

Boosting Circular Design for a Circular Economy



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A joint report by De Groene Zaak and Ethica

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SUMMARY

This report explores the crucial role of design in moving towards circular economy (CE). Can circular design approach be effectively furthered through regulation and if so, in what way? Can principles of circular design be embedded in the existing Ecodesign Directive?

Whereas the current Ecodesign Directive limits its focus to energy-consuming and energy-related products (leaving out, for example, transport) and aims to minimise their negative environmental impact, a circular design approach advocates value creation and maximising positive environmental impact at the systems level. Methods such as Biomimicry, Cradle-to-cradle® and Life Cycle Assessment can play a role in circular design strategies.

Moreover, ecodesign is based on an environmental framework unlike circular design, which has its foundation on an economic framework. As one of the interviewees for this report said, “this is not about sustainability, this is about business”.

Recyclability and the use of secondary raw materials have traditionally gained a great deal of attention when considering ecodesign. Indeed, increased use of secondary raw materials should be one main objective of the circular economy package. However, much less has been said about other design dimensions, for example, durability and modularity. These so called ‘inner loops’ of the circular economy model –including maintenance, repair, reuse, refurbishment and remanufacturing - need to be harnessed much more in the future to get us on the right track towards circular economy.

Accordingly, this report suggests that future regulation be a policy mix of the following carrots and sticks:

- Investigate if the existing Ecodesign Directive can be extended to cover circular design, both in terms of scope (extension from energy efficiency to resource effectiveness) and in terms of markets covered (from energy related products to all products and services). If not, launch a new Directive for Circular Design as part of the Circular Economy Package Action Plan.
- Base the future design directive on business logic, value creation and maximising the positive impact, while avoiding red tape.
- Introduce minimum requirements for circular design that are product-specific, aiming for long-term value creation at the systems level, reflecting frontrunners’ circular solutions, fostering fast followers, incentivising laggards and progressively adjusted each year. These requirements include circular business model aspects such as ease of maintenance, reparability, durability (e.g. warranty periods) and/or modularity and upgradability, performance based contracting, digitisation, ease of waste collection and separation, and the use of renewable energy. Don’t use fixed percentages of secondary raw materials in products as a minimum requirement for circular design. This approach is too much top-down, one-size fits all and leaves businesses insufficient room to develop innovative circular solutions.

- Support, fund and facilitate the creation of business ecosystems which create new products and services based on a closed loop system and design out waste, pollution and toxic materials to create a net-positive impact. These systems should be cross-organisational and cut across different sectors. Create suitable conditions for companies to experiment, pilot and test out new ways of operating as well as building up these systems. Include support for renewable energy as part of circular business models and remove financial incentives for fossil fuel energy systems.
- To raise awareness of circular business models and circular design strategies, make it mandatory for companies to briefly explain the measures they took as part of the design for each part of the value chain, or motivate why they could not take any measures.
- Implement new and improved Extended Producer Responsibility schemes giving clear price signals favouring products and services based on circular design for all sectors and tailored according to the end product and/or value chain, sector and region. Differentiation of levies down to product and company level is needed to incentivise companies to implement circular business models. Accordingly, transparency across the whole value chain needs to be increased.
- Make research programmes such as Horizon 2020 accessible for leading companies and value chain partners with questions concerning the implementation of circular design. The current programmes require too large consortia, the lead times are way too long and acquired subsidies cannot be used for projects already started.
- Increase the enforcement of existing environmental and new CE regulations. Without this, effective improvements will not be possible.
- When reviewing the current waste legislation, free ‘waste to raw material’ experimentations from red tape. Also, local authorities have to find novel ways of dealing with residential waste, for example, selling it to interested parties to use it as a secondary resource.
- Create programs on awareness and capacity building of ‘design for circular business’ like the Dutch [CIRCO](#) programme and the UK-based ‘The Great Recovery’. In many member-countries these programmes are not yet available and the existing ones need a broad implementation scheme.
- Introduce and support voluntary agreements that further the development towards circular economy. The outcome might be used for new minimum requirements.
- Publish guidelines for companies to facilitate and clarify the move from traditional to circular design.

The following views in this report are based on interviews conducted by Ethica with De Groene Zaak members and other experts (see Appendix 3), as well as the existing reports, papers and books on circular design and circular economy (see Literature).

INTRODUCTION: SETTING THE SCENE

The Netherlands is one of the hot spots in circular economy. Accordingly, De Groene Zaak has already done a lot to further CE amongst businesses, governments and EU policy, e.g. by publishing a business Manifesto on Circular Economy Policy in the EU and a study Governments going Circular (De Groene Zaak, 2015).

Moving towards a circular economy requires a multitude of actions to be taken in all sectors. Issues to be addressed range from removing obstacles in the current waste legislation to improving public procurement and extended producer responsibility schemes. A number of excellent policy papers and proposals already illustrate how to tackle these challenges and move towards a circular economy (see e.g. European Parliament (2015), PSI (2014) and Acceleratio (2015)). Therefore, the aim here is to explore only the design aspect and by doing so, provide some novel insights into the Ecodesign Directive debate.

Views on what constitutes the core of a circular economy vary a great deal. For example, one of the interviewees said CE is all about changing the business model. The other interviewee stated that CE it is about material flows. The third view advocates that a product lifespan extension lies at the heart of CE.

The multitude of views highlights the fact that CE is a broad church, and there are many alternative paths that lead us closer to CE. Similarly (as it was noted in the Manifesto), there is still no single definition of what constitutes a circular product or service, which can hinder developing proper incentives for companies to work towards circular models.

