

Circular Economy Sustainability Screening

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A CIRCit Workbook

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Circular Economy Sustainability Screening A support for decision-making through the sustainability screening of alternative circular solutions in terms of environmental, social and business potential. e-ISBN: 978-87-7475-601-9

2

Circular Economy Business Modelling A guide to the creation of circular business models based on a step-by-step approach, best practice and success cases. e-ISBN: 978-87-7475-603-3

3

Circular Product Design and Development An approach to assess product circularity and a set of circular design guidelines for early product development. e-ISBN: 978-87-7475-605-7

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Smart Circular Economy A look at how digitalisation and smart products can play a role in facilitating the transition to a Circular Economy. e-ISBN: 978-87-7475-607-1

5

Closing the Loop for a Circular Economy An assessment tool and guidelines to support the identification of the best circular strategy for products at end-of-use. e-ISBN: 978-87-7475-609-5

6

Collaborating and Networking for a Circular Economy An approach to support circular value chain configurations, seeking innovation through collaboration. e-ISBN: 978-87-7475-611-8

What are we exploring in this workbook?

Circular Economy is often seen as one of many means to achieving sustainability and the intentions of the practitioner are likely to be inherently sustainable. But is circularity intrinsically sustainable, all on its own? With this workbook, we provide support for the assessment of whether or not your ambitions, strategies and plans for Circular Economy are actually sustainable, seen from an environmental, social and economic perspective. We provide an approach to help you to choose the criteria and related indicators, to enable a sustainability screening of a circular business proposal, product design, maintenance strategy or take-back plan. And we provide a way of supporting the decision-making process for the practitioner to work through, to ensure that we make circular *and* sustainable decisions.



Circular Economy Sustainability Screening

A workbook in the CIRCit Series

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Cover Picture: Olga Lele/Adobe Stock

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Published: Technical University of Denmark (DTU)

Printed: KLS Pureprint A/S

Print Volume: 400

March 2020, 1st Edition.

e-ISBN: 978-87-7475-601-9

Citation data: Kravchenko, M., Hjort Jensen, T., Pigosso, D.C.A., McAloone, T.C. (2020) 'Circular Economy Sustainability Screening:

CIRCit Workbook 1', ISBN: 978-87-7475-600-2, Technical University of Denmark, 44 p.

E-book version and more information at www.circitnord.com



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Introduction to Circular Economy

What is Circular Economy?

Circular Economy is a concept, based on the principle of decoupling value creation from resource consumption. The basic idea of Circular Economy is to move away from the so-called linear mindset, where value creation is based on the 'take-make-use-dispose' dogma.

Circular Economy has the potential to achieve maximum value by increasing resource productivity, enhancing energy efficiency, lowering resource consumption and decreasing waste. To do this, we should continue to extract value from resources for as long as possible, by extending their productive lifetimes. This means, for example, increasingly enjoying product and service offerings that are not necessar-

ily based on one-time ownership, and not necessarily based on single-lifetime products.

On first thought, many might equate Circular Economy to recycling of old and used products and materials. And indeed, *material recirculation* is a possibility, whether it be via recycling, cascading or recovering. Alternatively, and more valuable again, one could consider *product recirculation*, by applying tactics such as upgrade, repair & maintenance, reuse or remanufacturing. Even greater potential could also be achieved, by rethinking whole new ways of generating value, via integrated product/service business approaches, shared-access products, or new service offerings for long life products.



Achieving a Circular Economy requires a fundamental shift in mindset through business model, product design, support of the active product life cycle and closing the product loop, when the user no longer has a need for it. At the core of a Circular Economy lies collaboration, within and across value chains and with different societal stakeholders than we've maybe been used to.

And there's no use being circular, if the outcome is less sustainable than the starting point. Therefore we need to be able to estimate the sustainability benefits and drawbacks of our actions.

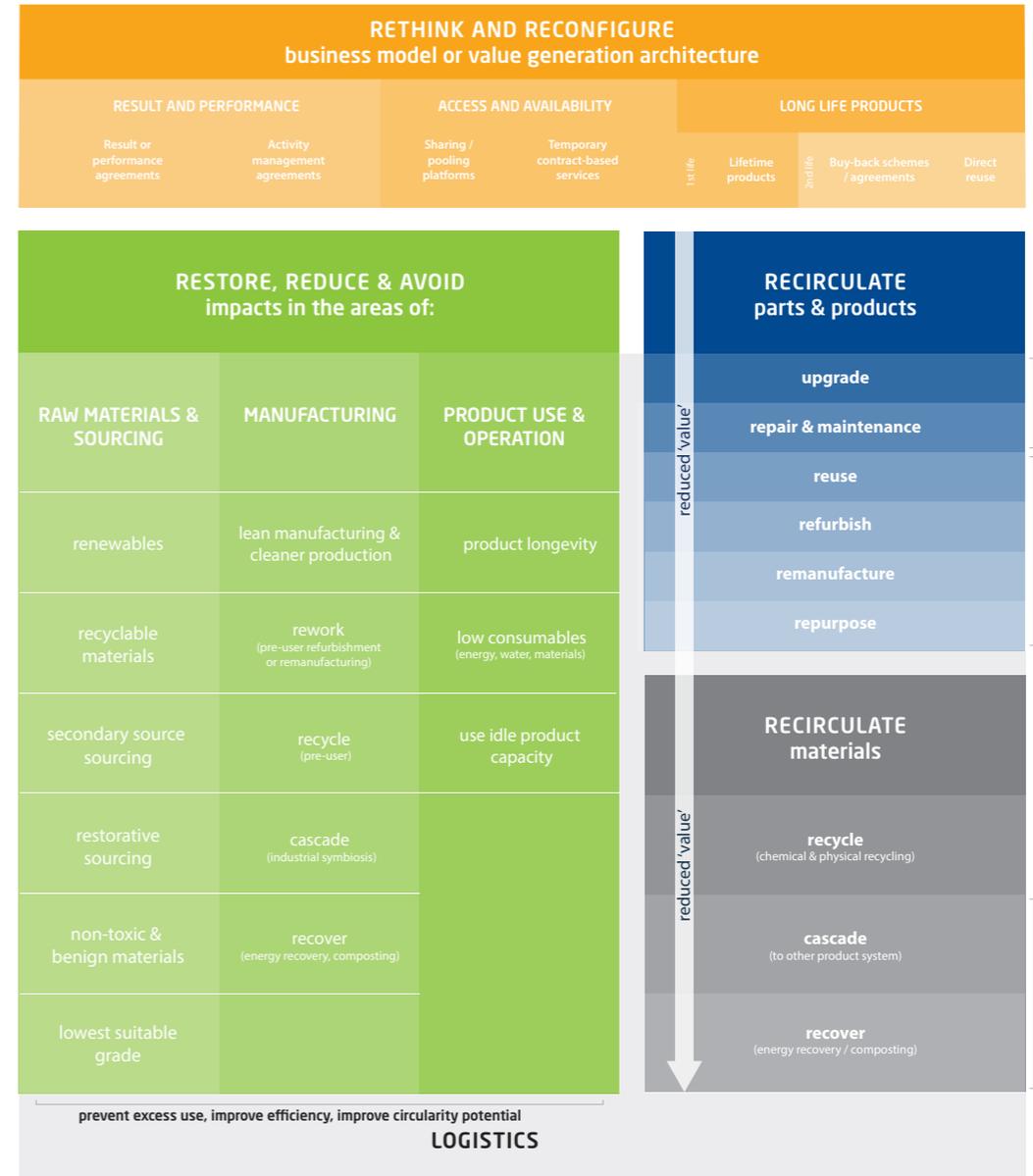
For many companies, there will be obvious low-hanging fruits, such as reduction of single-use packaging

in the production facility, or making small design changes to the product, to ease its disassembly at end-of-life. But for most, there will be a necessity to re-think the way in which business is done, materials and components are sourced, and new types of solutions are developed and marketed, in order to achieve maximum value and circularity from the resources used.

