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promoting resource and social sustainability**

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**PART 1:
THEORETICAL INSIGHTS FROM CIRCULAR ECONOMY
RESEARCH AND SUSTAINABILITY**

**1.DAĻA:
APRITES EKONOMIKAS PĒTNIECĪBAS TEORĒTISKĀS
ATZIŅAS UN ILGTSPĒJA**

CIRCULAR ECONOMY AS A RESPONSE TO CLIMATE CHANGE – WHERE TO START AND WHAT IS THE ACHIEVABLE RESULT?

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Global warming caused by GHG emissions is still increasing; therefore, moving towards a low-carbon economy is among the greatest challenges of modern society. European Union's (EU) Roadmap for moving to a competitive low-carbon economy concludes, "In the long run, all scenarios that achieve the emissions reduction target are cheaper than the continuation of current policies." Therefore, it is crucial to set an ambitious climate goal to reach climate neutrality, which will require action by all sectors.

The Circular Economy is recognized as a critical strategy for advancing sustainable development and achieving the United Nations Sustainable Development Goals at micro, meso and macro levels. The circular economy (CE) aims to reduce, alternatively reuse, recycle, and recover materials in production or distribution and consumption processes 'to accomplish sustainable development, which implies creating environmental quality, economic prosperity, and social equity to the benefit of current and future generations' [1]. In Latvia, the 'right of everyone to live in a benevolent environment by providing information about environmental conditions and by promoting the preservation and improvement of the environment' has been enshrined by The Constitution of the Republic of Latvia since 1922 [2]. This constitutional commitment to sustainability, although it dates back a century, aligns with the current principles of CE. Municipalities are key actors in implementing CE strategies [3] to enhance national and global goals, but measuring the level of CE implementation at the municipal level is still a challenge [4–5].

In 2024, the first scientifically led survey was conducted across all Latvian municipalities to evaluate the level of circularity or readiness for transitioning from a linear to a circular economy (CE). Through self-assessment, all municipalities provided their perspectives on key dimensions of the new economic paradigm. These insights were integrated with feedback from citizens, collected via a separate nationwide survey, to derive a composite index value.

This presentation aims to review other methods and assessments of circular economy conducted at the municipal level worldwide and to assess their applicability to municipalities. While most of the frameworks, either developed institutionally or by research groups, utilize statistical metrics to assess CE at the municipal level, the objectivity of such an approach is overshadowed by the data availability and complexity of the CE concept. Further research is required to develop state-of-the-art methodologies combining quantity and quality aspects in a good balance. In-depth assessments of specific areas might provide more value than a broad measure for a meaningful transition to CE.

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THE ROLE OF UNCERTAINTY IN ACHIEVING CLIMATE NEUTRALITY OBJECTIVES IN THE WASTE SECTOR

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The Latvian National Energy and Climate Plan 2021-2030, issued in 2024 and entered into force on 12 July 2024, provides for ambitious GHG emission reductions in the waste management sector. If the GHG emission reduction rate in 2022 compared to the 2005 level is 14.3%, the planned reduction rate in 2030 should reach 40.4%, and the target value would be 409.04 kt CO₂eq. Since 2005, waste disposal, wastewater treatment, and discharge have been the main sources of GHG emissions. The main long-term measures to achieve the above target are improving the efficiency of waste sorting, increasing the recycling rate of biodegradable waste, improving the inventory in the wastewater sector, and improving the efficiency of existing treatment plants. Public education and awareness-raising to change people's habits and behavior are also planned to play a key role. To implement all the planned initiatives, an investment of almost €105 million is needed, 99% of which will be in the wastewater sector, in addition to the funding included in the existing budget.