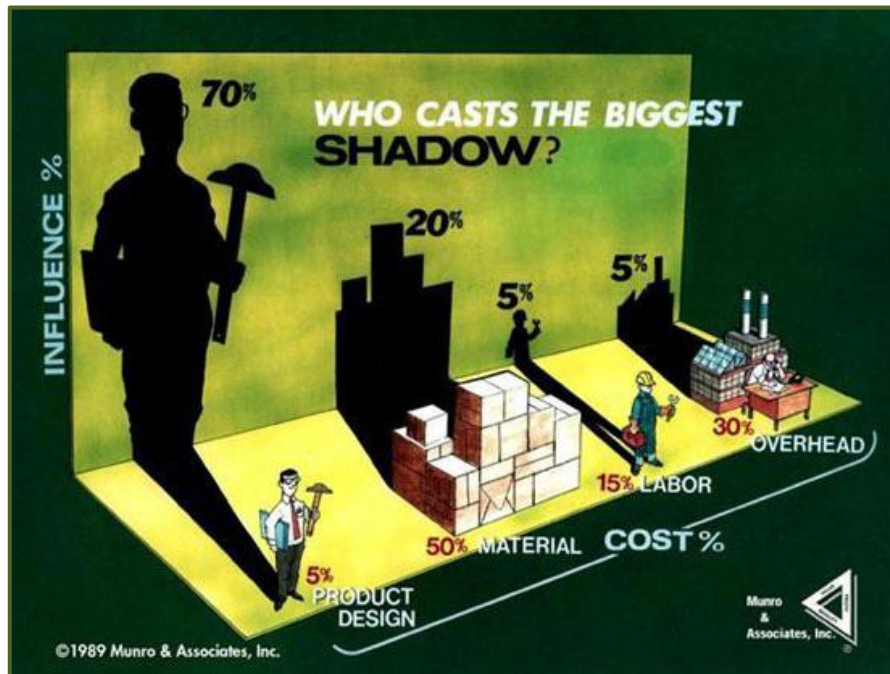


Also, different sectors seem to have very different – and sometimes opposite - needs and requirements regarding regulation, which complicates the formulation of future legislation. For example, the market for construction is very different from that for consumer goods or medical equipment, and what sounds like a sensible proposal to one industry, could have an adverse impact on the other. “Good intentions, unintended consequences” is a phrase that describes well the challenge of creating an ambitious circular design regulation coupled with an effective implementation without actually hindering innovation work of those businesses, that are already well on their way to transfer their modus operandi from linear to circular.

These complications also show that we are dealing with a fundamental change in the market. It needs to be viewed from a systems perspective before it starts to make sense. We hope this report provides some clues on to how some of the different views can be combined into a powerful vision on how to move forward with circular design.

THE EVOLVING ROLE OF DESIGN

Michael Braungart and William McDonough - the creators of the Cradle2Cradle concept - have said that “we don’t have a waste problem, we have design problem”.



Design indeed plays a crucial role when moving towards circular economy. It can be said that everything else depends on it; no matter how intelligently waste gets handled or whether materials are recyclable, design will either enable or hinder maintenance, repair, sharing, reuse, refurbishment, take back and remanufacturing, which are inner loops and cornerstones of CE. The picture above illustrates in a very concrete way the impact of design on the entire manufacturing process at only a fraction of the total costs.

The role of design has evolved massively within the last ten years or so. The shift from product design to system design is significant. In fact, design (or the lack thereof) in the broad sense plays a role in almost every aspect in our society and in businesses. Its multiple manifestations are deeply rooted in our values and views on what constitutes a good life. Hence, profound understanding of the different dimensions of design and harnessing its real potential is a key in transitioning towards circular economy.

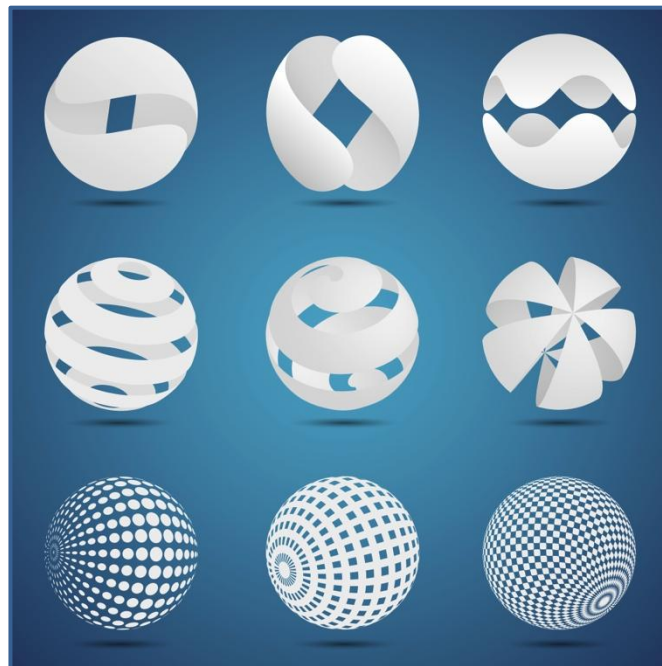
There are two relevant aspects to point out regarding the evolving role of design:

- 1) The power of design lies in its ability to truly re-think and *ask fundamental questions* such as: what is the real purpose (of this product)? Do we need the product or the service it provides us with? What is the actual need this product or service will fulfil? Can we increase well-being and happiness through this type of design? Does this have a zero impact or regenerative impact on the ecosystem?

Asking these kinds of questions is still relatively new and certainly outside traditional design brief; in fact, circular design approach requires taking one step back before the actual design brief. The traditional design brief is product focused without much realisation to the restorative opportunity of the ecosystem through design itself. However, once these questions are raised, a shift towards a circular mindset becomes possible.

Currently we are living in a transition period, where the challenge is that most companies are still operating on a linear model. Accordingly, their design brief for the designer is linear. Whether there is space and time to start a dialogue on the above circular questions partly depends on the management, business strategy and culture of the company as well as the designer him/herself. The current Ecodesign Directive is built on the linear model without any economic incentives. Therefore, creating regulation that is based on at least as much on carrots as on sticks can truly help companies to take a leap towards circularity.

2) Designers play a double role in furthering transition towards CE: on one hand they are creating increasingly circular solutions for companies, thus developing a circular product or service portfolio. On the other hand, *designers can create demand on the consumer side* not just through designing high-level functionality, but also, through designing for attachment, trust, well-being and identity. In other words, they can nudge consumers in a circular direction through creating an emotional bond. This is also where digital technologies come into play; its various applications help in terms of better functionality, but equally important is the emotional and social aspect digitalisation can enhance.



CURRENT ECODESIGN DIRECTIVE VS. CIRCULAR DESIGN APPROACH

Below tables lists some of the differences between the current Ecodesign Directive and circular design approach.

