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Circular Models for Cities & Regions

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Summary

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Introduction

Introduction and objectives of the Roadmap report

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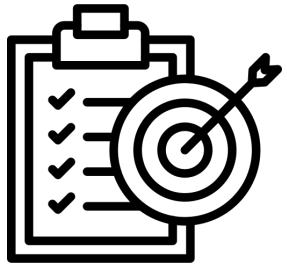
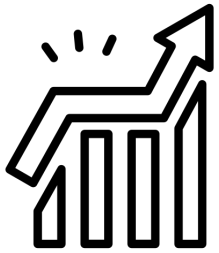
This report was developed as part of a broader initiative to identify and capitalize on market opportunities within the **Circular Models for Cities & Regions** sector. The report serves as a guide that maps out the market potential, challenges, and strategic actions necessary for the successful scaling of businesses in this sector.



The primary goal of the Circular Models for Cities & Regions Roadmap Report is to equip companies and stakeholders within the industry with the knowledge and tools needed to navigate the transition **towards more efficient, sustainable, and competitive market positions**.



Main function of the report is to highlight opportunities that the participating start-ups may have not recognised. It provides a structured approach to understanding market dynamics, customer needs, and emerging trends, thereby helping businesses position themselves effectively in the evolving marketplace.

Overview of the Participants

Ventures

Following the evaluations by the selection panel, 11 of the most promising European ventures in Circular Models for Cities & Regions were chosen through a competitive process. Companies were selected based on leadership potential, product/technology strength, market opportunity, go-to-market strategy, and business clarity.

AraBat

Reusing fruit and vegetable waste to recycle spent lithium-ion batteries and e-waste

BIO FASHION TECH

Pioneers in recycling of mix natural and synthetic fibres

BIOSPHERE SOLAR

We strive to make solar energy circular and fair by providing open-source, refurbishable and recyclable solar panels.

BLUEPLASMA POWER
Enabling circularity and decarbonisation

Blueplasma Power converts WASTE that nowadays are going to landfilling or incineration into ULTRA-LOW CO2 FOOTPRINT CHEMICALS.

Circular11

Circular11 turns low-grade plastic waste into building materials and home products, in order to create an end-market for the contaminated and film-based plastics that make up between 50 and 80% of global packaging waste.

untuvia

Untuvia is developing pioneering technology and building an infrastructure for down recycling at scale.

Greentech Innovators

Greentech Innovators are using biotechnology to process food waste and other organic waste streams into single cell protein and organic fertilizer to be used for microalgae production.

N1 Circular GmbH - Our Software-as-a-Service solutions help companies to identify and market materials for reuse and upcycling on and off construction sites, while reducing their environmental footprint.

Refresh

Transforming Textile Waste into Sustainable Materials with Local Microfactories

rewin

Rewin delivers cost effective, energy saving fiber-to-fiber recycling of polyester with ground breaking technology.

tozero

tozero GmbH is on the mission to challenge the status quo of lithium-ion battery recycling technologies and accelerate the decarbonization efforts.

Market opportunity Stakeholders

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Network partners

Atlan - The Nature-Tech Venture Studio

chemstars.de

Circular Valley

circuly GmbH

Deloitte

36 Growth Marketing

Moscarda consulting

nexustransform.com

Nitro Games Oyj

The People's Trust

Zero Waste Europe

Lead Customers

A2A S.p.A.

D²XCEL www.d2xcel.eu

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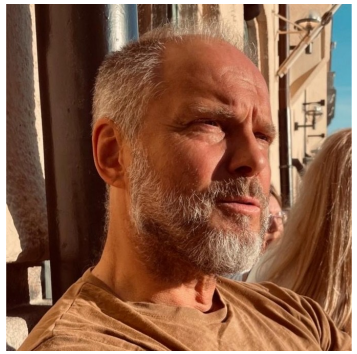

Antti Ainamo
University of Tartu

Caterina Crippa
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A2A

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Methodology

Starting point

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We state here some of the underlying assumptions and 'facts' about the Circular Models for Cities and Regions sector that serve as the basis and context of this analysis.

- **Resource Efficiency and Sustainability**: The primary goal of circular models is to enhance resource efficiency and sustainability. It is assumed that circular models aim to minimize waste, reduce consumption of finite resources, and promote renewable energy.

- **Waste Generation**: Cities and regions collectively generate significant levels of waste, which have vast implications for local and global ecosystems. Effective circular models aim to reduce this through various reuse, recycling, and upcycling practices.

- **Urbanization Trends**: Increasing urbanization puts pressure on existing infrastructure and resources, making the adoption of circular models more pertinent to handle the expected growth sustainably.

- **Economic Impact**: Circular models have the potential to create new economic opportunities, including green jobs and innovative business ventures, while reducing reliance on imported raw materials.

- **Global Movement**: The circular economy is part of a broader global movement towards sustainability, influenced by international agreements and commitments, such as the Paris Agreement and the United Nations Sustainable Development Goals (SDGs).