The good news is that there are increasing numbers of examples, in all types of business sectors and within civil society, in general. Circular Economy is a movement that is currently under rapid development, and the many necessary components to shift our mindset from a linear to a circular economy are increasingly manifesting themselves.

change of paradigm

REINVENT
strive for full decoupling



The **Circular Strategies Scanner** can help you to map which strategy or strategies are already being implemented by your company and to identify opportunities of complementary strategies to maximise the value created for as fewer resources as possible. We will refer to this Scanner throughout the six workbooks.



photo Nick Jio, Unsplash

How to make the transition

The basic concept of Circular Economy is easy to grasp for many. It is appealing from a business perspective, as it connects good business sense to good environmental stewardship. After all, which business would not like to reduce the consumption of cardboard boxes in internal production shipping; fully utilise its logistics capacity; or make its product easier to produce, maintain and upgrade?

The tricky part for many companies, however, is in knowing which steps to take first. How ready is your customer and the market in general, to embrace circularity and what role can your company play? Are there drivers or barriers to be found in the way in which regu-

lations are composed in your area of operation – and if so, are there ways of exploiting the drivers or removing the barriers? Should we design the product for upgrade, or should we develop a new business for leasing? Should we make a new partnership for materials sourcing, or should we be better at monitoring our product in-use? As with many new phenomena and business trends, it is often easier to admire and envy the existing good case examples than it is to actually get started on the journey within one's own business.

This workbook is one in a series of six proposed areas to begin the transition to a Circular Economy.



Circular Economy Sustainability Screening



Circular Economy Business Modelling



Circular Product Design and Development



Smart Circular Economy



Closing the Loop for a Circular Economy



Collaborating and Networking for a Circular Economy

Introduction to CIRCit

The CIRCit research project was a 3½-year research project, spanning the five Nordic countries, Denmark, Norway, Finland, Iceland and Sweden. Using a number of action research methods, CIRCit's objective was to support the Nordic industry to discover and implement the opportunities of Circular Economy, through the development, testing and implementation of science-based tools.

The project spanned six main areas, corresponding to the workbooks that you are currently reading, as follows.

Circular Economy Sustainability Screening

This workbook supports decision-making by providing sustainability screen-

ing of alternative circular solutions in terms of environmental, social and business potential.

Circular Economy Business Modelling

This workbook supports the creation of circular business models, based on a step-by-step approach, best practice and success cases.

Circular Product Design and Development

This workbook presents an approach for assessing product circularity in the conceptual design stage, plus practical design guidelines to support early product development decisions.

Smart Circular Economy

This workbook helps to evaluate how digitalisation and smart products can play a role in facilitating the transition to a Circular Economy.

Closing the Loop for a Circular Economy

This workbook provides an assessment tool and guidelines to support the identification of the best circular strategy for products, taken back at end-of-use.

Collaborating and Networking for a Circular Economy

This workbook presents an approach to support various circular value chain configurations, seeking innovation through stakeholder collaboration.

Sustainability Screening of Circular Economy Initiatives

1 Overview

The purpose of this workbook is to provide guidance on how to perform a sustainability screening of Circular Economy initiatives. The process is supported by a step-by-step procedure and a corresponding digital database, which are intended to facilitate discussion about corporate Circular Economy efforts and to guide quantitative performance assessment, with the ultimate goal of assisting decisions towards designing and selecting a more sustainable initiative.

What to expect?

The workbook is intended to show the main process of working with sustainability screening of Circular Economy initiatives. This is achieved by providing

explanations of the terminology and key concepts used, hands-on practical examples and references to CIRCit tools, developed to assist sustainability screening.

The main intended outcomes of using the workbook and corresponding tools are:

- Enhanced dialogue about Circular Economy in your corporate context and its intended outcomes
- Identification of key sustainability aspects to be considered for the design of your Circular Economy initiative
- A systematic process of selection of relevant sustainability indicators for your Circular Economy initiative

- Insight into what data is needed to calculate indicators and how to interpret their results
- Understanding of the sustainability implications of a Circular Economy initiative
- Quantitative support of an early identification of improvement opportunities to enhance sustainability performance.

When to use?

Before starting using the tools described in this workbook, it is important to have a clearly defined and detailed Circular Economy initiative. A Circular Economy initiative can be understood as a specific proposal of implementing a Circular Economy strategy or several strategies simultaneously (e.g. refer to

the *CE Strategies Scanner*, presented on page 7), with the intention of resolving a problem or improving a specific situation. A detailed Circular Economy initiative should therefore contain information about what exactly needs to be done, why it is important and what is intended to be achieved, and who is involved in its design & implementation.

If you have not yet defined an initiative, check out the other workbooks in this CIRCit series (covering business model innovation, product design & development, smart technologies, closing the loop and value chain configurations). By using the provided tools in these workbooks, you will be able to further define a number of initiatives to make the transition to Circular Economy – and

this workbook will then be able to help you in screening their sustainability performance.

Who can this workbook support?

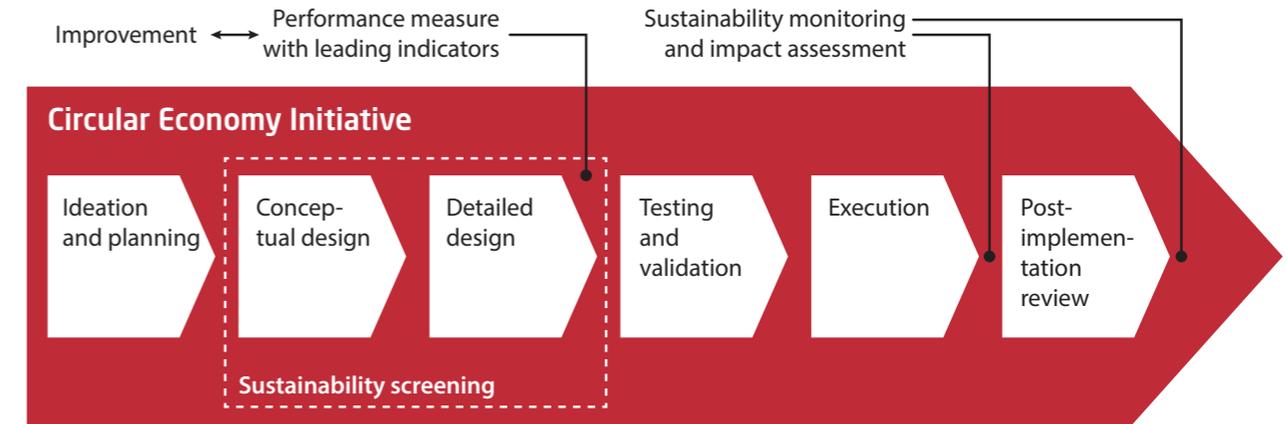
This workbook is targeted at the project management teams in manufacturing companies, which are aiming to understand the sustainability performance of Circular Economy initiatives that their company is planning.

