



**The 22<sup>nd</sup> European Roundtable on Sustainable Consumption  
and Production 2025**

**Book of Abstracts**

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Book of Abstracts: The 22nd European Roundtable on Sustainable Consumption  
and Production 2025

Edited by: Karmann, Christina; Růžička, Pavel; Banout, Jan

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## Foreword

We are pleased to present the Book of Abstracts from the ERSCP 2025, held in Prague from 15-18 September 2025. The conference brought together over 200 participants from academia, industry, policy, and civil society to share research, practical experiences, and innovative solutions for sustainable consumption and production.

Under the theme “Multi-stakeholder cooperation on sustainability: Role of business, academia, public sector, and civil society”, the conference featured five keynote sessions presented by invited speakers and many oral and poster sessions, and rich discussions that fostered new collaborations and actionable insights.

This volume captures the breadth of contributions presented, showcasing advances in circular economy, sustainable business models, policy, and transformative practices. We extend our sincere thanks to all authors, reviewers, session chairs, keynote speakers, and sponsors whose support made ERSCP 2025 a success.

We hope this Book of Abstracts will serve as a lasting resource and inspiration for researchers and practitioners in sustainable consumption and production.

*On behalf of the Organizing Committee,*



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## 1. Sustainable and Circular Business Models in Industry

### Creating a Taxonomy of Conflicts Arising Towards Transiting to Circular Economy within Fashion Industry

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#### Abstract

The transition of the global fashion industry to a circular economy represents a multifaceted challenge that extends beyond implementing sustainable practices or circular business models. Although collaborations between stakeholders such as designers, manufacturers, policymakers, and consumers are frequently presented as essential to this transition, the quality and dynamics of these collaborations are often assumed rather than examined. In particular, the conflicts that arise during these collaborative efforts remain significantly underexplored in existing research. These conflicts, stemming from divergent values, power asymmetries, competing priorities, or systemic inertia, have the potential to either hinder or reshape the trajectory of circular initiatives in the fashion sector. This study addresses this critical gap by investigating the types of conflicts that emerge among stakeholders collaborating on circular economy initiatives, such as repair, reuse, and recycling, and examines how these conflicts influence the effectiveness and direction of such efforts. The research is grounded in an extensive systematic literature review (n=40), designed to identify and synthesize existing academic knowledge on conflicts in circular economy (CE) transitions within the fashion industry. Sources were retrieved using platforms such as Elicit AI, Scopus, and Google Scholar, targeting peer-reviewed journal articles, conference proceedings, and grey literature. The PRISMA protocol guided the review process, ensuring transparency in the selection, screening, and inclusion of sources. Inclusion criteria were based on relevance to CE strategies (e.g., reuse, repair, recycling), stakeholder collaboration, and documented conflicts in sustainability transitions. Each document was systematically analyzed using qualitative coding within Obsidian software, which enabled the mapping of thematic patterns and the visualization of interrelations among stakeholder conflicts. Preliminary findings reveal a recurring set of conflicts that coalesce around decision-making, resource allocation, temporal priorities, and misaligned sustainability goals across stakeholders. This method provides a structured foundation for developing a taxonomy of conflicts relevant to circular fashion collaborations. In conclusion, this research offers a nuanced perspective on systemic change in the fashion industry by highlighting conflict as not only a barrier but also a catalyst for transitioning to a circular fashion system. It provides valuable insights for researchers, practitioners, and policymakers aiming to foster more collaborative and effective pathways toward a circular economy in fashion.

**Keywords:** circular fashion, taxonomy of conflicts, collaborations, circular economy, transitions

## **A Comparative Analysis of Circular and Sustainable Business Models: An Illustration Through Good Practices**

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### **Abstract**

This study compares circular economy and sustainable business models SBMs through an examination of how each model addresses social and environmental concerns in generating value for companies and stakeholders. The principal question under investigation is whether companies can become more successful in attaining sustainability through strategies focused on minimizing depletion and waste of resources, or through combining broader ecological and social factors in daily operations. The motivation for taking on this paper arises out of growing pressure to use natural assets responsibly and to develop lasting solutions with less impact on communities and environments. To explore this inquiry, the study first considers studies of circular business models CBMs and sustainable business models (definition, differences and common points) to lay a comparative basis for analysis. Examples of case studies in a range of industries and companies of varying scales are then analysed to grasp specific ways in which these models impact use of resources, value propositions, operational processes, and overall contribution to social and environmental welfare. Analysis in this case looks at how circular efforts seek to save and reuse materials for extended duration, and in contrast, sustainable approaches seek to expand consideration to broader dimensions of ecological and social stewardship. Preliminary observations reveal that each model possesses its respective strengths, such as the ability of circular solutions to reduce waste streams and the potential of sustainable practice to address equity and long-term survival. The study also looks at potential weaknesses, particularly when companies use narrow approaches with no consideration for interdependencies between cycling of resources, stakeholder dialogue, and social value creation. As circular business model subcategory of Sustainable business models, both offer complementary but different avenues to a regenerative economy. Where SBMs boost sustainability, CBMs transform economic systems completely. Rental services can be example of CBMs, with their ability to decouple growth from consumption. Implementational hurdles for companies include investing in digital infrastructure, collaborative engagement with stakeholders, and advocacy by means of public policies. The paper seeks to generate continued discussion regarding the value in embedding circular and sustainable thinking in a manner that maximizes both enterprise objectives and public interest.

**Keywords:** circular economy, sustainability, business model, good practices

## **Digital Tools for Supporting the Sustainability Management of Complex Multi-Component Products: The Case of the Digital Vehicle Passports to Enable a Sustainable and Circular Automotive Ecosystem**

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### **Abstract**

Digital product passports (DPPs) are perceived as enablers of European Green Deal (EGD) goals, as they could function as product life cycle data carriers. Thus, they could support the establishment of more circular and sustainable sectors. The transportation sector is one of the key sectors to achieve EGD goals, leading to the push of powertrain electrification to contribute to the decarbonization of the transportation sector. Electric vehicle concepts (such as battery electric or fuel cell) consist of various components (e.g., battery, motor, brake systems, etc.) that require sustainable product management (SPM) measures to enhance the overall vehicle sustainability and circularity. To do so, however, high-quality data is needed along the entire value chain to identify SPM-related strategies that maximise a vehicle's sustainability and circularity performance. Due to persisting data gaps along the vehicle value chain, smooth data flows are currently impaired, making SPM and respective decision-making more difficult. In this context, the concept of Digital Product Passports (DPPs) could prove valuable to support SPM of vehicles by providing product life cycle data. However, as of now, there is lack of research when it comes to exploring the potential of a DPP for such a complex multi-component product as a vehicle. This study presents the first conceptualization of a digital vehicle passport (DVP) in the context of SPM, focusing on an electric passenger car. The conceptualization was based on a systematic literature review, enabling a benchmark of existing regulatory and policy papers, as well as research papers that define DPP information content, use cases, as well as target groups considering SPM. Furthermore, a systematic stakeholder mapping was deployed to identify value chain stakeholders of major vehicle parts (e.g., engine, battery, brake systems) to identify respective SPM decision situations and data needs and requirements. The conceptualization process was then guided by means qualitative content analysis, following an abductive coding approach, enabling a synthesis of the literature findings. Furthermore, the developed DVP concept was further subjected to preliminary expert validation. This paper holds relevancy as its results, firstly, highlight the differences between currently proposed DPP variants (in regulatory papers, and research papers), in terms of information content, target groups, as well as use cases. This enabled identification sustainability gaps present in current regulatory and scientific DPP proposals in terms of data content for SPM, highlighting a sustainability delta. Second, the paper presents the first conceptualization of a DPP for a complex multi-component product in the context of SPM, combining the benchmark results to take into consideration a more holistic life cycle perspective. Thus, this DVP concept provides the foundation for the development of DPPs for complex multi-component products. Next research steps comprise further expert validation, as well as exploring potentials of DPP implementation while considering data privacy mechanisms.

**Keywords:** digitalization, sustainability delta, electric vehicle, qualitative content analysis, stakeholder mapping

## **Towards Circular Construction and Demolition: Digital Platforms for Secondary Construction Materials**

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### **Abstract**

The construction and demolition contribute to approximately on third of all waste produced and is the single largest contributor to waste in Europe. Most of the waste from European construction and demolition activities is crushed and recycled as backfilling. Only a limited amounts of the construction materials in demolished buildings are reused or recycled in new buildings, using circular principles. There are unfortunately, many barriers to the adoption of circular principles in the construction industry, including technical, economic, environmental and legislative. One of the key barriers is the lack of markets for secondary construction materials to bridging the gap between companies involved with demolition and companies involved with construction of new buildings. However, digital market platforms are emerging in many European countries. Since platforms for secondary building materials are essential prerequisites for developing efficient markets for such construction materials, this paper explores the use of platforms across five European countries (Denmark, Sweden, Poland, Estonia and Germany). The analysis identifies which types of construction materials (bricks, wood products, tiles, windows, doors etc.) that are exchanged on the platform, amounts, the business relations (B2B or B2C) and the additional services provided by the platforms. Based on the assessment of the use of digital platforms across the five countries, the paper reflects on the business models behind the platforms and synthesises a typology of business models to understand the variations in the business models, combining circular business model literature and circular construction literature. Finally, the article discusses how digital platforms for secondary construction materials and novel business models based on these platforms can influence circularity in the built environment.