Methodology

- 6 in-depth interviews were conducted with industry stakeholders using an AI tool to extract expert opinions across the following categories:

1. *Market trends and opportunities*
2. *Challenges and needs in sector*
3. *Key technologies and technology infrastructure*
4. *Competitive structure of sector*
5. *Risks for start-ups*
6. *Customer segments and distribution channels*
7. *Scaling and growth*
8. *Roadmap, i.e. evolution of sector*

- Surveys: Collected 10 survey responses to gather initial insights. The survey included 11 structured questions.

- Challenges queries for start-ups: We collected challenge statements from applying start-ups, and organized them by Market Opportunities and category, and analysed the interviews for expert insights for these categories of challenges.

- The gathered data was analyzed by focusing on key categories, identifying strategic opportunities and potential barriers. The analysis provided a comprehensive view of the sector, enabling the development of targeted insights for growth and scalability.

6 Stakeholder interviews

10 Survey respondents

27 Stated challenges by applying start-ups analysed

Validation

Total of 20+ Participants

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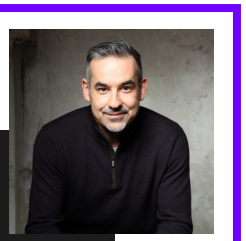
Results, Insights, Roadmap

Opportunities, Market trends: Flexibility from subscription models, reuse and refill –systems, as well as from resource recovery. (1)

There are several current market trends and opportunities regarding circular models for cities and regions. **Subscription-based access** to physical products is gaining traction as part of circular business models. This addresses consumer interest in avoiding ownership and supports sustainability. Innovations in **reusable and refillable systems** are identified as high-value opportunities in the sector, with unmet needs in scalable solutions for packaging and logistics. Emerging technologies like IoT, AI, and robotics present opportunities for cities to enhance **waste management and resource recovery**. **Circular manufacturing** using recycled materials and urban-focused circular practices are discussed as future directions. Yet, there is a need to **engage civil servants** in adopting innovative solutions to overcome administrative inertia.

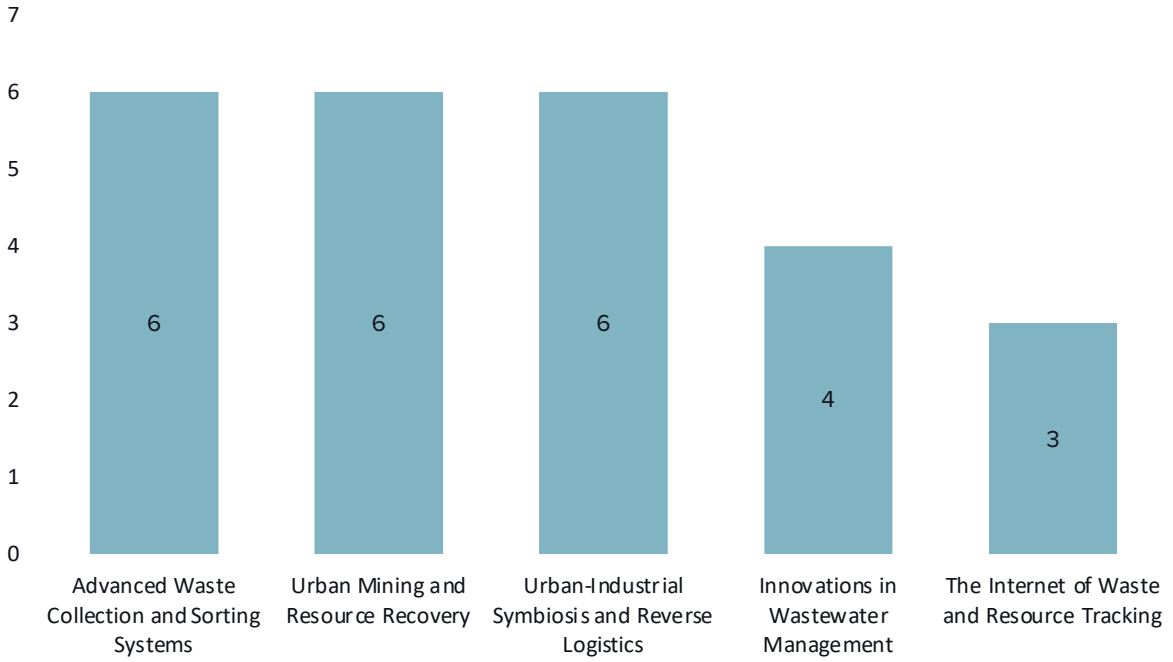


Scott Galveo

CEO, Circuly

" Up until now, there has not really been a software which adequately offers product sellers a good way to track, scale, and really grow their subscription business. And even if there were options of doing this, they were not easy to use. "

Which of the following market trends do you believe are most important for startups in the area of circular economy models for cities and regions?