It is important to bring a multidisciplinary team together, to tackle the Circular Economy initiative at hand, typically consisting of product managers, marketing managers, sales and operations managers, and sustainability managers. Engaging sustainability managers or sustainability ‘stewards’

will greatly facilitate the process of indicator selection and a dialogue about inclusion of significant sustainability aspects relevant not only for the Circular Economy initiative in focus, but also for the organisational context.

Circular Economy initiative detailing (an example)

Description	Taking back and recycling our own product into a similar product
What needs to be done?	Rethinking a business model to retain ownership of own product (for customer X in a country Y) Establishing a return system (logistics, warehousing) Understanding recyclability of our product and exploring potential recycling partners
Why is it important?	To reduce waste generated from our product To reduce virgin material input for our production site
What is intended to be achieved?	Resource conservation and reduced transport needs for virgin material
Who is involved?	Business managers, product developers, production engineers, other stakeholders (to be defined later)



2 Motivation

Sustainability screening in the context of Circular Economy

Sustainability screening is a process that entails gathering insights on (potential) sustainability performance of a specific initiative, in order to support planning and decision-making in a company, towards sustainability improvements. This process facilitates internal learning about sustainability implications of a specific initiative, rather than simply measuring “direction to target”.

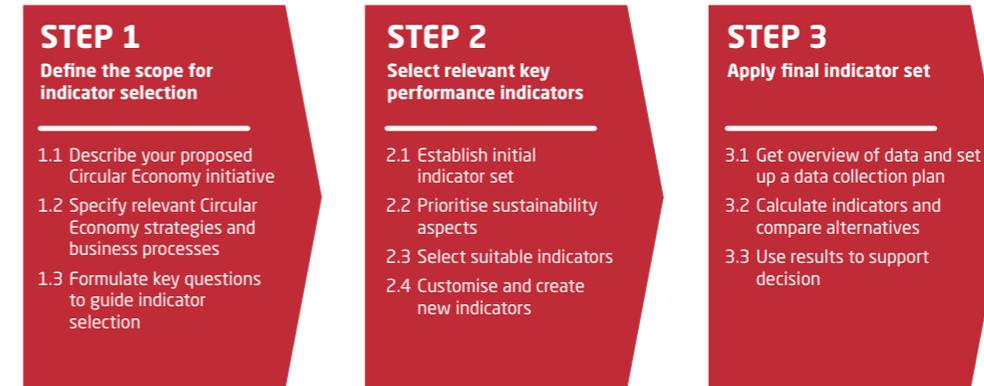
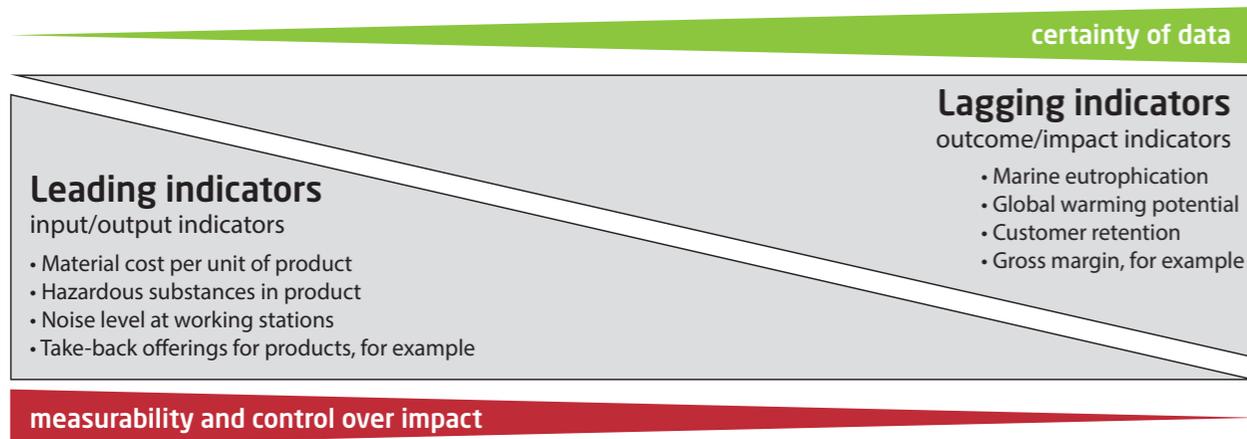
Contribution to sustainable development is primarily aligned with the triple-bottom line (i.e. according to the three main dimensions of sustainability: environmental integrity, social well-being, and economic resilience).

While some aspects only relate to performance on one dimension (for instance, cost aspect for economic performance, emission aspect for environmental, and safety for social), many of the aspects are cross dimensional, which indicates their implications on several dimensions simultaneously.

Circular Economy can be seen as means towards achieving enhanced sustainability – but this is not always the case. While repairing a product may indeed contribute to resource preservation, how is the energy consumption compared to a brand new product? When focusing on alternative materials, is it more sustainable to have bio-based or recycled materials?

Sustainability screening of Circular Economy initiatives contributes to a better understanding of potential sustainability performance within a Circular Economy context. Taking this perspective into account, the sustainability screening offers a structured support in early design phases by:

1. Indicating environmental, economic and social aspects that are potentially significant for the initiative
2. Providing guidance on selecting relevant indicators to quantify performance on the key aspects
3. Reflecting on the results to support initiative improvements.



3 A step-by-step approach

Focus on leading performance indicators

Sustainability screening in this work is based on *leading performance indicators*, which ensure early consideration of potential impacts on the sustainability performance and highlight areas to introduce improvements to.

Leading performance indicators are input/output indicators, used to help planning, designing and improving initiatives in the early design stages. Leading indicators are easier to understand and interpret than lagging indicators, which are mostly used to measure outcomes/impacts.

Major benefits of working with leading indicators include greater measurabil-

ity of potential impact and the ability to control it through design changes, which are more difficult to do with lagging indicators, despite the increasing certainty of data available for calculations.