**Keywords:** circular economy, waste, digitalization, business model, recycling

## **Teal Organizations: Experience and Potential Impact on the Environmental, Social, and Economic Performance of Businesses**

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### **Abstract**

My previous research in the area of new tools and concepts for Resource Efficient and Cleaner Production, conducted at the International Institute for Industrial Environmental Economics, led to a better understanding of leverage points for achieving more sustainable performance for a business and its value chain. While we possess many managerial and technical tools for desirable change, we often lack the means to address its human dimension at the guiding levels of the management pyramid – namely, actual goals, mental models, and underlying assumptions and paradigms.

This paper explores the "Teal" organizational model, conceptualized by Frederic Laloux, as an advanced stage in organizational evolution operating on different assumptions than traditional businesses. The Teal model involves three core breakthroughs and principles: Self-Management, grounded in trust and inner motivation, which replaces traditional hierarchy with distributed authority based on purpose-driven roles and peer-based processes; Wholeness, which encourages individuals to bring their authentic selves to work and focus on the full utilization of their human potential, including their unique talents, and fosters empathy and psychological safety; and Evolutionary Purpose, where the organization is guided by a sensed direction beyond profit maximization, adapting organically over time.

While working with Teal (self-managed) organizations, I recognized that an important added value of this organizational model is the full engagement of enterprise members and their organic accountability for decisions and actions made within their roles based on inner motivation. Combined with the values inherent in the Teal model, this observation led to the question of whether the introduction of Teal principles could positively impact the desirable change towards the sustainable business models described earlier. To explore this research question, I utilized a literature search and action research, merging empirical experience with systems theory and learning theory.

The core focus of this paper is an introduction to the Teal organizational model, experience with its use in different enterprises, and an analysis of how the Teal mindset and practice can influence a business's environmental, social, and economic performance. Self-management and related transparency enable and require the acceptance of full responsibility, thus optimising decisions made and minimizing the negative impacts. Wholeness enhances personal growth and social well-being, and facilitates the translation of internal care into sustainable external actions. Evolutionary Purpose offers the most profound potential for embedding Corporate Social Responsibility into an enterprise culture, though linking the business to the needs of stakeholders in a natural way.

The research is still ongoing. However, I can already share its preliminary conclusions. While Teal principles create fertile ground for superior outcomes, they are not inherently prescriptive, and each Teal enterprise creates its unique approach bottom-up. The Teal model offers an emerging alternative framework for understanding and navigating the desired changes being discussed at this conference.

**Keywords:** teal organizations, self-management, wholeness in business, evolutionary purpose, corporate social responsibility

## **Expanding Well-Being in Food Sustainability: A Systematic Review of Social Life Cycle Assessment**

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### **Abstract**

Our food systems and consumption patterns must evolve, necessitating a shift toward sustainable behaviours at the individual, community, business and system levels. As companies strive to reduce environmental impacts and promote societal well-being, robust indicators of both environmental and social performance become essential. However, while environmental assessment frameworks are well developed, the notion of well-being remains poorly defined and operationalized in social sustainability evaluations, particularly in the food sector, limiting informed action from both companies and policymakers.

This article aims to advance the integration of well-being into food system assessments by leveraging the Social Life Cycle Assessment (S-LCA) approach. S-LCA evaluates the positive and negative social impacts of organizations on various stakeholders, ultimately converging on the endpoint of well-being. We conducted a systematic literature review and content analysis of 59 peer-reviewed articles assessing social sustainability in food-related contexts. Our objectives were twofold: (1) to identify which well-being indicators are currently used in the literature in comparison with UNEP guidelines, and (2) to classify these indicators according to six well-being dimensions: physical, financial, psychological, social, subjective, and eudaimonic.

The analysis yielded over 400 social indicators grouped into 95 subcategories across 9 stakeholder groups. Results reveal significant gaps and inconsistencies in current S-LCA practices. Most studies focus narrowly on *workers* (e.g. health and safety, child labor, fair salary) or *local communities* (e.g. local employment, delocalization and migration), overlooking critical stakeholders such as *consumers, value chain actors, smallholders, children, and animals*. Furthermore, assessments often stop at the production or processing stage, rarely encompassing the full value chain, including distribution, consumption, and disposal. The six-dimensional categorization of well-being highlights further imbalances, with *physical* and *financial* indicators dominating the literature, while *psychological* (e.g. privacy), *social* (e.g. community engagement), *subjective* (e.g. satisfaction), and *eudaimonic* (e.g. professional growth) aspects are largely neglected.

Expanding the well-being framework is essential for a truly sustainable transition. *Psychological well-being* is crucial, as food workers often face stress, job insecurity, and exploitative conditions, while consumers experience cognitive overload from misleading sustainability claims. *Social well-being* highlights the collective nature of food production and consumption. Rural communities, smallholders, and workers thrive when policies support fair wages, social equity, and inclusive decision-making. *Subjective well-being* matters too, as food is deeply tied to pleasure, tradition, and identity. Sustainable choices should not feel restrictive but instead offer joy and cultural connection. Lastly, *eudaimonic well-being* emphasizes the role of food in creating purpose and long-term societal benefits. Supporting ethical labor practices, resilient local food systems, and consumer awareness fosters a future where food nourishes both people and the planet in meaningful ways.

By integrating these six dimensions into the assessment of social sustainability, this research not only highlights critical gaps in current S-LCA practices but also offers a more holistic and human-centered approach to evaluating food systems. It contributes to advancing sustainability science by proposing a multidimensional well-being framework that can inform future methodologies, support better

decision-making, and guide both academic inquiry and practical applications toward more equitable and impactful outcomes.

**Keywords:** sustainability, social life cycle assessment, well-being, sustainable food systems

## **Eco-design and Digital Product Passports as Key Tools for Circularity and Material Efficiency**

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### **Abstract**

The transition to a circular economy in the EU is accelerating through the implementation of new regulations, particularly the Ecodesign for Sustainable Products Regulation (ESPR) and the Packaging and Packaging Waste Regulation (PPWR). These frameworks introduce ambitious new requirements related to product sustainability, circularity, material efficiency and transparency. However, many small and medium-sized enterprises (SMEs) face challenges in interpreting and implementing such complex regulations in practice.

To address this, the project “Ecodesign and Digital Product Passports as Tools for Waste Prevention and Higher Plastics Recycling” - funded by the Technology Agency of the Czech Republic - supports Czech companies in applying eco-design principles and adopting Digital Product Passports (DPPs). The project’s objectives are to provide practical methodological guidance, raise awareness, and build internal capacities among SMEs.

The project runs from January 2025 to December 2026. Its main outputs—three professional handbooks—will be available in the second half of 2026 and will focus on the following topics:

- application of eco-design parameters in Czech companies,
- design for packaging recyclability,
- implementation of Digital Product Passports (DPPs) within company value chains.

Key project activities to successfully meet these goals include:

- expert consultations and legislative analysis to interpret ESPR and PPWR in the national context,
- mapping best practices across the EU and Czech Republic,
- engaging with stakeholders to identify specific needs and barriers in various sectors,
- and developing tools to support SMEs in implementation.

The presentation aims to share current findings, highlight opportunities for businesses, and discuss what to expect in light of the upcoming EU regulations. It will also invite discussion on how SMEs can practically prepare for and implement these regulatory changes.

**Keywords:** eco-design, digital product passports, ESPR, PPWR, DfR

## **Product Information for the Circular Economy Age: Using a Novel Model of Inventory - the Entity Management System**

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### **Abstract**

The circular economy involves not only shifting products from a linear production - consumption pattern, but the information that accompanies these products must also become circular. Information in modern supply chains is commonly stored in association with a product, which can be defined as a series of individual sellable items that are manufactured to be, in theory, identical. Identifying individual instances of products happens in some supply chains like in the pharmaceutical industry where products are serialized for traceability requirements, but this practice is not widespread across all industries. There are at least two shortcomings in the inventory information model for the circular economy. Firstly, the impact of a product as calculated in a Product Environmental Footprint (PEF) or similar framework is often generalized at the product level instead of attributing an accurate impact value to each individual item of a product (for instance two items of the same product moved by an electric vs diesel vehicle which will have different environmental impacts). Secondly, at the end of its use stage, the individual item will have a different user story than other items of the same product, a different quality and other characteristics that could influence consumers and others during subsequent uses. This is because fundamentally, each item is in fact a different 'Entity' with a different story. Efforts to add more fine-grained information to products are underway and are being examined by initiatives like the EU Digital Product Passport. These initiatives commonly require more information to be available with products, and strive to make this information accessible for customers, regulatory purposes, and for end of life uses and re-uses. The author has developed a new informational model for managing products which models physical inventory according to each individual entity, rather than the common product-centric model. This new model allows for information to be assembled at the item level thus providing a solution to the problems described. A practical use case using the Entity Management System as a viable method of managing information for the circular economy has been conducted. A small E-shop managed its products with a prototype system built on the principles of the Entity Management System and were able to manage all items on an individual basis. This demonstrated the potential for the Entity Management System to function on a small scale and proved that associating information with each Entity is possible. Larger implementations are necessary to prove that the Entity Management System could be used widely across facility sizes. Additionally, associating each item's impact data with the item in the form of a Digital Product Passport would be another step towards assessing the usability of this new model of managing items and inventory.

