



Circular Economy Start-up Landscape 2024

Emerging trends in Germany's
circular economy startup scene

powered by





Foreword

The Ellen MacArthur Foundation describes the circular economy as a driver of enormous creative opportunities that can drive higher rates of technological development, improved materials, energy efficiency, and new profit opportunities for companies [1]. Start-ups play a crucial role in advancing the circular economy. As they are often more innovative and agile than established companies, and can therefore develop new solutions and bring them to market more quickly, we see them as a major force in realizing the creative potential of circularity. For the benefit of both our environment and our economy.

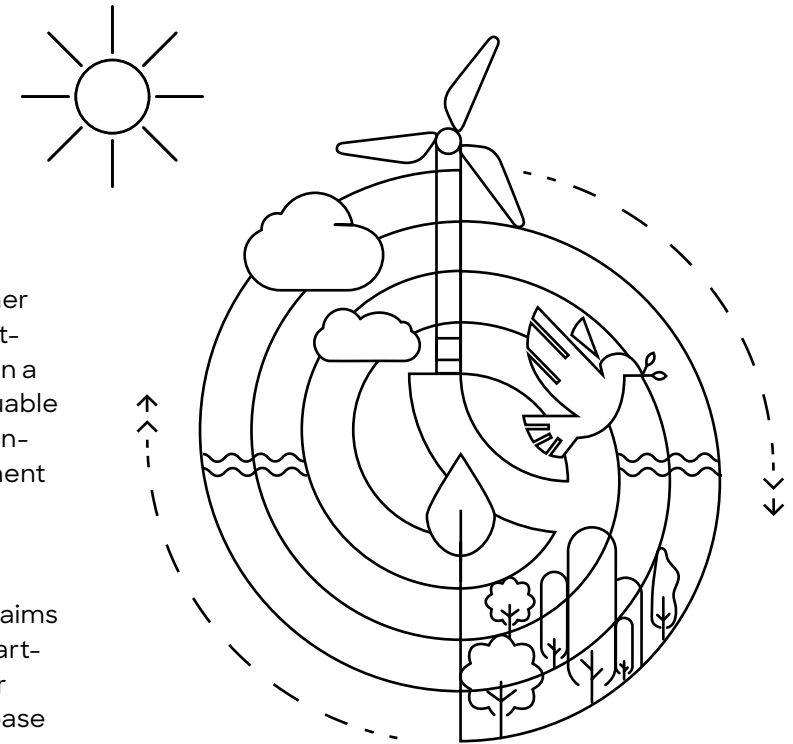
What emerging circular economy champions need is visibility. This helps them secure funding, forge connections with potential partners and customers, and attract top talent. Conversely, established companies also benefit from visibility and connections with emerging players. For venture capitalists, circular economy is a key growth theme and visibility of investment opportunities is a top priority.

For the second year in a row, CIRCULAR REPUBLIC by UnternehmerTUM is driving efforts to provide a comprehensive overview of this rapidly evolving space – The Circular Economy Start-up Landscape. This year, CIRCULAR REPUBLIC has partnered with *better ventures*, the TUM Venture Lab Sustainability and Circular Economy, and Unternehmer-

TUM's TechFounders program to bring together relevant expertise. Our aim is to spotlight start-ups operating in the circular economy space in a structured and systematic way, providing valuable guidance to those seeking suitable partners, investment targets, collaborations, or employment opportunities.

Our commitment to quality is paramount: the start-up database developed for the analysis aims for thoroughness in the DACH region (>350 Start-ups), and we consistently cross-reference our findings with global services such as Crunchbase or Tracxn. This report is not randomly spreading fame to companies active in this space but providing concise answers for anyone interested in emerging circular economy businesses.

We also aim to highlight the relevant developments in the space. The growing amount of capital invested underlines the importance of circular businesses and the distribution of the capital invested provides information on potential opportunities, challenging areas and white spots. We have therefore sliced and diced the databases of circular economy start-ups and investments in several ways to distill the most interesting trends and to raise awareness for the importance and potential of circularity. Through this work, we seek to catalyze innovation in the circular economy by showcasing new business models and techno-



logies and attracting further funding. All in all, we are humbly trying to chip in a small contribution to accelerating the transition to a circular economy.

Matthias Ballweg

Co-Founder CIRCULAR REPUBLIC

Tina Dreimann

Co-Founder *better ventures*



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Executive Summary



This year's Circular Economy Start-up Landscape offers a comprehensive overview, including funding development, founder perspectives and insights from investors.

- **Rapidly increasing Funding for Circular Economy Start-ups.** Despite the COVID-19 pandemic, global funding for circular economy start-ups continues to rise. Notably, Germany has experienced a remarkable increase in early-stage funding, more than tripling from 2022 to 2024. However, the number of start-ups in the sector is decreasing, indicating a missed opportunity for founders in the circularity space.
- **Germany emerges as a vibrant hub for circular start-ups,** with Munich being the largest hot-spot. The Munich ecosystem is exceptionally conducive to circular economy start-ups, offering a supportive infrastructure comprising universities, initiatives, accelerators, corporate partners, and municipal backing.
- **Most investment is directed towards impactful circular economy strategies.** However, there exists a significant funding gap in product lifetime extension. The imminent EU „right to repair“ legislation is expected to disrupt this space, creating massive opportunities for start-ups focusing on repair, refurbishment or remanufacturing models.
- **Only 8% of circular economy start-ups in Germany leverage AI-driven business models,** highlighting an untapped opportunity for integration between circularity and AI, necessitating further development.
- **Circular economy founders recognize supply chain resilience as a crucial advantage** over linear competitors. However, they face challenges in securing funding for capital expenditure and hardware-intensive business models, especially when compared to software solutions.
- **Price competitiveness and cost efficiency remain critical challenges** for circular economy start-ups, exacerbated by price volatility in resource markets.
- **There is a noticeable trend towards gender diversity in founder teams,** as investors increasingly emphasize female founder participation and strong team dynamics.
- **Hardware start-ups are gaining investor interest,** given their pivotal role in circularity, particularly concerning materials.



Naja Bertolt Jensen - unsplash.com



Introduction

In an era marked by unprecedented environmental challenges and economic uncertainties, the imperative for sustainable practices and resilient supply chains has never been more pronounced. The intersection of these two critical pillars lies at the heart of the global discourse on fostering a more sustainable and robust economy. Against this backdrop, circular economy start-ups emerge as trailblazers, embodying the principles of sustainability and navigating the complexities of modern supply chains, while tapping into new value streams and business opportunities.

We Take, Make, Use and then Waste Resources: Circular Economy is a way out.

The traditional linear model of production and consumption, characterized by 'take-make-use-waste,' has long been recognized as unsustainable and prone to disruptions [2]. In contrast, circular economy principles offer a transformative approach, emphasizing the regenerative use of resources, minimizing waste, and maximizing the value of materials throughout their lifecycle. As



55% Of Greenhouse Gas Emissions caused by Resource Extraction

90% Of Biodiversity Loss caused by Resource Extraction

Model of the linear economy and the resulting negative environmental impacts. Source: United Nations Environment Programme (2024)

the world grapples with the pressing realities of climate change, resource scarcity, and socio-economic disparities, circular economy start-ups stand at the vanguard of innovation, offering pragmatic solutions that redefine business paradigms.

Circular Economy is the Growth Opportunity of our Time. It combines Resilience, Sustainability, and Profitability.

Central to the circular economy is the recognition that sustainability and profitability need not be mutually exclusive. By embracing circularity, these ventures unlock untapped economic opportunities while mitigating environmental impacts. The inherent resilience of circular economy models lies in their ability to decouple growth from resource consumption, thereby insulating businesses from volatility in raw material prices and supply chain disruptions. In this sense, the circular economy is the growth opportunity of our time. It combines sustainability, resilience to global crises, and profitability.

Moreover, circular economy start-ups exemplify entrepreneurship driven by purpose. Beyond profit motives, these ventures espouse a commitment to social and environmental stewardship, catalyzing systemic change across industries. As consumers increasingly demand transparency, accountability, and ethical practices from businesses, circular economy start-ups are well-positioned to meet these evolving expectations, fostering trust and brand loyalty.



Driving forces of circular business making.
Own illustration by CIRCULAR REPUBLIC



