Fostering Circularity: Building a Local Community to Implement Circular Processes

An Approach to Overcome the Barriers to a Sustainable Future

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1. Introduction

To realise a globally sustainable future, the transformation of industry is an essential intermediate step, as currently, a large part of the greenhouse gases that cause demonstrable climate change are emitted by companies (Alvarez-Risco et al. 2022). Therefore, sustainable business models are needed, which can create value efficiently in the long term while minimising resource requirements and environmental impact (Ritzén/Sandström 2017). The requirements for such a business model are complex, as resource consumption is rising due to increasing population numbers and occurring price and availability fluctuations that strain supply chains (Geng et al. 2014). Considering in this context the fact that there is only a limited amount of resources globally available (Tu et al. 2019), it becomes clear that the resource efficiency of companies must be increased (Jesus/Mendonça 2018).

In this context, the circular economy approach is an essential building block to enable this development (Corona et al. 2019). This approach is therefore being discussed intensively in business and science, as it represents a concept specifically for companies to address the problems already displayed in a targeted manner. (Ritzén/Sandström 2017). The main goal of the circular economy is to minimise or, if possible, eliminate waste production and the need for newly mined materials by increasing resource efficiency. The latter would then lead to a stage of ultimate circularity (Potting et al. 2017). However, the global economy is still far from this state. The Circularity Gap Report (Circle Economy 2022) found that the global economy was only 8.6% circular in 2020. The conclusion is that over 90% of economic processes produce waste, require new raw materials for production processes and thus follow the classic linear business model.

Many governments and organisations want to counteract the current linear business models using the circular economy concept. Governmental proponents include, for example, countries such as China (Lieder/Rashid 2016), which has even legally committed to implementing a circular economy, and the entire European Union (European Parliament 2015). In addition, specific initiatives such as the

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"Circular Economy Roadmap" in Germany, the "Transition from Linear to Circular Economy" in India, and the "Circular Taiwan Network" are also pushing for greater use and implementation of a circular economy (Alvarez-Risco et al. 2022). The circular economy concept is also receiving increasing attention in the academic context. This can be seen in that renowned universities such as University College London or the University of Cambridge have set up special departments to deal with this topic. In addition, an increasing number of academic initiatives by universities such as the University of Oxford, the University of Harvard and the Massachusetts Institute of Technology emerged (Alvarez-Risco et al. 2022). The increasing focus on the circular economy is reinforced by the fact that the mass of research papers on the circular economy has increased sharply since 2017 (Ayati et al. 2022).

In addition to the strong interest from governments and non-governmental organisations, companies are also increasingly interested in moving towards the circular economy. Public proponents include, for example, companies such as Google, Amazon, Apple, Johnson & Johnson and Procter & Gamble (Alvarez-Risco et al. 2022). They all want to benefit from the positive effects of this business model, which have already been proven in numerous use cases (Liu/Bai 2014). One example of such a use case is the city of Kalundborg in Denmark, which has established a complete symbiosis of different companies to increase resource efficiency and reduce the burden on the environment as much as possible. This concept has proven its worth over the last 50 years (Kalundborg Symbiosis 2023). But circular business models have also proven their efficiency in other areas by achieving cost savings of 40 to 60% (Ellen MacArthur Foundation 2013).

However, despite the high level of interest from various parties and the positive practical results, the concept is predominantly unknown among the general public. A study from 2019 showed that for 75% of the interviewed people from the industry, the idea of a circular economy was unknown (Duurzaam Ondernemen 2019). The fact that there is not yet a consolidated model for implementing a circular economy (Ritzén/Sandström 2017) justifies that the concept itself is not yet sufficiently understood to realise a greater circularity of the overall economy (Jesus/Mendonça 2018).

In addition to the lack of understanding and the insufficient dissemination of the concept (Ritzén/Sandström 2017), there are other barriers to the implementation of a circular business model. These include, for example, the resulting complexity caused by the necessary holistic view of business processes. This means that in circular business models, all components of the value-adding process, from the choice of materials to product design and production, must be considered. Even the processes outside the direct value-creating process, such as data management and the selection of distribution strategy, must not be neglected (Ritzén/Sandström 2017). In addition to the enormous planning and implementation effort,

this radical change in corporate processes also involves an indispensable socio-cultural change within the company, which increases the complexity of the change-over (Potting et al. 2017).