**Keywords:** circular economy, inventory, product information, digital product passport

## **Circular Economy Practices that Support Industrial Symbiosis: A Systematic Literature Review**

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### **Abstract**

Industrial symbiosis is a key tool of the circular economy, enabling industries to achieve greater resource efficiency and lower environmental impact through waste, water and energy exchange. Although the concept of industrial symbiosis is recognised in European policies, there is no clear and common definition that covers the different circular practices that companies are implementing to support industrial symbiosis. The literature often treats industrial symbiosis narrowly, through case studies, neglecting the definition of a broader set of practices that contribute to the creation of synergies between industries. This study seeks to fill this gap by analysing, through a literature review, circular economy practices that directly support industrial symbiosis. The aim of the study is to provide a more comprehensive definition of industrial symbiosis practices in order to provide a more holistic approach and a framework for future research and practical applications. Based on a systematic literature review, the study analysed research articles found in the Web of Science database using the keywords "industrial symbiosis" and "circular economy practices". The selected articles underwent a rigorous screening process to ensure their relevance in the context of the research problem. The analysis identified and categorised different circular economy practices that support industrial symbiosis, and aligned them with the analytical framework for circular business models. This methodological approach allows a better understanding of how circular economy practices contribute to the development of industrial symbiosis in industries. Preliminary results of the study show that industrial symbiotic practices go beyond by-product exchange alone, including by-product exchange, symbiosis creation, co-financing and joint management of resources, among others. Preliminary results also suggest that the vast majority of circular economy activities supporting industrial symbiosis are located in the material and production-marketing phases of the five-phase life cycle. Through a systemic approach, the study offers a broader definition of industrial symbiosis that takes into account the sharing of both tangible and intangible resources. It supports the understanding of how symbiotic models of cooperation can support the sustainability of value chains, and which circular economy practices need more attention and support to promote industrial symbiosis. The results of the study are important in both academic and practical contexts as they contribute to understanding the role of industrial symbiosis in promoting the circular economy. The identified practices and their systematic categorisation through life-cycle phases provide valuable input for industrial companies wishing to implement symbiotic solutions, as well as for policy makers planning measures to increase resource efficiency. The study also provides an in-depth understanding of the opportunities and challenges for promoting industrial symbiosis, suggesting approaches for new research.

**Keywords:** industrial symbiosis, circular economy, circular practices, business models, life-cycle

## **Dynamic Simulations: The Driving Force behind Water Management Digitalization**

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### **Abstract**

Digitalization has long been a key trend in the water management sector. Digital solutions offer benefits across all project phases, from planning and design to implementation and infrastructure operation. Modelling and process simulation are crucial to this digitalization, having seen significant advancements. Despite the availability of high-quality, proven hardware and software for modelling and simulations – tools that could efficiently support various project tasks – they are often underutilized. One of the platforms that can be used for simulations in water management is the SIMBA# simulation software, with more than 30 years of tradition. This presentation summarizes how dynamic simulations can be effectively used from conceptual planning through operation, enabling stakeholders to make informed, data-driven decisions and enhance operational safety and efficiency.

**Keywords:** water management, digitalization, process simulation

## **Information Flows in Circular Economies: A Research Agenda for Enabling Circularity**

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### **Abstract**

The realisation of a Circular Economy (CE) depends not only on material flows but also on the information flows that enable their coordination, optimisation, and scalability. Data availability, traceability, and digital technologies play a crucial role in managing circular strategies, ensuring that materials are effectively circulated and value is retained. Different CE strategies rely on distinct ways of managing and utilising information to support circularity. At present, discussions on the interplay between material and information flows lack nuance concerning how different versions of a CE could or should look and what role information flows and digital technologies should play in them. For example, Bauwens et al. (2020) differentiate circular futures based on varying levels of technological innovation (e.g., high-tech versus low-tech approaches) and governance structures (e.g., centralised versus decentralised systems). However, the role of information and data in shaping these futures, as well as their distinct requirements, remains insufficiently examined. This gap limits our ability to understand how different circular futures can be effectively developed and operationalised. Different CE futures will necessitate distinct data infrastructures, shaping how circular value chains function. By critically assessing the role of data in circular value chain development, this study serves as a research agenda for CE from a data perspective. Understanding the data requirements of different CE narratives allows for more targeted research and decision-making, ensuring that circular strategies align with their respective socio-technical contexts. The paper argues that different CE scenarios generate unique challenges, requiring tailored research questions to address the informational and operational needs of each approach. To explore the intersection of CE narratives and data requirements, we begin by examining existing circular scenario frameworks and narratives. Based on this review, we identify a framework that allows us to analyse different visions of CE, particularly those that emphasise contrasting approaches to circularity. We then construct a typology of CE narratives and evaluate their implications for data requirements. To validate this framework, we analyse case studies from the construction, textile, and technology sectors, using them as evaluation scenarios to examine how data infrastructures support or constrain circular strategies in different contexts. This analysis will highlight enablers and constraints within these systems, identifying areas where data availability and governance influence circular value chain development. This study will provide a structured exploration of how different CE narratives shape the data needs of circular value chains. Key outcomes include: 1) A typology of CE narratives that highlights alternative visions beyond material circularity; 2) an assessment of the data requirements necessary to operationalise these narratives; and 3) a set of guiding research questions for future investigations into the role of data in CE transitions. By situating CE within diverse circular narratives, this research seeks to go beyond the notion of a singular CE vision and instead presents multiple, viable circular futures. This approach can inform policymakers, businesses, and researchers in designing data-driven strategies that align with specific circular models.

**Keywords:** Circular Economy Narratives, Circular Value Chains, Data Infrastructure, Sustainable Business Models, Circular Futures

## **Embedding Reuse into Business Strategy**

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### **Abstract**

Wistron strategically focuses on environmental protection and the integration of sustainability principles into all areas of its business, which monitors through the systematic collection of environmental, social, and corporate data (ESG). The main pillar of its approach is innovation that supports sustainable practices in manufacturing processes. Key initiatives include WASTE REUSE and performance monitoring through the WASTE INDEX and RECYCLING RATE. By introducing the REUSING PROGRAM, we integrate internal and external activities to aim of creatively using old materials, promoting reuse, and significantly reduce waste. Regular initiatives include the sale of materials for further use, the use of packaging materials for export, active employee involvement, thematic exhibitions, and cooperation with a kindergarten. These activities raise awareness of the importance of sustainability and promote a responsible relationship with natural resources.

**Keywords:** Waste reuse, Recycling rate, Waste index

## **Niche Management and Business Model Analysis: The Case of Small Hydro Power in Indonesia**

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### **Abstract**

Indonesia has a large potential for small hydro power, particularly for rural electrification. Whereas 19,385 MW of small hydro power potential lies across the Indonesian archipelago, only 0.6% of the total potential contributes to the overall power plant installed capacity in Indonesia. Although international donors and development agencies have conducted small hydro power experiments in Indonesia since the 1990s, the contribution of small hydro power is currently still low. Therefore, it is relevant to study the development of small hydro power in Indonesia to gain insights into actors and factors that have influenced the development, address niche development over time and identify barriers and opportunities for broader adoption. Furthermore, given the diversity of small hydro power business models implemented in Indonesia, it is interesting to analyze how business models contributed to small hydro power niche development and what their role is in niche formation from an energy transition perspective. Moreover, in the field of transition studies there is still a lack of niche studies on cases in the Global South, while also the role of business models in sustainability transitions is raising interest.

In our paper Transition analysis, Strategic Niche Management and Business Model Analysis were combined to conduct a comprehensive analysis of mini hydropower business development on West Java, Indonesia. A refined Business Model Canvas was used to describe four business models of small hydro power in Indonesia, following the approach proposed by Elmustapha and Hoppe (2020). The data collection includes (i) interviews with 12 informants representing different groups of actors in the small hydro power sector, (ii) desk study and (ii) secondary data analysis. The research methodology is developed to answer the following research question: "How has the small hydro power market niche developed in Indonesia and how did business models facilitate niche development?"

Results show that niche formation took gradually place since the 1990, leading to a successful niche industry producing for both Indonesian market and abroad. Moreover, in different periods business actors implemented different kinds of business models to overcome adoption barriers of small hydro power in Indonesia. The cooperative business model emerged as the implementation of micro hydro power plant projects using grants in rural areas was based on the active participation of the local community to improve operation sustainability. The Public-Private Partnership (PPP) business model is developed to overcome the financial barrier of the project funded by a grant through a partnership with the private firm. Finally, the Independent Power Producer (IPP) business model has emerged as an incremental improvement in the regime sociotechnical dimensions that facilitate niche development.