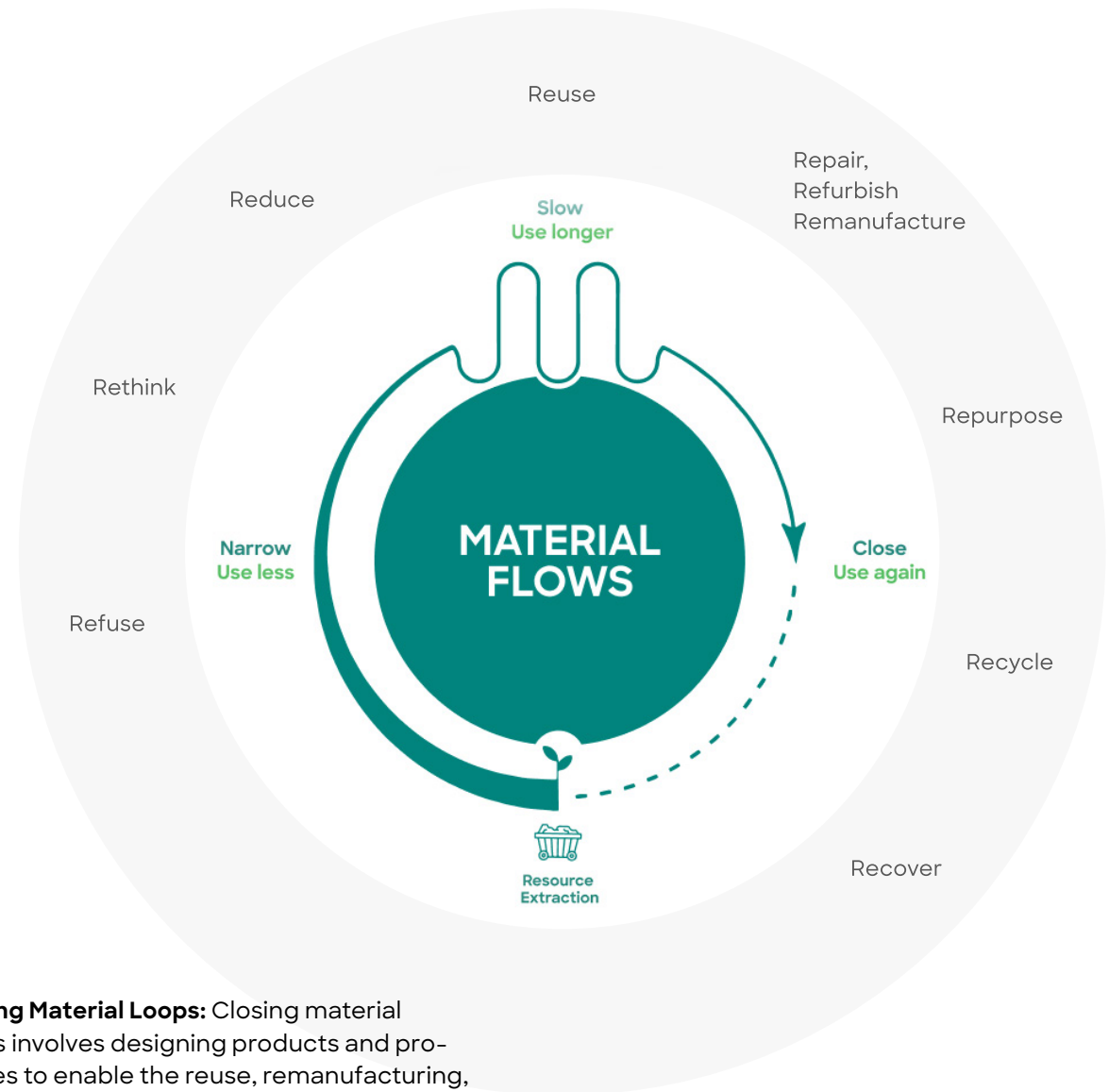
Circular Economy Concepts & Method

Circular Economy Essentials

The „Narrow, Slow, Close“ (NSC) model by Nancy Bocken provides an intuitive framework of circular economy principles. It highlights the three key levers to make value chains become circular: **Narrowing** material flows, **slowing** resource consumption, and **closing** material loops to minimize waste and maximize resource efficiency. The model is complemented by the 10 so-called R-strategies, offering practical guidelines for achieving these objectives.

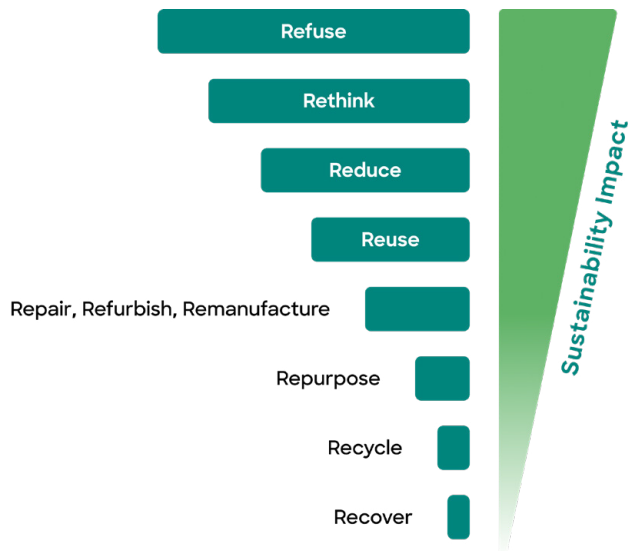
- **Narrowing Material Flows:** This involves minimizing the extraction, consumption, and disposal of resources by adopting resource-efficient practices such as waste reduction and recycling.
- **Slowing Resource Consumption:** Slowing resource consumption entails prolonging the lifespan of products and materials through measures such as durability, reuse, and repair. By extending product lifecycles, businesses can reduce the need for continuous resource extraction and manufacturing.

- **Closing Material Loops:** Closing material loops involves designing products and processes to enable the reuse, remanufacturing, and recycling of materials at the end of their life. This promotes a circular economy wherein resources are continuously circulated within the system, minimizing waste and environmental impact [3].



NSC Model with corresponding R-Strategies. Source: Based on Konietzko et al. 2020 & Morsetto 2020

The 10 R-strategies follow a strict hierarchy, with each strategy representing a different level of impact in terms of resource efficiency and sustainability.



R-strategies with repair, refurbish, and remanufacture merged into one category. Source: Based on Morseletto (2020)

Refuse: Refusing unnecessary goods and services is the most impactful strategy as it prevents the consumption of resources from the outset, thereby minimizing environmental impact.

Rethink: Increase product utilization through sharing schemes or introducing multifunctional products to the market.

Reduce: Reducing resource consumption through efficiency measures and conservation practices helps minimize waste and environmental degradation.

Reuse: Reusing products and materials extends their lifespan and reduces the demand for new resources, making it a highly effective strategy in promoting resource efficiency.

Repair: Repairing products to maintain their functionality and usability helps extend their lifespan and reduces the need for premature disposal, contributing to resource conservation.

Refurbish: Refurbishing products to restore them to a like-new condition extends their usability and reduces waste, although it may require more resources compared to repair or reuse.

Remanufacture: Remanufacturing products using recycled materials and components helps minimize waste and energy consumption, although it requires significant resources and energy for the remanufacturing process.

Repurpose: Repurposing products or materials for alternative uses helps extend their lifespan and reduce waste, although it may not always be feasible or practical.

Recycle: Recycling materials to extract valuable resources helps divert waste from landfills and conserve resources, although it may require energy and resources for the recycling process.

Recover: Recovering energy or materials from waste streams helps minimize environmental impact, although it is typically less efficient compared to other strategies higher up in the hierarchy [4].

fuse
 think
Re:duce
 use
 pair
 refurbish
 manufacture
 purpose
 cycle
 cover



Method & Data Collection Process

The CIRCULAR REPUBLIC Database, serving as the foundation for the analyses in this report, stands out as the most comprehensive and high-quality source for circular economy start-ups in Germany due to the manual amalgamation of multiple databases. Key sources included Tracxn, Crunchbase, and Netzero, selected for their extensive coverage of start-up activities and funding details. Alongside existing databases, we collected insights from industry experts through interviews and consultations. Information from circular economy accelerators in Germany was integrated to supplement and enrich the dataset. Furthermore, we manually evaluated the underlying technologies driving each start-up's business model to provide deeper insights into their operational frameworks. Manual verification of all entries guarantees the accuracy of the data. Start-ups meeting the following criteria were included in the database:

- **Relevance to Circular Economy:** start-ups engaged in activities aligned with circular economy principles such as resource efficiency, waste reduction, and sustainable consumption.

- **Geographical Focus:** Emphasis was placed on start-ups operating within Germany, aligning with the primary focus of the analysis.
- **Activity Period:** start-ups founded after 2009 were included.

To analyze global developments, we utilized the Tracxn database, particularly for tracking funding data on both a global and German scale over time. The analysis period spans from 2010 to 2022, providing insights into trends and patterns in funding within the circular economy sector. In addition to quantitative data analysis, we conducted semi-structured interviews with start-up founders and experts. These interviews aimed to complement quantitative findings with qualitative insights.

Start-up Categories

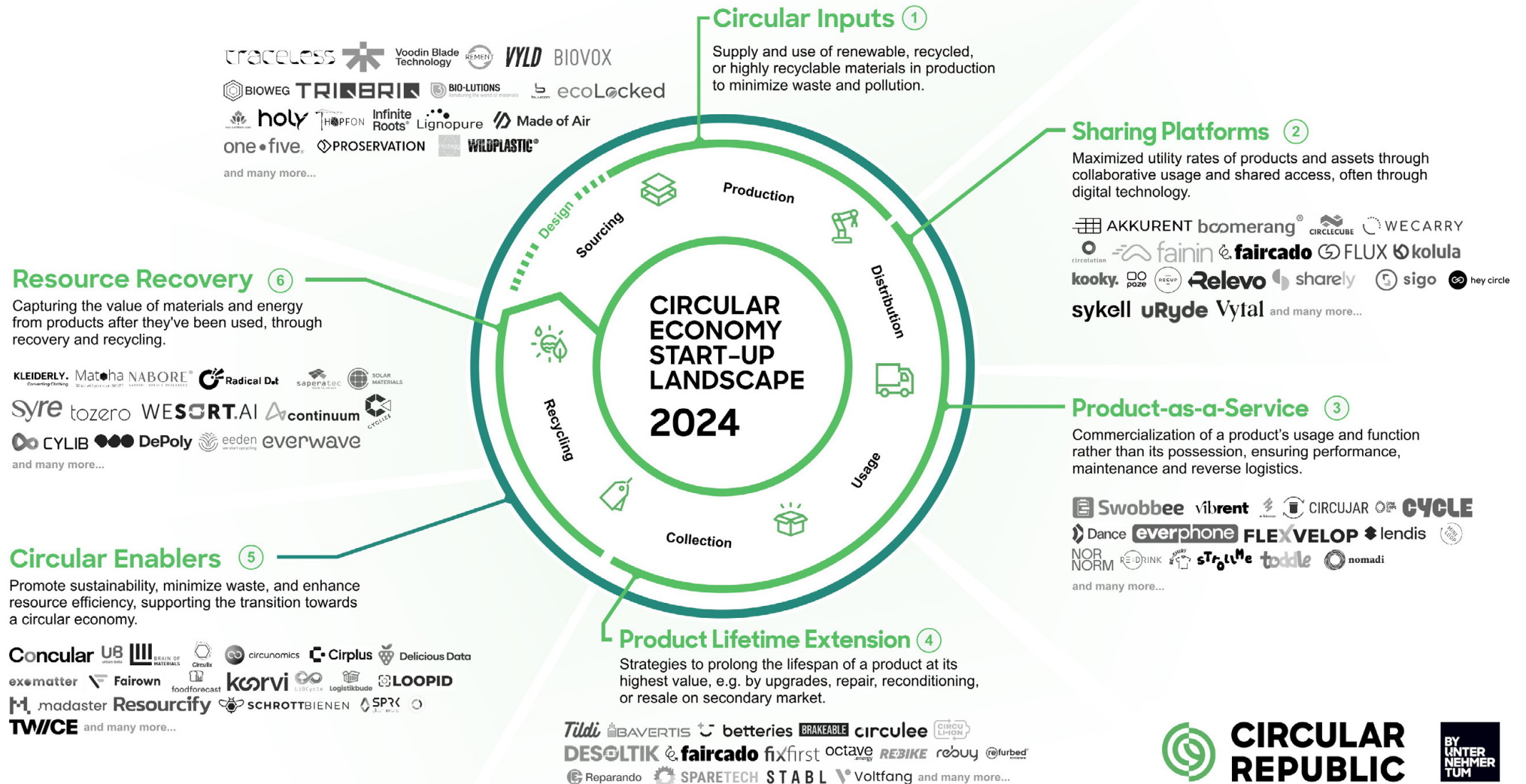
Upon identification, each start-up was subjected to manual review and categorization based on its primary business model within the circular economy framework. We categorized each start-up in one of six relevant circular business fields:

- **Circular Inputs:** Supply and use of renewable, recycled, or highly recyclable materials in production to minimize waste and pollution.
- **Sharing Services:** Maximized utility rates of products and assets through collaborative usage and shared access, often through digital technology.
- **Product-as-a-Service:** Commercialization of a product's usage and function rather than its possession, ensuring performance, maintenance and reverse logistics.
- **Lifetime Extension:** Strategies to prolong the lifespan of a product at its highest value, e.g. by upgrades, repair, reconditioning, or resale on secondary market.
- **Circular Enablers:** Promote sustainability, minimize waste, and enhance resource efficiency, supporting the transition towards a circular economy.
- **Resource Recovery:** Capturing the value of materials and energy from products after they've been used, through recovery and recycling [5].



The Circular Economy Start-up Landscape 2024

The landscape provides an exemplary overview of the most promising players in the circular economy world in Germany. Given that there are over 350 promising start-ups in this field in Germany alone, only a representative sample can be showcased here. The full set of companies is available through the CIRCULAR REPUBLIC start-up database.



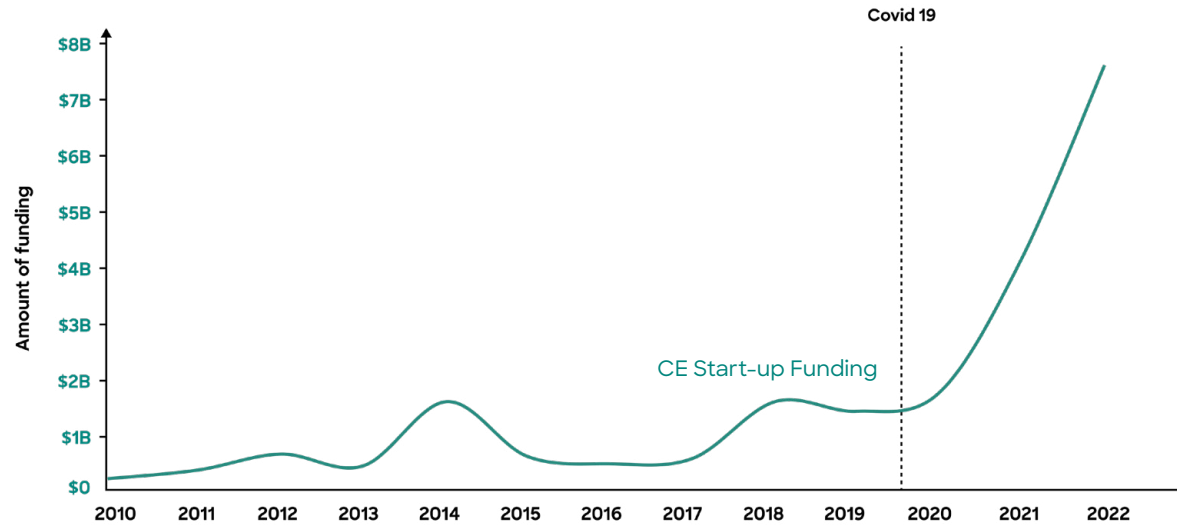


The Big Picture

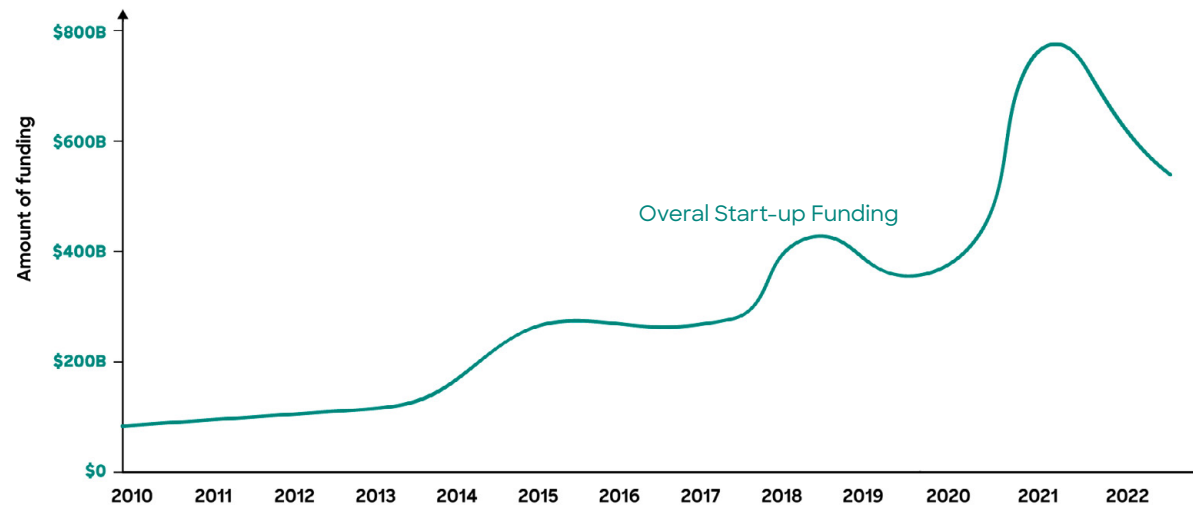
Recent Funding Developments in the circular Economy Start-up World

Rapidly Increasing Funding for Circular Economy Start-ups against the overall VC trend

Funding for circular economy start-ups has experienced robust growth on both a global scale and within Germany. Between 2010 and 2023, the CAGR was 28%, with a particularly significant surge observed in the last three years. Despite challenges posed by events such as the COVID-19 pandemic and geopolitical tensions, investment in circular economy ventures continues to rise. In Germany, the growth rate of venture capital (VC) funding for circular economy start-ups surpasses global averages, boasting a CAGR of 33% from 2011 to 2023. This trend underscores the country's commitment to fostering innovation and sustainability in its economy. In comparison to the overall developments in the venture capital sector, the consistent rise in circular economy investments is noteworthy, as it clearly diverges from the negative trend observed in the overall market in 2022.



Total funding per year for circular economy start-ups between 2010 and 2022. Source: Based on Tracxn database



Overall global start-up funding per year between 2010 and 2022. Source: Based on Tracxn database

Circular Economy Investments Thrive Amidst Global Challenges

It is noteworthy that despite geopolitical tensions, a difficult economic situation, and global crises such as the COVID-19 pandemic, investment in the circular economy continues to grow. This resilience underscores the attractiveness of circular economy ventures as sustainable investment opportunities that offer long-term value and resilience in the face of uncertainty.

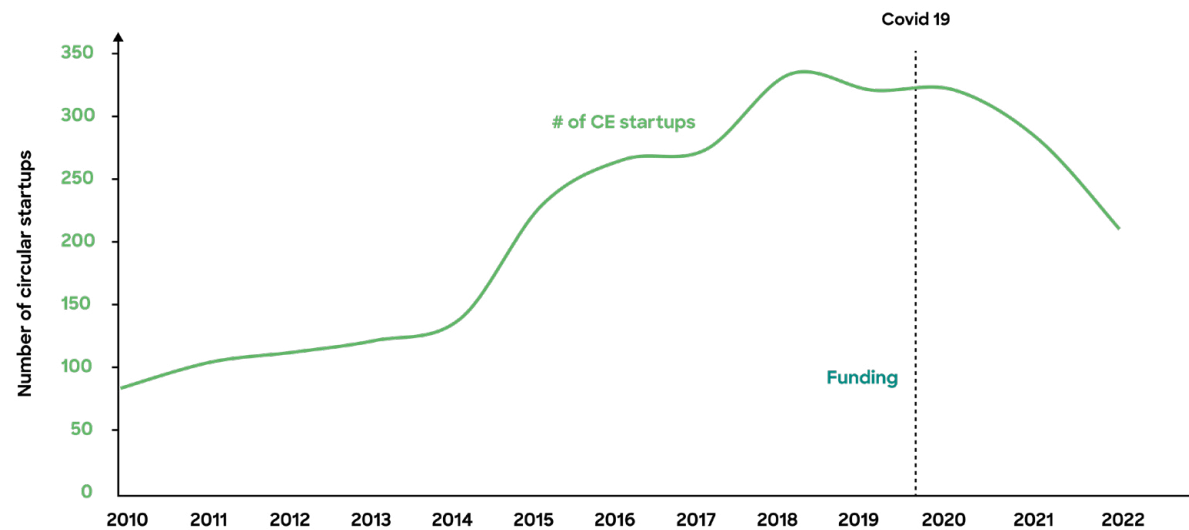
Challenges in Funding Allocation

Despite the rapid growth in funding for circular economy start-ups, the share of investments in circular economy ventures remains relatively low compared to total VC capital. Only a small percentage of overall VC investments, approximately 1,47 percent in 2023, is dedicated to circular economy start-ups. In Germany the share of capital invested in circular start-ups has been 1,46 percent of the overall venture capital in 2023. While this number grows continuously, this allocation gap still highlights the need for increased investment in the circular economy sector to fully realize its potential.