ECODESIGN DIRECTIVE	CIRCULAR DESIGN APPROACH
<ul style="list-style-type: none">• Product focused, limited to energy-consuming and energy-related product groups• Framework directive; does not directly set minimum environmental requirements• Trying to improve energy efficiency of products and curb CO2 emissions• Aims to minimise negative environmental impact through energy focus: 'be less bad'• Maintains the linear economy approach: accommodates environmental standards into the current system• Ecodesign is an environmental issue	<ul style="list-style-type: none">• Systems approach: value chain, cross-organisational and cross-sector approach• Pursues value creation and innovation, focuses on new business opportunities• Circular design, business model and clean energy go hand in hand• Focuses on maximising a positive footprint: a so called net positive approach (not only zero emissions or zero waste, but creating a regenerative impact): 'be more good'• Requires the whole ecosystem support, no organisation alone can make a transition to CE• Circular design is an economic opportunity

De Groene Zaak Manifesto: "It also means a shift from a focus on technology as a driver to technology as an enabler, and from detailed environmental legislation to a framework with economic incentives that creates conditions for innovation."

As the above tables show, the current Ecodesign Directive and what could be the future Circular Design (circular design) Directive uphold a very different approach to design. The current model is about 'regulation' in a traditional sense: the directive aims to improve efficiency through minimising negative environmental impact, whereas the circular design approach is about maximising a positive, regenerative footprint.

The other notable difference is a systems view versus product view. If there will be targets, they have to be either sector-specific or supported by a holistic approach on the overall impact. Without it, the outcome could be negative from a systems perspective.

Agnes Schuurmans of ROCKWOOL highlighted the potential pitfalls of not taking a holistic view through a following example in a construction sector: a requirement of a specific percentage for second-hand/recycled materials could mean that there are increased emissions at production (due to the composition of second-hand material).

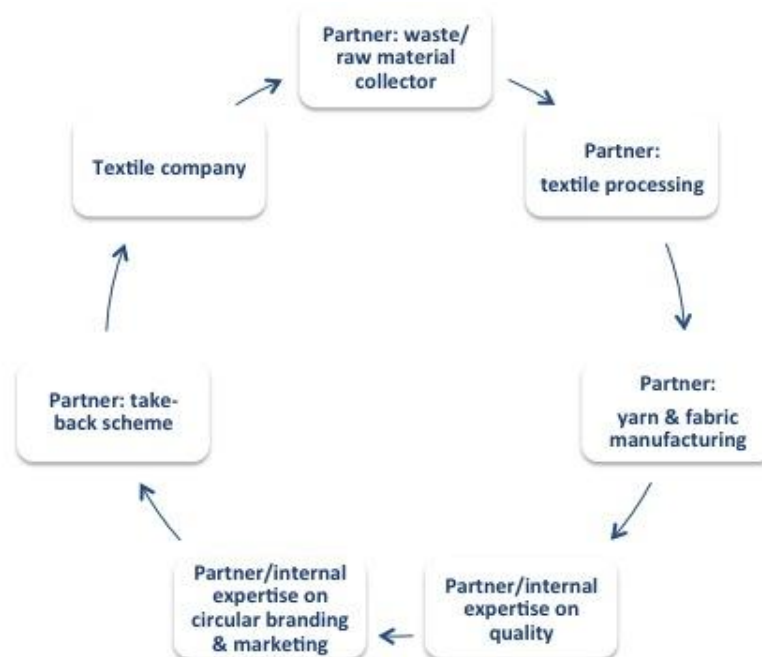
Tools such as Life Cycle Assessment can help to identify potential side effects and the preferred amount of specific recycled materials with the lowest overall environmental impact. Recycled content should be looked at as *means* to achieve a better environmental performance, not a goal in itself.

Also, circular design requires a new way of doing business across the value-chain. This means that a business cannot move to circular economy alone and without partners, as the CEO Bas Gehlen of Van Houtum points out:

“We are very thankful to our partners, we couldn’t make this transition towards Circular Economy without them. They provide us with knowledge, products and services we need. Partnerships are the key towards CE.”

- Bas Gehlen, Van Houtum

Before linear system is turned into a closed loop system, most of the issues that require re-thinking and re-organising are system-level. Below is an example of a textile company’s circular ecosystem and need for - at least - the following partners.



The most crucial difference, however, is that circular design views sustainability - perhaps for the first time in history - as an economic opportunity instead of an environmental issue. This is a huge shift in the mindset and should guide the future legislative work. As Douwe JanJoustra, one of the pioneers in introducing Circular Economy in the Netherlands and founder of Implement Circular Economy puts it:

“What is needed is empowering and informing companies, creating conditions, allowing experiments and nurturing innovation rather than constructing a robust regulation.”

The current Ecodesign Directive neither addresses nor incentivises the economic aspect, which is crucial for companies to proactively adopt circular design principles and lead the way to CE.

Boosting circular design requires a number of various supporting policies, including regulations and guidelines to create a shift from a linear to circular model, beyond the scope of the current Ecodesign Directive. It requires a move 1) from product level to the systems level 2) from energy-related products to all products and services and also, (3) an effective approach to incentivise businesses to adapt their design strategies accordingly. The economic opportunities for jobs and growth are enormous. Careful consideration of the regulation, including minimum requirements, is necessary. For example, too stringent top-down measures would hinder circular frontrunners and SMEs and prevent them from developing innovative circular solutions. Also, too soft measures watered down by conventional industries would slow down the transition to circular design.