While all the measures to reduce GHG emissions from the waste sector in the Latvian National Energy and Climate Plan (2021-2030) are reasonable, some critical points are still missing. National reports are prepared using the calculation methodologies developed by the Intergovernmental Panel on Climate Change. It should be noted that this methodology was developed in 2006 and is updated as new, scientifically based findings become available. In the waste sector, the last update was made in 2019 for the wastewater treatment sub-sector, while for the municipal solid waste disposal sub-sector, the last update was made in 2007. The waste management sector's share of GHG emissions in 2022 is capped at 5.8%, and the wastewater sub-sector generates 20.7%. According to the methodology, the methods and algorithms for calculating GHG emissions are different, and each waste flow is considered activity data, composition, treatment methods, and other factors. The choice of the assessment method has a significant impact; it can be TIER1, TIER2, or TIER3, depending on the quality of the available data. For example, GHG fluctuations during waste decomposition are highly variable, being influenced not only by the composition of the waste and the carbon available for biodegradation but also by the atmospheric and precipitation regimes, the layering, and the proposed default emission factor methods, which are subject to high uncertainties. It is concluded that in the case of Latvia, uncertainties in the range of 5 - 30% are mainly indicated. However, the uncertainty is assessed for each factor and gas, and the impact on the result is assessed as cumulative uncertainty. In this view, the cumulative uncertainty is not less than 68% in any of the sub-sectors of the waste sector, but in some cases, it reaches 100%.

This result demonstrates the acute need to assess country-specific relevant factors, otherwise it is inherently impossible to estimate GHG emissions in a concrete way. In terms of quality control methodology, an uncertainty of 20% would be considered sufficient, while an uncertainty of 5% would indicate a high-quality method and data.

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CONCEPT OF SOCIAL SUSTAINABILITY IN CIRCULAR ECONOMY RESEARCH: HUMAN SCALE DEVELOPMENT (H-SD) APPROACH

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In the European Green Deal policies, circular economy (CE) is positioned as a transformative model to achieve economic benefits through efficient resource use while ensuring environmental and socio-economic benefits. Successful transition towards CE will contribute to the quality of life, create innovative jobs and enhance knowledge and skills, all facilitated by the emergence or transformation of services, businesses, and technologies. Moreover, the transition is a profound socio-technological change with major implications for well-being of people [1], and it involves fundamental socio-cultural and behavioral changes [2]. However, to date, CE literature has primarily concentrated on scientific, technological, and business perspectives, leaving the social dimension of CE insufficiently explored [3]. As a result, CE implementation is often driven by a 'top-down' approach, neglecting the potential benefits from a more inclusive, stakeholder-driven process [4]. Limited CE services and infrastructure, makes it challenging to adopt a circular lifestyle. A lack of knowledge, skills, and participation remains significant barriers to CE adoption at the local level [5].

In recent years, there has been increasing recognition of the challenges faced by policymakers and researchers in measuring sustainability of CE, particularly its social aspects [1;3 & 6]. In a broader perspective, social sustainability contributes to the satisfaction of human needs; the preservation of nature and its reproductive capacities, and the normative requirements of social justice, human dignity and participation [7]. By analogy, social sustainability in the CE context encompasses the conditions essential for achieving a meaningful life, including health, food, water, energy, networks, housing, gender equality, social equity, political voice, peace, justice, income, work, and education [1].

Human Scale Development (HS-D) approach put forward by Manfred Max-Neef [8] offers a scientific and practical framework for addressing well-being through the satisfaction of Fundamental Human Needs (FHN). FHN are seen as both drivers for an action and prerequisites for a good life. The application and adjustment of the HS-D framework for CE research is novel and poses some challenges, given the current focus on technological solutions, but the author suggests that it is a perspective tool for exploring the social sustainability of CE, while also contributing to addressing gaps in the current research.

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INTERNATIONAL STANDARDS IN THE CIRCULAR ECONOMY: BRIDGING THEORY AND PRACTICE IN THE TOURISM INDUSTRY

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The EU's Environmental Action Programme 8th assessment report shows very slow progress towards the targets, with most of the targets not coming close to the likely on track significantly to reduce material footprint and generated waste by 2030 [1]. The tourism industry demands clean, pristine resources but generates pollution, especially in the form of transport and food waste.

This study provides an overview of international standards in the circular economy (CE) and aims to identify which requirements to include in the study of tourism system enterprises and tourism destinations to meet Sustainable Development Goals and Climate neutrality. The s includes two international standards: ISO 59010 Circular Economy—Guidance on the transition of business models and value networks (2024) [2] and ISO 59020 Circular Economy—Measuring and assessing circularity performance (2024) [3].