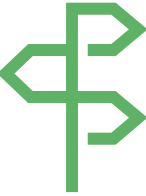
Declining Numbers of Newly Founded Circular Economy Start-ups

An emerging trend in the circular economy start-up landscape is the decline in the number of newly founded ventures since 2018. This decline poses a significant challenge to the continued growth and sustainability of the circular economy ecosystem. Termed the „start-up gap,“ this phenomenon signifies a disconnect between the availability of VC capital and the number of new entrants into the market.

THE START-UP GAP



Number of newly founded circular economy start-ups per year between 2010 & 2022. Source: Based on Tracxn database

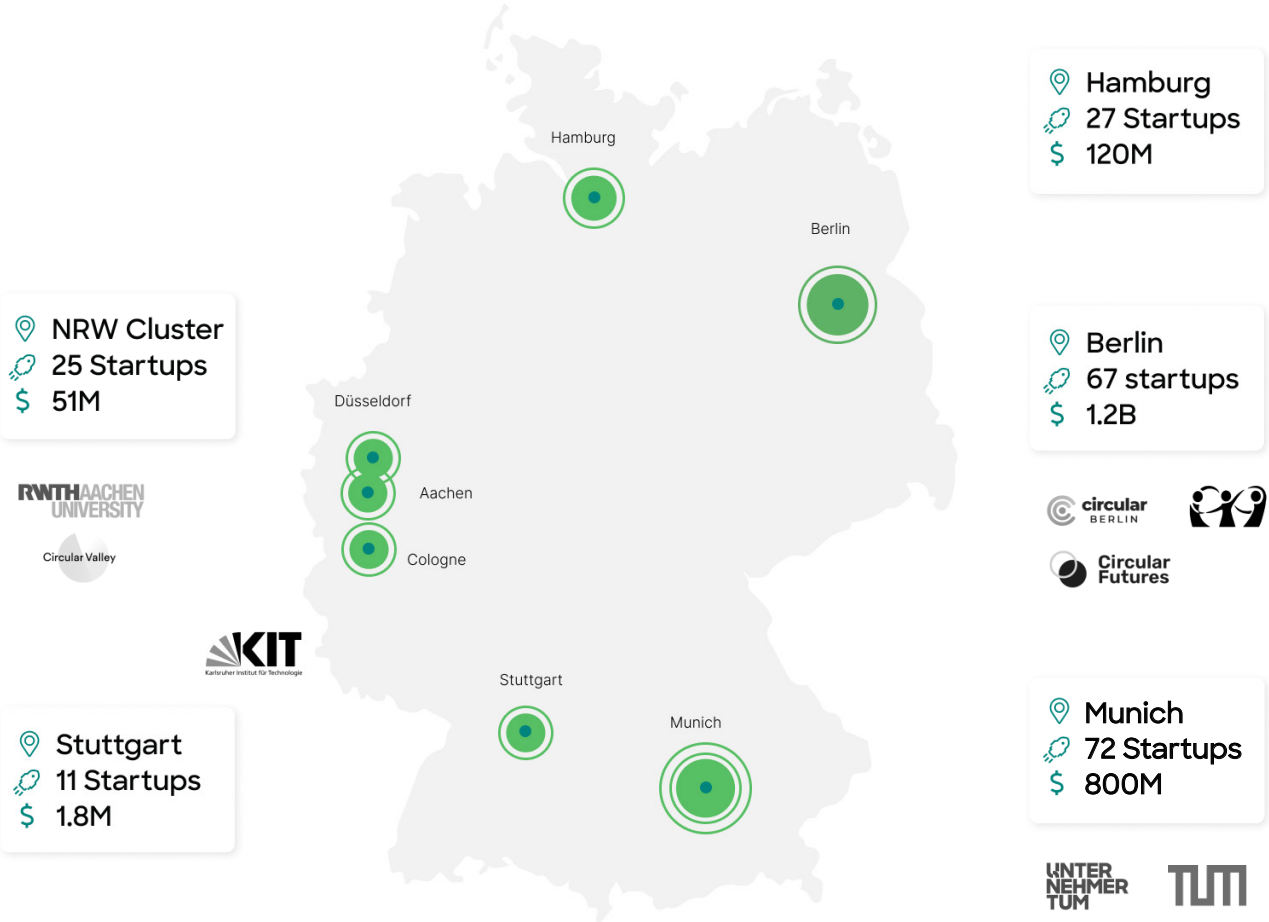


Heading in the Right Direction, Yet More Funding Needed

Despite the challenges outlined above, the overall trajectory of funding for circular economy start-ups is positive. The significant growth in investment signals a growing recognition of the importance of circular economy principles in driving sustainable economic development. However, to fully capitalize on the potential of the circular economy, greater investment is needed. The relatively low share of VC capital allocated to circular economy start-ups underscores the importance of increasing funding in this sector to accelerate innovation and scale existing ventures.

Circular start-ups thrive across Germany with 327 start-ups overall and Munich remaining the largest hotspot.

Germany boasts a vibrant ecosystem of circular economy start-ups, with a total of 327 ventures operating across various sectors. Munich, Berlin, and other clusters within the country have emerged as hotspots for circularity, attracting talent, investment, and support from a diverse range of stakeholders. These cities offer conducive environments for start-up growth, fostering collaboration, and providing access to resources and networks.



Circular economy hotspots in Germany. Source: CIRCULAR REPUBLIC Database; unicorns excluded

Impact of Ecosystems and Initiatives

Ecosystems and circular economy initiatives play a crucial role in fostering the growth of start-ups in Germany. In particular, initiatives like CIRCULAR REPUBLIC at UnternehmerTUM in Munich appear to have a positive impact on start-ups in the circular economy space.

The Munich Ecosystem: A Model for Circular Economy Start-ups

Munich remains the largest hotspot for circular economy start-ups in Germany, with a supportive ecosystem that propels the growth of new ventures in this space. The city's ecosystem is characterized by a combination of institutions of the municipality, strong corporate partners, impact investors, academia, and initiatives like the CIRCULAR REPUBLIC by UnternehmerTUM.

- **Municipalities:** The City of Munich actively promotes circular economy initiatives, particularly through the establishment of the Circular Economy Koordinierungsstelle (CEKS) and collaboration with relevant ecosystem players.
- **Corporate Partners and Investors:** Munich boasts a strong network of corporate partners and investors committed to circularity and innovation. These entities offer mentorship, funding, and partnership opportunities to circular economy start-ups, enabling them to scale and grow.



You feel that start-ups with a sustainable orientation are founded in the right area as initiatives such as CIRCULAR REPUBLIC and DLD Circular drive the integration of circularity within innovation ecosystems.

Barbara Bachus, exomatter



In Munich, there are favorable conditions for starting a business. Strong startups already work on „reuse“. By networking with them and using their great cases as role models, a snowball effect happens. It causes more founders to tackle this topic.

Doris Diebold, hey circle



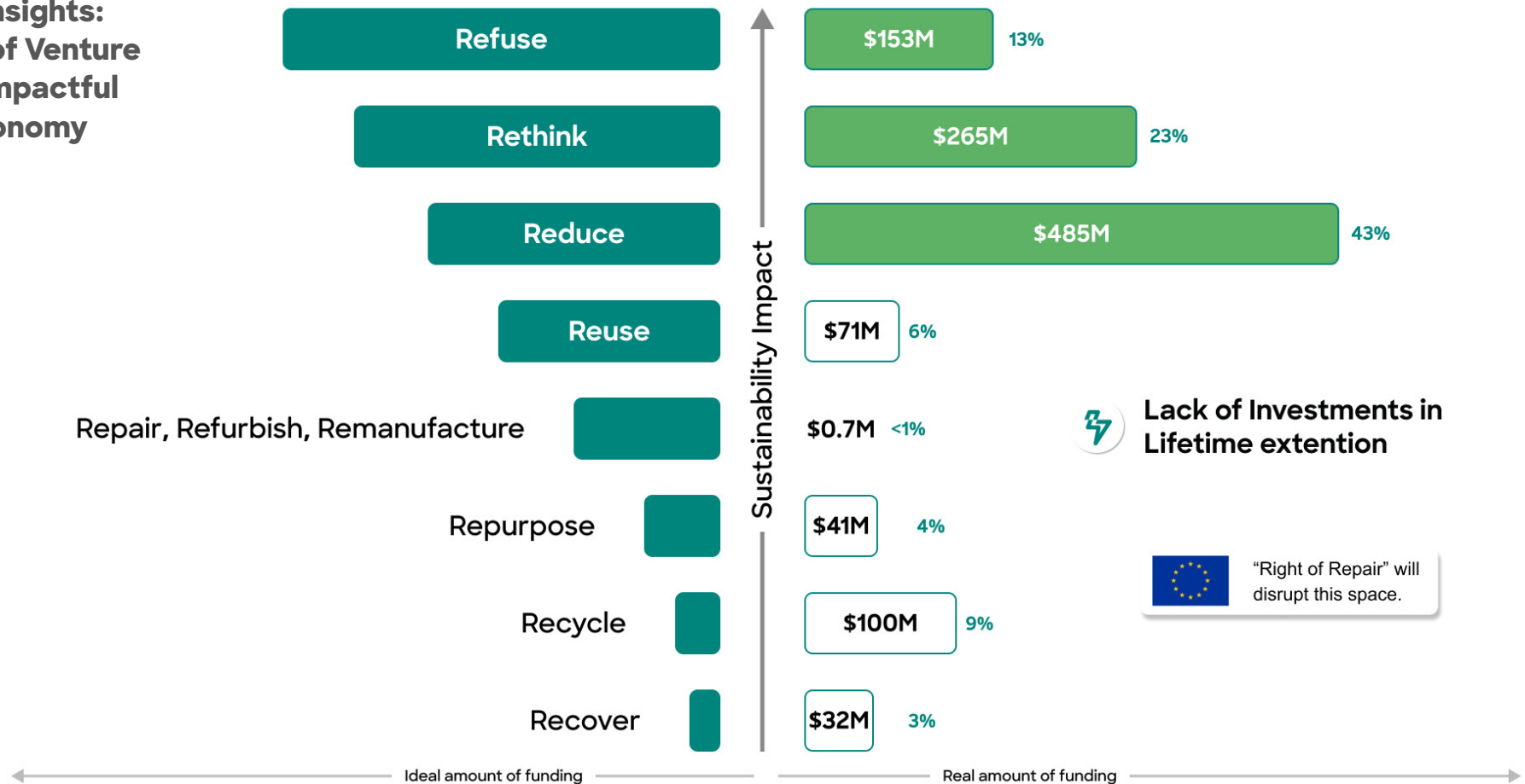
- **Academia:** Munich's universities and research institutions contribute to the development of circular economy start-ups by providing access to cutting-edge research, expertise, and talent. CirculaTUM as Germany's largest circular economy interdisciplinary research network drives collaborative initiatives between academia and industry propelling innovation and knowledge exchange in the circular economy space.
- **Institutions like TUM Venture Lab Sustainability & Circular Economy** as well as **UnternehmerTUM's CIRCULAR REPUBLIC** initiative specifically support circular economy start-ups through mentoring, networking, and access to resources.