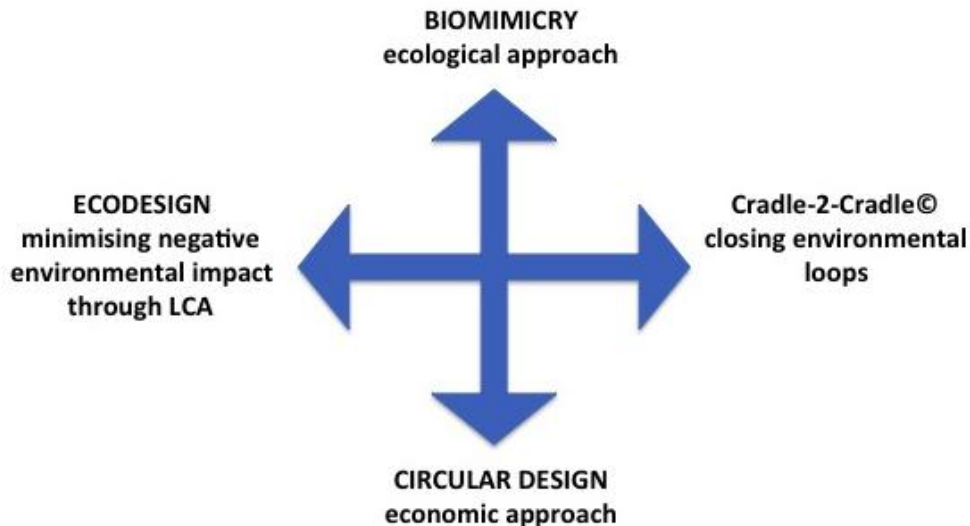
Therefore, we recommend to base the future Ecodesign Directive on minimum requirements and incentives. In other words, to focus on value creation and maximising the positive impact, while creating suitable conditions for companies to experiment, pilot and test out new ways of operating as well as building up circular business ecosystems.

FURTHERING CIRCULAR DESIGN STRATEGIES AND CIRCULAR BUSINESS MODELS

“Most designers are not aware of the fact that everything they do is defined by an implicit business model, and that this is virtually always a model to sell products and then ignore them.”

- Products that last book

Exploring circular design also means exploring business models and energy, as those three are interlinked. Unlike ecodesign, which aims for energy efficiency, circular design aims to create and maintain long-term value - not through the current linear system but - through re-thinking the purpose of a product and what kind of impact it has on a systems level. The graph (below) helps better understand various design approaches and their interrelationships.



In the graph, Cradle-to-Cradle®, Biomimicry and circular design represent different design strategies next to ecodesign. Ecodesign uses Life Cycle Assessment (LCA) as a tool but restricts the analysis to energy use and the negative impact of CO₂ emissions. Cradle-to-Cradle® focuses on positive impacts following from product redesign. Biomimicry uses inspiration from nature to generate new solutions, both in the technical and social or organisational sense. Circular design is a relatively new approach working from the systems level and circular business models.

In practice, those forerunner companies that are transitioning towards circular economy often use ecodesign in combination with one or more of the other strategies. In other words, they start from reducing their negative environmental impact before they can move on maximising their positive impact while creating business value out of it. Although this is a logical route, without an effective directive for circular design, only leading companies with an ambitious circular economy vision will succeed and go towards zero impact and beyond (i.e. aim for a regenerative impact). Otherwise the outcome will always be 'less bad' within the existing linear system.

As mentioned before, there are alternative paths towards circular economy, but there is still a lack of awareness of various circular business models and related design strategies. What is needed is to move away from the current linear business model and fossil fuel energy; we recommend to couple renewable energy support measures and zero emission targets to circular business model awareness raising, while removing financial support for the use of fossil fuels.

Hence, the future Ecodesign Directive should advocate a '**maintain and create long-term value**' as an overarching approach.

Accordingly, raising awareness regarding various circular business models (e.g. the hybrid, access or performance model) and design strategies is important. Pilot schemes that allow the company to "re-invent" itself (like Van Gansewinkel, which has extended its business from waste collection to new business opportunities through becoming a secondary

materials producer) create a circular business ecosystem roadmap articulating circular design strategy and test the operating model should be supported at the EU level.

We therefore suggest to make it mandatory for companies to briefly explain the measures they took as part of the design for each part of the value chain, or motivate why they could not take any measures at this time. This would again also increase transparency across the value chain. We warn however to make this a “light” obligation in the sense that red tape is minimised, which is very important for the partner companies of De Groene Zaak.

In the UK, Belgium and the Netherlands programmes have been started on the awareness and capacity building of design for circular business. The Dutch program CIRCO is part of the national CE-accelerator and focuses on connecting product-, service- and business design. Through design tracks, master classes, student and professional inquiries this program seeks to show all industry how circular economy has an impact on design and vice versa. The UK-based program ‘The Great Recovery’ is also aiming at education and information through publications and hands-on activities for productdesigners. These are relatively small examples that need more exposure and follow up by other member states. The directive should aim for a strong implementation strategy and facilitate knowledge and methodology exchange. Furthermore funding directed at knowledge and capacity building will strengthen the economic power of Europe.

For more information on circular design strategies and circular business models see Appendix 1 and 2.