In the tourism sector, policy planning documents and best practice studies include the implementation of circular economy principles and progress towards climate targets: Transition pathway for tourism: Taking stock of progress by 2023 (European Commission, 2024) [4], Global Sustainable Tourism Council Destination Criteria with performance indicators and SDGs (The Global Sustainable Tourism Council, 2019)[5], Managing the Transition to a Circular Economy. Action Plans in the Tourism Sector (Ed.M.Segarra-Ona, V.Santamarina-Campos, A.Peiro-Signes, 2024) [6].

ISO 59020 requires the selection of the CE level boundaries. In the field of tourism system is four levels: macro (tourism destination, city, regional, national), meso (organisational) and micro (tourism product /service). The ISO 59020 defines five categories of circularity indicators: resource flows, resource outflows, energy, water and economics [3]. In the tourism sector, there will be activities for which it will not be possible to assess all five categories, such as water and energy not being used in service provision. This calls for a search for solutions to determine the level of circularity for organisations in the tourism system. The assessment of the tourism sector circularity indicators should also consider the indicator's time unit, as there are a number of areas where the service is provided only during the season, which in turn affects the comparison of results.

The six principles of the CE set out in the ISO 59010 apply to tourism system enterprises and the tourism destination: systems thinking; value creation; value sharing; value sharing; resource stewardship; resource traceability; ecosystem resilience [2]. The specific characteristics of a tourism service, such as heterogeneity, perishability, inseparability, non-tangible things, and seasonality, must be considered when designing circular economy principles and aspects in the tourism sector. These characteristics require finding measurable parameters, where the standard examples given are difficult to apply to individual tourism services.

ISO 59010 specifies actions to support CE transition, such as general education and research, innovation, collaboration, and networks, helping users change their behaviour, policy and legal system, financial services, and digitalisation [2]. Digital technologies, the Future of mobility, and Breakthrough innovations are highlighted as critical to the tourism sector [7]. For the tourism sector as a whole and for the tourism destination to make a common assessment of circularity, adjustments need to be made.

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Keywords: ISO, Tourism destinations, planning, indicators, green deal, circularity

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SOCIAL FACTORS IN THE SUSTAINABILITY MODEL OF THE HEALTHCARE SECTOR

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Climate change puts a twofold burden on the healthcare sector. On the one hand, healthcare must adapt to climate change by transforming the healthcare system to treat climate change-induced diseases and health disorders. On the other hand, it is acknowledged that the healthcare sector is responsible for almost 5% of global emissions, a figure which can even reach 10% in some high-income nations [1] and lags behind other sectors in reducing its carbon footprint [2]. To slow down global warming and mitigate its negative impacts, on 31 July 2023, the European Commission adopted the **European Sustainability Reporting Standards (ESRS)**, which specify the information that the companies shall disclose about their material impacts, risks and opportunities in relation to environmental, social, and governance (ESG) sustainability matters.

To enhance the governance solutions in the Latvian public hospitals, Riga Stradins University launched a Latvian Council of Science financed project “Socially Responsible Green Transition: Enhancing Governance Solutions to Empower Homo Climaticus in the Healthcare Sector” (Nr. Lzp-2023/1-034) in 2024. A new, four-dimensional utility model was proposed for defining measures in the context of the sustainability linked to a framework for designing the corporate governance of the public hospitals. This study was aimed to identify the key measures for defining sustainable development of the social priorities for the utility model that consists of social, environmental, economic, and governance (ESGE) dimensions.

A survey of the literature was conducted to identify the interdependence of the social factors and sustainability and the benefits of their integration with the ESGE framework, social and governance factors in particular. The literature review covers published information for the period from 1994 till 2023. Systematic literature resulted in the identification of 49 potential measures for defining sustainability priorities of green transition in healthcare sector, of which 12 measures were related to social dimension of the sustainable corporate governance, namely: patient well-being, workforce well-being, health and safety, *incl.* practice “Do not harm”, skills and knowledge, quality of care, equity, collaboration, employment, sustainable health, accessibility, availability (24/7) and affordability.

