CIRCULAR BUSINESS MODEL DESIGN

A checklist for creating environmental benefits

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CIRCULAR BUSINESS MODELS:

What are circular business models?

Circular business models are designed to create, deliver, and capture value while implementing circular economy strategies, such as long-life products, reuse, repair, remanufacturing and recycling. In circular business models, product systems and value creation architectures are adjusted to retain resources at highest value for as long as possible and to close material loops at the end-of-life.

An overarching goal of circular business models is to reduce the environmental impacts embodied in products, components and materials (e.g. impacts from primary material extraction, production emissions, or waste). Yet, by retaining resource value, circular business models may generate many other types of benefits, such as cost savings in production, superior customer value from, for instance, increased convenience through services or extended life times, or regional employment creation.

CIRCULAR BUSINESS MODELS AND SUSTAINABILITY:

Do circular business models contribute to a sustainable development?

Circular business models are key for developing and commercializing production and consumption practices that could satisfy the needs of a growing world population within planetary boundaries. They will be more suited when policies and economic frameworks are in place that include the negative externalities of production in prices (e.g. carbon price tax) and mitigate pressing challenges as climate collapse, resource scarcity, and overconsumption.

With their origin in environmental management strategies such as Cradle2Cradle, Industrial Symbiosis, or the Performance Economy, circular business models are most commonly applied with a focus on the environmental dimension. Therefore, circular business models can best be regarded as a subset of various solutions to advance social, environmental, and economic sustainability. Let us have a look at the potential environmental benefits of circular business models on the next page.

CIRCULAR BUSINESS MODELS AND ENVIRONMENTAL IMPACTS:

Do circular business models result in environmental benefits?

If planned from the beginning, integrating circular strategies in the business model and product design has high potential for reducing emissions embodied in products and materials (e.g. impacts from material extraction, processing and production, and waste creation) and for facilitating more sustainable use. This makes circular strategies key for lowering a product's footprint and contributing to more sustainable production and consumption (see Cases 1,2,3).

However, implementing circular strategies does not reduce environmental benefits by default. Environmental benefits may vary with the circular strategy applied, product characteristics or business model design. Both at product and at system level, there are a few trade-offs and rebound effects that can undermine environmental benefits from retaining resource value. These are important to consider when designing circular business models. On the next pages these key considerations are explained in more detail and at the end of the booklet you can find a checklist to ensure that your circular business model is fit for realizing its environmental potential.

CASES

01

Gamle Mursten
Gamle Mursten is a Danish company that reclaims bricks from demolished buildings, cleans, tests and sells them. Bricks can be recovered individually or as panels. They are offered in different colours and for a compatible price with new bricks, but with a significantly reduced environmental footprint.

99% Carbon savings potential of brick reuse compared with primary bricks [1].

02

HOMIE
HOMIE is a Dutch washing machine company operating a business model that leases washing machines to customers. Washing machines are high quality ones that can be repaired, monitored remotely and reused from customer to customer. In HOMIE's model, customers pay per use and the business model is designed to encourage sustainable use patterns, such as less washing and at lower temperature.

8.4°C average washing temperature for HOMIE customers compared with the European average of **43°C**[2].

9.4 washing cycles as monthly average of HOMIE customers compared with European average of **13.5**[2].

[1] Nußholz, J.L.K., F. N. Rasmussen, L. J. R. Milios (2019). Resources, Conservation, and Recycling. "Circular building materials: Carbon saving potential and the role of business model innovation and public policy". 141: 308-316
[2] Bocken, N. M., C. A. Bom, and H. Lemstra. (2017)." Business-led sustainable consumption strategies: the case of HOMIE". Paper presented at 18th ERSCP Conference.

03

Caterpillar
Caterpillar is a multi-national machine manufacturer for infrastructure development, energy and natural assets development. Through setting up a remanufacturing programme, Caterpillar's business model is designed to retain the environmental and economic value of its machines in the company's value network for as long as possible. Machines are designed for disassembly, refurbishing, remanufacturing. Take-back is enabled by offering a refund for returned product cores. Customers benefit from maintenance services and performance tracking, or from the opportunity to purchase remanufactured and rebuilt machines or replacement parts, typically costing 20–40% less than new ones.

Remanufacturing program generated

61% reductions of CO^2 emissions

86% reduction of energy use

90% reduction of raw materials

99% reduction of landfill waste[3].