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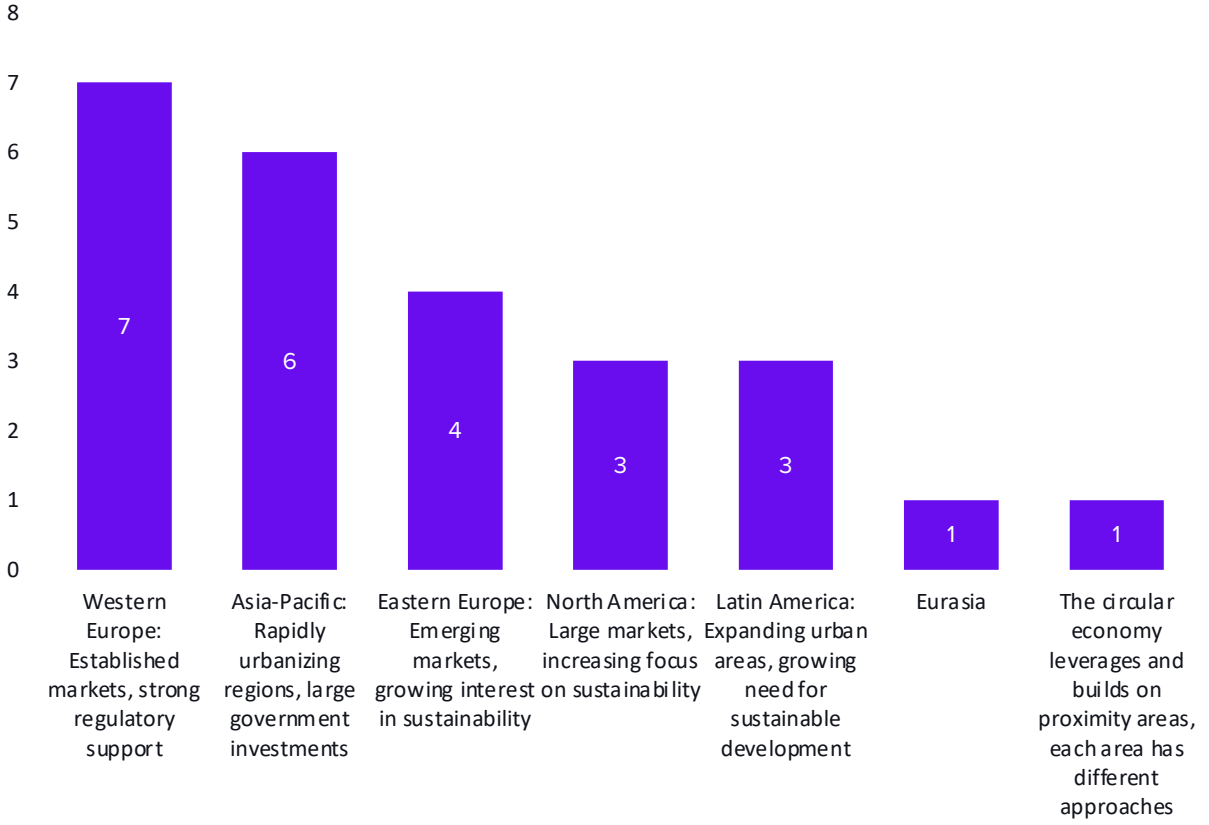
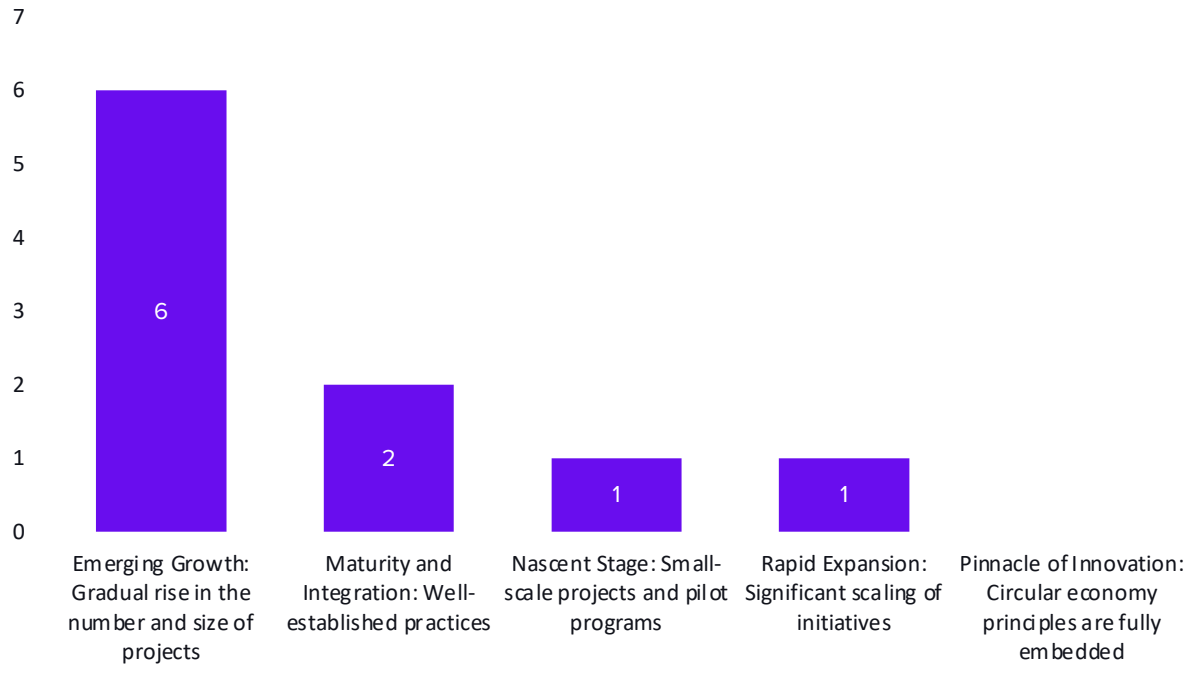
Opportunities, Market trends: Flexibility from subscription models, reuse and refill –systems, as well as from resource recovery. (2)

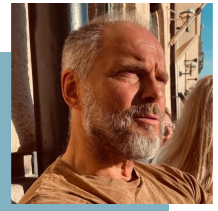
In terms of geographic markets, where do you see the greatest opportunities for European start-ups for growth in the area of circular economy for cities and regions?