Where does the Money Flow: Comparing Capital Allocation and Sustainability Impact

The majority of VC funding in Germany in the circular economy sector is allocated to impactful strategies such as Refuse, Rethink, and Reduce, aiming to minimize waste and maximize resource efficiency. These strategies often involve scalable, software-

driven business models like sharing platforms and product-as-a-service models, which offer innovative solutions to reduce consumption or optimize resource utilization.

Database Insights: Allocation of Venture Capital in Impactful circular economy Strategies



Capital allocation along R-strategies. Source CIRCULAR REPUBLIC Database (excluding outliers)



Database Insight: Funding Gap in Product Lifetime Extension

Despite the emphasis on higher-order circularity strategies, there exists a significant funding gap in models focused on extending product lifespans in order to slow the loop. This gap can be attributed to several factors, including the dominance of easily scalable software-driven business models in the Reduce and Rethink categories, which may overshadow investment opportunities in product lifetime extension.

Challenges in Funding Product Lifetime Extension / Slowing the Loop

Another challenge hindering investment in product lifetime extension models is restrictive intellectual property (IP) jurisdiction [6]. Start-ups entering the repair or refurbishment market face barriers related to accessing proprietary information, such as product blueprints and technical specifications. These barriers limit innovation and competition in the repair and refurbishment sector, discouraging investment in related ventures and putting OEMs at advantage.

Anticipated Impact of EU Legislation on the „Right to Repair“

The anticipated EU legislation on the „Right to Repair“ presents a significant opportunity to revolutionize the product lifetime extension sector. The legislation aims to enhance consumer rights by granting access to repair information, spare parts, and diagnostic tools for electronic and electrical products. This regulatory framework promises to level the playing field for Repair, Refurbishment, and Reprocessing models, enabling greater competition and innovation in the market.



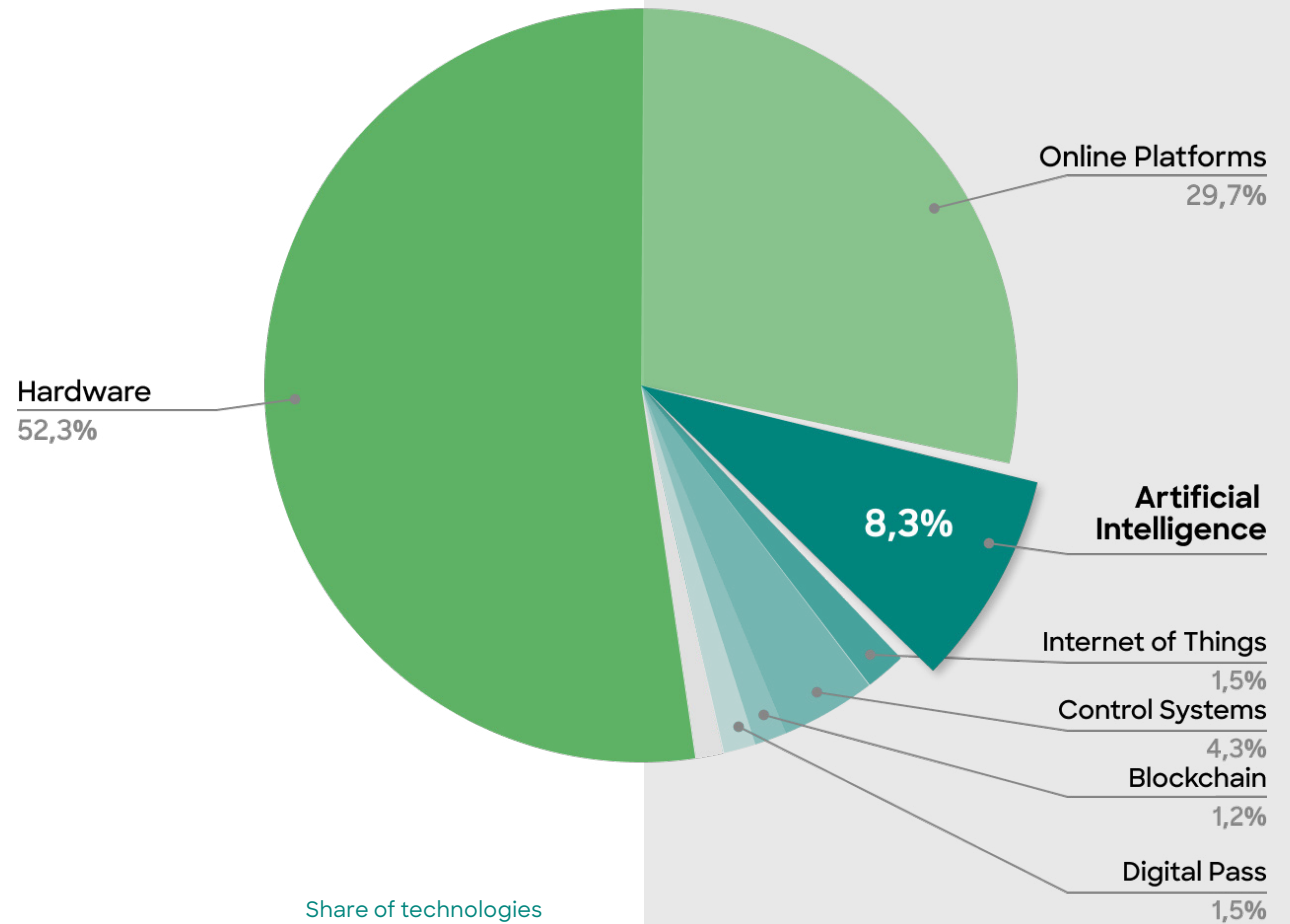
This might help to unlock market opportunities for repair, refurbishment and remanufacturing models.

Only 8% of Circular Economy Start-ups in Germany have a Business Model that is Driven by AI.

Artificial Intelligence (AI) holds immense promise for revolutionizing various industries, including the circular economy. However, despite the significant potential, only a small fraction of circular economy start-ups in Germany currently utilize AI-driven business models. This chapter explores the intersection of AI and circularity, highlighting the opportunities and benefits it presents for sustainability and business innovation.

Database Insight: Only few Start-ups Draw on AI-driven Business Models

In Germany, only 8% of circular economy start-ups have adopted AI-driven business models. This low adoption rate underscores the untapped potential of AI in the circularity space. While AI technologies have gained traction in other sectors, such as healthcare and finance, their integration into circular economy initiatives remains relatively limited.



Share of technologies relevant to start-up business models. Source: CIRCULAR REPUBLIC Database

Potential of AI in the Circular Economy

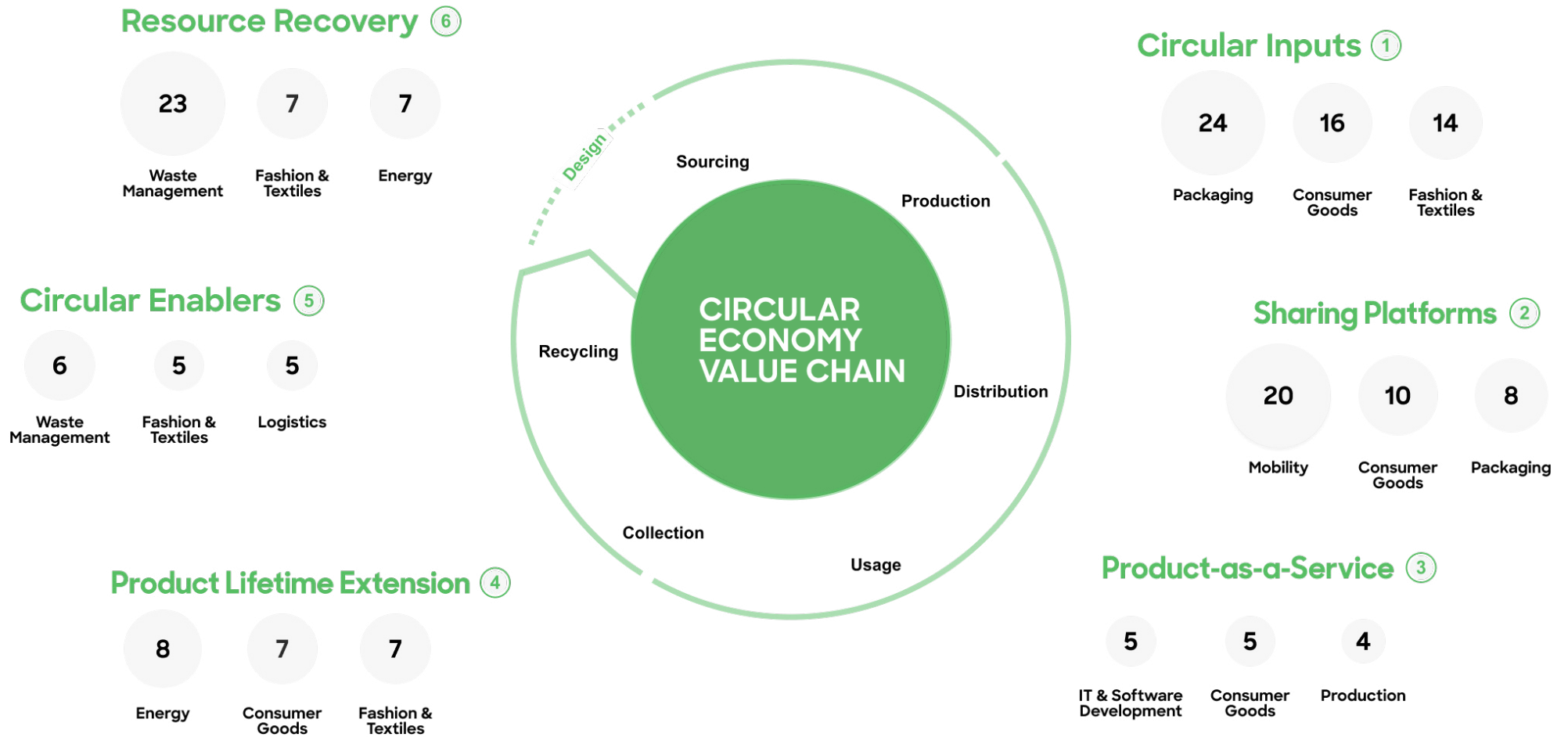
The combination of AI and circularity represents a powerful alliance with significant potential for driving sustainability and business innovation. AI technologies, such as machine learning and predictive analytics, can optimize resource utilization, improve waste management processes, and enhance supply chain efficiency in the circular economy ecosystem. Some of the most promising areas are:

- 1. Enhanced Efficiency:** AI algorithms can analyze large datasets and identify patterns to optimize resource use and minimize waste generation, leading to increased operational efficiency [7].
- 2. Predictive Maintenance:** AI-powered predictive maintenance systems can anticipate equipment failures and schedule maintenance proactively, reducing downtime and extending the lifespan of assets [8], [9], [10].
- 3. Supply Chain Optimization:** AI-driven supply chain optimization tools can optimize logistics routes, minimize transportation costs, reduce carbon emissions and help to predict resource flows including their quality and quantity [11].
- 4. Customer Insights:** AI-driven analytics can provide valuable insights into consumer behavior, preferences, and feedback, enabling businesses to tailor their products and services to meet customer needs more effectively and maximize product utilization [12].
- 5. Waste Management:** Computer vision algorithms can help to sort waste streams for example in the textiles or electronics industry leading to a higher degree of value retention and more high quality materials for recycling processes or the detection of hazardous objects such as lithium batteries in household garbage [13], [14].

The letters 'AI' are rendered in a white, outlined font. Two thin black lines extend from the right side of the 'I' and fan out to the right, framing a large green 'AI' graphic.A large, bold, green graphic of the letters 'AI' is positioned on the right side of the page. It is partially framed by two thin black lines that originate from the 'AI' text on the left and fan out to the right.

Circular Economy Start-ups Thrive in all Industries. These are the Top 3 Industries per Category.

There are clear trends within specific industries. For example, it is not surprising that the packaging industry focuses on circular inputs, while sharing models play a significant role in the mobility sector.



Top industries per circular economy business field. Source: CIRCULAR REPUBLIC Database



The Founders View

Hardware, Customer's Costs, and Resilience are Three Hot Topics in the Circularity Space.

In interviews with founders we have identified three critical topics shaping the discourse and strategies within the circular start-up space: Hardware, customer's costs and resilience.

Hardware



Technology-heavy CE-start-ups, don't be afraid of hardware

Customer's Costs



Focus on cost advantage in the scaled-up version of yourself

Resilience



B2B customers want supply chain resilience – build your service accordingly

Three hot topics in the circular economy start-up world.
Source: Based on CIRCULAR REPUBLIC Interviews



Hardware: Embracing Technological Foundations

Hardware serves as the cornerstone for facilitating the circular transition. After all, the circular economy is concerned with the flow of materials and not with software. However, hardware-intensive start-ups often encounter challenges in securing funding due to the capital-intensive nature of their endeavors and long development cycles. Nonetheless, founders emphasize the necessity

of embracing hardware solutions despite funding obstacles and stress that investors and VC's are increasingly willing to invest in hardware-driven start-ups. **Technology-heavy circular economy start-ups are encouraged not to shy away from hardware but rather to leverage it as a catalyst for tangible change.**

CHALLENGE



CHANCE



Circular start-ups with hardware technology require more funding than software-based equivalents.



Markus Johanning, Protegg



Compared to software, with hardware you have more technological aspects to burn your hands with and it usually doesn't scale as fast.



Fabian Eckert, Recup



There is a considerable number of VCs with investments and the expertise in CapEx-heavy ventures.



Dr. Gideon Schwich, Cylib



We see many investors entering the market and raising funds with an explicit CapEx focus on circular technologies.



Steffen Gerlach, eeden

Customer's Costs: Scaling for Cost Advantage

Circular economy start-ups can offer cost advantages over linear value chains, but realizing these benefits requires scaling up operations. As start-ups evolve, focusing on optimizing costs and efficiency becomes paramount to achieve

economies of scale. Founders stress the importance of **prioritizing cost advantages in the scaled-up version of their businesses** to deliver superior value to customers and solidify their competitive position in the market.

CHALLENGE



CHANGE



In the construction industry costs need to be cut. Circular alternatives that require a price premium, are currently dropped.



Mauricio Fleischer Acuña, HopfON



Within the plastic industry, investors are hesitant as recycled materials of high-quality are still more costly than virgin materials.



Christian Schiller, Cirplus



We are circular enablers, helping clients to save cost and time.



Barbara Bachus, exomatter



Reused, second-hand products are on average 50 to 70% cheaper compared to new ones.



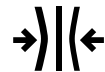
Evoléna de Wilde d'Estmael, faircado

Resilience: Meeting B2B Demands for Supply Chain Resilience

Supply chain resilience emerges as a key focus for circular economy start-ups along the value chain. B2B customers increasingly prioritize resilient supply chains, prompting founders to align their

services accordingly. Recognizing the significance of resilience, founders are encouraged to build robust supply systems and processes capable of withstanding disruptions and uncertainties.

CHALLENGE



CHANGE



Supply chain risks for electronics are a central challenge for us.



Fridolin Franke, Solar Materials



When building pilot lines or new plants, we are severely affected by supply chain disruptions.



Dr. Gideon Schwich, Cylib



We want to build a platform that enables a circular business and secures access to raw materials. This is directly linked to saving costs.



Gary Lewis, Resourcify



Companies have realised that we need different models to achieve material resilience and independence.



Markus Johanning, Protegg



The Investors' Lens

After a founder's perspective on the latest developments in the field of circularity, the following section presents the investor's lens from *better ventures*.

better ventures: the impact angel club uniting Europe's strongest entrepreneurs investing in circularity start-ups.

better ventures is on the mission to create Europe's leading ecosystem for impact start-ups - for people and planet with **circularity solutions being on top of better angels' minds!**

Out of currently 39 companies, **a high share of better ventures portfolio pays into the circular economy** - new start-ups joining every month.

+70 better angels

100% experienced entrepreneurs

+60 companies built

+25 industry backgrounds

+25% female entrepreneurs

+650 previous start-up investments



Circularity

Top 2
focus vertical



With its novel investment model, *better ventures* is not tied to a fixed investment area, but can flexibly adapt its focus to the latest investment interests of its business angels. According to their recent angel survey, *circularity and resource efficiency* was identified as one of the top 3 focus verticals (2nd after *energy* and ahead of *health*). This is also reflected in their investments to date, with a significant 31% of the *better ventures* portfolio allocated to circularity start-ups, demonstrating the angels' interest in accelerating the transition to a circular economy and underlining the role that investors can play in nurturing start-ups that follow circular economy principles, thereby facilitating positive environmental impact.



Extract of *better ventures*' investment criteria

Identifying the most ambitious founders and promising innovations early, requires clear investment criteria.

better ventures aims to become Europe's leading early-stage impact investor by continuing to back 1-2 impact start-ups per month and is ready to accelerate promising start-ups driving the transition to a circular economy. Impact-driven angels therefore look for both exceptional team compositions and business models combining impact and return.

Personality traits and team composition analysis help pave the way for success.

Early-stage investing is similar to recruiting high-performing teams. With their angels having recruited 100s of them, *better ventures*' evaluation of start-up teams hinges on a multifaceted approach that delves deep into both founder team properties and personality traits. They want to see that the founder is passionate about the problem they're addressing and the product they're building, as well as their willingness to collaborate closely and culturally fit within their ecosystem. Accumulated relevant job experience and

fair share ownership are also key considerations, along with a complementing skill set that positions them for success in their industry. Furthermore, diversity, not only in terms of skills but also personality and gender, is crucial for fostering innovation and resilience within the team. Traits like openness to advice, a growth mindset, adaptability, and strong communication skills are equally essential, along with the presence of at least one decisive and independent decision-maker.



Assessment can be supported by data-driven personality profiling tools such as *Predictive Index* which enables users to gain insights into the composition and dynamics of the founder team. Based on the data input, a discussion with the founder team helps to develop a deep understanding of team dynamics. Moreover, the tool helps to mitigate unconscious biases to ensure fair evaluations that truly reflect the potential of the start-up team.

Apart from the founder team, clear investment criteria are applied

To screen and source early-stage circularity start-ups, several clear criteria are applied, such as:

- **Problem:** The founder team should tackle a substantial problem for the target customer. While the solution is important, it can and probably will be pivoted in some way throughout the start-up journey. Hence, a strong pain point is crucial.
- **Innovative technologies:** *better ventures* prioritizes companies leveraging defensible tech and teams with a clear competitive advantage.
- **Impact potential:** Evaluation of the start-up's impact potential is important to estimate its long-term effects, enabled by transparent measurement and reporting.
- **Market demand and scalability:** Assessing market demand for circular products/services and evaluating scalability potential to gauge customer reach.
- **Profitability and financial viability:** A business should be capable of generating revenue and achieving profitability while promoting sustainability.
- **Traction:** Even in early-stage investing, a startup's first traction should prove product-market fit and companies developing alongside the customer are favored.