In summary, the key benefits of leading performance indicators are:

- Help to structure, summarise and condense complex information
- Induce learning about significant sustainability aspects associated with specific materials, products, processes and operations
- Help to anticipate possible impacts of a certain action and/or initiative, prior to its implementation
- Support early consideration, hence the possibility to adjust and improve

the initiative

- Allow comparison of alternative initiatives and highlight potentials for optimisation.

Therefore, sustainability screening based on leading indicators can assist structured and informed sustainability-oriented decision-making in the early stages of planning and designing Circular Economy initiatives.

The workbook supports sustainability screening by assisting selection, customisation and implementation of relevant leading performance indicators. The purpose is to enable industry to perform sustainability screening in a systematic way.

A step-by-step approach for a systematic indicator selection for sustainability screening of Circular Economy initiatives

The step-by-step approach supports a systematic selection of sustainability performance indicators for a range of Circular Economy initiatives.

The process is supported by a *digital database*, which can be downloaded from the CIRCit webpage (www.circitnord.com).

The database contains a comprehensive collection of sustainability indicators, classified according to a number of criteria to support the selection process:

- Circular Economy strategies
- Business processes
- Sustainability dimensions and related aspects.

Once a Circular Economy initiative is detailed and the scope is defined (Step 1), four sub-steps are carried out for the selection and customisation of indicators (Step 2). The process of indicator selection and customisation results in a final set of key indicators (Step 3), which can be used to screen the selected Circular Economy initiative according to its economic, environmental and social performance .

Circular Economy initiative detailing (an example)

Description	Maintenance service for a specific product and subsequent take-back of the used product for internal spare parts retrieval (reuse) and consequent recycling
What needs to be done?	Rethinking a business model to offer subscription to a monthly maintenance service (for customer X in a country Y) Establishing a maintenance service system and facilities Complete product disassembly for part reuse and material recycling (incl. understanding of the recyclability of our product and exploring potential recycling partners)
Why is it important?	Capture value embedded in our long-life product Reduce premature product obsolescence Ensure product parts and materials are reused in the system
What is intended to be achieved?	Prolong product useful life Capture economic benefits of the new offering Resource conservation and reduced transport needs for virgin material
Who is involved?	Business managers, marketing and sales coordinators, service managers, production managers, other stakeholders (to be defined later)
Identified CE strategies	Identified business processes
<ul style="list-style-type: none"> • Rethink value generation (business model transformation) • Repair and Maintenance • Reuse • Recycle 	<ul style="list-style-type: none"> • Business model • After-sales service • End-of-life operations

Step 1 - Define the scope for indicator selection

The goal of Step 1 is to further elaborate on a defined Circular Economy initiative, in order to clearly set the scope for indicator selection. By specifying and elaborating your initiative, you create alignment within your team about your Circular Economy initiative intentions, as well as to clarify, who should be engaged in the screening process.

Participants required

A range of experts are often involved in planning and designing a Circular Economy initiative (e.g. board members, marketing & sales coordinators, sustainability strategy & innovation managers, service & operations engineers, managers, product designers and project managers).

Describing your Circular Economy initiative and identifying Circular Economy strategies and business processes, relevant for that particular initiative, helps to involve the right people for the process based on the provided example of the Circular Economy initiative).

It is important that the team have knowledge and expertise about the company's sustainability priorities, specifics of the sector, process and product.

Time required

- 15 min to describe the Circular Economy initiative in focus
- 15-30 min to select relevant business processes and Circular Economy strategies.

Step 1.1: Describe your proposed Circular Economy initiative

Circular Economy initiatives can entail several Circular Economy strategies that are to be implemented together. For example, a Circular Economy initiative can be formulated as providing a monthly maintenance service for a specific product and subsequent take back of the used product for internal spare parts retrieval (reuse) and consequent recycling. This is a first overall initiative description, which requires more details to be provided for it, for example, what exactly needs to be done, why it is important and what is intended to be achieved, who is involved in its design and implementation.

Step 1.2: Specify relevant Circular Economy strategies and business processes

To assist characterisation of the details of the selected initiative, the *circular economy strategies scanner* should be used, so to select only Circular Economy strategies relevant for that particular initiative ('identified CE strategies' on page 18). Furthermore, it is important to identify what business processes are involved, which helps bringing the right participants in the team. For instance, if the initiative requires changing commercial relationships with your customers and/or partners, *business model* should be selected.

Following the example, *business model* has been selected as one of the business

processes, as the initiative requires changing commercial relationships with customers, by offering a new type of service ('identified business processes', see page 18). Likewise, after-sales service is selected, as the initiative requires changing the way of delivering service to the customer and supporting product in use. In addition, *end-of-life operations* has been preliminary selected, to understand whether disassembly and recycling is to be carried out internally or externally. Use the checklists available under tab 'Step 1' in the *digital database* to assist yourself in identification of relevant Circular Economy strategies and business processes that are involved in the selected Circular Economy initiative.

Step 1.3: Formulate key questions to guide indicator selection

A list or overview of the relevant Circular Economy strategies and business processes helps understanding the real scope and effort to design and implement a particular Circular Economy initiative. To continue the process of sustainability screening, it is important to formulate key questions, which would take into consideration a combination of selected Circular Economy strategies and business processes.

Using the example on page 18, a CE strategy *Rethink value generation* can be combined with a business process *business model*, and this combination could help to formulate a key question to assist activities in Step 2. A key question

would then be "What indicators to use to understand sustainability performance when developing a business model based on subscription scheme?".

Similarly, more questions may be formulated to help the team see the importance of meaningfully combining Circular Economy strategies and business processes, for instance, the CE strategy *Repair and Maintenance* can be combined with *Reuse* and *After sales service*, supported by a key question "What indicators to use to understand sustainability performance when delivering a maintenance service and retrieving parts for reuse?". These questions can be registered under tab 'Step 1-Activity 3' in the *digital database*.

To help your team in creating relevant questions, always start by using the umbrella question "What indicators to use to understand sustainability performance when...?", followed by stating a relevant scope.

Outputs

The outputs of this step are:

- A set of selected relevant business processes and Circular Economy strategies for the particular Circular Economy initiative
- A set of key questions to guide a meaningful indicator selection
- A team of (new) key participants identified by detailing the Circular Economy initiative

Key learnings and recommendations

- Provide details for a specific Circular Economy initiative before proceeding to the next step of indicator selection
- Focus on the sustainability hotspots across the life cycle (i.e. areas where the sustainability impact is significant) to formulate objectives
- Understand what particular business processes and Circular Economy strategies are involved
- Formulate key questions to support a meaningful indicator selection in the next step
- Try out different combinations of business processes and Circular Economy strategies
- Engage a multidisciplinary team.



Photo CIRCI Industry workshop

Step 2 - Select relevant key performance indicators

Step 2 supports the selection of a set of performance indicators for the Circular Economy initiative in focus. Key performance indicators are used to measure performance on key sustainability aspects as well as to provide assistance in a decision-making process. Step 2 consists of four sub-steps, described as follows.

Inputs and support tools

- List of selected Circular Economy strategies and business processes (outputs of Step 1) and key questions
- Team with key participants (outputs of Step 1)
- A *digital database* and information under 'Indicator database' tab.