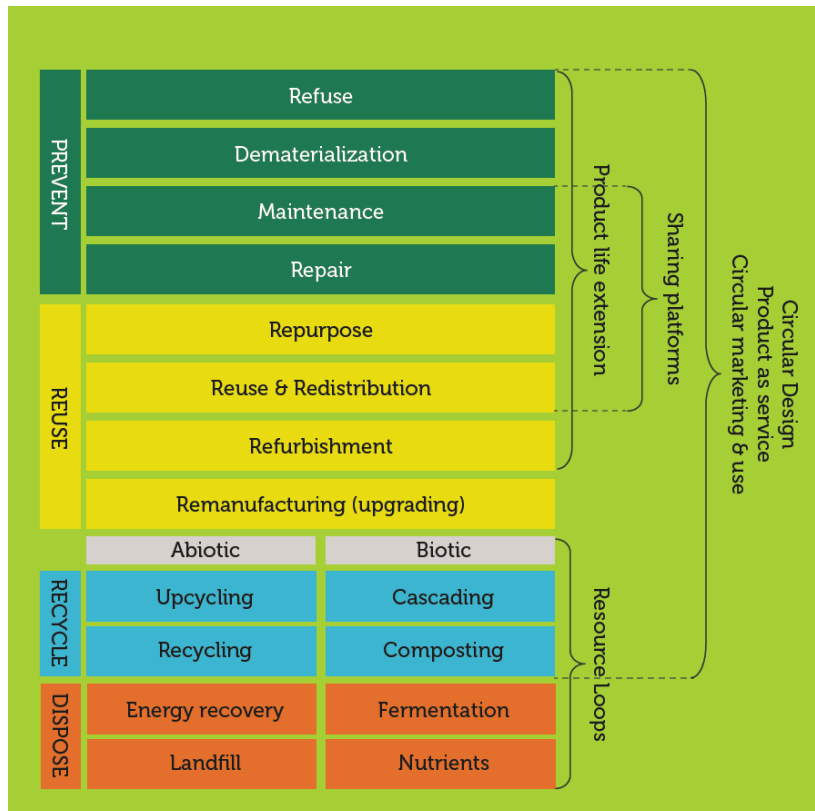
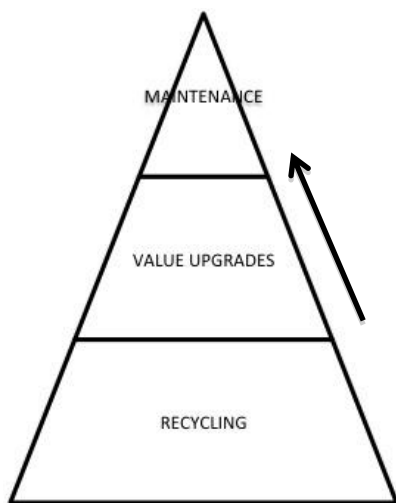
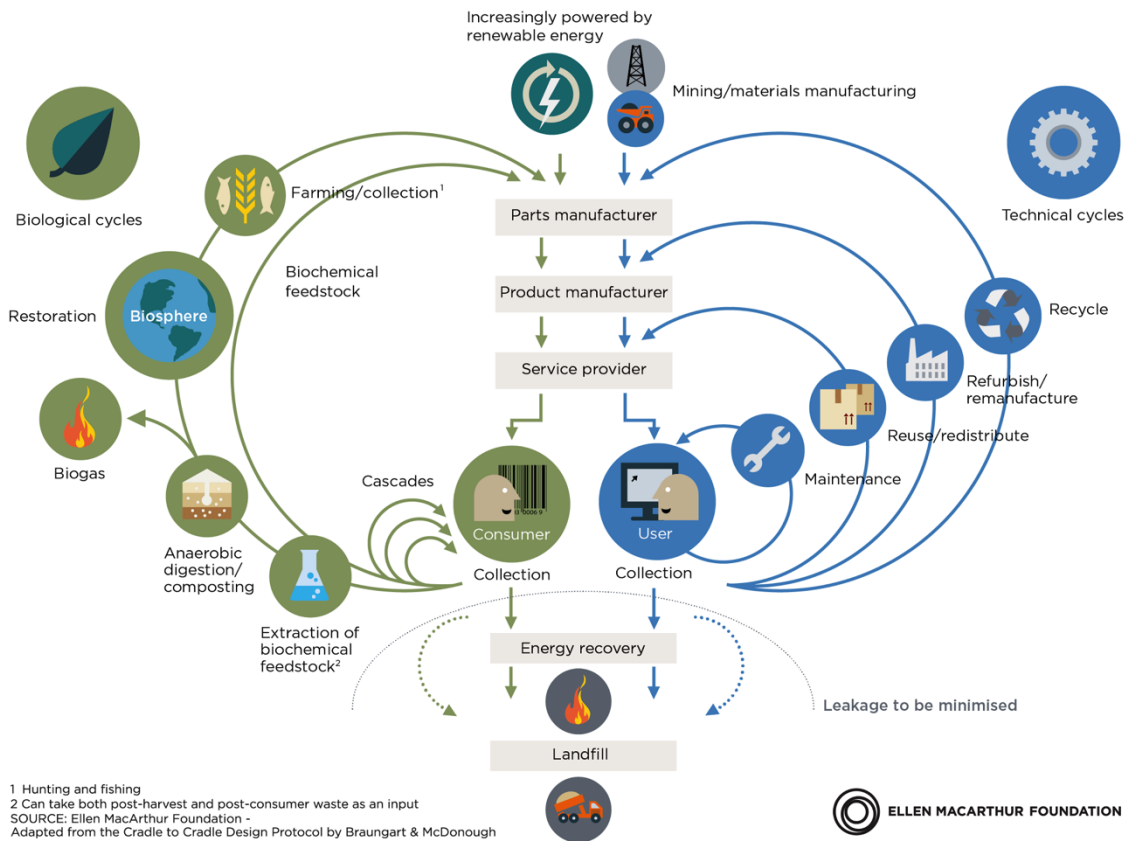
DESIGN FOR MAINTENANCE, REPAIR AND DURABILITY

It is still quite often that circular economy debate revolves mainly around recycling and recyclability. Recycling is important: increasing recycling by a landfill ban will give an enormous boost to the circular economy. However, it only forms the outer loop of the right wing in the ‘butterfly’ model from the Ellen MacArthur Foundation shown on page 13. A lot of value is still lost. The above-mentioned ‘create and maintain long-term value’ approach can be better achieved through the inner loops. In addition, cascades on the biosphere (left wing) represent an equal amount of value to be untapped.

According to the *Products that last* book (Bakker et al., 2014) ‘Closing the loop’ can refer either to an ecological or economic loop. Circular design aims to do both - but as value maintenance and value creation are paramount in CE, closing the economic loop needs to be addressed first.

The butterfly diagram can also be viewed as a 3D model (Bakker et al. 2014, left below) where the ‘maintenance’ loop is at the top of the mountain and ‘recycling’ loop is at the bottom.

CIRCULAR ECONOMY - an industrial system that is restorative by design



Following this logic, the aim is to maintain the value of a product as long as possible before it gets recycled. In other words, product lifespan extension, durability, changing the business model to a service model and/or upgradeability (see next section) should be the main concern as design strategies before resorting to recycling.

Similarly, a link between circular design (figure below, on the right), aspects of circularity and the so-called “waste hierarchy” (on the left) is made in this graph from De Groene Zaak (Governments going Circular, 2015). Waste prevention strategies work much better than recycling or disposal.

To prove the point regarding durability over recyclability, Interface provides an interesting case study.

Through high-quality and proper maintenance Interface is able to nearly double their carpet tile life cycle. This makes sense from the sustainability point of view and creates less negative impact than replacing the old carpet tiles, recycling them properly and using them as raw material in new production.

Looking from a business perspective selling less may sound like disadvantageous, but when looking at the whole picture, it actually is good for business, too. Interface maintains a circular customer relationship through maintenance work, which is much more about partnership than a linear, one-off transaction. They also help the customer save money, which easily turns the existing customers into ‘ambassadors’ marketing Interface products and services on behalf of the company. This illustrates how circular design often involves changes in the *business model* besides technical product innovations.