It was also found that several factors hamper the development of small hydro power, including regulation, financial, policy, social, and technology. Private investors perceive small hydro power as an uncertain sector due to frequent regulatory changes. Therefore, private investors are reluctant to invest and adopt the "wait and see" strategy. In terms of the economy of scale, micro hydro power is too small for private investors and hence not commercially viable. In addition, banks do not have the capability to evaluate small hydro power projects' technical and economic feasibility. In terms of policy, the government's commitment to the 35 GW project that coal-fired power plants dominate creates an entry barrier for small hydro power. Furthermore, small hydro power plants are often

installed in customary land, potentially leading to conflicts with indigenous communities for land acquisition.

Relevance of the paper for the Sustainability Transitions field consists of a case in a Global South context and increasing the understanding of the interactions between niche and business model dynamics. More details are available in an underlying report (Hakim, 2021).

**Keywords:** small hydro power, strategic niche management, business model, renewable electricity Indonesia

## Competition for Used Apparel Acquisition Between Charities and For-Profit Organizations

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### Abstract

There is increased competition for the acquisition of used apparel from consumers as more for-profit organizations (FPOs) are entering a market that has been dominated by charities. Our research focuses on the competition between charities and FPOs. Specifically, we study how consumers' used apparel return decisions are impacted by (1) the organizations' social orientation, (2) the financial reward level, and (3) the convenience level. We conduct incentivized discrete-choice experiments in a laboratory. Participants bring one piece of used apparel that they no longer need to the lab, and then decide whether to give their used apparel to a charity, to an FPO, to the residual waste, or to take it back home. The alternatives differ in terms of financial rewards, information about the organizations' social activities, and convenience. Using a multinomial logit model, we find that financial rewards significantly impact consumers' return decision for *both* FPOs and charities. Further, charities can significantly influence consumers' return behaviour in their favour by increasing convenience levels. This is not true for FPOs: for them, the provision of information on their social activities significantly impacts consumers' return behaviour. Consumers with high moral identity are not more likely to return used apparel to either a charity or a FPO unless the residual value of their used apparel is high enough. Our results show managers from charities that financial rewards offered by charities for used apparel do not crowd-out intrinsic motivation but rather increase consumers' utility of returning to them. Thus, in an increasingly competitive market, charities can increase their return rates by offering financial rewards and offering more convenient options to consumers.

**Keywords:** nonprofit operations, charities, used apparel, closed-loop supply chains, circular economy

## **The Ambidextrous Orchestrator: Circular Bioeconomy Innovation Ecosystems at the Crossroads of the Fashion and Food Industries**

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### **Abstract**

The circular economy practice and scholarship in the recent years has produced an extensive body of research. However, this is often focused on recyclability, specifically of the technical components of the economy. The bioeconomy based circular ecosystems are comparatively less explored, especially when it comes to cross-sectoral ecosystems, due to the particularities of the bioeconomy and the lack of antecedents (which requires advanced innovation capabilities). We introduce a theoretical model that conceptualizes circular bioeconomy innovation ecosystems (CBIEs) as orchestrated systems with a dual purpose: fostering innovation and advancing sustainability. By integrating the closed-loop logic of industrial ecology with the strategic actor alignment emphasized in ecosystem theory, this framework aims to underpin the orchestration dynamics that support cross-sector collaboration between the fashion and food industries. These two sectors, traditionally unconnected, are increasingly linked through circular value flows, shared sustainability goals, and the valorisation of biological resources. Because the routines, skills, and structures required for resource efficiency differ fundamentally from those needed for innovation, the effective orchestration of such ecosystems demands ambidextrous capabilities that integrate exploration and exploitation logics across sectoral and institutional boundaries to simultaneously advance innovation and sustainability objectives. Our framework highlights the interdependencies among ecosystem actors and the need for their alignment around a shared innovative value proposition for circularity. The concept of ecosystem orchestration is central to this approach, understood as a set of dynamic capabilities deployed by ecosystem leaders to coordinate, and mobilize actors under conditions of uncertainty and institutional complexity.

The framework is structured around three theoretical pillars:

1. **Innovation Ecosystems and Actors' Alignment:** Drawing on Adner's (2017) alignment view of ecosystems and the strategic literature on ecosystem participation (Aarikka-Stenroos et al., 2021), this pillar emphasizes the need for congruence in goals, roles, and timing among heterogeneous actors. Misalignment is framed as a core barrier to circular innovation, especially when ecosystems span across industrial domains such as fashion and food.
2. **Dynamic Capabilities for Orchestration:** Inspired by Teece's (2007, 2018) framework and recent contributions by Linde et al. (2021), this section explores how orchestrators sense, seize, and reconfigure resources to support systemic innovation. Particular attention is paid to non-redeployability and ecosystem-specific investments, which are essential to sustaining collective action in CBIEs.
3. **Collaborative Business Models and Ambidexterity:** Building on Pedersen et al. (2021), the framework introduces the concept of value creation ambidexterity – the ability to simultaneously explore new sustainable practices while exploiting existing capabilities. This duality is seen as crucial for managing tensions inherent in circular transitions and enabling long-term ecosystem viability.

We argue that successful orchestration in CBIEs depends not only on individual firm capabilities but also on institutional embeddedness and spatial complementarity (Chertow, 2007). These contextual enablers shape the feasibility and scalability of cross-sector collaboration.

By articulating a theoretically grounded framework, this research contributes to the emerging literature on circular innovation ecosystems and provides a basis for future empirical inquiry. Ultimately, it seeks to inform both scholars and practitioners on how to foster resilient, cross-sectoral collaborations that address the wicked problems of sustainability transitions.

**Keywords:** circular economy, bioeconomy, ecosystem orchestration, ambidexterity

## **Transition Conditions of the Chemical Industry Towards Carbon Neutrality - Czech Republic**

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### **Abstract**

In order to define possible conditions for achieving carbon neutrality by 2050 the model of the Czech chemical industry was created using 16 selected key chemical commodities relevant to the Czech chemical industry, taking into account production and demand in the Czech Republic, representing key sectors in terms of sales, profitability, environmental impact and investments. The iC2050 model was used carried out in 24 under the scenarios. The modelling outputs show that the goal of achieving climate (carbon) neutrality is not achievable unless the following conditions and assumptions are created:

1. Electricity is available at an affordable price to guarantee the global competitiveness of the industry;
2. Greenhouse gas intensity in the energy sector (electricity) will decrease and reach zero in 2050;
3. Sufficient amount of sustainable biomass available for the chemical industry in the Czech Republic it is around 1 million tons;
4. Appropriate technologies, e.g. electrified steam cracking units (ethylene), will be available, at least partially, in 2033, other emission reduction technologies are being deployed on time;
5. Creation of sufficient financial resources for investments (sufficient profitability of the sector should create the necessary equity financing and investment sustainability);
6. Availability of sufficient public resources for possible operational and investment support for new technologies;
7. Modern energy, digital, CCUS implemented and recycling infrastructure (see availability of selected technologies).

Conditions can be generalized for the entire chemical industry sector by using a multiplier (1.2 - 2.0). Electricity consumption for a defined part of the sector will gradually increase from 1.5 TWh/year to 5 to 12 TWh/year (depending on the selected sub-scenario).

The need for oil and other fossil fuels will decrease from the current level of approximately 2.2-2.5 million tons/year for the needs of the petrochemical industry to 1.7-1.8 million tons/year.

**Keywords:** decarbonisation, carbon neutrality, transition pathway

## How Sustainable Are Germany's Biggest Supermarkets?

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### Abstract

The global food system is responsible for 26-34% of global greenhouse gas emissions. It also has substantial negative impacts on biodiversity, soil erosion, and both water consumption and pollution. Food retailing plays a key role in the food system. Not only does it strongly influence what consumers buy in supermarkets through its range of products, pricing policy, and advertising. Its purchasing decisions also determine how raw materials are produced and how products are manufactured. However, research and the public debate about the changes needed for a sustainable food system concentrate on the starting and end points of the value chain: agriculture and consumers. The powerful stakeholders in between are not given enough attention. The aim of the research presented here is to assess the extent to which Germany's eight main food retailers, which account for 76% of the market, are using their power to support a more sustainable food system. We evaluated these companies based on 23 fields of action, 90 indicators and 103 sub-indicators in two studies using data from 2020 and 2023. While the first study focused on environmental aspects, the second one additionally includes the aspects of social responsibility and animal welfare. The available action points with regard to the food retailers' contribution to sustainable development are divided into three categories: supply chain, own facilities (including production and distribution facilities and stores), and consumption. The focus of the research is on each company's own-brand food product range. The data used comprises both publicly available as well as internal company information obtained by means of a questionnaire. All in all, the food retail companies were able to demonstrate many relevant activities in the analysed fields of action, although there were some major differences between companies across and within these fields. In 2023 compared to 2020, the overall data quality and assessment results in the area of environmental protection generally improved. However, there were still major gaps in the companies' sustainability strategies and especially their implementation. While this applies to the "environment" area, these differences were even more pronounced in the areas of "social responsibility" and "animal welfare", which lack a systematic strategy that goes beyond legal requirements and selective activities. By and large, the food retail sector is still not doing enough to fulfil its role as a gatekeeper for the urgently needed transformation of the food system. The research identifies action points and provides recommendations for the food retailers to improve their sustainability performance. Productive exchanges with the retailers during the course of the study revealed that their participation in the research was an opportunity to take additional steps toward sustainability. The research also showed that certain policies aiming at the sector proved to be effective. The German law on corporate due diligence in supply chains is one case in point. Given the average performance of the companies on sustainability so far, we conclude that the policy framework needs to be enhanced to enable food retailers to improve their sustainability performance without suffering significant competitive disadvantages.