Time required

- 1-2 hours to perform all the sub-steps under Step 2.

Step 2.1. Establish initial indicator set

The goal of Step 2.1 is to narrow down the number of available indicators to the ones that are potentially relevant for the circular initiative in focus. For that, the combinations of selected Circular Economy strategies and business processes (output of Step 1.3) are used. It may be necessary to start with one combination at a time, to reduce complexity and confusion when selecting the key indicators. For instance, a CE strategy *Repair and Maintenance* can be combined with *Reuse* and *After-sales service*. In order to establish the initial

set, filters next to CE strategy *Repair and Maintenance*, CE strategy *Reuse* and a business process *After-sales service* need to be applied using the 'Indicator database' tab.

Step 2.2. Prioritise sustainability aspects

A sustainability-related aspect relates to any aspect under environmental, economic and social dimension of sustainability. Therefore, a sustainability-related aspect can be defined as an element of an organisation's activities, products, or services that has or may have an impact on the environment, economy and society.

The *digital database* incorporates 12 aspects under environmental dimension,

Sustainability dimensions	Definition	Examples of aspects
Environmental dimension	Identification and management of aspects to ensure long term positive impact on living and non-living natural systems.	Resource consumption (material, energy, water, land) Emissions to water, soil and air Chemicals
Economic dimension	It concerns the way assets and resources are managed to optimise cost-efficiency, ensure revenue streams and customer satisfaction related to the quality of the product or service offered.	Operational costs Revenue User costs
Social dimension	Identification, accounting and management of values and needs of different stakeholders a company interacts with. The stakeholders can be identified as internal and external groups of people that interact with and directly or indirectly affected by the company and its activities.	Community relationships Employee health and safety Equality

Examples of sustainability dimensions and aspects

5 under economic and 8 under social. Each aspect is explained in detail, under tab 'Sustainability aspects' in the *digital database*.

The key questions defined in the previous step (e.g. "What indicators to use to understand sustainability performance when delivering a maintenance service and retrieving parts for reuse?") should support the team in prioritising significant sustainability aspects and selecting relevant indicators to measure performance.

The prioritisation can be based considering the specifics of your sector, company, process, product or service, or the selected Circular Economy initiative. Example of a prioritisation logic is

shown in Helpbox A. Important to note that one aspect can often be measured by a number of indicators.

Note: aspect prioritisation is an optional activity – it may be that you, as a team, desire to review all aspects and related indicators first and then only select relevant ones; differently, your team might want to first prioritise some aspects and then add new ones, if necessary, which can provide a benefit of starting with fewer indicators and then gradually expanding the scope.

Key learnings and recommendations:

- Engage a multidisciplinary team, which can be facilitated by a participant with sustainability knowledge and expertise, who can support selection of important sustainability aspects and provide argumentations of their importance to the team
- Take your time and dive into what each sustainability aspect entails; use the digital database under the tab 'Sustainability aspects' for detailed descriptions
- Use results of any other sustainability assessment to support selection of key sustainability aspects.

Step 2.3. Select suitable indicators

Once you have selected a combination of Circular Economy strategies, business processes, and sustainability aspects, start reviewing the proposed indicators with your team.

During the review process, consider the key question you formulated, as well as specifics of your sector, company, process, product or service, or specifics of the selected Circular Economy initiative. Additionally, use the set of guiding questions proposed to discuss each indicator, as following:

- How relevant is this indicator for your industry and company?
- How relevant is this indicator for your initiative?

Helpbox A - prioritising sustainability aspects
 – working on a combination of a Circular Economy strategies *Repair and Maintenance, Reuse* and *After-sales service* supported by a question "What indicators to use to understand sustainability performance when delivering a maintenance service and retrieving parts for reuse?"
 * Prioritise cost aspects to understand the cost of providing such service (incl. transport needs and spare parts); material and energy consumption to provide service, including use of lubricant and coolant fluids (if applicable to the type of product); labour cost per unit of service; etc.

- How much data is required to measure this indicator and how big is the uncertainty of data collection?
- Does the data collection of this indicator involve significant costs or time?
- Is this indicator easy-to-use and understand?
- Does the use of this indicator require experts?

When selecting a relevant indicator in the digital database, put an 'x' next to it to indicate it was selected. Use the 'Navigation' tab in the *digital database* to be guided through navigation features.

Overall, a recommended number of indicators for the screening should be between 7 and 15, to ensure a good amount of indicators to choose from

- but not too many. In case fewer or more indicators are selected, it may be important to go back and forth between sub-steps to (de)select other suitable indicators, or even to Step 1 to redefine the scope. Overall, you can reiterate whichever step if necessary to enhance granularity of the screening process.

Step 2.4. Customise and create new indicators

Some indicators may need to be customised to better reflect your scope. It may also be necessary to create new indicators.

Once you have the overview of the selected indicators (save them in the 'Step 3' tab of the *digital database*), customise and create new indicators (if

Helpbox B - creating new indicators

– if the company's objective is to reduce maintenance costs of a product, new indicators can be created to address it. Thus, the indicator 'Volume and number of different chemicals and solvents used for product maintenance' can be developed, being based on the existing indicator; to complement it, an economic indicator 'costs associated with the use of chemicals and solvents for product maintenance' can be formulated

needed) considering the specifics of the sector, company, process or product, or the selected Circular Economy initiative. Also, you may use the information that your company already collects to create a new indicator. One of the examples is shown in Helpbox B.

After step 2.4, you should have a list of key indicators to be labelled as the final set for your selection, i.e. either a first combination of a CE strategy and a business process, or the complete Circular Economy initiative.

As stated earlier, a recommended number of indicators for the screening should be between 7 and 15, which would depend of the breadth of the scope considered in Step 1. Essentially,

use the checklist, opposite, to ensure the credibility of your final indicator set to make sure it captures important aspects.

Outputs

- A set of relevant key performance indicators to calculate performance on social, economic and environmental dimensions
- A shared understanding of why using performance indicators in the context of sustainability.

Key learnings and recommendations

- It may be beneficial to start working with fewer indicators, then expanding the 'scope' to incorporate indicators from other sustainability

aspects, additional circular strategies and business processes.

- Select only key indicators, to eliminate extra effort of unnecessary data gathering.
- It may be necessary to create a 'parking lot' for indicators that are considered important, but require extra effort in data collection. Do not dismiss an indicator just because it is time consuming to calculate it.
- It may be necessary to consult industry associations to understand the sustainability 'areas of concern' that are particular to your sector or material/substance you would like to use; this can facilitate selection of indicators that otherwise could be missed out.

A checklist before proceeding to the next step



Do you have the right number of indicators?

Remember that the optimal number is between 7 and 15



Are they all relevant for the Circular Economy initiative in focus?