When talking about product lifespan extension, ease of maintenance, reparability and durability, ‘designing for attachment and trust’ can play an important role in creating an emotional bond to support the willingness to take care of the product as long as possible. Mobile phones, toys, clothes and cars are good examples of products that have a bigger meaning than just using the product; we often get attached to them and feel that through choosing a certain style or model they convey a message that supports our identity. Although this may sound like a soft and secondary issue, it is, in fact, quite the opposite: product lifespan extension becomes much easier and more desirable when the elements of attachment and trust are taken into account during the design phase and it helps get rid of the ‘buy and throw away’ culture.

Depending on the product (this will be discussed in the next chapter) designing for reparability and durability should be part of a sector specific circular design criteria in the future Ecodesign Directive as part of the CE Package.

DESIGN FORMODULARITY, UPGRADABILITY AND ADAPTABILITY

If a requirement of durability is included in the review of the current Ecodesign Directive (this would also address the issue around planned obsolescence), it needs to be sector and product type specific: it is crucial to consider what type of a product is in question and what design strategy is needed to aim for circular business operations. For example, a washing machine could have a lifespan of over 15 years unlike a smartphone, which evolves into a newer generation on a much shorter timescale. In the former case, designing for durability could be a requirement, whereas in the latter case, a requirement for modularity and/or upgradability could be an effective game changer. For this reason the circular design criteria should be tailored according to different products and sectors. N.B. This just as an example; washing machines can also be upgraded, and are already being offered as a service through performance-based contracting by the Dutch company Bundles.

A good example of a modular and upgradable design is a Finnish [PuzzlePhone](#). You can upgrade 1) 'the brain' of the phone, i.e. technology to improve performance 2) battery and 3) screen. Previously one needed a new phone if the screen was shattered or battery lost its power, but PuzzlePhone allows you to change only the broken or obsolete parts, not the entire phone. In this way, designing for modularity and upgradability also aim for product life extension.

This example also shows that ambitious minimum requirements can be formulated depending on the best available technologies. An even more ambitious approach would not only consider technologies, but also best available circular solutions. E.g., since many copying and printer companies (starting with Ricoh long ago) have shown that performance-based contracting is an excellent business model even in our linear economy, an EU circular design directive might forbid business models selling printers, and also make it obligatory to make cartridges refillable. However, this would be rather prescriptive. In many cases a whole range of different business models can offer circular solutions, so the Directive should rely on competition in the market while exclude only the worst performing linear ones. This is why we would prefer a strong EPR system giving clear price signals favouring circular products and services over linear design, rather than forbidding certain business models.

Examining from the circular business model perspective, modularity, upgradability and adaptability provide alternative ways of generating revenue. Selling a durable washing machine can be coupled with selling low cost by-products starting, for example, from detergents, stain removers, hangars etc. This is called a hybrid model.

Modularity and upgradability also enable an access model and performance model, which both provide access to service but retain ownership of the product on the manufacturer.

Interesting examples that combine hybrid and access models can be found, for example, in a textile sector: The Swedish company [Filippa K](#). invested two years of R&D to become a circular design brand. They sell high-quality clothing that lasts for years, and encourage customers to take good care of them and have a take-back scheme in place. They are generating additional revenue streams through leasing their clothes and selling Filippa K. branded detergents and other products. The Dutch company Mud Jeans has gone through a similar development, switching from their initial leasing contract to a "sales with take-back premium" scheme.

DESIGNING FROM WASTE TO RAW MATERIAL



“If someone wants to explore waste and its various opportunities, you don’t always know at the beginning, what and how you’re going to do with it, so you need the possibility to explore the opportunities. If, for example, I now take waste from 3rd party, I need a permission, even though I’m not sure at first what and how to do with it exactly.”

-Bas Gehlen, Van Houtum

One of the core ideas of circular economy is that waste doesn’t exist. It is designed out, which means that waste becomes raw material. All the circular economy policy papers as well as people interviewed saw the review and implementation of the current waste legislation as a crucial starting point.

In addition, at least the following aspects should be taken into account:

- 1) Nurturing innovation and enabling experimenting with waste.

Bas Gehlen of Van Houtum told the following example: a mixture of short fibers and calcium carbonate is a by-product of their manufacturing process, but the company can’t use it for further purposes. Their business partner instead needs it as raw material, so this ‘from waste to raw material’ approach sounds like an ideal industrial symbiosis. However, according to the current regulation this by-product is waste and hence couldn’t be transported and used. The companies decided to start the co-operation anyway and to perform trials together. They talked openly about this situation. The process was tested and everything worked fine, but then they stopped and started the process to get the official permission. This took 9 months and a lot of valuable raw material ended up as waste.

- 2) Local authorities & waste: currently local authorities own residential waste, which could be turned into valuable raw material. Local authorities need to become circular in their approach to deal with waste. The aim should be to eliminate waste through, for example, selling it to interested parties who want to explore ways to turn it into raw material thus maintaining value instead of, say, incineration (incineration is still too cheap compared to recycling).
- 3) Find ways to implement the thinking about a second, third or next life of a product. In public procurement it might become obligatory for builders (architects) to show in advance how their building can have a second life with another function: working and/or living. The same can be done with other products: implement design for disassembly and show relevant uses for the product and/or its parts after the first use. In this way public procurement becomes an active policy-instrument to enhance the quality of circular economy. We used some examples; this needs to be enriched with new governance and stronger forms of usage.

EXTENDED PRODUCER RESPONSIBILITY & TRANSPARENCY

“It is all about business models; we need to change the economic system. Currently the manufacturers sell away their responsibility along with their product. The manufacturer should retain the responsibility throughout the lifecycle of the product.”- Douwe Jan Joustra, Implement Circular Economy

Implementing Extended Producer Responsibility (EPR) across different sectors has been suggested in various papers and also some of the interviewees regard it as one practical solution towards CE. In short, EPR retains the responsibility of the entire lifecycle of the product on the manufacturer. Germany and France, for example, have successful EPR programmes in place in a form of a take-back scheme. A similar model can and should be piloted at the EU level.

