that we are at the limits of the current linear economy. This is why we are approaching the times when business and society needs to embrace a new standard: the circular economy.

What steps do you need to take?

So how can your organization profit from these new developments? We would not advise anyone to blindly adopt circular solutions. The common thread throughout the case studies outlined here is for organisations to take a new perspective on products and business models in order to meet their objectives.

The way we approach the circular economy is by not taking the circular economy concept as a goal, but as a means to strengthen the organisation's primary processes.

We therefore advise our clients to develop a strategy for the circular economy which explores how the circular economy can firstly strengthen its core processes. Only after this will we work with the client to realize this strategy in its projects.

A transition to a circular economy for your organization starts with a focus on the horizon – your business goals – and includes the development of a clear roadmap to help you reach your goals.

If you are interested in making the transition to the circular economy than we would like to be your partner, please contact one of our experts below:

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