**Keywords:** food retail, supermarkets as gatekeepers, sustainability assessment, systems of provision

## **PSG Construction Group: A Century of Sustainable Building and Business**

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### **Abstract**

In 2024, PSG Construction Group celebrates 100 years of building projects that shape the future. From its origins in Tomáš Baťa's construction department in the 1920s to becoming a leading Czech family-owned construction group, PSG has delivered projects in more than 20 countries across four continents – including a polar station in Antarctica.

Today, with over 400 employees and expertise ranging from turnkey industrial projects to reinforced concrete structures and prefabricated technologies, PSG continues to combine innovation, long-term stability, and sustainability. The presentation will highlight key milestones, modern approaches such as prefabricated bathrooms, and the company's commitment to environmental and social responsibility.

**Keywords:** heritage, innovation, sustainability

## **Between Sustainability and Structural Challenges: A Participatory Action Research Case Study on the Impact of Food Cooperatives**

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### **Abstract**

Transforming food systems is essential to address climate change, biodiversity loss, and economic disparities. Conventional food supply chains prioritize efficiency and profit maximization, often at the expense of ecological and social sustainability. Alternative Food Networks (AFNs), particularly Food Cooperatives (FoodCoops), seek to counterbalance these shortcomings by fostering direct consumer-producer relationships, promoting regional value creation, and enabling democratic decision-making. While their potential benefits are widely recognized, empirical research on their long-term impacts remains scarce. This study aims to contribute to this research gap by examining how FoodCoops influence consumer behavior, economic resilience, and community engagement. By analyzing both individual and systemic effects, the study provides insights into the structural strengths and limitations of this model, informing future policy and organizational strategies. A participatory action research approach was applied, integrating qualitative and quantitative methods. The case study focused on a FoodCoop in Lower Austria with approximately 50 active members and over 30 local producers. Research was conducted over four years [2020-2023], during which the author actively participated in cooperative activities, including governance meetings and operational processes. Data collection included participant observation, document analysis, informal interviews, and an online survey. This multi-method design facilitated a comprehensive understanding of cooperative dynamics and their broader implications.

Findings indicate that FoodCoop membership fosters greater awareness of food origins, leading to more deliberate purchasing decisions favoring local and seasonal products. Consumers reported an increased sense of autonomy, while producers valued the stability of direct market access. However, governance structures posed challenges: decision-making often became concentrated within a small core group, leading to concerns about burnout and limited participation from newer members. Economic uncertainties persisted, particularly in balancing fair producer compensation with consumer affordability. Additionally, fluctuating order volumes and logistical constraints complicated long-term planning for producers. Beyond individual behavior, FoodCoops generate broader systemic effects. Socially, they strengthen community cohesion through shared responsibilities and knowledge exchange. Environmentally, they contribute to reducing food miles and food waste by shortening supply chains. However, their reliance on volunteer engagement limits scalability and operational efficiency. While revenue in the cooperative network remained stable, rising costs and economic pressures on small-scale producers pose long-term sustainability concerns. These findings highlight both the opportunities and limitations of FoodCoops in advancing sustainable food systems. Their long-term viability depends on well-structured governance, distributed responsibilities, and sustained member engagement. The case study emphasizes the need for external support, transparent decision-making processes, and mechanisms to mitigate over-reliance on a small group of active members. Addressing these structural challenges is crucial for ensuring resilience while maintaining cooperative values. This study contributes to the broader discourse on sustainable food systems and alternative consumer networks. It offers practical insights for policymakers and community organizers seeking to develop scalable, ethical, and community-driven alternatives to conventional food supply chains. Furthermore, it underscores the

need for continued research on governance structures and operational challenges in community-based food networks to fully understand their transformative potential.

**Keywords:** alternative food networks, food cooperatives, grassroots initiatives, participatory action research, governance challenges

## **Circular Economy Innovation for Energy Storage Technologies, Services and Business Models beyond Lithium-Ion Batteries**

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### **Abstract**

Renewable, low-carbon electricity is crucial to mitigating global warming, yet its variable nature demands large-scale electricity storage solutions. While Lithium-Ion Batteries (LIBs) have become the dominant technology of global new installations due to major cost declines, their value chains cause significant environmental and social impacts. Circular Economy (CE) strategies offer for the European Union a toolbox to improve sustainability and resource resilience; however, academic discourse on circular storage often focuses narrowly on LIB recycling. Thus, this study explores the research questions: Which circular energy storage technologies, services, and business models exist today in Europe beyond purpose-built grid-scale LIBs and where is more innovation needed? The study applied a three-step approach: (A) public data collection, (B) expert interviews, and (C) data analysis and coding, with iterative refinement. The linear energy storage value chain was mapped via desk research and unstructured interviews. An industry-specific coding framework was then developed by adapting the CE 10R framework using academic and grey literature. Companies engaging in circular storage were identified from expert interviews and leading industry association member lists, the Long-Duration Energy Storage (LDES) Council and the European Association for Storage of Energy (EASE). The company's products or business models were then coded into the 10R framework using information from interviews, websites (industry alliance and company) and company sustainability reports. Results show that the linear energy storage value chain offers multiple opportunities for circular strategies: Short-loop solutions are chronically underinvestigated, usually framed as sufficiency, efficiency and not as circular, while delivering the greatest environmental benefits, and they are usually not framed as "circular (economy)" although they are. The shortest loop solutions (R0-R2), dynamic tariffs, Vehicle-to-Grid, or hydro dam pumping retrofits can significantly reduce – but not fully replace – the need for new purpose-built grid-scale storage. Products like "1Komma5 heartbeat" and "Sonnen" enable virtual power plants by integrating home batteries and battery electric vehicles. Mechanical storage, e.g., adiabatic compressed air and pumped hydro, use much less and easier to recycle materials, compared to complex chemical compounds used for (lithium-ion) batteries. Large-scale retrofitting, such as vw illwerke's 1 GW project or Axpo's Mattmark dam expansion, and repurposing gas infrastructure for compressed air storage, illustrate innovative business models.

**Keywords:** circular economy, circular (business model) innovation, energy storage, 10R framework

## Scaling Upcycling Business Models in Cross-Sector Urban Value Networks

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### Abstract

New municipal infrastructures with unusual public-private collaborations have emerged across Dutch cities to tackle growing urban waste streams. Municipalities and businesses facilitate access to discarded resources to local entrepreneurs, citizens and social institutions engaged in urban upcycling. A wide range of urban upcycling initiatives have emerged across multiple supply chains, creating unusual value networks based on closed urban loops in open cycles. However, recent studies show that upcycling entrepreneurs in these cross-sectoral urban value networks face various challenges to develop promising activities towards scalable business models. Important barriers identified include the scarcity of data, capacity and/or competences to manage extreme varieties in quantity and quality of resources across multiple supply chains. While frameworks for circular supply chain management and circular business model innovation exist in literature, scaling-up urban upcycling business models in circular supply chains remains an understudied topic. Therefore, this qualitative empirical research investigates common approaches used by actors in urban upcycling engaged in developing and scaling upcycling business models in urban value networks and across multiple supply chains. The study aims to understand whether available frameworks in state-of-the-art literature resonate with the practices and challenges faced by urban entrepreneurs developing upcycling initiatives towards scalable business model manifestations. The research method consists of three steps. First, scaling processes in urban upcycling are described based on narrative analysis of empirical data. Second, key elements in the scaling process, such as options, criteria and decisions are summarized and mapped through deductive coding. Third, and finally, empirical data is compared with existing frameworks from literature on circular supply chains, circular business model innovation and scaling circular business models. Primary empirical data is collected through semi-structured interviews with six experts who are engaged in scaling business model manifestations and/or orchestrating urban upcycling value networks. Secondary data shared by interviewees and from public archives is used for data triangulation. Expected results include a conceptual framework for scaling urban upcycling business model manifestations in cross-sector value networks, and an overview of important mechanisms and key elements. Preliminary results show the importance of a strategic portfolio-based view on business model innovation for urban upcycling and an integrated value network perspective on strategic, tactical and operational collaboration between collaborating urban upcycling business model manifestations across multiple supply chains. The results can be used by researchers and practitioners to study and further develop frameworks, approaches and processes for post-pilot scale up of urban upcycling business model manifestations in cross-sector value networks.