EPR indeed is a viable tool to further CE. In addition to regulating for EPR, making it mandatory for the specific sector within the region or member state, we recommend EPR is introduced along with a circular business model and design strategy pilot programme, so that businesses would be both incentivised and facilitated to adapt to CE principles and a new mindset regarding CE business logic. Differentiation of levies down to product and company level is needed to incentivise companies to implement circular business models. Without this, they would have to pay for the waste from the rest of the sector regardless of their own measures to close the loop.

EPR would also boost much needed transparency across the value chain. Transparency is crucial for a circular economy. It builds trust with both value chain partners and with consumers, for which there is a rapidly growing demand. It also nudges companies to take care of all the negative impact they create and aim for maximising a positive impact. In addition to EPR, Environmental Product Declarations (EPDs) are an effective voluntary tool for companies to enhance transparency throughout the value chain.



Looking at current practice, design policies stimulating a reduction of the number of different materials in products would also facilitate recycling. For instance, a policy goal might be that the majority of all plastic products consist of a limited number (e.g. 5-7) of types of plastics. Promoting *simplification* of the materials composition as a guidance for design would also help.

Finally, equally important is the attention throughout the EU for enforcement of the existing and new regulations. For instance, some manufacturing companies have become weary and even cynical of EPR schemes because they have observed the occurrence of corruption, including illegal waste shipments. Their assertions would imply that the levies are not used to invest in closing the loop while the waste from their products is shipped elsewhere rather than re-entering the EU market. Before EPR can be improved, it first needs to function as intended.

VOLUNTARY AGREEMENTS

In addition to these regulatory solutions to further circular design, it is also worth noting that some sectors are moving towards CE without any government intervention. For example, the textile sector has established a number of various industry initiatives, voluntary agreements, R&D pilot projects etc. The reason for this is the urgent issues they need to address in order to survive, keep their licence to operate and succeed in the marketplace, e.g.

- An increasing water scarcity, especially in relation to growing cotton, which requires a lot of irrigation
- Alternative raw materials for cotton are needed; hemp, nettle, post-consumer waste, cellulose etc.
- Land use: fields are needed for growing food due to rapid population growth
- Heavy use of pesticides and water/land pollution as a result of manufacturing and dyeing processes
- Exponentially growing need for raw materials and reliability; many global clothing brands view the raw material issue and the object of closing the loop not as a sustainability issue, but as a critical business issue.

Examples:

Circular Textile Programme (The Netherlands): <http://circle-economy.com/projects/sector/circular-textiles-program-2/>

Turning waste cotton into new fibre for the fashion industry (Finland):

<http://www.vttresearch.com/media/news/unique-production-experiment-in-progress-turning-waste-cotton-into-new-fibre-for-the-fashion-industry>

H&M closing the loop: <http://about.hm.com/en/About/sustainability/commitments/reduce-waste/closing-the-loop.html>

Puma C2C: <http://www.c2ccertified.org/innovation-stories/puma>

Pure Waste: <http://www.purewastetextiles.com/>

These voluntary agreements are a great example of how they further innovation instead of hindering it. However, they should never be an alternative to circular design regulation. History shows that established industries use voluntary agreements to avoid legislation and delay change. Instead, the resulting circular business solutions should be used to formulate new minimum requirements and thus accelerate and mainstream circular design throughout the sector.

WHAT ELSE

In addition to the above, we recommend the following:

- Investigate if the existing ecodesign directive can be extended to cover circular design, both in terms of scope (extension from energy efficiency to resource effectiveness) and in terms of markets covered (from energy related products to all products and services). If not, launch a new Directive for Circular Design as part of the Circular Economy Package Action Plan.
- Support, fund and facilitate the creation of business ecosystems which create new products and services based on a closed loop system and design out waste, pollution and toxic materials to create a net-positive impact. These systems can be cross-organisational and cut across different sectors. Create suitable conditions for companies to experiment, pilot and test out new ways of operating as well as building up these systems.
- Make research programmes such as Horizon 2020 accessible for leading companies and value chain partners with questions concerning the implementation of circular design. The current programmes require too large consortia, the lead times are way too long and acquired subsidies cannot be used for projects already started.
- Look for new governance that supports or empowers the quantity and quality of circular economy initiatives in the member states. More creative and powerful governance is needed to achieve this.
- Raise awareness of circular business models and circular design strategies and facilitate capacity building.
- Don't use fixed percentages of secondary raw materials in products as a minimum requirement for circular design. This approach is too much top-down one-size-fits-all and leaves businesses insufficient room to develop innovative circular solutions.
- When reviewing the current waste legislation, 'waste to raw material' experimentations should be freed from red tape. Also local authorities have to find novel ways of dealing with residential waste, for example, selling it to interested parties.
- Publish guidelines for companies to facilitate and clarify the move from traditional to circular design.

CONCLUSIONS

Creating and maintaining long-term value should be the foundation of the future Ecodesign Directive. Moreover, the Directive has to be based on business logic, incentives, value creation and maximising the positive impact.

Furthering circular design requires regulation, incentives, guidelines and support. Without a proper mix, only the leading companies will compete on the outcomes of circular design while most will continue to design for linear take-make-waste solutions on the market.

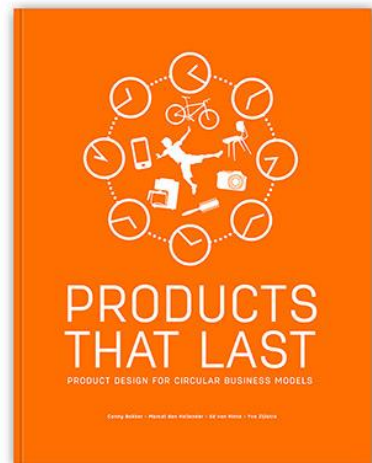
Accordingly, circular design principles should be fostered and mainstreamed through a mix of carrots and sticks as described in the summary: a directive based on minimum requirements, avoiding red tape, amplified by Extended Producer Responsibility (EPR) schemes, accompanied by mandatory motivation of measures (not) taken, programmes on awareness and capacity building as well as by guidelines and support for research and innovation. Differentiation of levies down to product and company level is needed to incentivise companies to implement circular business models.

APPENDIX I: CIRCULAR DESIGN APPROACHES

6 DESIGN STRATEGIES

The [Products that last](#) book presents 6 different Circular Design strategies, all of which aim to maintain or even add value over time.