Currently, the transformation process represents an implementation risk for many companies due to the significant investment in terms of time and money. With the need for more understanding of the circular economy concept, the transformation process has a deterrent character (Rizos et al. 2015). In addition, only a few comprehensive examples in practice can provide a detailed determination of the expected financial benefits or generally answer whether a profitable implementation of a circular business model is possible for all companies (Ritzén/Sandström 2017).

The latter is directly related to the technical barriers to circular business models, as many processes require new technologies to implement circular processes. Suitable technologies, especially in recycling areas, are still insufficiently developed in many primarily specialised areas, thus limiting companies in their transformation opportunities. This point is a key barrier to the broad shift from a linear to a circular economy (Jesus/Mendonça 2018).

Beyond that, there are further barriers which, apart from the technological and financial aspects, also target areas of corporate culture, legislation and the customer. These barriers have been studied by different authors and are mostly congruent (Araujo Galvão et al. 2018; Kok et al. 2013; Ritzén/Sandström 2017; Shi et al. 2008). Accordingly, no clear driver or barrier hinders the large-scale implementation of circular business models. Instead, it is an overlap of different challenges that makes the transformation of companies more complex and thus slows it down (Jesus/Mendonça 2018).

Building on this, Leuphana University Lüneburg has set itself the goal of meeting these challenges in practice and supporting companies in their transformation. In the project "Transformation durch Innovation und Kooperation in Communities" (Transformation through Innovation and Cooperation in Communities), a network of different actors who can and want to implement a circular economy in the Lüneburg region will be established over the next five years. To this end, industry, politics, science and society partners must be integrated to enable mutual support and the associated exchange. In addition to implementing a circular economy with the resulting positive effects on the economic, ecological and social sustainability (Ayati et al. 2022) of the region, the project should also serve as a pilot project.

In addition to direct, practical and economic participation, the project intends to contribute scientifically to relevant research areas. This is made possible by testing new findings within the network to eliminate delays between knowledge generation and application in the best possible way.

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This contribution is structured as follows to present the planned approach in a detailed and orderly manner. In the following second part, the concept of the circular economy is defined and presented in more detail to obtain a clear picture of the object of investigation for the following chapters. Subsequently, in the third part, the individually planned phases of the project are disclosed, and the intention of each step is described. Based on this, the fourth part focuses more on the scientific contribution and the intended knowledge gain. In this context, some research fields are presented with considerable contribution potential. Finally, concluding remarks and a summary will precisely present the core of the overall project.

2. Definition of Circular Economy

Even though the topic of circular economy has attracted increasing attention in recent years, the idea of circular processes has been around for several decades. The first scientific articles on this topic were published as early as the late 1960s (Gregson et al. 2015), and since then, it has not yet been possible to come up with a widely accepted definition (Ritzén/Sandström 2017). For this reason, Kirchherr et al. (2017) compared a total of 114 different alternatives of the circular economy and derived the following definition:

> Circular Economy can be defined *"as an economic system that replaces the 'end-of-life' concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes. It operates at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation and beyond), with the aim to accomplish sustainable development, thus simultaneously creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations. It is enabled by novel business models and responsible consumers"* (Kirchherr et al. 2017, p. 229).

Similar starting points can be found in the definition of the Ellen MacArthur Foundation (2013). However, it refers more to the material side of sustainability than to the triple-bottom-line approach, which relates sustainability to ecological, economic and social development (Elkington 1998). Nevertheless, the Ellen MacArthur Foundation clearly illustrates how material cycles can be closed. These different forms are displayed in the so-called butterfly diagram.

This figure illustrates the possible processes for the cycle of finite and recyclable biological materials and shows that the material cycles can be closed at different points. It also addresses the separation of biological and finite materials, which was already presented by Michael Braungart in his Cradle to Cradle concept (Braungart et al. 2016). This separation shows that long-term planning must already be carried out in the early stages of product and process planning in order to be able to use the comprehensive strategies sensibly and comprehensively. On this basis, the figure shows that the cycles to be aimed for differ between biological and finite materials. While biological materials should primarily be returned to the environment after they have reached the lowest cascade, finite materials and products should always be kept at their highest value level and therefore also be returned to different points in the supply chain. This is represented in the diagram by the processes recycle, remanufacture and reuse for finite materials.