Developments in a circular economy deal flow

To get real-life insight into what an early-stage investor currently sees in the circularity landscape, *better ventures*' circularity economy deal flow was analyzed with a focus on only start-ups founded in Germany.

Looking at *better ventures*' circular economy deal flow, the current development aligns with their preference for gender-diverse founding teams.

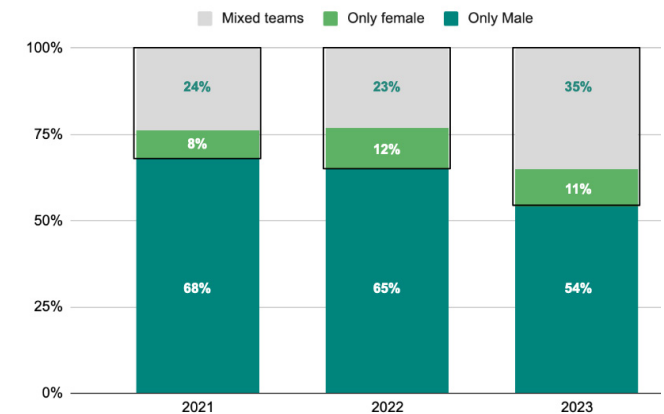
Delving deeper into the topic of founder teams, diversity and complementary of founder team composition is a relevant investment criterion, which can manifest in various dimensions, including gender diversity. For some business angels, gender diversity is indeed a strict investment requirement. Studies demonstrate the positive impact diversity has on company success [15]. Therefore, *better ventures* has implemented a quota: at least 30% of their investments should be directed towards founder teams with at least one female founder (currently 35.9% of the start-ups *better ventures* invested in have at least one female co-founder).



I prefer to invest in mixed gender teams as statistics show that founding teams with at least one female founder are more successful. For me, gender diversity is a crucial investment criterion.

Marko Vogt, *better ventures*

Looking at *better ventures*' deal flow over the past few years, it can be observed that while founding teams remain predominantly male, with over 50% in the previous year (2023), the proportion of teams with at least one female co-founder is on the rise. In 2021, this proportion stood at 32%, increasing to 46% in 2023. However, mixed-gender teams thereby significantly outnumber purely female-led teams.

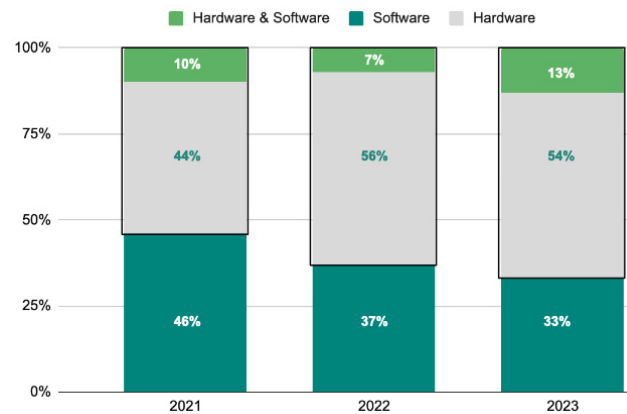


Gender composition in founder teams of *better ventures*' circularity startups; Source: *better ventures* deal flow

Early-stage circular economy start-ups seem to shift more towards hardware instead of relying on digital solutions.

Industries such as carbon capture and storage (CCS) and waste management demonstrate that hardware technologies are indispensable for the transition to a circular economy. This seems to align well with a noticeable start-up trend towards hardware innovation within *better ventures*' deal flow.

In 2021, software start-ups comprised 46% of all circular economy start-ups, dropping to 33% in 2023. Last year, 67% of circular economy start-ups were based on a hardware component. This suggests that the market seems to learn that with circularity revolving around materials, hardware innovation is needed to drive a circular economy, i.e., software / digital solutions are often dependent on physical technologies.



Hardware/software composition of *better ventures*' circularity startups; Source: *better ventures* deal flow

This shift poses important implications for *better ventures* and fellow investors. Whereas the traditional investor mantra favoring quick scalability and minimal capital investment for quick returns resulting in a preference for digital products and B2B SaaS models, the paradigm is now challenged. Hardware start-ups require more capital for development and industrialization, thus increasing the funding risk. This development calls for alternative financing avenues such as grants and debt. Hardware start-ups, for instance, have enhanced opportunities for government funding and should incorporate this into their financing strategies. Moreover, investors may need to reconsider existing investment models and be more courageous in financing until the start-up generates substantial revenues.



Hardware innovation is crucial for the transition to a circular economy. Yet HW startups face funding risks due to higher capital needs, calling for innovative ways of financing and courage of investors.

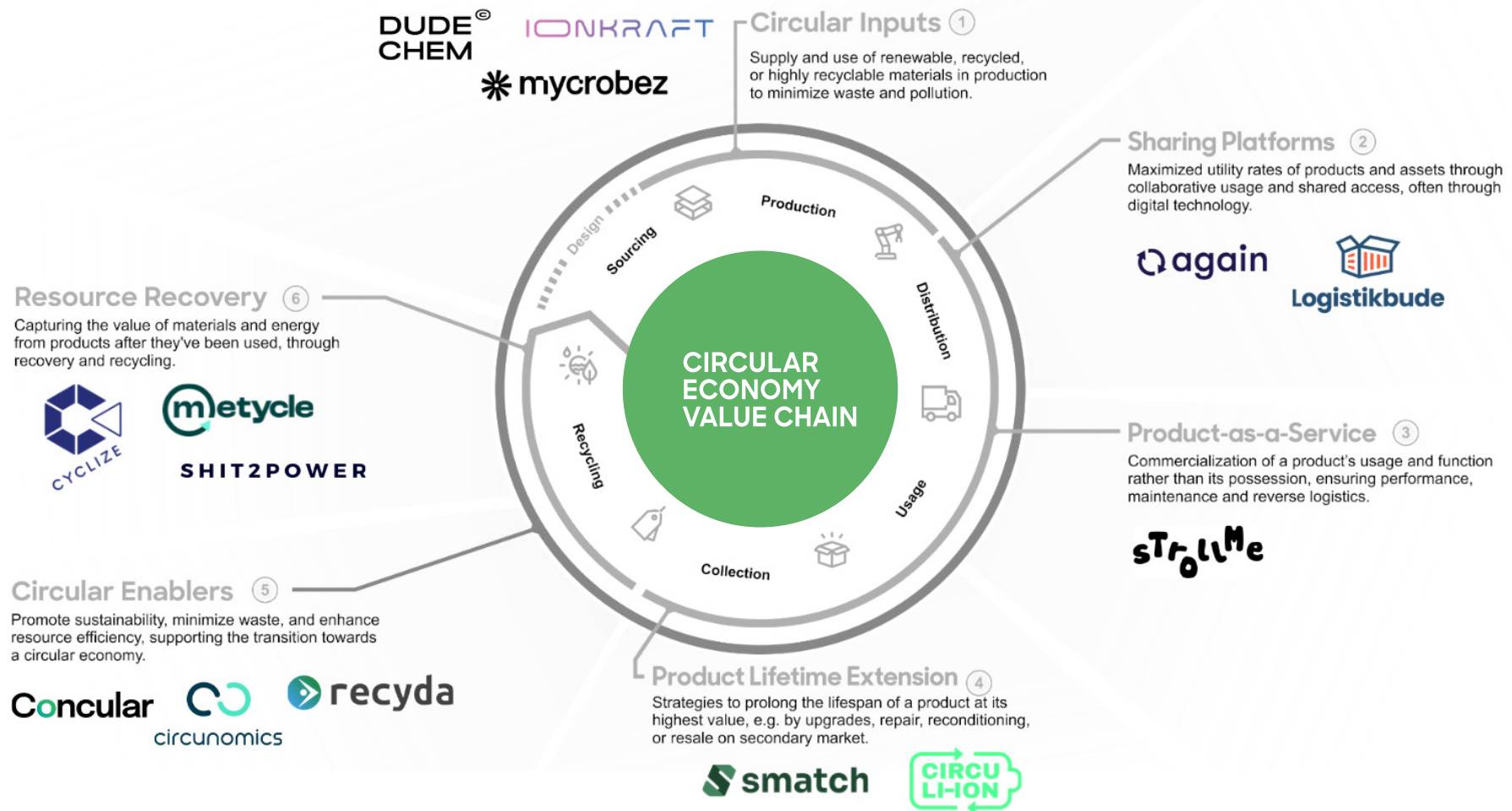
Gwendolyn Schröter, *better ventures*

Startup Spotlights

Who is flying under the radar? Putting hot pre-seed and seed circular economy start-ups of 2024 to watch on the map.

Based on the presented investment criteria and current focus segments in the circularity space, *better ventures* came up with an outlook for start-ups to watch in the near future. The selection criteria were based on investment principles, insights from expert sessions with business angels from the circularity space, and findings from this report. Focusing on the European market and early-stage start-ups (max. seed funding round

closed), these ventures address highly relevant industries, markets, and use cases with significant demand and impact potential. They utilize innovative technologies such as AI on the software side and circular energy generation methods on the hardware side. Additionally, signals such as substantial traction in terms of revenues, pilot projects or already granted patents and interest from other investors have been taken into account.



Radar map for promising circularity start-ups; Source: *better ventures*



When it comes to circular input and recycling hardware, I look for solutions that show signs of early profitability and scalability potential. I must also recognize to what extent I can guide a startup with my expertise.

Daniel Winzent, *better ventures*



Especially in Germany, we're equipped with the technology and expertise to keep existing products and precious resources in our circular lifecycle. My focus as an investor is to back solutions that extend the usage of products without high capital intensity.