Remove redundant indicators, or use them as complementary to the key ones; remember there is a difference between having 'must' versus 'nice to have' indicators



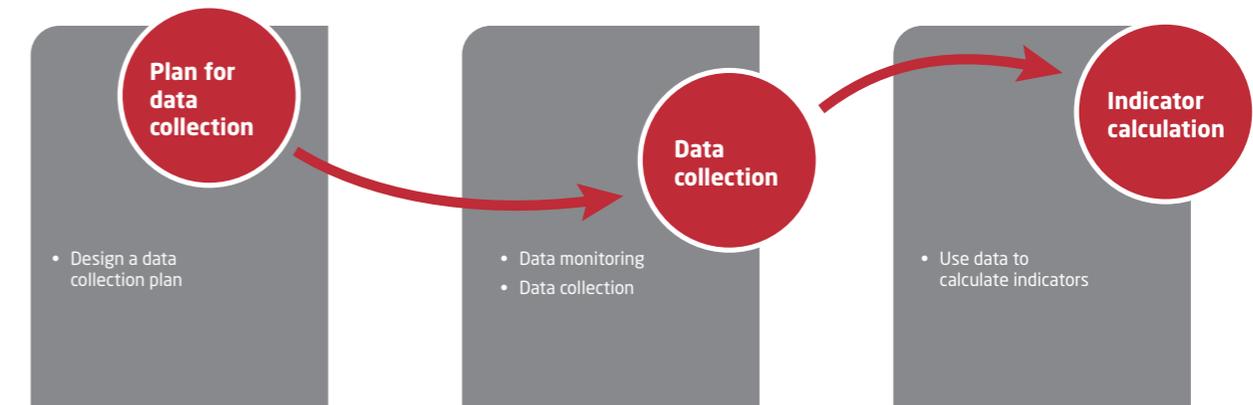
Are all sustainability dimensions covered?

Use the tab 'Step 3' in the digital workbook for visualisation of sustainability coverage



Do they reflect life-cycle thinking? (if applicable)

Life cycle thinking expands the narrow 'gate-to-gate' approach of traditional manufacturing to a more holistic approach, which includes the pre- and post-manufacturing stages (i.e. resource extraction, production, packaging, distribution, use, maintenance, and eventually recycling, reuse, recovery or final disposal). This approach helps to ensure a more systemic view and reduce the risk of shifting a burden from one stage to another.



Step 3 - Apply final indicator set

The aim of this step is to collect reliable data and calculate key indicators.

Inputs and support tools

- List of final key performance indicators (outputs of Step 2.4)
- Sustainability or data manager
- A *digital database* and information under 'Indicator database' tab.

Time required

- Days or weeks: data collection and indicator application can be considered the most extensive step of the screening, since it requires planning and executing several sub-steps (i.e. planning, data collection, calculating indicators).

Step 3.1. Get overview of data and set up a data collection plan

To start off, compose the final set of indicators and start a data collection process for the Circular Economy initiative and a reference (current) system or any other initiative aiming to address the same problem (as pointed out during Step 1). The *digital database* and the tab 'Indicator database' offers detailed information about each indicator, such as a relevant formula with variables and measurement units. Furthermore, it provides assistance in interpreting the indicator result, under the column 'Purpose and significance of indicator value', often providing guidance on how to act to improve the performance.

Each of the chosen indicators would require you to track, collect and manage different data, which needs to be collected for all the options that would be compared on the basis of the selected indicators. Ideally, a sustainability or data manager should create an overview of data that needs to be collected and contact 'key' people, who would be responsible to register relevant data and feedback to the data manager, who in turn will set a team to calculate indicators (Helpbox C).

Data can be collected from internal management or technical reports, however, for some indicators it is necessary to collect data externally, from your suppliers, partners or customers. It is important that you try to use the data

Helpbox C - Example of data collection plan

Data collection process: the helping questions:

- What methods will you use to collect the data?
- Where is the data?
- How often will it be collected?
- Who is responsible for collecting the data?
- How will you manage and store the data?

Indicator	Data	Collection process			
		Who	When	How to collect	
				Data source	Method

Data sources

- Overview of potential data sources

- management, technical, procurement reports
- surveys, interviews, observations
- scientific and legislative reports
- stakeholder meetings: consumers, suppliers, partners, interested parties
- management systems (environmental, energy, OH&S, risk, quality, etc.)

practice. If you don't have the dataset required to calculate a given indicator, start focusing on indicators for which you have data readily available. Data collection processes should ensure that collected data is reliable, valid and verifiable, and requires a critical technical assessment.

Step 3.2 Calculate indicators and compare alternatives

Data quality can influence the results of the screening and compromise the decision-making process. While using generic databases may be less costly, collecting data from own operations or value chain actors increases data accuracy and validity.

Importantly, the options can only be compared based on the same set of indicators, because only then the real performance can be evaluated, i.e. whether the initiative has a better or worse performance and on what aspects.

Opposite, we provide an example of a calculated indicator set for a reference case and a Circular Economy initiative. Based on the calculation results for both options, it is now more evident how each option performs ('worse' and 'better' performance are marked red and green correspondingly).

Data quality matrix

Criteria	Score	1	2	3	4	5
Accuracy, integrity and validity	own operations and direct suppliers	Independent 3rd party verified data provided with documentation	Non-verified internal data with documentation, or verified data partly based on assumptions	Non-verified data partly based on assumptions, or data based on grey scientific report	Qualified estimate (e.g. by expert), or data based on non-scientific report	Non-qualified estimate, or unknown source
	other value chain actors	Data obtained from value-chain actor directly and provided with 3rd party documentation	Data obtained from value-chain actor directly with documentation	Data obtained from other value-chain actors with poor or incomplete documentation	Data obtained from literature	Unknown source
Timeliness		Data from current reporting period	Data from previous reporting period	Data from 2 years before reporting period	Data from 3 years before reporting period	Data from more than 3 years before reporting period, or unknown age of data
Correlation		Data from specific site under study	Data from other sites of the company in the same region	Data from relevant sites of the company in other regions	Data from other companies in same region with similar product conditions	Average sector or country data from public or 3rd party database provider

Selected indicators	Units	Reference case (as-is)	CE initiative
Product weight	kg	2.0	2.0
Product and packaging recyclability	Y/N	=*	=*
Waste converted to reusable material	kg	2,052	3,780
Embodied energy	kWh	32,400	108,000
Renewable energy for process	kWh	*	**
Compliance with the REACH directive (restricted materials)	kg	NO	YES*
Purchase of locally produced and offered goods and services	Y/N	NO	YES
Joint sustainability-oriented initiatives	nr	NO	YES
Material cost	EUR	720	2,880

Calculated indicator set

Step 3.3. Use results to support decision

Sustainability screening based on leading indicators aims to support decision-making in a company towards designing and improving any (Circular Economy) initiative to attain greater beneficial outcomes on all dimensions of sustainability. Following the results depicted in the calculated indicator set, it becomes evident that neither of the considered options is 'the best', i.e. neither delivers a better performance on all indicators. Our practical experience shows that such results are not exceptions in most of sustainability assessment approaches. The result interpretation therefore is an important activity to carry out in a multidisciplinary team, who should be at the

core of the sustainability screening process. We suggest following these key considerations to ensure the results are interpreted and used in the most accurate and beneficial manner:

- ensure that the data quality is similar for all the comparable options
- ensure the consistency of units for collected data and calculated indicators
- link the indicator result to your corporate sustainability objectives; i.e. analyse the 'severity' of the result through the lens of your company and its values
- consult your sector association or value chain partners to help clarifying the result.