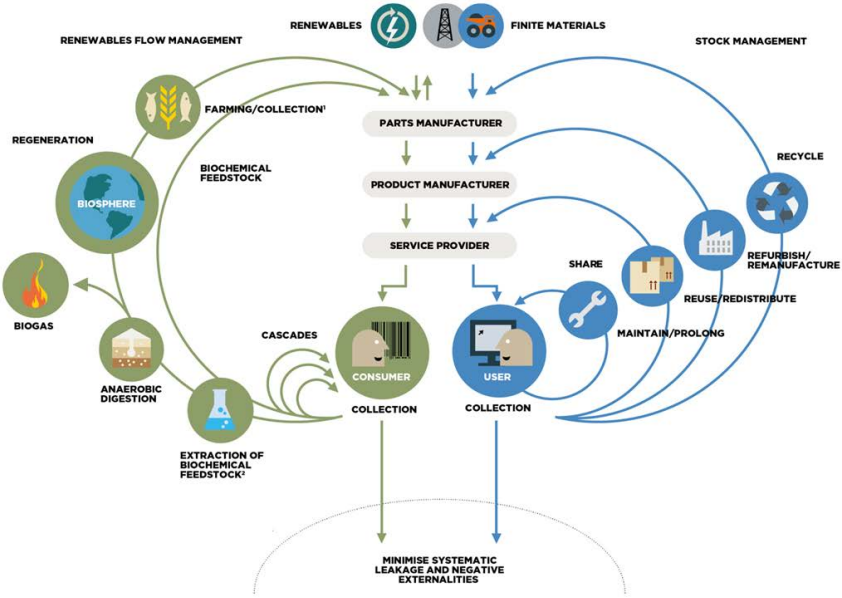

Figure 1: The Butterfly Diagram (based on Ellen MacArthur Foundation 2013, p. 24, 2019)

Potting et al. (2017) use a similar starting point. The authors identified different approaches with varying degrees of influence on the circularity of a system (Alvarez-Risco et al. 2022). Based on this, the "R-strategies" were ordered to generate a ranking of each approach. The result of this ranking is displayed in figure 2.

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This figure clarifies that there are various strategies for closing material cycles and making corporate processes more circular.

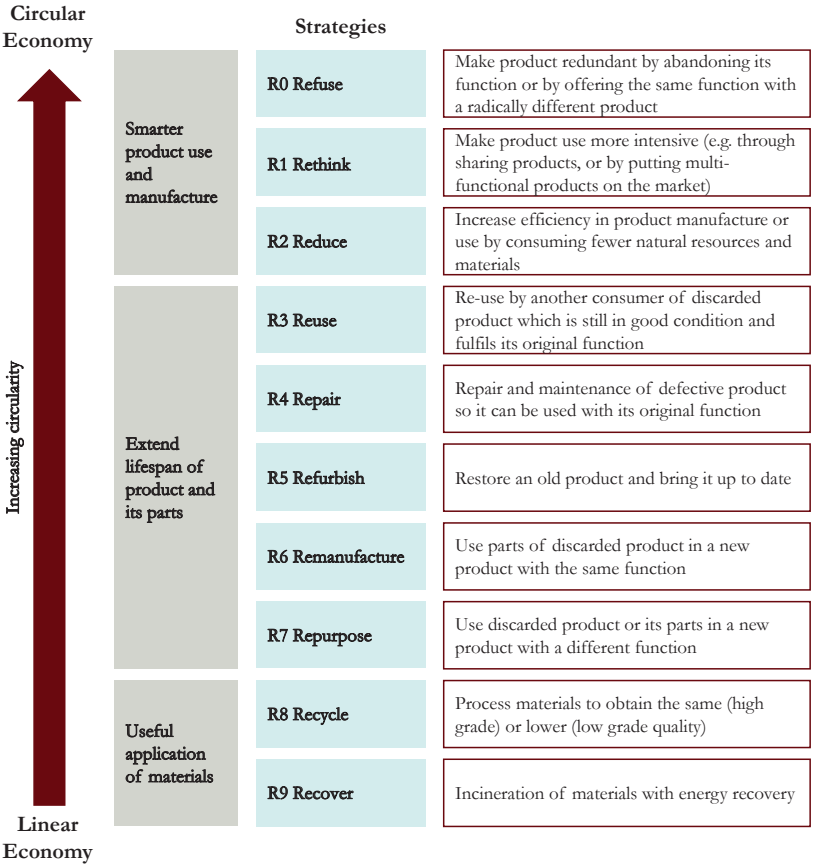

Figure 2: R9 model (based on Potting et al. 2017, p. 15)

However, the depth to which each of these individual strategies can be implemented and presented (Reike et al. 2022) increases the scope that must be considered in a holistic view of the circular economy concept. In addition, these strategies can be applied not only within a company's sector (closed loop) but also across sectors (open loop) (Farooque et al. 2019).