What is the state of the area of circular economy for cities and regions currently in its long-term evolution?



Technology: New solutions for circular models rely extensively on software-based technologies



Antti Ainamo

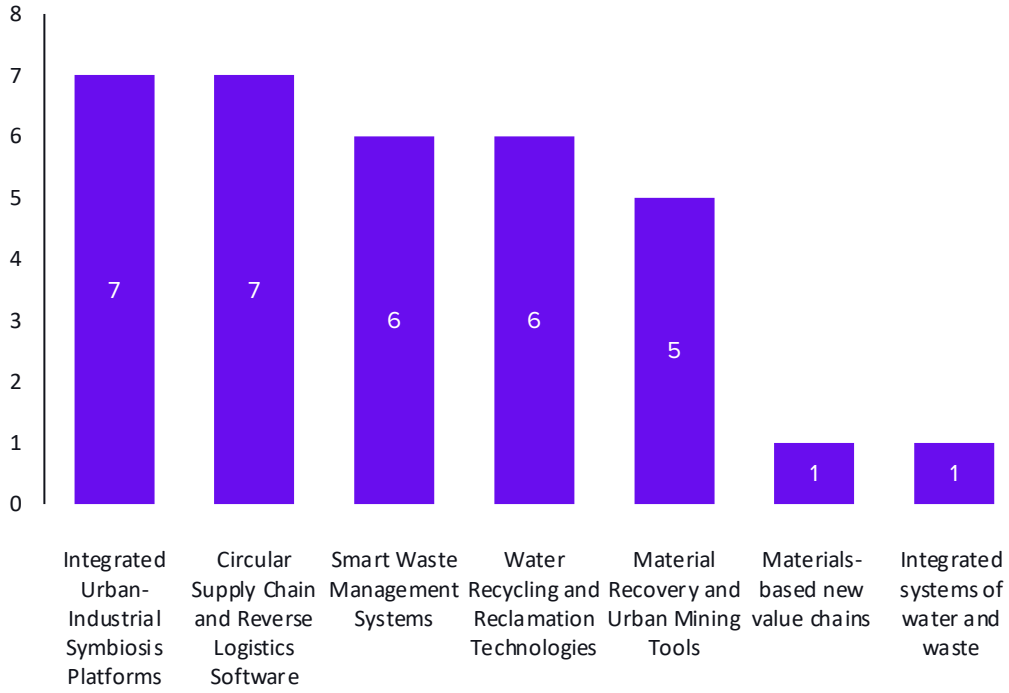
Associate Professor, University of Tartu

"I don't think there's so much legacy technology that has to be phased out to collect garbage. I think there will rather be one technology stacking on top of another."

These technologies are consistently highlighted as transformative tools for advancing waste management, material recovery, circular supply chains, and sustainable product lifecycle practices.

AI and Machine Learning	AI can improve sorting, recovery rates, and predictive analytics for resource optimisation
IoT and Smart Sensors	IoT enables real-time tracking of waste, materials, and products, improving circular supply chains
Blockchain	Blockchain ensures traceability of materials, making it easy to verify recycled content and carbon credits
Robotics and Automation	Robotics improves sorting efficiency, precision recycling, and disassembly of electronics & construction materials
Bioengineering and Circular Material Innovations	Biotech is creating biodegradable & regenerative materials, reducing reliance on non-renewables
Digital Platforms and Mobile Applications	Mobile-based waste tracking & collection platforms (e.g. apps for coordinating informal waste pickers)

What technology needs are critical for the future in the area of circular models for cities and regions?



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Scaling: Circular economy is a growth area where the legacy challenge is less with technology and more with administrative processes (1)

There is significant potential for growth in circular economy models, yet there are barriers such as **legacy administration** and the **need for education** to foster broader acceptance of circular models. Key insights:

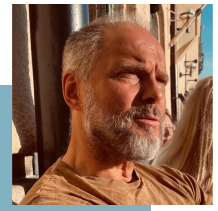
Critical resources for growth: Emphasis on early customer bases, networking, and reverse logistics infrastructure.

The role of technology: AI, IoT-enabled systems, and software solutions, can facilitate scaling in circular businesses.

Consumer trends and regulations: A trend towards access over ownership, while regulations are becoming more stringent.