Furthermore, when one option could show a better performance on most of the indicators, there can still be a risk of trade-offs, i.e. accepting a situation where performance on some indicators has to be compromised. Therefore, it is important that your team discusses the results and utilises decision support tools to make a decision, which can take a direction of redesigning any option to improve its performance, accepting one option to be implemented or rejecting both options and resorting to the development of a new initiative. To support a more informed decision-making and trade off analysis, CIRCit offers a supplementary tool to assist your company, found on the CIRCit website (www.circitnord.com).

Outputs

- Quantitative comparison of several initiatives (options), based on their economic, environmental and social performance.

Key learnings and recommendations

- It is important to set up a data collection plan
- Ensure validity and quality of data as it influences the accuracy of the result
- Collect data for all the options that are being compared
- Analyse trade-offs to avoid sub-optimisations or shifting the burden from area to another
- Once you learn how to apply the procedure and use the correspond-

ing digital database, it will become a routine for your team to perform screening for any type of initiatives, including emerging Circular Economy ones or any other sustainability-related initiatives, which will facilitate organisational learning about their sustainability implications and provide arena for continuous improvements.



Photo Mimi Thian, Unsplash

Circular Economy Initiative

Description	Offering of carpets through a product/service-system, which includes product leasing, installation, repair and maintenance, and removal at the end of use for recycling back into own products
What needs to be done?	Rethinking a business model to offer leasing and subscription to a repair and maintenance service (for customer X in a country Y) Redesigning the product (carpet) to ensure easy maintenance and possible repair as well easy recycling at the end of life Planning repair and maintenance service (tooling, frequency, time) Establishing a take back system to own production facility for recycling
Why is it important?	Satisfy changing requirements from the customers Establish long term customer relationship Reduce premature product waste Minimise waste by recycling Reduce raw material use and use recycled material instead
What is intended to be achieved?	Prolong product useful life Capture economic benefits of the new offering Resource conservation and reduced transport needs for virgin material
Who is involved?	Business managers, marketing and sales coordinators, service and logistics managers, production managers, product designers, sustainability coordinator

Identified CE strategies

- Rething value generation (business model transformation)
- Reduce impact in: Raw materials and sourcing
- Repair and Maintenance
- Recycle

Identified business processes

- Business model
- Product development
- After sales service
- End-of-life operations

4 Exemplary case

– to demonstrate application of the step-by-step procedure

About the case

CarpetCo is a carpet manufacturer and provider of a wide range of flooring solutions, including indoor decorations and furnishings, to private and public sectors. CarpetCo's intention is to create a long-term relationship with customers by providing quality products and offering long-life support services. The main objective is to reduce premature product obsolescence, waste generation and increase customer satisfaction.

Step 1 Define the scope for indicator selection

Step 1.1 Describing the proposed Circular Economy initiative
By consolidating the main corporate intention, CarpetCo has formulated a

Circular Economy initiative, which comprises the offering of carpets through a product/service-system, which includes product leasing, installation, repair and maintenance, plus removal at the end of use for recycling back into own products.

With the Circular Economy initiative defined by the company, the activity now is to specify its details and identify key Circular Economy strategies and business processes involved. The key participants for this step are sustainability strategy and innovation managers, marketing and sales coordinators, product designers and project managers. The team now has filled in the details of the identified Circular Economy initiative.

Step 1.2 Specifying relevant Circular Economy strategies and business processes

During the discussion in the project team, it has become evident that the initiative affects the:

- type of a product and channels through which the corresponding service will be offered
- product design for repair to fit the desired offering
- type of materials and parts to supply for servicing
- transportation modes for recycling and substitution of raw material by a recycled material.

Using this input and the checklists in tab 'Step 1' of the digital database, the Cir-

cular Economy strategies and business processes has been filled.

Step 1.3 Formulating key questions to guide indicator selection

Following the proposed steps, the team now have used the ‘umbrella’ question “What indicators to use to understand sustainability performance when...” and created several key questions to assist themselves in the next step:

1. What indicators to use to understand sustainability performance when developing a business model based on leasing scheme with repair and maintenance as ‘add-on’ service?
2. What indicators to use to understand sustainability performance when designing a carpet to be repairable and recyclable?

3. What indicators to use to understand sustainability performance when delivering a repair and maintenance service?

4. What indicators to use to understand sustainability performance when taking back the used carpet and recycling it on site?

After formulating these questions, it has become clearer that for each question a different set of indicators need to be selected. Furthermore, it is also clear who should be engaged in each selection round as the core activities and business processes differ.

Step 2 Selection of relevant key performance indicators

Step 2.1. Establishing initial indicator set

To establish a first set of potentially relevant indicators, the team has set up several combinations of Circular Economy strategies and business processes to identify the indicators for. These combinations match the key questions, so it helps the team to decide which indicators would be more relevant for their scope. The tab ‘Step 1’ in the digital database has been used to indicate relevant Circular Economy strategies and business processes, shown in the table next to the matching key question.

Now, these combinations should be used in the digital database to filter relevant indicators. To visualise the selection, the team has decided to start

Key questions from Step 1.3

Relevant Circular Economy strategies and business processes

1	<ul style="list-style-type: none"> • CE: Rethink value generation (business model transformation) + Repair and Maintenance • BP: Business model
2	<ul style="list-style-type: none"> • CE: Repair and Maintenance + Recycle • BP: Product development
3	<ul style="list-style-type: none"> • CE: Repair and Maintenance • BP: After sales service
4	<ul style="list-style-type: none"> • CE: Reduce impact in: Raw materials and sourcing + Recycle • BP: End-of-life operations

with question 2 and corresponding combination. Using the tab ‘Indicator database’ the filters was set next to two Circular Economy strategies: Repair and Maintenance and Recycle. Furthermore, the Product development was added to match identified business process. Product developers have pointed out that they prefer to understand indicators first for designing a carpet for repair and maintenance, and then for designing for recycling. Therefore, firstly, filters have been set to Circular Economy strategy Repair and Maintenance and business process Product development, with Recycle strategy omitted for now. This example shows the flexibility embedded in the tools to match preferences of the key participants and ease. The same process was followed for questions 1, 3 and 4 – we will exemplify here how the pro-

cess continued for question 2 (the same is applicable to the other questions).

Step 2.2 Prioritising sustainability aspects

The CarpetCo team decided not to prioritise sustainability aspects and focus on the review of proposed indicators available after filtering, 36 of which covered environmental aspects, 3 – social, and 8 economic.