The considerable volume of different strategies and approaches has led to a gap between theory and practice, as practical relevance is often lacking (Ayati et al. 2022). This fact has already been uncovered by different authors and resulted in a

call for the practice-oriented implementation of the approaches to be able to generate further sound knowledge (Angelis et al. 2018; Araujo Galvão et al. 2018; Ayati et al. 2022; Fehrer/Wieland 2021). This call is now being answered through the practical implementation of the planned project. The following chapter explains how the intended structure helps to unite theory and practice.

3. Structure of the Project

To establish a suitable basis for the upcoming project, elementary components in the literature were examined, which are needed to build a community and promote the Circular Economy's further development. Therefore, the structure of the project is divided into four different phases, which build on each other at the start of the project. During the project duration, these can influence each other and be processed agilely. The four phases are as follows:

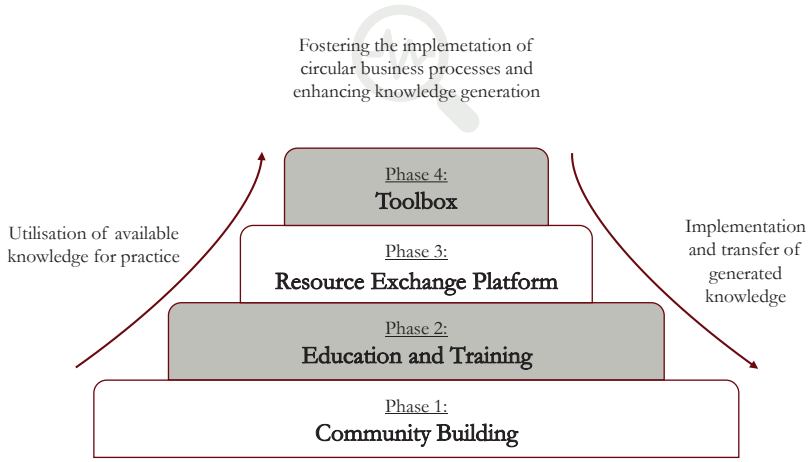

Figure 3: Conceptual Structure of the Project

The project's first part aims to build a community of different actors and interested parties to enable a mutual exchange. Based on this, the second step is to provide up-to-date and relevant knowledge to prepare all actors for further actions. These include, among others, the development of an online platform in the project's third phase, enabling and facilitating the exchange of resources in the sense of a circular economy. The procedures and processes used in this phase are to be continuously examined to finally, in the last phase of the project, allow companies to select the right strategies for them from various procedures in a targeted and analytical manner.

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All the steps mentioned pursue the overarching goal of first using existing knowledge and implementing it in practice. This implementation should ultimately be the catalyst for the ongoing generation of further knowledge regarding the Circular Economy. This generated knowledge can and should be used in the project to further develop the individual project phases. In this way, it can be ensured that a broad transfer of the generated knowledge takes place in the community that has been built up. In this way, the conceptual structure of the project ensures that, in addition to the new knowledge provided, direct value is also created for the members of the community.

How the individual phases are to be structured in detail will now be taken up in the following subchapters to create a sharper overall picture. The order of the subchapters follows the chronological sequence of the phases within the project.

3.1. Phase 1: Community Building

The aim of the community-building step is to enable communication between different actors in a supply chain. This is essential for closing material loops (Leising et al. 2018; Ritzén/Sandström 2017). For this, academic and public institutions are involved in creating an impetus for common frameworks, which also aim to ensure long-term support (Su et al. 2013). This linkage of different involved parties is a crucial step for the forcing of sustainable economic development. This is because the challenges related to holistic sustainability are too multifaceted to be solved comprehensively by one company alone (Gallo et al. 2018; Rossignoli/Lionzo 2018).

In this phase of the project, the community will initially serve the sole purpose of building relationships between the different actors, assessing readiness for the implementation of circular business models, and identifying problems and challenges already encountered in practice, as well as activities. The exchange will take the form of in-person meetings, such as topic-based meetups and discussion groups, workshops designed to promote understanding among the actors, and conferences, which will aim to advance the overall project.

To also achieve a higher frequency of communication and a faster reaction time to emerging problems, an online forum is also to be set up. Here, news about the current progress and results should be permanently visible, and questions from all project partners can be asked. The long-term goal is that the support will come from other project partners who have already gained practical experience in the respective area or who can provide support in a direct form. In the short term, however, Leuphana University will take on a moderator role in this context until the project partners' theoretical knowledge and practical experience are sufficient to help each other.