**Keywords:** supply chain management, upscaling, cross-sector collaboration, circular cities, circular business model innovation

## 2. Circular Economy and Sustainable Use of Resources

### **Multi-Criteria Assessing Industrial Symbiosis Potential in European Countries: An Integrated Entropy-COPRAS Approach**

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#### **Abstract**

The circular economy represents a modern approach to sustainable development that strives to conserve resources through waste minimization, material reuse, and production and consumption efficiency improvement. One of the key mechanisms for its implementation in the industrial sector is industrial symbiosis, a concept that implies cooperation between different industrial actors in exchange for materials, energy, and by-products, which contributes to reducing the ecological footprint and increasing economic benefits. Hence, this paper aims to assess the potential for industrial symbiosis in the European Union member states (EU27), using an integrated multi-criteria approach based on circular economy indicators. The European countries' ranking and comparison process was conducted using the multi-criteria method COPRAS (COmplex PROportional ASsessment). The analysis is based on 16 relevant indicators from four categories available through the Eurostat database from 2020 to 2023. The objective Shannon entropy method was used to determine the weight of the indicator. The findings provide insight into the relative performance of countries, identifying both leading and lagging members regarding the application of circular practices. The results obtained using the COPRAS method show that Germany, followed by Finland and France, achieve the best overall performance in terms of circular economy and potential for industrial symbiosis compared to other EU members. These results indicate the existence of stable and functional systems that support industrial symbiosis, including policies that encourage cooperation between industries, innovation in waste management, and strong mechanisms for reinvestment in green technologies. In this sense, these countries can serve as examples of good practice and potential models for implementing circular strategies in other EU member states. Generally, circular policies are more advanced in Western and Northern European countries, while the potential of Southern European nations, such as Malta and Cyprus, is comparatively weaker. These results establish a basis for further strategic planning and the development of industrial symbiotic networks within the EU.

**Keywords:** industrial symbiosis, circular economy, European countries, COPRAS, multi-criteria decision-making

## **From Policy to Practice: A Simulation Game for DPP Governance in the Furniture Sector**

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### **Abstract**

The increasing strain on ecological boundaries caused by modern industrial production and consumption necessitates a shift towards a resource-efficient and low-emission circular economy. The European Green Deal drives this transition through regulations like the ESPR. A key measure is the 'Digital Product Passport (DPP)', ensuring compliance with ecodesign standards and improving transparency along the value chain. Once implemented, only products meeting these criteria and equipped with a DPP will be marketable in the EU. The DPP compiles comprehensive product data, including materials, chemical composition, repairability, spare parts availability, and disposal guidelines, thus supporting informed decision-making across all lifecycle phases. Beyond regulatory compliance, the DPP offers significant advantages for product design, material selection, and overall sustainability assessment. By facilitating an in-depth understanding of a products life cycle, the DPP empowers consumers with crucial purchasing information and assists companies in strengthening their sustainability efforts. Moreover, it enables efficient recycling and take-back systems, allowing manufacturers to recover valuable raw materials. Additionally, the DPP enhances traceability along the value chain, making it a key enabler for the broader transformation envisioned by the Green Deal.

The European Commission is prioritizing high-potential sectors such the furniture industry. With important sectors like furniture and textile industry the 'Society of Institutional Analysis (sofia)' already realize projects in the field of traceability and DPP implementation. For instance, the 'ECHT' project enables DPP for chemical traceability in textiles, helping SMEs adapt to circular economy regulations – key for cross-sector transparency. 'TRUSTex' enhances textile circularity by optimizing Extended Producer Responsibility (EPR) schemes and governance, aligning with the session's focus on DPP-driven sustainability. 'R-evolve' drives circular transformation in furniture through DPP implementation, which opens up new business models.

However, unlocking the full potential of the DPP requires not only clear regulatory frameworks and standardization measures but also well-defined governance structures and operational rules. Establishing a coherent DPP governance framework is crucial to ensure that all stakeholders – manufacturers, regulators, and consumers – adhere to uniform standards and effectively utilize the DPP. As part of the R-evolve research project, sofia therefore developed governance conditions to enable data sharing in the furniture industry. The aim of the Thematic Session proposal is to briefly

present the research results and afterwords to test the governance framework in the context of a simulation game.

The simulation game is a solution-orientated method for real challenges and deals with relevant players in the real world. It enables to observe stakeholder interactions, identify potential obstacles, and assess the impact of regulatory and standardization measures in a controlled environment and timewise condensed manner to enhance them. The simulation game benefits from transdisciplinary cooperation between policymaking players, industrial companies and service providers. Through the research results and the simulation game conduction itself, the participants gain a comprehensive understanding of the complexity and requirements involved in implementing the DPP. This structured foresight and reflection process is intended to yield actionable outcomes, including policy recommendations and governance design principles. The results are summarized at the end.

**Keywords:** Digital Product Passport, Governance Framework, Information Requirements, Traceability, Simulation Game

## **Ecodesign and Circular economy approach within the FRONTSH1P project**

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### **Abstract**

The ecodesign and circular economy approaches, which are being developed and widely explored through numerous research and projects worldwide, can be applied in different contexts with specific needs and goals.

This communication presents their application in the FRONTSH1P project, highlighting the development and adaptation of the ecodesign methodology and related tools.

The FRONTSH1P (FRONTrunner approach to Systemic circular, Holistic & Inclusive solutions for a new paradigm of territorial circular economy) is a EU Horizon 2020 programme project (2021-2025), which aims to support the green and just transition of the Polish region of Łódzkie, shifting from the current linear economic towards decarbonisation and territorial regeneration. The project focuses on four Circular Systemic Solutions (CSSs) targeting different economic sectors: CSS1- Wood Packaging, CSS2- Food & Feed, CSS3- Water & Nutrients, and CSS4- Plastic & Rubber Waste.

The ecodesign approach within the project aimed to identify measures that have the strongest leverage for an environmentally oriented improvement of products and processes in different value chains and identify potential symbioses among them. The methodology adopted relies on a life cycle approach, based on the characterization and analysis of the different value chains, and the identification of relevant value losses and opportunities leading to the application of design strategies to identify new high-impact potential solutions. Moreover, this methodology, along with the definition of design strategies, guidelines and criteria for the identification of new opportunities, can be replicated in other value chains and regions in Europe.

The method follows five steps: 1) identification of actors in the value chains, 2) identification of interactions/activities/inputs and outputs, 3) identification of value losses (environmental, economic and social), 4) identification of circular economy and ecodesign opportunities, and 5) development of guidelines for improvement. It enabled the identification of value losses and opportunities to retain and capture value, not only in a strictly economic sense, but also in terms of environmental value (biodiversity, consumption of resources - water, materials and energy - especially those of concern, such as scarce or critical, as well as high impact resources, and pollution in all forms) and social value (working conditions, (un)employment, (in)equities, etc.).

This work resulted in the identification of 67 opportunities to improve circularity and sustainability (17 in the 3 value chains of CSS1, 22 in the 3 value chains of CSS2, 11 in the value chain of CSS3 and

17 in the 2 value chains of CSS4), being the most representative, the redesign of products, the creation and integration of services, the transition to renewable resources and energy, the creation of energy communities, the valorization of marginal lands, the development of biofuels and biofertilizers, etc.

The opportunities were analyzed and evaluated according to their potential to promote sustainability and circularity of the different inputs and outputs within each value chain.

This analysis considered the environmental, economic and social advantages and disadvantages, as well as its potential for implementation both during and beyond the project period. Additionally, it helps to identify potential synergies, with the aim of fostering symbiosis among the different CSSs

**Keywords:** Ecodesign, Circular Economy, Design Approach, Cross-sector, Symbiosis.

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## **Facilitating Circular Innovation in Hospitals: Initial Lessons from Medical Living Labs**

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### **Abstract**

The healthcare sector's environmental impact necessitates a transition towards more circularity. Living Labs (LLs) offer a platform for fostering circular innovation within this complex domain. This paper analyzes the initial phase of LL implementation in two academic hospitals within the Dutch NWO ESCH-R project ("Evidence-based Strategies to create Circular Hospitals"). ESCH-R is the first large-scale project on circular interventions in hospitals in The Netherlands. The project enables industry to rethink and redesign medical instruments, consumables and their packaging based on the 10-Rs circularity framework and shift hospitals towards circularity. This paper examines LL conceptualization, reports on early experiences at Erasmus Medical Center Rotterdam (EMC) and University Medical Center Utrecht (UMCU), identifies key factors and challenges, and formulates elements for a structured approach for Circular Medical Living Labs in hospitals.

Healthcare's environmental and material footprint is significant and demands, among others, circular solutions. Dutch environmental goals for the sector include 100% circularity and climate neutrality in 2050. LLs, with their user-centric co-creation in real-world settings, are proposed to drive systemic change and innovation for this purpose. However, implementing innovation with LLs in academic hospitals poses specific challenges like stakeholder engagement, medical protocols, product certification and access constraints. This study investigates LL effectiveness in promoting circularity and aims to develop an initial framework for their establishment and operation.

This qualitative study analyzes the initial ESCH-R LL implementation. Data collection included: observations of LL activities, interviews with stakeholders, literature review, document analysis, and preliminary environmental data collection. The analysis focused on stakeholder involvement, co-creation, LL structure (physical/virtual), and initial circularity outcomes in EMC and UMCU.