1. DESIGN FOR ATTACHMENT AND TRUST
2. DESIGN FOR DURABILITY
3. DESIGN FOR STANDARISATION AND COMPATIBILITY
4. DESIGN FOR EASE OF MAINTENANCE AND REPAIR
5. DESIGN FOR UPGRADABILITY AND ADAPTABILITY
6. DESIGN FOR DIS- AND REASSEMBLY



NATURE INSPIRED DESIGN APPROACH

[Nature Inspired Design](#) (NID) combines biomimicry, cradle to cradle and design for circular economy and aims for added value - just like the above 6 circular design strategies. It advocates strong interdependency between a product and its surrounding system and strives to bring the nature's successful biological systems into design process.

The six NID principles are:

- 1) WASTE EQUALS FOOD
- 2) USE CURRENT SOLAR INCOME
- 3) BE LOCALLY ATTUNED AND RESPONSIVE
- 4) ADAPT AND EVOLVE TO CHANGING CONDITIONS
- 5) INTEGRATE DEVELOPMENT WITH GROWTH
- 6) BE RESOURCE EFFICIENT

APPENDIX 2: CIRCULAR BUSINESS MODELS

As it has become clear, to create a successful Circular Design strategy, developing a right business model requires equal attention. The linear economy is based on 'sell more, sell faster' mode, so changing the design strategy towards circular without examining the business model does not work.

Below you find two lists of circular business models based on different approaches. Taken together they can provide new guidance to develop circular design strategies.

First, six design strategies from the Products That Last book.

1. THE CLASSIC LONG LIFE MODEL refers to a high-quality product with a long lifespan.
2. THE HYBRID MODEL: a high-quality product coupled with repeat sales of a branded side product, for example washing machine and detergent, or printer and ink cartridge. Selling coupled with take-back scheme and leasing service is another example.
3. THE GAP EXPLOITER MODEL exists on many levels: a person who provides a repair or refurbishment service; another example is creating a platform for second-hand markets (e.g. eBay).
4. THE ACCESS MODEL: customer gets an access to the use of, for example, a car, but the ownership stays with the provider.
5. THE PERFORMANCE MODEL aims to provide a seamless and premium quality service thus maintaining overall control of the product. Pay per lux by Philips is the best known example of the performance model.

Second, a different approach to circular business models was taken by the former think tank IMSA, that came up with a list of 19 circular business models for 6 product categories: (see next page)

Table 1. Circular business models (IMSA, 2015)

1. Short cycle		
1	Pay per use	One time payment to use product or service
2	Repair	Product life extension by repair services
3	Waste reduction	Waste reduction in the production process
4	Sharing platforms	Products and services are shared among consumers
5	Progressive purchase	Pay periodically small amounts before purchase
2. Long cycle		
6	Performance based contracting	Long term contract and responsibility with producer
7	Take back management	Incentive to ensure product gets back to producer
8	Next life sales	Product gets a next life
9	Refurbish & resell	Product gets a next life after adjustments
3. Cascades		
10	Upcycle	Materials are re-used and its value is upgraded
11	Recycling (waste handling & repurpose)	Materials are cascaded and reused, recycled or disposed
12	Collaborative production	Cooperation in the production value chain leading to closing material loops
4. Pure circles		
13	Cradle to cradle	Product redesign to 100% closed material loops
14	Circular sourcing	Only sourcing circular products or materials
5. Dematerialized services		
15	Physical to virtual	Shifting physical activity to virtual
16	Subscription based rental	Against a low periodic fee consumers can use a product or service
6. Produce on demand		
17	Produce on order	Only producing when demand is present
18	3D printing	Using 3D printing to produce what is needed
19	Customer vote (design)	Making customers vote which product to make

From: Koen van Renswoude, Arthur ten Wolde and Douwe Jan Joustra, Circular Business Models – Part 1: An introduction to IMSA’s circular business model scan, IMSA Amsterdam, April 2015

APPENDIX 3: LIST OF INTERVIEWED PARTNERS AND EXPERTS

Joost Brinkman, Accenture
FemkeGlas and Ivo Salters, Click NL Design
Rudi Daelmans, Desso
Douwe Jan Joustra, Implement Circular Economy
Geanne van Arkel, Interface
Tommy van de Giessen, Lumeco
Hans van der Wel&Leendert Jan de Olde, Philips
Agnes Schuurmans, ROCKWOOL B.V.
Bas Gehlen, Van Houtum

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- De Groene Zaak: [More prosperity, new jobs: Manifesto on Circular Economy Policy in the EU](#) (2015)
- CECED: Comments on the Study on socioeconomic impacts of increased reparability (2015)
- Circle Economy: [Circular Design & Business Opportunities \(2015\)](#)
- De Groene Zaak: Governments Going Circular, [publication](#) and [website](#) (2015)
- De Groene Zaak: Memo for RACE on EU CE Policy update (09/2015)
- Eurometaux: What do we need: 11 recommendations from the EU non-ferrous metals industry, slideshare presentation (2015)
- Digital Europe: Important conditions and drivers for promoting the circular economy in the digital sector (2015)
- European Commission: Ecodesign Directive (2005/09)
- European Commission: Roadmap Circular Economy Strategy (July 2015)
- Except: Symbiosis in Development (SiD), a quick guide (since 2009)
- IEEP: Circular Economy workshop, background paper (Sept 2015)
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- PE North West Europe Ltd: Background report: Thermal Insulation and the EcoDesign Directive: A review (2011)
- Vito: Exploratory study with regard to Ecodesign of thermal insulation in buildings (2014)
- European Parliament: Resource efficiency – moving towards a circular economy, Pietikäinen (2015)
- PSI et al., for DG Environment: [Scoping study](#) to identify potential circular economy actions, priority sectors, material flows & value chains (2014)
- RACE Coalition: [Design principles for Circular Economy](#) (2014)

WEBSITES:

Except: <http://except.nl/en/>

Circle Economy: <http://circle-economy.com/>

Ellen MacArthur Foundation: <http://www.ellenmacarthurfoundation.org/>

BOOKS:

Nature Inspired Design (Tempelman et al. 2015, Delft University)

Products That Last (Bakker et al., 2014, Delft University)