The latter pursues the goal of consolidating a deep bond and symbiotic relationship between different companies in the long term, moving away from a purely competitive approach. This should lead to a change in the company's thinking, which should develop from a company-centric focus to a holistic view of the system (Wiek et al. 2011). This is because exclusively profit-oriented value creation is not suitable to efficiently address the complex challenges of sustainability and social inequality (Montabon et al. 2016). It is important to emphasise that while circular business models are not focused on profit maximisation, economic growth is imperative for a company's sustainable development, and thus this is also an essential and central component (Bocken et al. 2016). In this context, economic growth is achieved through the cooperation of companies (Gallo et al. 2018; Rossignoli/Lionzo 2018) and through the maximisation of resource and energy efficiency (Bocken et al. 2016), which entails the growth of an economic system.

This collective thinking should be strengthened between different industry partners, as described above, but also between companies and political and academic partners. For example, through exchange with political partners, a consensus could emerge that leads to legislation that minimises the implementation risk of circular business models and promotes efforts on the part of companies (Ayati et al. 2022). This could also create incentives for other companies to deal with circular business models and to join the community that has been established.

Compared to the political partners, it is envisaged that the academic partners in the community, in addition to providing theoretical knowledge, can also directly influence the companies' further development. Possible approaches in this regard include the Living Lab method (Canzler et al. 2017; Claude et al. 2017; Compagnucci et al. 2021), which is intended to enable new scientific results to be tested and validated directly in practice. This accelerates knowledge generation and minimises implementation risk for companies through ongoing support. The projects successfully created in Living Labs can be continued by the companies and transferred to other business areas or products. In addition to the practical contribution, the results can be scientifically processed and thus immediately contribute to the overall project's progress. After processing, this information is made available at the conferences and in the online forum so that all project participants can participate and benefit.

The newly acquired knowledge will be taken up in the second phase of the project "Education and Training", in addition to the theoretical frameworks and models on the circular economy, to generate a direct practical reference.

3.2. Phase 2: Education and Training

The second phase of the project aims to establish knowledge and awareness of the circular economy and circular business models. For this purpose, workshops and courses can teach topics such as the R9 model (Potting et al. 2017) or approaches

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such as those of the Ellen MacArthur Foundation (2019). This step will lead to a reduction of the barriers to the implementation of a circular economy through company-enriched knowledge (Ritzén/Sandström 2017).

In addition to in-person workshops, teaching materials will also be made available on an online platform. These teaching materials will be in written and video graphics, enabling effective and efficient self-study. Making some materials available globally is conceivable to incentivise external parties to join the community and contribute to the overall project.

The main focus of this phase should be on providing teaching materials and a practical learning environment in the form of a learning factory. This can build on existing concepts of Leuphana University (Rokoss et al. 2021), which can then be continuously supplemented with different approaches and strategies of the circular economy. For example, the existing assembly-focused concept could be complemented with a material recycling process that entices participants to think about the far-reaching possibilities of the R9 model and implement it in a learning factory environment. Using this model can sharpen understanding and stimulate creativity among participants. As a starting point, versatile requirement profiles for the learning factory can be created using different scenarios using different strategies from the R9 model in defined cases. Here, the learning success of the participants can be favourably applied to their own company processes utilising knowledge transfer.

Building on this transfer, individual mentoring programs can be established on the part of Leuphana University. Once the knowledge and awareness of the participants have been created and the initial idea of how the circular approach can be incorporated into a specific company has been developed, an individual implementation plan can be generated in close collaboration in such programs. Such a plan can also be understood as generating knowledge, which can also be provided to other project partners and serve as inspiration. In some instances, the knowledge gained can also be extensively incorporated into the materials provided and the workshops to increase practical relevance continuously.

Once the initial implementation plans have been drawn up and circular business models are present in the target region, the third phase of the overall project can be initiated. This includes the further development of the already active knowledge online platform, which is primarily intended to facilitate the exchange of material between different parties. How this is envisaged is presented in the following subchapter.

3.3. Phase 3: Resource Exchange Platform

After sufficient knowledge has been anchored in the companies and the first circular processes have been implemented, the next phase is to create an opportunity to minimise the hurdles for exchanging materials between companies. In addition

to the communication and exchange function, the online platform should operate as an online marketplace. Companies should be able to offer and make available by-products or waste from their production to other companies.