Importance of transparency and results: Growth potential depends on transparency and results-orientation of municipalities

Overall potential for transformation: Much potential for growth, as much is still linear but can go circular

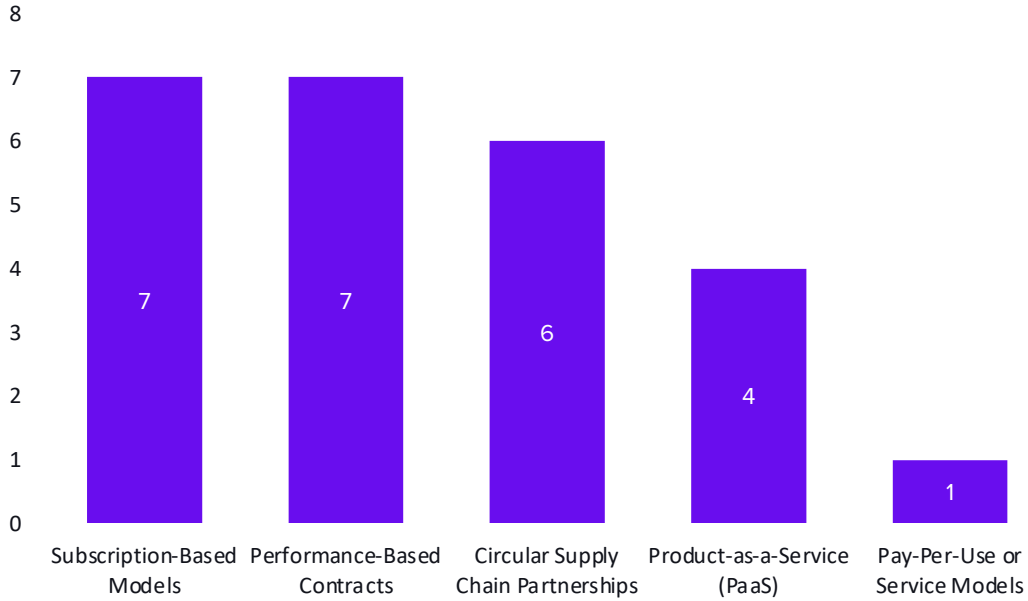


Antti Ainamo

Associate Professor, University of Tartu

" There's is growth in cities [and] many cities are trying to have more people living in smaller space supposedly on the premise that there will thus be less wasteful mobility between one place and another. Both trends highlight need for attention to how to organize e.g. garbage collection."

Which types of revenue models do you find most sustainable or appealing, given the current market conditions in the area of circular models for cities and regions?



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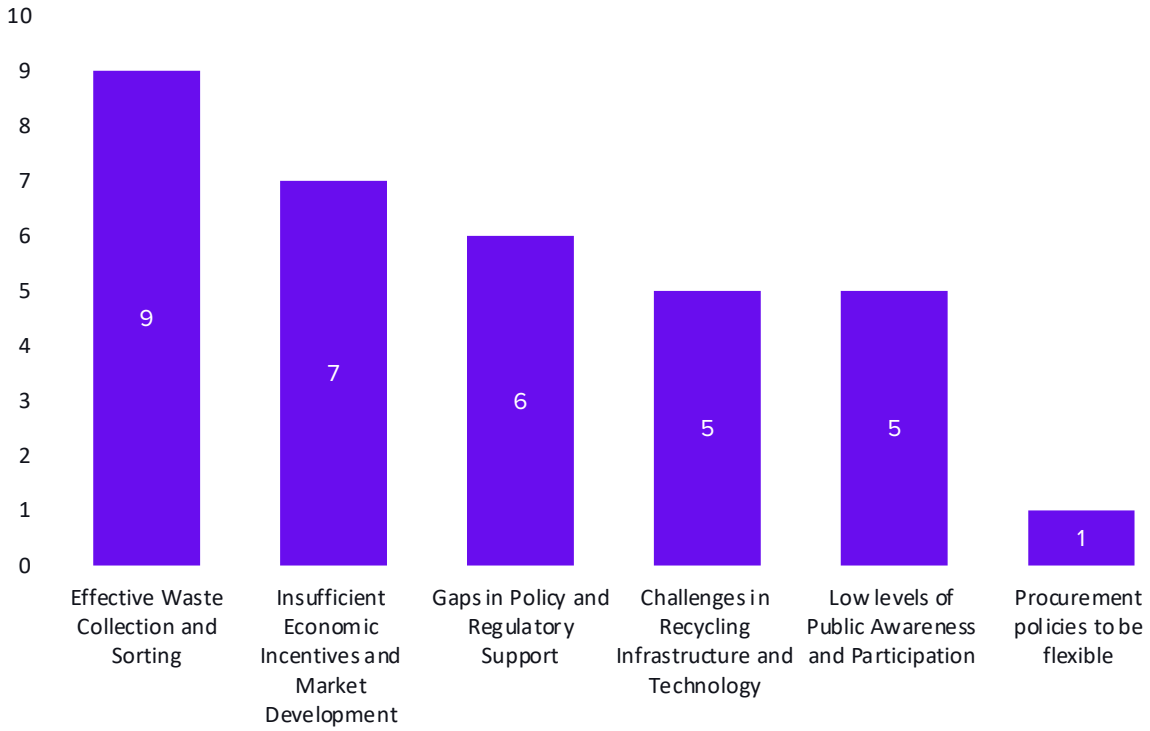
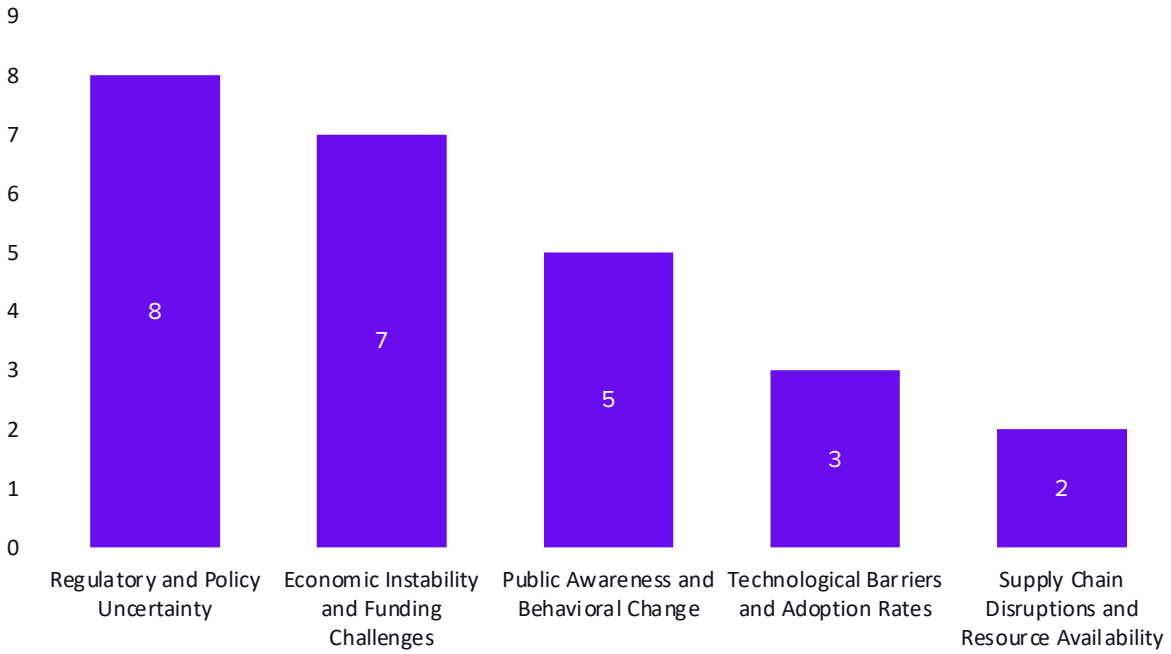
Scaling: Circular economy is a growth area where the legacy challenge is less with technology and more with administrative processes (2)