Limitations and future research: limitations of the study come from the sustainability reporting/management framework within the scope of the European Sustainability Reporting Standards as well as most of the studies have focused on public healthcare settings only. Future research directions may consist of further investigations of the possible/actual outcomes in green transition of healthcare organisations that are based on their developed and adopted business models.

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**PART 2:
CIRCULAR ECONOMY-BASED BUSINESS MODELS AND
INDUSTRIAL SYMBIOSIS**

**2.DAĻA:
APRITES EKONOMIKAS PRINCIPOS BALSTĪTI BIZNESA
MODEĻI UN INDUSTRIĀLAS SIMBIOZES PIEREDZE
LATVIJĀ**

INDUSTRIAL SYMBIOSIS – A CIRCULAR ECONOMY TOOL TO CREATE COMPETITIVE ADVANTAGE FOR STATE’S ECONOMY

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Industrial symbiosis (IS) is the use by one company or sector of underutilised resources broadly defined (including waste, by-products, residues, energy, water, logistics, capacity, expertise, equipment and materials) from another, with the result of keeping resources in productive use for longer

IS presents a transformative approach in the circular economy framework. IS is the use by one company or sector of underutilised resources broadly defined (including waste, by-products, residues, energy, water, logistics, capacity, expertise, equipment and materials) from another, with the result of keeping resources in productive use for longer [1]. The project “Development of Quintuple Helix Circular Business Model for Industrial Symbiosis (QH-BIS)” aims to carry out an assessment of industrial symbiosis opportunities and barriers within the Green Deal and, in particular, Latvian socio-economic position and identify preconditions for its efficient application, as well as identify key success indicators for implementation of IS. A key feature of the approach is integrating the quintuple helix model, which incorporates government, academia, industry, civil society, and the environment into a unified strategy for circular business model development.

The author analyses a value-based resource efficiency indicator developed by Di Maio *et al.* [2] as an enhancement over traditional mass-based indicators. This metric aligns more closely with broader social, environmental, and economic policy objectives and can be harmonised across EU member states. Based on global literature and local application, the research proposes a new Industrial Symbiosis Index comprising key performance indicators covering legal, economic, technical, environmental, and socio-cultural dimensions.

Research findings emphasise that IS contributes to waste reduction and efficiency and drives innovation, resilience, and cross-sectoral knowledge exchange. As such, industrial symbiosis is positioned as a powerful enabler for sustainable development and economic resilience at the national level.

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MAPPING OF RESOURCES IN ZIEMEĻVIDZEME REGION: IDENTIFYING CHALLENGES AND OPPORTUNITIES

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Industrial symbiosis (IS) is a concept that is widely used in various countries and, in Europe in particular, has been used for years as a basis for minimizing waste generation and fostering cooperation and innovation between sectors. Latvia already has several IS practices, i.e., Smiltene Piens, Getliņi EKO, and BalticFloc. However, often it can be observed that companies are involved in IS, without necessarily associating it with the IS. Thus far, IS initiatives have not been widely pursued in Latvia and knowledge of IS best practices is limited.

To bridge the knowledge gap and guide the development of IS, potential and existing cases of symbiosis in Latvia, Ziemeļvidzeme region, were assessed. The study was carried out in the framework of the European Union funded project “Waste to Resources Latvia – boosting regional sustainability and circularity” (LIFE Waste to Resources IP).

The aim of the research was to identify material flows and side-streams in the Ziemeļvidzeme region and to assess the potential for reuse and valorisation of production waste and financial feasibility of IS’s approach implementation.

The methodology takes the form of a cascade, in which the researchers progress from a larger dataset to a smaller one (see fig. 1.). Through quantitative data analysis followed by interviews and surveys, opportunities for IS between and within companies were identified.