[3] Caterpillar. 2019. https://www.caterpillar.com/en/company/brands/cat-reman.html. Accessed 12.09.2019.

KEY CONSIDERATIONS FOR ENVIRONMENTAL BENEFITS:

To safeguard environmental benefits in circular business model design, the goal of environmental impact reduction has to be specifically set when innovating the business model. On the next pages, four key considerations for environmentally beneficial circular business model design are explained.

PSS-based CBMs models

Trade-offs from life extension

Life extension of active product

Rebound effects of CBMs

1 Circular business models based on access and performance (PSS)

have high potential for environmental impact reduction. This is especially the case, the more a PSS business model involves manufacturers owning products (e.g. in a result-oriented rather than a product- or access-oriented business model). In such models, the producer has the ability to incentivize customers towards sustainable use or to design products in a way that facilitates value retainment. Yet, achieving environmental benefits of PSS is context dependent and requires careful design to mitigate potential negative impacts (e.g. premature wear-down from irresponsible use).

2 Circular business models extending product and resource value

can employ circular strategies such as reuse, repair, remanufacturing, recycling. However, operation of these strategies requires energy, transport or material inputs to get products, parts or materials into a suitable state and location for reuse. The associated processes need to be carefully organized to ensure that their impacts do not outweigh the benefits from extended life. Moreover, environmental saving potential depend on which of the harmful processes in the primary production the circular strategy replaces.

3 Circular business models extending value of products that use resources in the use phase (e.g. energy or consumables)

require some consideration for determining whether life extension is the preferred option. Replacement with new, more efficient products may be a preferable option, if their benefits from improved use-phase efficiency can outweigh the benefits from life extension. For an informed decision, environmental assessment needs to be employed to identify the optimal lifetime of products on a case-by-case basis.

4 Circular business models may cause re-bound effects at system level

that can outweigh environmental benefits at product level. If implementing circular strategies does not reduce primary production, they risk increasing overall production in the economy, partially or fully offsetting their environmental benefits. This can be, for instance, when secondary products are not compatible alternatives to primary products. Or if they reduce prices or increase availability of products or services, which can lead to increased overall consumption. While this is to some extent outside of companies' influence, companies can at least ensure that secondary products are compatible with primary alternatives or that they adopt marketing that encourages sustainable use and non-consumerist purchase behaviour.

Environmentally Sound Circular Business Model Design

CHECKLIST

Environmental Assessment

- ☐ Environmental assessment is used to identify environmental hotspots throughout the product life cycle and the circular strategies that can effectively address these hotspots.
- ☐ An iterative design approach is employed, including evaluation and improvement cycles, to verify and improve environmental benefits, and to manage trade-offs among environmental impact categories.

Considerations for PSS Design

- ☐ In PSS-based business models, opportunities for result-oriented PSS are explored as they tend to give manufacturers more opportunities to increase resource efficiency (e.g. design for longevity or repair and incentivizing sustainable use).
- ☐ Especially in PSS-based business models, customers are incentivised and encouraged to use products in a sustainable way (e.g. saving energy, consumables or preventing wear-down).

Considerations for Life Extension

- ☐ If products are designed for long-life, material use (e.g. higher or more impactful) does not outweigh benefits from prolonged life.
- ☐ If life extension of products and resources is applied (e.g. remanufacturing, recycling), processes and primary material inputs do not outweigh the benefits from retaining value.
- ☐ If life extension is applied to products that require energy or consumables during use, it is verified that replacement with new, more use-efficient products is not a preferable strategy.

Rebound Effects

- ☐ Potential rebound effects at system level (e.g. increasing overall consumption) are considered and where possible addressed (e.g. customer education, offering suitable replacements for primary products).

Holistic Approach to Sustainability

- ☐ Sustainability strategies beyond circular strategies that address other hotspots of a product and business model are considered, including strategies that address the production stage or the social and economic dimension of sustainability.
- ☐ Avoidance' (e.g. reducing the need for consumption and use) is encouraged and prioritized in order to respond to the first principle of the waste hierarchy.

ABOUT THIS BOOKLET:

This booklet builds on four years of interdisciplinary PhD research on business models for a circular economy and the value they create. It aims to summarize the state of the art of knowledge on environmentally sound circular business models design, including the findings of the MISTRA REES program.

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