What are the areas of circular economy in cities and regions where needs or challenges have not been yet adequately solved?



What do you consider to be the key risks that could impact the area of circular economy for cities and regions in the next 3–5 years, particularly in the European context?



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Competition: The diverse and evolving nature of competition of circular economy

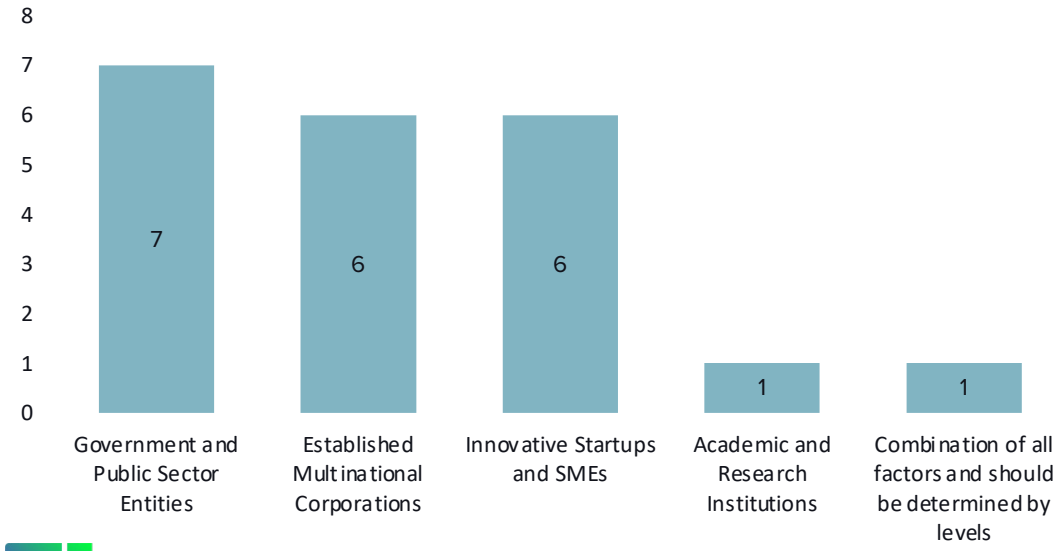
Circular models is a dynamic sector. On the one hand there is a **diversity in company sizes and focus areas** – no single company dominates the sector, but different companies lead in different specific areas. There seems to be also **more collaboration than competition** among smaller firms, as they see goals that are shared. On the other hand, **competition varies by region**, as it is influenced by local policies and development levels. Finally, in some countries there are **specific sector challenges** – especially in waste management – where large corporations or even organised crime has had significant control over the sector.