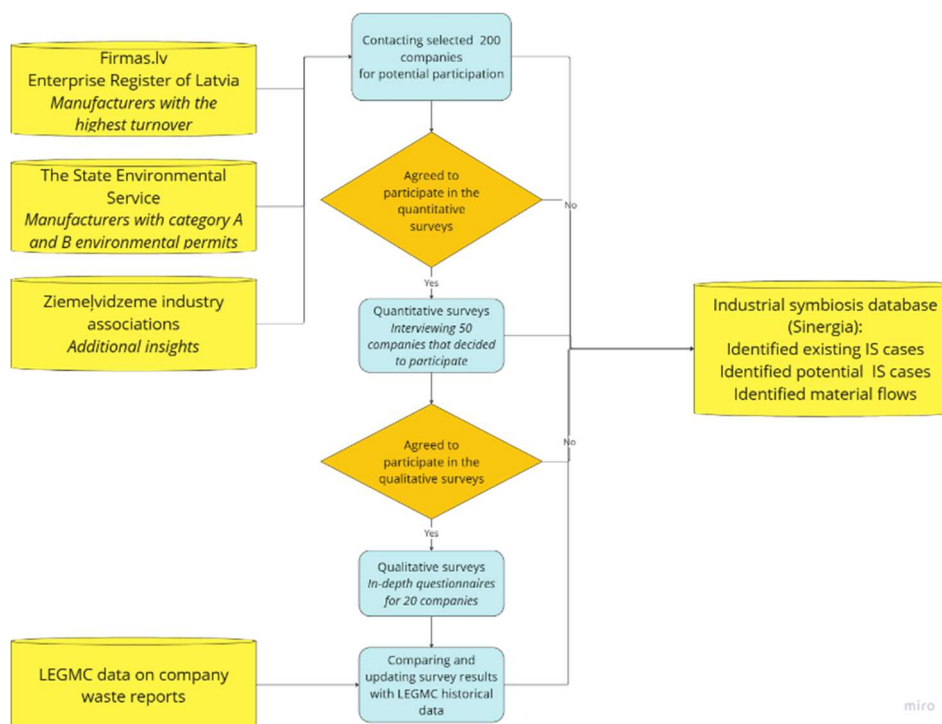


Fig. 1. Flowchart of the methodology (Source: by authors)

The main findings revealed that industries often share similar waste streams or by-products that could be used in new ways. However, this approach is often undermined by a shortage of sufficient available funding, whilst being innovative or moving towards cleaner production is not a high priority for companies. It is necessary to define stakeholder cooperation principles and promote industrial symbiosis as an effective circular economy model in Latvia. For the further development of the circular economy in Latvia, adapting the legal framework to support IS initiatives is essential.

THE ROLE OF CYBERSECURITY IN ADVANCING CIRCULAR AND ENVIRONMENTALLY SUSTAINABLE BUSINESS PRACTICES

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The integration of circular principles and cybersecurity is a novel, but emerging area of research with implications for any company. This study explores the interrelationship between these domains, highlighting how cybersecurity (CS) can both support and challenge the transition towards environmentally sustainable businesses. Circular principles are guiding ideas or rules for companies to promote resource efficiency, waste minimization, reuse or recycling of materials [1]. Certain circular principles advocate leveraging digital technologies to address environmental challenges. This includes virtualising products, utilising digital platforms, and advancing data-driven smart green technologies with real-time monitoring capabilities [2]. However, digitalisation, which is a critical enabler of the circular economy, introduces CS vulnerabilities that may hinder sustainable development efforts. As companies adopt digital solutions for resource tracking, supply chain optimisation, and sustainability reporting, the risk of cyber threats increases. Cyberattacks can disrupt circular business practices by compromising data integrity, leading to financial and reputational losses, and undermining trust in digital sustainability initiatives [3].

The proposed EU regulations promoting eco-design, digital product passports, and digital data exchange on raw materials, production processes, and product lifecycle tracking reinforce the necessity of integrating CS into sustainable business practices. The Corporate Sustainability Reporting Directive (CSRD) mandates extensive sustainability-related digital data accumulation within companies and across supply chains. Emerging regulations emphasise transparency in CS practices, reinforcing the need for businesses to adopt comprehensive security strategies aligned with circular economy goals.

The study finds that integrating cybersecurity measures into environmental sustainability practices enhances the strategic resilience of companies by mitigating cyber risks that could threaten sustainable business operations. Sustainable cybersecurity, also known as "green cybersecurity" [4], focuses on minimising the environmental impact of digital security infrastructures, reducing energy consumption, and optimising the use of secure, resource-efficient technologies. By embedding CS within ESG frameworks, organisations can strengthen their sustainability commitments while ensuring the strategic resilience of companies.