In addition to the pure offer, the products can be quantified according to quantity and quality to facilitate the buyer company's decision. By measuring the quantity and frequency of supply, long-term business relationships can also be established between companies, influencing production planning and control (PPC) through regular purchases.

By handling single transactions and regular material exchanges through the online platform itself, valuable data can be collected that can be used to develop the platform and its performance further. For example, using artificial intelligence and machine learning, the data can be used to develop matching algorithms that make it easier for companies to find suitable materials and make this process as efficient as possible. This could also bring together companies that would not have come together without this support.

The achieved connection of a wide variety of companies through material flows is pursued with a long-term goal in addition to the circularity achieved in the short term. If stronger material-related relationships are possible between certain companies due to the characteristics of their respective productions, this can be a starting point for deeper cooperation. For example, production processes could be adapted to make better or more extensive use of the by-products. Thus, this form of social interaction could close material cycles more extensively (Bocken et al. 2016) and, therefore, the overall system of different companies gains circularity.

Especially this strong interconnectedness and the emergence of a system consisting of different companies means that, compared to linear business models, new and unfamiliar processes have to be implemented for the company. This challenge will be addressed in phase four of the overall project by providing a toolbox.

3.4. Phase 4: Toolbox for Local Industry

The diversity of the different companies means that different forms of the circular economy and, thus, different processes will be practised in the companies. These processes will influence various objectives within the company differently, whereby the interdependencies still need to be clarified (Ayati et al. 2022). To counteract this barrier, the processes tested in practice are to be scientifically examined and analysed for interdependencies with specific objectives. The reviewed procedures will be summarised in a toolbox and made available to the companies.

This toolbox will help companies to choose from the available processes and to adapt the configuration of the different methods and strategies to the respective business model. This strategic decision helps support the company's sustainable

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development in the long term. Based on this, uniform guidelines and "best practices" can be isolated for different types of companies, further lowering the barriers to using circular strategies and increasing the speed of their implementation.

Since the toolbox creation is the last phase of the overall project, the exact orientation and characteristics will depend heavily on the previous results achieved. Based on this, the examination of the procedures will focus not only on the implementation path but also on the effects on the corporate objectives that have emerged as central in the course of the project. These can include, for example, objectives from the area of logistics performance and costs (Schmidt/Nyhuis 2021), but primarily objectives that are relevant for measuring circularity.

The latter is an important field of research that is to be further explored by the overall project, among others. In this context, the fourth phase and the research results are thus interrelated. In addition to the measurement of circularity, there are other research fields to which the project can contribute. Which research fields these are will be highlighted in the following.

4. Scientific Contribution

In addition to the practical benefit generated by the direct support of the companies, a scientific contribution should also be generated from the academic side through the in-depth practical research of the circular economy. This follows the call of various authors (Angelis et al. 2018; Araujo Galvão et al. 2018; Fehrer/Wieland 2021). Due to the scope of the overall project and the complexity of the circular economy, different research fields have arisen.

These are shown in the following figure, taking into account the macro-, meso- and micro-levels of the circular economy, which are taken up in the definition by Kirchherr et al. (2017).