Step 2.3 Selecting suitable indicators

For this step the team relied on the knowledge of business and product developers and sustainability managers - it was important to ensure that a new product design fits a new business model. A new design is suggested to make a carpet that consists of tiles instead of being a mono-structure to

ensure replacement of only the pieces that are worn out and avoid replacing the whole carpet, corners and sides of which are normally not worn because of carpet use patterns. Again in this step, the key question “What indicators to use to understand sustainability performance when designing a carpet to be repairable?” was used to guide selection of important and relevant indicators. Table on the following page shows what indicators the team has selected and justifications why. As seen from the table, initially 12 indicators have been selected.

Step 2.4. Customising and create new indicators

Following the indicator review process, the team decided to customise indicator #9 to reflect the particularities of their

#	Indicator name	CarpetCo comments and justification for selection
1	Cost of non-destructive disassembly (non-CND)	This is important to consider to ensure the product (carpet) is designed for easy repair of worn out parts (tiles), which affects the labour hour spent on removal of worn parts and installation of new ones
2	Duration of product use	This indicators can be used to compare longevity of our old carpet model with the new one
3	Existence of Repair Manual with instructions	Can be important to consider if the repair service will be performed by a third party service provider, who might use these instructions
4	Availability of repair kit or spare parts	Important because we need to make sure spare parts (tiles) are available anytime they are required
5	Secondary energy consumption during use phase of the product	We think this is important because we would like to ensure that our redesign makes it easier to clean and maintain the carpet while its in use (e.g. vacuum cleaning consuming energy)
6	Water consumption during use phase of the product	Similar to energy indicator. The new design should ensure not much water is required to clean the carpet. Furthermore, we should consider cleaning agents as a potential indicator
7	Amount of Restricted Materials (REACH) in products	Important to reduce (or eliminate) hazardous/toxic material content in products to minimise health risks and increase potential for open loop recycling
8	Number of modules	Modular design facilitates repair, reuse and recycling
9	Time for battery charging	Time for worn part replacement - It's necessary that worn parts are easily accessible and visible, in order to facilitate and economise on the process of their replacement
10	Painted, Stained and Pigmented surfaces	It is important to ensure that our new design considers elimination of use of any impregnated or glued surfaces. This is to ease repair, but also facilitate recycling
11	Spare parts and consumables	Important, but coincides with indicator #4
12	Product Solid Waste Fraction	We need to measure how much product is 'saved' from removal due to our modular design and repair

Data collection plan

Indicator	Data	Collection process			
		Who	When	How to collect	
				Data source	Method
Duration of product use - measures the difference of the product's durable life from the market average or its old design version	wear-out life of a new (redesigned) product and wear-out life of an old product (months)	Product designer and marketing coordinator	Upcoming weeks	Customer interview, market data	Interview with business customer, estimation of usage
Product Solid Waste Fraction – measured as a mass of non-recovered parts of the product by the total mass of product	mass of non-recovered parts of the product	Marketing coordinator	Upcoming weeks	Customer interview	Estimation
	total mass of product	Product designer	Upcoming weeks	Bill of materials	Calculation

initiative. Furthermore, some indicators were 'downgraded': i.e. they were still important to the team to be used as complementary indicators, but not as key indicators. The de-selected indicators were: #11, mainly because it repeats #4 and #9, which is already a variable in indicator #1.

Step 3. Apply final indicator set

Step 3.1. Getting overview of data and set up a data collection plan

For the final set, the checklist provided in the workbook was used to review the final indicator set. Overall, the final number of indicators was 10, after the redundant ones were removed. The team made sure to cover the three dimensions of sustainability. The data collection plan is exemplified for indicators #2 and #12 above.

Step 3.2 Calculate indicators and compare alternatives

Once all the key performance indicators are selected, they need to be applied and then used to compare different options, including the selected circular initiative, so to understand their potential performance. Doing this will highlight areas to be improved or altered, giving the opportunity to act before the actual initiative implementation.

Step 3.3. Use results to support decision

On the basis of the calculations and option, CarpetCo decided to proceed with the development of the initiative, which would be supported by the carpet designed for repair. As most of the indicators show, the Circular Economy initiative would make it possible to prolong use life of the product (indica-

tor #2) and almost eliminate resource waste at the end of life (indicator #11). However, the team decided to work on further improving the carpet design and its material composition as it wants to eliminate the restricted substances found in one of the materials (indicators #7).

Key learnings and considerations from the case

Step 1:

- after the team discussion, it became clear that the carpet had to be redesigned to match the new business model that relied on repair and maintenance services
- it may be necessary to do sub-steps under Step 1 iteratively and allow more time to understand what actually your Circular Economy initiative

#	Selected indicators	Units	Reference case (as-is)	CE initiative
1	Cost of non-destructive disassembly (CND)	EUR/m ²	disassembly not possible	3.0
2	Duration of product use	months	6	>12
3	Existence of Repair Manual with instructions	Y/N	NO	YES
4	Availability of repair kit or spare parts	Y/N	NO	YES
5	Secondary energy consumption during use phase of the product	kWh/year	160	160
6	Water consumption during use phase of the product	L/year	525	340
7	Restricted Materials (REACH) in products	mass	phthalates in PU	phthalates in PU
8	Number of modules	nr/m ²	0	3
9	Time for repair	hr	n/a	0.5
10	Painted, stained and pigmented surfaces	%	15	0
11	Product solid waste fraction	%	100	10

- is about and what it requires
- in the initial activities, prefer to involve too many rather than too few people, otherwise commitments can be made without understanding what effort it required (e.g. delivering a repair service for a product that is hard to repair can hardly result in a profitable business).

Step 2:

- the process of indicator selection was greatly facilitated by the key questions formulated in Step 1
- selecting indicators for each question separately ensured that the selection is meaningful and indicators are relevant for the team (e.g. indicator 'number of modules' might not have been useful for the innovation or sustainability coordinator, while it was

- important for the product developer, who could also explain its importance to the team)
- participants with 'right' expertise could greatly assist indicator customisation and creation, so only 'must' indicators were selected and used for the final set.

Step 3:

- get an overview of all key indicators relevant for the Circular Economy initiative in focus and the data needed, so same data can be reused in case it is needed to calculate several indicators
- make sure that data sources are properly identified – your customers, suppliers and partners are sources of very valuable information, therefore use them for data collection; as a

- company you may be surprised to learn from your customer that your product is only used for 1 year despite being designed to serve 2 years
- decision-making is an iterative process, which allows to collect and use the 'right' information to support introduction of new and continuous improvement of past initiatives.

What now?

A detailed sustainability screening of your Circular Economy initiative paves the way towards a more structured and informed decision-making process in your company, allowing to design a Circular Economy initiative that also deliver benefits for the triple bottom line dimensions of sustainability.

Needless to say, sustainability screening and leading indicators can also be used to support analysis and development of any other sustainability-oriented initiative. The step-by-step procedure presented in this workbook is designed to support corporate learning about sustainability, which facilitates integration of sustainability criteria in any design and development process run by your company.

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Nordic Green Growth

This workbook supports decision-making by supporting sustainability screening of alternative circular solutions in terms of environmental, social and business potential.



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