In conclusion, aligning CS and circular principles is essential for advancing environmental sustainability. Companies must proactively integrate CS into their sustainability frameworks to protect their digital assets, foster stakeholder trust, and ensure long-term strategic resilience.

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**PART 3:
NEEDS AND OPPORTUNITIES FOR IMPLEMENTING
CIRCULAR ECONOMY AT THE LOCAL LEVEL.**

**3.DAĻA:
APRITES EKONOMIKAS IEVIEŠANAS VAJADZĪBAS UN
IESPĒJAS VIETĒJĀ LĪMENĪ**

CĒSIS COUNTY CIRCULAR ECONOMY ROADMAP: FRAMEWORK, DEVELOPMENT AND INSIGHTS

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In 2024, within the framework of the LIFE IP project “Waste To Resources Latvia - boosting regional sustainability and circularity”, a circular economy roadmap was developed for the Cēsis municipality. The roadmap is designed as a digital tool for municipal employees in practically all areas of activity and can also be used in other Latvian municipalities. It includes approximately 140 practical recommendations – actions for implementing a circular economy, starting from the level of daily work duties and up to strategic planning. The tool will be available on the “Lietovelreiz.lv” platform in internet.

The theoretical basis is adapted from the Ellen McArthur Foundation’s circular economy diagram [1], supplemented by the place of waste in the economic cycle. In accordance with the chosen approach, the roadmap actions are offered not only for waste management, but also for the use of raw resources. It is based on calculations of the expected depletion of non-renewable resources – clay and peat in the municipality within 50-100 years[2]. For easy use of the roadmap in digital format, each action has been assigned appropriate parameters in three categories: the autonomous function of the municipality to which the respective action is applicable, the ranking in the resource value preservation hierarchy, and the name of the resource whose circularity the action affects. The parameters of these three categories can be used as search keywords so that the user can select the actions of interest.

The actions of the roadmap were tested in workshops of employees of various sectors and departments of the Cēsis municipality. Two directions of comments dominated the feedback – the actions are aimed at economic and rational activity, at the same time the implementation of several actions is limited by the current regulatory enactments and the usual way of managing in the municipality.

According to the experience of developing the roadmap, it must be concluded that until the circular economy is normalized in regulatory enactments, its implementation will not be the usual practice. Within the municipality, cooperation with other administrative institutions is crucial, it is hindered by the sectoral approach to management and the “place” of the circular economy in environmental department. The advantage of the chosen format of the roadmap is the possibility of supplementing it as needed, as well as including actions for which the political environment of the municipality is not yet mature. Thus, the roadmap also serves as educational material. The content quality of the roadmap was increased by the consultations of the author team with municipal specialists at various stages of its development.

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SCALE-UP AND SCALE-OUT OF CIRCULAR BUSINESS MODELS INCENTIVIZING RESOURCE EFFICIENCY AND SUSTAINABLE URBAN DEVELOPMENT

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Cities are increasingly grappling with the scarcity of space, natural resources, and materials, making the transition to a circular economy critical. This research addresses the challenges of urban circularity and resource sharing, focusing on the scaling up and scaling out of circular and sharing economy (CSE) initiatives. As urban areas face mounting pressures from resource scarcity, environmental degradation, and socio-economic inequalities, they present an ideal environment for experimenting with circular models. The study explores how municipalities, communities, and NGOs can collaboratively drive sustainable urban transitions by closing material loops and enhancing socio-economic resilience through CSE initiatives.

Employing a multi-method approach, the research combines a literature review, semi-structured interviews, Future Literacy Labs (FLLs), Policy and Practitioners Discussion Labs, comparative case studies, and material flow analyses to develop comprehensive solutions that integrate environmental, economic, and social dimensions of urban sustainability. By identifying enablers and barriers to CSE adoption, the project aims to generate actionable insights for policymakers and urban stakeholders. The research will contribute to the circular economy discourse by offering strategies that enhance resource efficiency, promote social equity, and foster long-term sustainability in European cities. The theoretical contribution of this research lies in its exploration of the relationships among stakeholders, the co-creation of value, and the collaborative transformation of urban systems. The study will investigate how governance structures can be reshaped to facilitate the scaling of CSE practices and promote the effective engagement of diverse stakeholders. Additionally, it seeks to advance new business models, governance frameworks, and organizational forms that support circular and sharing economies, contributing significantly to urban sustainability. Through its focus on co-creation and inclusive governance, this research aims to provide new insights into the future of urban circularity and the practical implementation of sustainable solutions in cities across Europe.