Miguel Carmona Cabello

Researcher, Universidad de Cordoba

"There are three types of companies: 1. Macro-enterprises that have a perfect command of technology; 2. Medium-sized companies that have access to technology but are unable to manage it themselves. 3. Micro-enterprises that can be of great interest in reaching rural micro-environments that are not economically viable but that the circular economy gives life to."

What is the competitive structure of the area of circular models for cities and regions?



What specific attributes or capabilities do you look for to indicate a competitive advantage in the area of circular models for cities and regions?

Challenges and risks for start-ups in circular economy: Several challenges persist

Circular economy sector has opportunities but also considerable challenges, creating high barriers for start-ups to compete – yet there are differences among cities and regions.

Regulatory and Policy

- Inconsistent regulations across regions, making it difficult for businesses to scale across borders.

Supply Chain and Infrastructure

- Many cities lack infrastructure to support recycling and reverse logistics, e.g. waste sorting, repair hubs, composting.

Consumer Adoption and Behavioural Barriers

- Perceived lower quality of recycled, refurbished, reusable by consumers. Also, convenience vs. change of habits.

Financial and Investment Challenges

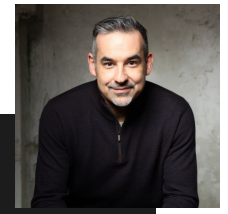
- Heavy capex of setting up circular infrastructure, and potentially longer ROI timelines.

Administrative Conservatism

- Nature of civil servants/service to avoid mistakes rather than to be radically innovative.

Technical & Infrastructure Dependencies

- IoT enabled systems need reliable internet and sensor infrastructure, which may not exist in some regions.

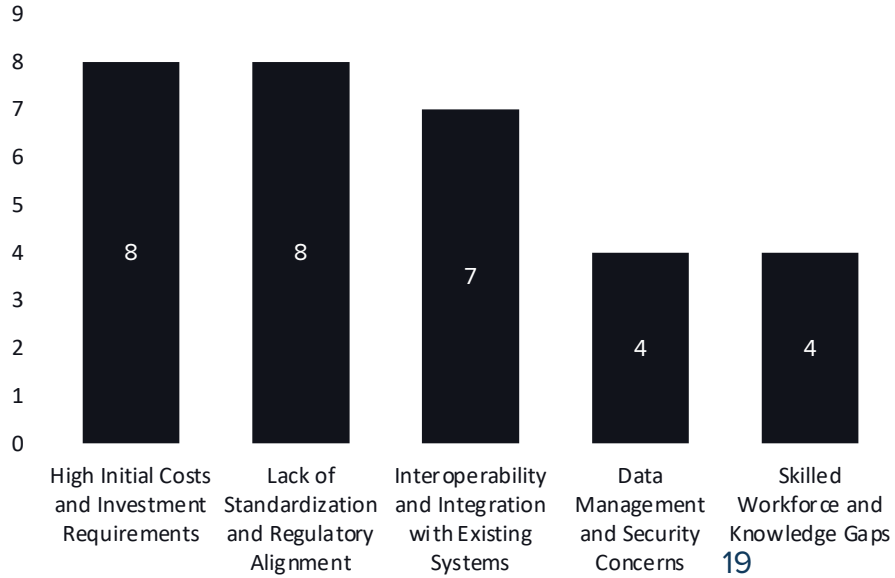


Scott Galveo

CEO, Circuly

"One real problem in terms of sustainability is that we as consumers are simply consuming way too much and not actually using the products for very long. This is inefficient, bad for the environment. (But) there is clearly a trend towards access over ownership."

What are the main technological or operational challenges that may hinder the adoption of new technologies or operational practices in the area of circular economy?



Customer segments and distribution channels: Value chains still underdeveloped, impacting customer segments and distribution channels

As municipalities are the most typical customer segment, the manner in which their procurement processes are open and even favourable to circular solutions has had a significant impact on the sectors development – or underdevelopment.

Customer segments

- There are several types of customers but it's challenging to categorize them due to the absence of established value chains
- Municipalities are one type of customer, some of them want to be leaders among peers
- Asset owners are seeking to reduce their scope 3 CO_2 emissions
- Individual households and responsible businesses are other type of potential customers in the sector.