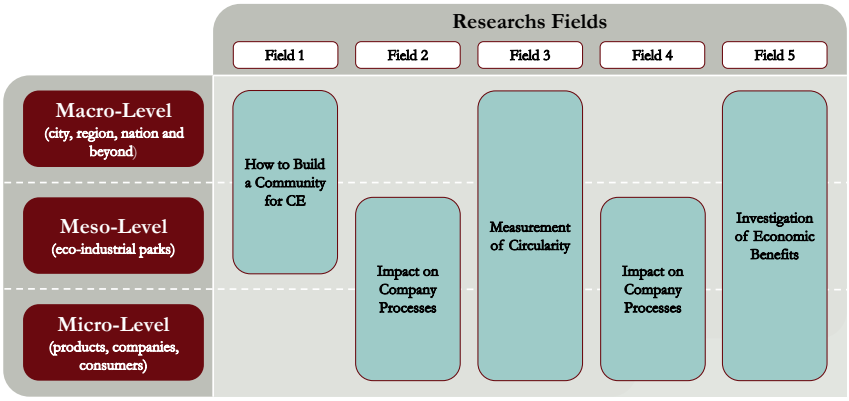

Figure 4: Presentation of the Research Fields Considered and their Impact Level

The size of the respective fields does not indicate the scope or the importance of the individual research field, but only the influence or the affiliation to the respective macro-, meso- and micro-Level. It is impossible to place the research fields under consideration on just one level (see Figure 3). For example, the first research field cannot be clearly assigned since community building can refer to entire regions and the symbiotic association of a few companies. Similarly, in the second research field, it cannot be said that business processes only refer to one company or one product because the influence on the external supply chain design still needs to be determined. In comparison, the measurement of circularity can be relatively clearly assigned to all three levels. This is because circularity can be determined at the most minor (product) level and scaled to an entire nation. The fourth research field can be located in the same way as the second since the influence of a new business model indisputably directly Impacts a company (micro-level) and can thus also shape a system of different companies (meso-level). Furthermore, only a minimal influence on the macro level will be possible as long as it is not a disruptive innovation. However, this will be neglected in this context. As the last research field considered, the investigation of economic benefits again refers to all levels since, for example, both a product line per se (micro-level) and the economic performance of an entirely circular economy (macro-level) can be investigated. Thus, here too, there is a wide range of possible results. The following sub-chapters discuss how the respective content contributes to the research fields mentioned.

4.1. How to Build a Community for CE

The very approach of building a community can already generate new insights. This refers to the lack of experience in building a community that focuses on the circular economy. Due to this lack of experience, there is a large gap between theory and practice (Ayati et al. 2022).

Through the practical establishment of such a community and the detailed documentation of this process, conclusions can be drawn about the overall project's success. Through recurrent evaluations and interviews with project partners, efficient and practical working steps and procedures can be identified and developed. In the same stage, it is possible to analyse procedures that negatively influence the project to improve or discard them for subsequent work steps within the project, if necessary.

This way, developing a practicable process model can help future organisations build such a community. Such a process model would result in lower implementation hurdles, a predictable output, and justifiable time predictability. Such a development would have a strong positive influence on future projects on the topic of the circular economy.

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4.2. Impact on Company Processes

In addition to the results for future projects to build communities, direct conclusions can be drawn for companies and their processes. The extent of this scope and the associated value of these results is already clear from the definition by Kirchherr et al. (2017), which divides the circular economy project into the micro, meso and macro levels. To be successful in the circular economy, a transformation must be made on all three levels (Kirchherr et al. 2017), and how this transition can be shaped is of great value to companies.

For example, at the micro level, which refers to individual products or companies, a circular economy's impact on a company's PPC could be examined. Expanding existing framework models, such as the Hanoverian Supply Chain Model, is conceivable to provide companies with a practicable application model (Schmidt/Nyhuis 2021). The challenge here is that different process configurations are possible due to the available strategies for implementing a circular economy (Potting et al. 2017; Reike et al. 2022). This increases the complexity and versatility of the processes to be investigated. However, this point, in particular, underlines the importance of this project to sustainably support companies in configuring their internal processes and the corresponding planning and control processes.

If the view is directed from the company's internal to external processes, the focus shifts to the influences on the meso-level. At this level, circular supply chain management (CSCM) offers an exciting approach, as it combines the idea of the circular economy with the conventional methods of supply chain management (SCM) (Farooque et al. 2019). This topic and, thus, this field of research is of utmost importance, as sustainable business models and supply chain design are interdependent and must be considered together (Lüdeke-Freund et al. 2017). Concerning the research project, the question of how the configurations of supply chains will or must change to move from a linear to a circular economy could be explored. Possible research topics regarding the configuration of supply chains include, for example, order fulfilment principles (e.g. make to order, make to stock, assemble to order, engineer to order), process design (supplier and customer connectivity in circular processes) and methods and procedures for cross-company coordination of capacities and inventories in the circular economy. To enable this transformation, ways can be explored how this design can be done (Angelis et al. 2018) and which specific measures lead to a sustainable and resilient supply chain (Negri et al. 2021).

To implement the points mentioned above on a broad scale, small and medium-sized enterprises must also be involved in the transformation and are supported by guidelines and incentives (Panigrahi et al. 2019). At this point, an extension of the research field already described arises, which detaches itself from the entrepreneurial focus and links up with the first-mentioned research field. In this context,

it is primarily in the public interest to support companies to implement the transformation broadly at the macro level as best as possible. In this context, investigating which form of support is needed by different companies can also be a research topic. This would allow measures for policy to be derived.