EMC established a physical LL engaging three clinical departments (IC, Obstetrics, Cardiology) and researchers, focusing on diverse circular interventions. UMCU has a virtual approach, with three developing clinical LLs (Ophthalmology, Urology, Nephrology) driven by PhD research and industry collaboration. Crucial elements for LL development are identified. LL typology analysis indicates a "medium co-creation/technical innovation" model in both hospitals. Stakeholder engagement is growing, involving healthcare professionals (through "Green Teams") and students. Co-creation methods are used, facing challenges in clinical staff engagement. Preliminary results show identified interventions and initiated research with a focus on higher R-strategies (Refuse, Reduce, Reuse). Management support is essential in both hospitals.

LLs show promise for fostering circularity in academic hospitals, requiring context-specific implementation. The current focus on technical innovation is a starting point. Moving towards high co-creation and social innovation demands increased investment and stakeholder engagement. Key challenges include ethics, scalability, complexity management, and the time-intensive nature of co-creation. Future work should develop a comprehensive framework for Circular Medical Living Labs,

enhancing stakeholder engagement, integrating circularity into practice, and securing sustainable funding. Initial building blocks for this framework are proposed.

**Keywords:** Circularity, Innovation, Medical, LivingLab, Co-creation

## **Life Cycle Assessment of Circular Strategies Suggested by the Swedish Brewing Industry**

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### **Abstract**

The circular economy aims to close resource loops, reducing waste and improving resource utilisation. Within the food and beverage sector, which has substantial environmental impacts, circular strategies are gaining traction. In Sweden, the brewing industry is a significant part of this sector, with over 526 breweries operating in the country. While previous research has identified various circular strategies within the industry, their environmental impacts remain largely unassessed. This study seeks to bridge this gap by evaluating the sustainability outcomes of these strategies and their potential contributions to circularity in the brewing industry. This study employs a multi-stage research approach to evaluate circular strategies within the brewing industry. First, a literature review was conducted, with a particular focus on grey literature, to identify circular strategies that brewing businesses are currently discussing or implementing. These findings were then combined with the narratives identified in previous studies to create a mapping of circular initiatives within the sector. From this mapping, the most frequently discussed strategies were selected for further evaluation using a consequential life cycle assessment. The life cycle assessment aimed to quantify the environmental impacts of these strategies, providing data-driven insights into their effectiveness. Based on the life cycle assessment results, a subset of strategies was chosen for a more in-depth analysis. In this final stage, system dynamics related to the selected circular strategies were examined to understand potential feedback loops, trade-offs, and broader implications for the brewing industry as well as other connected systems. Preliminary results indicate that several strategies, while highly publicised, only result in minor environmental improvements for the overall brewing system and that some less public strategies offer significantly higher potential in this regard. Some strategies also appear to have wide reaching implications for mostly unrelated sectors, which should also be considered when decisions are made on their implementation. This report gives a quantified and comprehensive overview of circular strategies that brewing businesses suggest are effective approaches to reduce the industries environmental impacts. The results allow for the development and adaptation of strategies to ensure the most effective solutions are implemented.

**Keywords:** circular economy, beer brewing, life cycle assessment, system dynamics

## **Upscaling Reuse in Sweden: Mapping Conditions for the Private and Public Sector**

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### **Abstract**

To be able to meet the global sustainability goals for sustainable consumption and production and the Paris Agreement, which aims to limit climate emissions, we need to use the resources we extract in a better way. A key to sustainable transition is reduced new purchases and slower product rotation, and reuse can be part of the answer. Today's product supply system is primarily aimed at delivering new products and discarding or recycling used ones. While recycling has largely been solved with the help of technology and a few actors, reuse requires other types of innovations and solutions. A broad range of actors is needed to bridge the gap between new purchases, the second-hand market, and what we leave at recycling centers, and to maximize opportunities for reuse. Issues related to accessibility, logistics, and transportation will be important, as well as habits related to reuse. To answer the research questions, two studies were conducted: one study with fewer questions (the survey study) and one study with more questions (the interview study). Both studies were conducted in 2023 on 10 and 9 different initiatives, respectively. The purpose of these two customer surveys (hereinafter referred to as the "survey study" and the "interview study") is to investigate customers' motivations, barriers, and habits regarding second-hand consumption. The main research question is: How do the conditions, practices, barriers, and motivations differ and resemble each other in different reuse context? The studies have identified the environment, followed by economics, and thirdly design aspects as the main driving forces for private consumers to acquire second hand goods and that this could be enhanced by providing increased and easier access to goods. For actors on the market both internal factors such as the organisation of acquiring, sorting, pricing and storing of goods and external factors, such as demand, competition and policy are important to allow for the reuse sector to grow and manage increased material flows. New collaborations and business models are prepared in the next phases of the project based on future scenarios of reuse. These are preliminary results which will be extended on in the presentation of the studies.

**Keywords:** reuse, circular economy, sustainable lifestyles, product lifetime extension, circular business models

## **The Circular Economy of "Gambiarra": How the Brazilian Approach to Repairs Promotes Sustainability**

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### **Abstract**

"Gambiarra" is a term that originally in Portuguese referred to an electrical extension with a lamp, but in Brazil it came to mean clandestine electrical connections, often used in contexts of scarcity or precarious infrastructure. Over time, the word evolved into a broader concept: today, gambiarra represents any improvised, temporary solution crafted with limited resources, typically to address an urgent problem. It embodies both resourcefulness in adversity and the realities of informal or makeshift problem-solving. This study explores the Brazilian practice of "gambiarra"—a cultural form of improvisation – and its contribution to sustainability within the framework of the circular economy. Addressing a gap in recognizing informal repair practices, the research investigates how "gambiarra" prolongs the lifespan of everyday products, reducing waste and conserving resources in contexts of scarcity. Using a qualitative and exploratory methodology, the study first conducts a literature review to correlate the terms and then analyses four cases, demonstrating how these creative, cost-effective solutions maintain the functionality of objects without altering their original purpose. The findings reveal that "gambiarra" aligns with circular economy principles by promoting repair and consequently extending the lifespan of products, challenging its popular perception as a mere temporary fix and framing it as a legitimate practice with significant environmental, social, and economic benefits. This research contributes to the discourse on sustainable design by highlighting the overlooked value of informal repair practices and emphasizing their potential to inform inclusive, innovative approaches to waste management and resource efficiency, offering insights relevant to policymakers, designers, and sustainability advocates.

**Keywords:** Gambiarra, repair, circular economy, design for sustainability

## **The Future of Building Emissions in Austria: Combining Delphi Insights and Prospective Life Cycle Assessment Projecting Future**

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### **Abstract**

Building construction and renovation, as well as building operations, contribute significantly to greenhouse gas emissions. Therefore, developing and implementing strategies to reduce emissions throughout the entire building life cycle is especially important. We present a comprehensive analysis of the developmental trajectory of emissions in the Austrian building sector by proposing a methodological synthesis using scenario-based Delphi analysis and prospective life cycle assessment (LCA) to project future emission pathways and evaluate emission mitigation strategies. We identify effective emission mitigation measures applicable in the Austrian context by consulting an expert panel employing a Delphi method. These measures encompass advancements in material technology, production and construction practices, and energy efficiency improvements. A first set of measures is derived through semistructured interviews, providing the basis for expert judgment. The application of a Delphi method further allows quantifying the reduction potential of various measures, their relevance for new and renovated building types, and their potential scalability. The findings of multiple feedback rounds inform scenario development, providing the basis for a prospective LCA model.

Subsequently, we model the life cycle emissions of buildings until 2050, integrating the measures with the highest reduction potential and consensus among the experts consulting in the Delphi study. Modelling the measures for particular building types (e.g., single-family homes, apartment buildings, etc.) enables the integration of building stock changes and projections. The application of a prospective LCA model takes into account the potential adoption of identified mitigation measures and incorporates higher-level systemic and environmental changes for background data (i.e., energy production).

Our analysis aims to determine critical intervention points where targeted actions would effectively reduce emissions associated with the built sector. Additionally, the prospective view on the development of the building stock and projected changes in background LCA data enables the validation of expert judgment through impact quantification. The integration of specific building type requirements allows us to project trade-offs between the level of renovation efforts and the benefit through increased energy efficiency during the use phase. Additional objectives include assessing various material and production process choices to evaluate their effectiveness in terms of emissions savings. Moreover, we aim to derive recommendations for mitigation measures that have the potential to steer Austria's building sector toward a significantly lower emissions trajectory.

This study addresses the Austrian context but can serve as a blueprint for other countries seeking to align their built environment with carbon neutrality goals. Furthermore, we present a novel approach to project building emissions by combining Delphi analysis and prospective LCA. Importantly, our

research underlines the necessity for adaptations regarding the materials, processes, and operations within the built environment to achieve the transition to a sustainable building sector.