Distribution channels

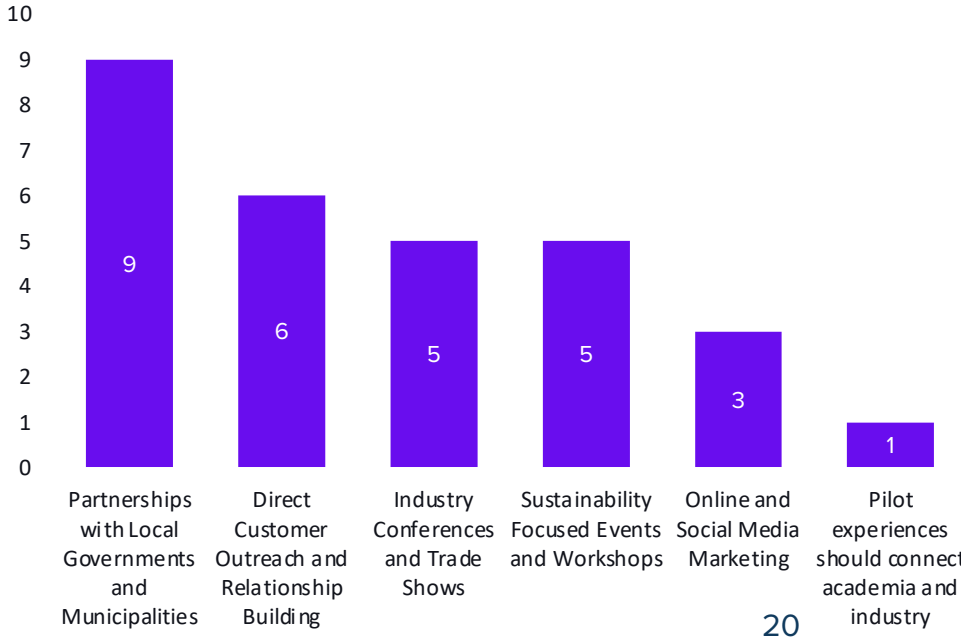
- Cities are the most obvious channel, but procurement rules, with often cheapest offer chosen, causes challenges to new solutions, as quality may not rise to level needed
- Circularity is not always a decisive feature in city procurement processes
- Distribution channels need to address logistical inefficiencies and increase accessibility to drive adoption of circular models.

Miguel Carmona Cabello

Researcher, Universidad de Cordoba

"There are really no active or passive buyers, (because) the problem is that the value chains have not yet been established."

What channels are most effective for reaching and engaging customers in the area of circular economy for cities and regions?



Roadmap: The evolution of the Circular Models in Cities and Regions

Past

Linear Economy Dominance

- Single-use, waste-heavy linear model, fuelled by industrialization and urbanization
- ”Take-make-waste" approach
- Recycling efforts were minimal
- sustainability was not prioritized
- **1972**: Recognition of industrial waste impacts at a UN Conference (UNCHE)
- **1987**: Introduction of “Sustainable Development” in the Brundtland Report

Present

Smart Circularity & Niche Status

- Transition toward technology-driven circular models
- Smart waste management
- Material tracking technologies
- Cities are adopting zero-waste buildings and infrastructure
- Business models like leasing and product-as-a-service
- Moving toward technology-driven circular models with closed-loop supply chains.
- Critical policies, like the EU Circular Economy Action Plan, have driven progress

Short-term Future

Expansion in the Next 5-10 Years

- Progress expected in localized waste solutions and municipal transparency
- Cities aim to see quick measurable results in their climate plans
- Startups focusing on technological infrastructure and circular strategies are expected to grow rapidly

Long-term Future

Fully Integrated Circular Systems by 2050

- By 2030-2050, circular models are envisioned to reach full integration
- Expectation of AI-powered material recovery systems, autonomous waste management, and blockchain-based marketplaces
- **2035**: "Zero-waste cities" become the norm, with landfill bans
- **2050**: Major cities operate under fully circular resource flows

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Challenge-to-Action Framework

Challenge Description	Category	Start-ups with challenge	Mentor & Stakeholder insight	Start-up action plan
Developing scalable technology solutions	Technology	8	Pilot projects and public-private industrial facilities are suggested for testing and scaling. Value of digital tools, such as smart infrastructure, IoT systems	Start with low-cost, stable technologies that secure revenue and can later be expanded. Leverage flexible and adaptable technologies
Securing funding for scaling, technology, and partnerships	Funding	8	Blended finance, combining public grants and impact investments. Partnerships with established entities are recommended to access funding and resources	Create modular and scalable business models, and prioritize a subscription-based model to ensure recurring revenue
Scaling production while maintaining quality	Scaling	7	Focus on gradual adaptations rather than immediate global solutions. Integrate advanced technologies like AI or IoT for quality control	Start with robust planning and cost-effective technologies to ensure financial stability before scaling
Expanding customer base and building partnerships	Customers	6	Important to understand customer needs deeply and to align offerings with their pain points, e.g. through affordability, convenience, or improved functionality	Work closely with procurement managers to reduce knowledge gaps, align strategies with local ecosystems, and leverage early adopters
Increasing visibility and adoption of solutions	Visibility	4	Ensuring the products address customer needs better than existing options can increase visibility. Transparency in the value chains can also build trust	Build partnerships with established organizations. Target customer pain points, e.g. cost savings and operational efficiency
Pivoting to a licensing model	Licensing	1	Focus on reshaping the internal philosophy to prioritize long-term rentals and subscriptions over product sales. Transition requires clear planning	Build sustainable customer relationships and ensure flexibility and scalability in business models for overcome initial challenges

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Other Market Opportunity Roadmaps

Supply Chain Management & Trade Finance roadmap

Renewable Energy Production roadmap

Sustainable Mobility roadmap

AI-Powered Utility Management for Sustainable and Smart Cities roadmap

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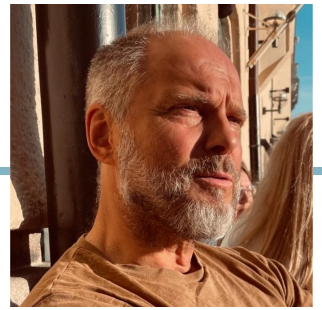

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THANK YOU!

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