4.3. Measurement of Circularity

Another important field of research is the measurement of circularity. The broad interest in this field of research can be explained by the fact that the circularity of a product or an individual company can be measured, as well as the circularity of an economic system, a region or an entire nation. All these different expressions of circularity are of central importance for corporate and public objectives, which justifies the need for a transparent means of measurement.

Currently, many of the available performance indicators are criticised for addressing only a few aspects of circularity (Åkerman 2016; Geng et al. 2012; Pauliuk 2018; Saidani et al. 2017) and thus not providing an exact measure (Saidani et al. 2017). This is because challenges such as the great complexity of the processes to be studied and the difficulty of data collection make comprehensive measurement challenging (Corona et al. 2019). To make progress in this area, one of the research priorities is to develop one or more parameters that are both valid, reliable and practicable for companies (Bannigan/Watson 2009), taking into account all aspects in the sense of the triple-bottom-line (Kirchherr et al. 2017).

In this context, assessment tools can be continuously investigated and further developed. These tools evaluate different alternatives for action to decide which alternative makes the most significant contribution to general circularity. Possible examples are Life Cycle Assessment (LCA), Material Flow Analysis (MFA) and Input-Output Analysis. It is conceivable to develop a metric based on these tools that comprehensively consider all aspects of circularity (Corona et al. 2019).

4.4. Development of New Business Models

To provide companies, in particular, with even more extensive opportunities, new business models can also be developed based on the results of the studies on LCA. This can significantly contribute to the broad implementation of a circular economy (Bocken et al. 2018) and counteract the low implementation frequency of such models (Linder/Williander 2017; Stål/Corvellec 2018; Tukker 2015).

The complexity of this research field is extensive, as there are already various approaches in the literature on how circular business models can align themselves. These include efficient material-technical loops, effective product-service loops, social-collaborative loops and symbiotic ecosystems (Fehrer/Wieland 2021). On this basis, new types of circular business models can be developed, or specially

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tailored solutions can be created for project partners. Both could serve as inspiration for future research projects and thus make a significant contribution to progress towards a circular economic system.

4.5. Investigation of Economic Benefits

Besides contributing to sustainability, circular business models should be profitable, even if maximising profit cannot be the sole focus (Montabon et al. 2016). However, circular business models still need to be more fully proven economically to entice companies to adopt such business models. This can be achieved through extensive research on the various economic benefits, such as reducing material costs, increasing raw material availability, improving efficiency in implementing environmental regulations and growing profits. Companies will consider this path for themselves only when the circular economy concept has proven itself economically.

However, since a circular business model can work economically (Liu/Bai 2014) and help save costs (Ellen MacArthur Foundation 2013) is not enough, the transformation itself must also be included in the analysis. It is conceivable to examine the transformation of individual project partners in different cases and then compare the time and financial expenditure with the resulting benefits. In this way, the defined value of the transformation for a respective company is ultimately determined. This value will impact all components of the triple-bottom-line, even if the economic part will have the most significant influence on the final motivation.

This economic value has a substantial governmental interest in addition to the entrepreneurial one. Even though circular business models are an approach that does not refer to the profit maximisation of an individual company, it is necessary to investigate and quantify how the economic performance of a system behaves. If it turns out that economic performance is increased by the widespread implementation of circular business models, this will result in political interest for the accompanying transformation. This research and these results would thus significantly Impact both the economic and societal levels.

5. Summary and Outlook

This contribution presents the structure of the described project in conceptual form. The four defined project phases aim to give companies an impetus from research and politics and to support them in developing and implementing circular business models.

The first step is to build a community by facilitating communication between participating companies and other interested groups in politics and science. In addition to meetups and conferences, the core of this communication will be an online platform that will enable the exchange of information, knowledge and experience.

Based on this, after project partners have expressed interest and joined the community, a training programme will be initiated, which should enable the development of further practice-oriented knowledge that can be learned in learning factories, for example. The project partners with new skills can now develop and apply their circular business models, which a Resource Exchange Platform supports. Finally, the emerging processes within the partner companies will be continuously analysed to conclude interactions between individual processes and relevant objectives. These results will be made available to the project partners in a structured form.

In addition to directly shaping the local economic structure, the project results are to be academically processed to have a global influence on further economic development. In this contribution, the research fields of community building, the impact on business processes, the measurement of circularity, the development of new business models and the general investigation of economic benefits were named as examples. The potential for further development of these research fields is considerable due to the practical relevance of the project.

In the future, both the practical and the scientific project results should support the transformation to a sustainable (regional) economy to achieve a long-term economically attractive, ecologically efficient and socially sustainable future.

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