Preliminary Concluding Remarks

As cities continue to face escalating environmental and socio-economic challenges, the need for scalable and effective circular economy solutions becomes increasingly urgent. This research highlights the pivotal role that circular and sharing economy practices play in driving urban sustainability. Preliminary findings suggest that the active engagement of municipalities, communities, and NGOs in the co-creation of circular solutions holds significant promise for fostering resilient urban systems.

The early stages of the research reveal that the success of CSE initiatives is contingent upon strong governance structures, effective policy frameworks, and a collaborative approach that includes diverse stakeholders. While barriers such as resource constraints and regulatory limitations remain, there are also notable enablers that facilitate the scaling and expansion of circular practices, including community engagement, innovation in business models, and supportive public policies. As the project progresses, it will continue to refine strategies for overcoming these challenges and enhancing the scalability of CSE initiatives. The anticipated outcomes will provide valuable insights for policymakers and practitioners working towards more sustainable, equitable, and resource-efficient urban futures. By bridging the gap between theory and practice, this research aims to contribute to the transformation of cities into more sustainable, circular hubs of innovation and resilience.

Keywords: *Urban Sustainability, Circular Business Principles, Circular Economy, Sharing Economy, Stakeholder Engagement, Environmental Impact, Socio-Economic Benefits.*

INOVATĪVA APRITES EKONOMIKAS IZGLĪTĪBA: DIGITĀLO GALDA SPĒĻU LOMA

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Aprite ekonomikas un ilgtspējīgas attīstības principu integrācija augstākās izglītības programmās ir būtiska, lai sagatavotu speciālistus globālo izaicinājumu risināšanai. Šajā pētījumā aplūkoti zinātniskās literatūras sniegtie pierādījumi un teorētiskais pamatojums šo tēmu iekļaušanai akadēmiskajās mācību programmās, uzsverot to nozīmi studentu kompetenču attīstībā ilgtspējīgu risinājumu ieviešanā.

Analizējot 16 augstākās izglītības programmas Eiropā, tika identificētas jaunās tendences uzņēmējdarbības izglītībā, kas koncentrējas uz aprites ekonomiku. Galvenās jomas ietver biznesa modeļus un zaļās piegādes ķēžu pārvaldību. Pētījumi atklāj zināšanu trūkumu par aprites ekonomikas un uzņēmējdarbības izglītības savstarpējo ietekmi, norādot uz turpmāko pētījumu nepieciešamību. [1]

Eiropas universitātēm ir izšķiroša loma Zaļā kursa mērķu sasniegšanā, taču tām trūkst resursu un politikas atbalsta. Ilgtspējīgas izglītības kursu trūkums un zināšanu pārnese uz uzņēmējdarbību ir būtisks izaicinājums, kura risināšanai ir nepieciešama ciešāka sadarbība starp akadēmisko vidi, uzņēmumiem un politikas veidotājiem, lai efektīvi īstenotu Zaļā kursa stratēģijas. [2]

Viena novatoriska pieeja studentu zināšanu nostiprināšanai un ilgtspējīgas domāšanas veicināšanai ir uz spēlēm balstīta mācīšanās. Spēļu digitalizācija maina izglītības rīkus, padarot ilgtspējības un aprites ekonomikas koncepcijas pieejamākas un saistošākas.

Kā galvenos ieguvumus no uz spēlēm balstīta mācīšanās var minēt studentu iesaistes un motivēšanas veicināšanu, kritiskās domāšanas attīstīšanu, zināšanu saglabāšanas un mācību rezultātu uzlabošanu, kā arī sasaistes veidošanu starp teoriju un praksi. Šos ieguvumus novērtē gan mācībbspēki, gan studējošie.