Thomas Gros, *better ventures*



To highlight a few examples:

- **Mycrobez:** The hardware start-up categorized into *circular inputs* was founded by a young team from Switzerland who are developing an alternative styrofoam based on organic waste and mycelium. Their application spans packaging, construction, and agriculture, aiming to demonstrate scalability and material properties comparable to petroleum-based EPS, while also mitigating supply chain risks through feedstock diversification.
- **Concular:** The PropTech software start-up classified as a circular enabler focuses on the construction industry, responsible for 38% of global greenhouse gas emissions [16]. Founded by a complementary team with strong academic backgrounds, their solution helps stakeholders in the construction and real estate sectors in circular building challenges for new and existing buildings, preserving property value and demonstrating that impact and return can go hand in hand.
- **Cyclize:** The resource recovery start-up spun off from research at University of Stuttgart, helps to close the value chain to a circular carbon economy. Their plasma technology enables the conversion of plastic waste into new chemical intermediates that can be used directly to manufacture new products. This process helps companies to produce plastics in a CO₂-neutral or even -negative way.



Highlighting *better ventures'* circularity portfolio companies on the following pages



Re-engineering the global food system with Mycelium-based alternative protein, enabled by extremely fast and efficient production without resource loss.

Founding year: 2019
Industry: Food
Total funding: EUR 2.8M
Impact KPI kg CO₂ avoided,
L water saved

Sourcing & Production

Why did we invest in them?

The team has a strong industry background, giving us confidence that they can scale a plant-based product to compete with conventional animal protein. This circular model challenges the status quo with more accessible quality sustainable protein.

What makes this business circular?

Kynda offers a biotechnology system to enable decentralized mycelium fermentation. They promote circular practices with a regenerative plant resource as input, heat storage to retain energy used and repurposing run-off water with valuable enzymes.

What market opportunities are there for the team?

With the current decrease in VC funding, especially for BioTech businesses without revenues yet due to technological development, Kynda's zero-waste approach offers an advantage of re-used resources to enable a growing number of plant-based initiatives. They already produce at scale, generate sales and do not require novel foods approval.

Their take: role of startups in the CE transition

Startups must lead the way with innovations because industry readiness for change is currently still met with significant resistance, as decision-makers are not taking bold enough steps towards a circular economy.



A business is only sustainable when it is circular. As soon as you create waste, you lose efficiency.



Franziskus Schnabel

#1
PORTFOLIO
SPOTLIGHT



Safe and future proof medical grade bioplastics for MedTech, lab & pharma applications.

Founding year: 2021
Industry: Health
Total funding: EUR 3.6M
Impact KPI kg CO₂ emissions avoided

Sourcing & Production

Why did we invest in them?

The team is the first to make sustainable plastics available for the health-care sector and were already able to gain a significant share in a difficult market because of that. Their scientific background gives us confidence offering a competitive product.

What makes this business circular?

BIOVOX uses biobased, recycled and recyclable materials, considers the entire value chain and focuses on future-proof materials to comply with long-term regulations. This approach is crucial in the MedTech sector due to its extended product cycles.

What market opportunities are there for the team?

Pending material bans plus sustainability regulations in the EU and beyond, like CSRD and Packaging Directive, provide the opportunity to gain market share and accelerate momentum. On the flip side, VC funding in the industry is difficult to secure as VCs are averse to long sales cycles and often require a series production stage, so they had to bridge with angel and public funding.

Their take: role of startups in the CE transition

Greater credibility with no fossil legacy, faster execution accompanied by a high willingness for risks and greater freedom of choice for materials without restrictions by existing production facilities.



The question is not whether circularity will come, but rather a question of how quickly it will.



Carmen Rommel

#2
 PORTFOLIO SPOTLIGHT



Germany's leading provider of baby carriages and children's bikes in the subscription sector, making premium children's products more accessible.

- Founding year:** 2020
- Industry:** Consumer Goods
- Total funding:** USD 4.9M
- Impact KPI** kg CO₂ avoided, #yr lifetime extended

Distribution & Usage

Why did we invest in them?

B2C rather than P2P model with a high potential for lean business scaling as a SaaS solution. The team chose a specific focus area as their target group to capitalize on the fact that baby products are typically not needed for continued use.

What makes this business circular?

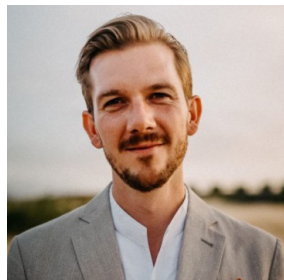
Enable the extension of product use with great flexibility and cost-effectiveness by renting items like strollers and baby carriers. After each use, the products are refurbished and rented out again, maximizing their lifespan and minimizing waste.

What market opportunities are there for the team?

Their business has many opportunities for expansion as their model applies to a vast scope of products. Especially as parents' first point of contact, StrollMe has the potential to extend their services throughout the entire growth of a child.

Their take: role of startups in the CE transition

Shift in product manufacturing with interchangeable parts for easier reparations and offering the same standard for products as in a linear economy to achieve a tangible mindset shift of consumers.



Circular business models only work, if the consumer demand for them is also there.



Sebastian Reichelt

#3
PORTFOLIO
SPOTLIGHT



B2B SaaS solution focused on creating digital twins of reusable assets like pallets, containers, and racks, helping companies optimize their operations and save costs.

Founding year: 2021
Industry: Logistics
Total funding: EUR 2.2M
Impact KPI # of newly produced assets avoided

Distribution & Usage

Why did we invest in them?

Their asset-light product allows for high scalability and a unique initial standing point of no substantial competition, allowing for market leadership potential. Plus, the founders' many previous years working together provides a solid team foundation.

What makes this business circular?

Avoiding the reproduction of reusable objects by deploying existing ones more effectively and keeping them within the circular value chain.

What market opportunities are there for the team?

Any major corporation is involved with logistics. Logistkbude's goal is to reach no more single-use in B2B. They will continue to expand into a range of assets from a coffee cup to cargo bikes to pallets and beyond.

Their take: role of startups in the CE transition

Innovation and pushing boundaries by challenging established players to adapt their practices. They can only stand a chance if they keep price parity with linear solutions.

#4 PORTFOLIO SPOTLIGHT



Reusable systems have to work just as well as disposable systems for customers to want to use them.



Philipp Hüning



MEINE ERDE

An ecological burial alternative that fulfills the wish of many people to remain in the cycle of nature.

Founding year: 2020
Industry: Death care
Impact KPI kg CO₂ avoided

Recycling & Regeneration

Why did we invest in them?

Well-positioned team with previous founding experience, tapping into a market that inevitably affects everyone. As the very first alternative to cremation and earth burials, Meine Erde displays high defensibility, already from the start with the proven success of their prototype.

What makes this business circular?

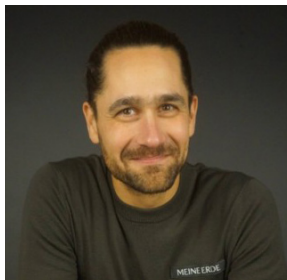
Leveraging tech and biodegradation principles to decompose a corpse into soil without the use or release of toxins or fossil fuels. Furthermore, this startup catalyzes systemic change by directly influencing societal mindset shift around burials and thus, redesigning old-fashioned policies.

What market opportunities are there for the team?

As there is a consistent and everlasting demand for burials, Meine Erde can expand beyond Germany into other global markets. After first successes in direct influence of German policy change, the team will challenge further current restrictions for more widely accepted innovations.

Their take: role of startups in the CE transition

Startups must show courage and resilience with their innovations. Likewise, it is important for investors to share this courage in investing in new ideas and technologies for society's greater good.



Ultimately, where we dare to do something, we can only win!



Pablo Metz

#5
PORTFOLIO
SPOTLIGHT



Greenlyte

Low energy direct air capture approach via electrolysis to capture CO₂ while generating hydrogen as a byproduct.

Founding year: 2022
Industry: Carbon Removal
Total funding: EUR >20M
Impact KPI kg CO₂ captured

Recycling & Regeneration

Why did we invest in them?

Team setup of strong technical expertise and serial entrepreneurship with a product that is vital for combating climate change. They stood out because of their ability to capture CO₂ at the highest possible concentration with less energy usage than other players.

What makes this business circular?

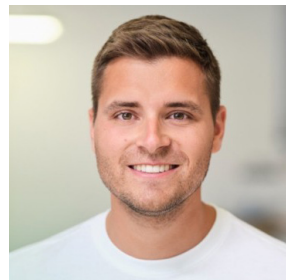
GCT's extraction of the raw materials H₂, O₂ and CO₂ from the air enables their reentry into the circular value chain. Applications include the green fuels, e.g. for aviation, as well as carbon storage to create negative emissions.

What market opportunities are there for the team?

CDR is a large market and will continue to grow as carbon removal is a necessary counterpart to emission mitigation efforts globally to minimize atmospheric CO₂. The team will focus on carbon storage and utilization as they scale.

Their take: role of startups in the CE transition

Startups have a unique position freedom in testing different innovations with a concentrated team, amount of funding and time. Compared to large companies with legacies, startups are more agile to lead the way in a green economy transition.



As a startup, we look to hire people with a great passion for the problem, a strong sense of urgency, and the courage to even fail with us.



Florian Hildebrand

#6
 PORTFOLIO
 SPOTLIGHT



Outlook

“**Either** our future will be circular **or** there will be no future.”

In closing, the authors would like to express their sincere gratitude to all the individuals and organizations who contributed their time, expertise, and data to this report. We hope that it inspires action in many ways - be it in investments, job matching, new business relationships or even new start-up foundations.

We look forward to building on this foundation and releasing the next edition of the Circular Economy Startup Landscape at the **CIRCULAR REPUBLIC FESTIVAL** on May 22-23, 2025.

On behalf of the full team

Leonhard Teichert

Program Manager CIRCULAR REPUBLIC

- **Janez Potocnik**

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The authors have benefited from the insight and contributions of countless start-up founders in the field of circular economy.

More information

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