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COMPARATIVE REVIEW OF PIONEERING URBAN RESOURCE CENTERS

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Construction and demolition waste (CDW) is the most important waste stream in the EU in terms of mass, with around 340 million tonnes between 2010 and 2018 (EEA, 2020). Most member states achieved a recovery target of 70% for this fraction, however, it is mainly based on backfilling or downcycling. Materials coming from demolition and renovation work are not often available for reuse or recycling activities, with some noticeable exceptions in the case of some pioneering Urban Resource Centres (URCs). URCs are physical centres that promote the circular economy at local level prioritizing reuse, preparation for reuse, upcycling and remanufacturing activities over material recycling [1]. This is an emerging concept throughout Europe, that has received much policy attention given its potential to help achieve Circular Economy goals set by the European Commission. So far there have been few systematic analyses of URCs, their operation and their impact. The goal of this paper is twofold: 1) to understand how frontrunning URCs currently operate and 2) to derive conclusions/design principles for URCs. This article presents a comparison of nine site visits to pioneering URCs. The data has been gathered from guided study visits to the different locations, complemented by additional information provided by the managers of the URCs through their yearly reports and follow up conversations. The research took place as part of the project Centers for Urban Resources, Reuse and Remanufacture (Cure+), which aims to establish URC pilots in the four project cities (Riga, Tartu, Kavala and Barcelona).

Five URCs typologies were identified, based on the differences observed in the study visits: 1) Recycling Centers +, are recycling centers that allow for material reuse. 2) Remanufacturers, are URCs that focus on repair, refurbishment or repurposing with dedicated production facilities. 3) CDW Resellers, resell materials obtained from deconstructions or donations, suitable for small-medium scale construction and renovation projects. 4) Residential reuse and repair spaces, help residents donate and take pre-used household items and clothes, while teaching some repair skills. 5) Demonstrators, are buildings made or refurbished using mainly CDW, helping demonstrate what can be done with secondary material.

The typologies are not strict, as one given URC can belong to more than one type, nor definite, as there might be more types of URCs not observed in this review. But this comparison helps describe the different approaches observed in facilitating material reuse.

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CITY GOVERNANCE APPROACHES TO THE CIRCULAR MANAGEMENT OF CONSTRUCTION AND DEMOLITION WASTE

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The construction and demolition is a resource intensive sector, with Construction and Demolition Wastes (CDWs) considered as the largest waste streams accounting for 374 million tonnes in Europe. Although the 70% target for material recovery of CDWs set in the European Union Waste Directive Framework has been achieved by most European countries, the majority of these Circular Economy (CE) practices are through backfilling and downcycling [1]. This poses opportunities for improving the circular practices in CDWs.

With the increasing population and urbanization, cities have important role in realizing the CE ambitions for three reasons. These are (1) CE is incorporated in policy frameworks focusing on closing material loops in production and consumption in cities [2]; (2) City governments have the capabilities and resources to transition towards circularity of CDWs; and (3) City governments serve as the link between various stakeholders such as citizens, companies, and knowledge institutes, and therefore can drive changes towards the city.

This study analyzes how four European cities namely Riga, Tartu, Barcelona, and Kavala use different forms of governance to address the challenges and barriers, and ultimately increase the circularity in CDWs. The methodology is qualitative, multiple case study using interviews, city reports, site visits, and validation workshop. Results show that cities deploy various forms of governance to address barriers and speed up the transition to a circular economy. These include contracting waste management companies, collaborating in local and international projects, fines for improper waste separation and illegal dumping, subsidies for recycled materials, and green procurement. Despite the use of different forms of governance, the majority of CE practices in the city are still focus on recycling and recovery, which is the lowest degree of circular practices. There is also an increasing focus on middle-level activities, such as repair and remanufacture, as well as on high-level activities such as rethink and reduce, yet these activities are mostly small scale and experimental. Therefore, cities are still learning on the process and have potential to further explore and integrate higher level circular practices.

The implications of this study for city governments include to (1) set stricter standards for circular procurement, (2) collaborate and establish strategic (long-term) partnerships between universities, citizen groups, NGOs and businesses, and (3) provide creative spaces for developing and implementing circular ideas.

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