**Keywords:** LCA, built sector, delphi analysis

## **Resource Efficiency Solutions for Circular Bioeconomy: Initial Bioresource Potential Assessment**

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### **Abstract**

Resource efficiency and the economic decoupling from resource use are both a part of the three main intertwined objectives of European Green Deal (EGD). Bioeconomy is considered as a means towards sustainability and achieving EGD goals. This is also substantiated by the growing research on the bioeconomic potential of particular resources at national and international level upon which the strategies for bioeconomy development may be based. But there is an implementation gap between bioeconomy planning level and the actual stakeholders that are implementing the practical actions and are faced with reality challenges. Also, in the context of reaching EDG goals, the attention must be given to ensure that the bioeconomy solutions are implemented with sustainability and circularity in mind. The present study is developed as a part of a research project Resource efficiency solutions for circular bioeconomy, and the main findings of the first stage of the project are presented. Based on previous experience regarding barrier research, the regional (municipality) level is selected in this project as the most appropriate for an in-depth study on bioeconomy implementation gap, its causal relationships and to propose actions and/or bioeconomy business models to overcome the mentioned barriers for circular bioeconomy. The focus of the current research is the identification of bioresource availability and bioeconomic potential at municipality level with Latvian case study. This activity is devoted to evaluation of the existing situation in the region and is divided into two parts - identification of current bioresource production capacity and identification of existing bioproduct production tendencies. The research methodology includes scientific literature analysis, data gathering, stakeholder interviews and survey, use of mathematical modelling, data processing and analysis. The integration of these methods to provide in-detail input for bioeconomy ecosystems model is an innovative approach that will allow to achieve the defined research objective - to foster bioeconomy implementation based on the regions individual characteristics and to facilitate economic competitiveness, resource efficiency and the social benefits. Particularly, data for the research is gathered by (1) analysing the online available information, (2) by consulting with the regional authorities (municipalities representatives with close connections to local producers and companies), (3) by contacting local companies and performing semi-structured interviews. This chain of communication activities ensures integrated framework that will provide insight into the current situation and a valuable input for further modelling of the bioeconomy resource efficiency solutions.

**Keywords:** regional development, bioresource added value, bioeconomy modelling, circular economy

## **Systemic, Multi-Stakeholder Collaboration to Achieve Zero-Waste Cities and Decarbonised Industrial Systems**

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### **Abstract**

Achieving zero-waste cities and decarbonised industrial systems requires a fundamental shift from linear to circular value chains. This is best facilitated through systemic, multi-stakeholder collaboration. The United Circles project is experimenting with new multi-stakeholder governance models to this end, funded under the European Union's Horizon Europe programme under grant agreement 101178798 from Nov 2024 to Oct 2028 with 48 partners coordinated by CARTIF from Spain. The project addresses the goal to transition from linear to circular value chains by fostering urban-industrial symbiosis as a means through a mission-driven network.

Our hypothesis is that a neutral initiating and facilitating party, in the project terminology a Hubs4Circularity, is a necessary institution to govern and accelerate processes across activities to deploy circular value chains. Activities of a Hub4Circularity include engaging stakeholders, technology evaluations, raising technology infrastructure investment, and setting agreements to ensuring equitable coordination and implementation. The involved stakeholders in this network include local and regional governments, industry, academia, and the waste management sector. A neutral body is necessary to help shape the required network and institutional structures, facilitate processes and knowledge management, and provide agency to each stakeholder's individuals within their organisations to include delivery of circular value chains in strategies and decision making.

The United Circles project targets three critical material flows—construction and demolition waste, urban and industrial wastewater, and food waste—developing 15 innovative circular technology solutions such as 3D-printed construction elements using recycled aggregates and low-carbon cement, resource recovery from wastewater, and bioplastic production from used cooking oil. These interventions are embedded within regional 'Hubs4Circularity', designed to accelerate adoption, attract investment, and facilitate large-scale deployment of circular technologies.

United Circles pursues four core objectives: (1) demonstration of waste-free cities through near-commercial scale pilots; (2) reduction of resource and water use, exemplified by a 50% decrease in freshwater consumption and 90% solid waste recycling at a Spanish wastewater facility; (3) creation of healthier, low-emission urban spaces; and (4) strengthening transnational cooperation in line with the European Green Deal. Demonstration projects in Spain, Italy, and Turkey provide practical validation, while mirror and seed Hubs4Circularity in countries including Hungary, South Africa, Lebanon, and Austria support the transferability and contextual adaptation of solutions.

This paper presents the conceptual foundation and implementation strategy of the Hubs4Circularity within United Circles as a neutral systemic, multi-stakeholder collaboration to achieve zero-waste cities and decarbonised industrial systems, to offer a scalable model for advancing the deployment of circular value chains with their technologies and practices in diverse socio-economic contexts. The paper will outline based on linear vs circular value chain examples why such a neutral systematic multi-stakeholder collaboration is necessary and can be transformative. And will discuss what tools

and frameworks and support mechanisms are necessary for a Hub4Circularity to function adequately.

**Keywords:** zero-waste cities, decarbonised industrial systems, hubs of circularity

## **Upcycle Residual Straw for New Bio-Products Entailing Carbon Storage & Utilization - Exploratory Case Study of Three Future Danish Pathways**

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### **Abstract**

Residual straw, a byproduct of cereal production, represents an underutilized biomass resource with significant potential to contribute to sustainable development and climate goals. This paper addresses the challenge of optimizing straw utilization in Denmark, focusing on its applications in renewable energy, materials production, and carbon storage. Guided by the principles of the circular bioeconomy and carbon capture, utilization and storage (CCUS), the study investigates three case studies: bio-refinery applications, biogas plant integration, and prefabricated building materials. The theoretical framework emphasizes resource cascading to maximize the utility of straw across multiple applications. The methodology combines an exploratory case study approach with literature review and comparative analysis to evaluate the environmental and economic benefits of each pathway. The bio-refinery case demonstrates the potential to produce high-value products, such as prebiotics, ethanol, and lignin, but highlights challenges related to scalability and high investment costs. Biogas plants, exemplified by the Abed Biogas Plant, are shown to efficiently integrate straw into renewable energy production and utilize captured CO<sub>2</sub> for bio-product manufacturing. Prefabricated building materials offer long-term carbon storage, but face logistical and infrastructure challenges in Denmark. The findings indicate that biogas plants provide the most immediately feasible pathway due to their existing infrastructure and CO<sub>2</sub> utilization capabilities, while the long-term potential of straw-based building materials require further investment. A balanced strategy that utilizes the strengths of each pathway is essential for maximizing the environmental and economic benefits of straw utilization. This study contributes practical insights to Denmark's renewable energy transition and climate neutrality ambitions.

**Keywords:** biogas, bio-refinery, building materials, carbon capture utilization and storage, Denmark

## **Environmental Implications of Beer Concentration for Reducing Logistic Impacts**

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### **Abstract**

Beer, which is 90-95% water, is traditionally transported in its final liquid form, resulting in high fuel consumption, greenhouse gas (GHG) emissions, and packaging waste. A potential solution to mitigate these impacts is beer concentration, where water is removed before transportation and reintroduced at the point of consumption. This study analyzes the environmental implications of this approach by comparing conventional beer distribution systems with ultra-high gravity (UHG) concentrated beer supply chains across domestic and international markets.

To assess these implications, we developed scenarios for multiple logistical options based on UHG concentration processing from the company Porifera. For the domestic U.S. market, we compared the impacts of traditional beer supply chains—where a large brewing conglomerate with approximately 10 major breweries brews and distributes full-volume beer to large population centers—against an alternative scenario in which UHG beer is transported in concentrated form and reconstituted at dispensing points or packaging facilities. Additionally, given that a significant share of beer consumed in the U.S. is imported, we evaluated two supply chain models. In one model, beer is conventionally produced in Europe and exported in its full-volume form to the U.S. In the alternative model, beer is concentrated at the origin (e.g., Italy), then shipped as a UHG product to the U.S., where it is reconstituted at bottling centers or serving locations. These scenarios enabled a direct evaluation of emissions, resource use, and transport efficiency between traditional and concentrated beer distribution systems utilizing life cycle assessment and including environmental indicators from the Environmental Footprint v. 3.1 methodology.

Our findings indicate that concentrating beer before transportation can substantially reduce transportation and thus environmental impacts. For the domestic market, beer concentration led to significant reductions in transportation distances and associated emissions, packaging material usage (particularly for kegs), and refrigeration energy demands. The GHG emissions reductions ranged from 0.9 to 2.7 million tonnes CO<sub>2</sub>-eq for cans and kegs, respectively. In the imported beer scenario, replacing conventional supply chains for a brewery in Italy exporting to the U.S. with UHG beer reduced GHG emissions by over 124 thousand tonnes CO<sub>2</sub>-eq for kegged beer and 96 thousand tonnes CO<sub>2</sub>-eq for canned beer annually. However, the feasibility of widespread adoption depends on infrastructure adaptations, the development of standardized reconstitution systems, regulatory considerations, and consumer acceptance. While the results presented here include only GHG emissions, the study also includes all other environmental indicators from the EF 3.1 LCIA methodology, including e.g. water depletion, resource efficiency, etc., but also highlighting important KPIs for the brewing industry reduced logistics (tonne-km) and material and packaging use.

While resource efficiency measures in the brewing industry have traditionally focused on packaging and energy efficiency in production, this study highlights beer concentration as a scalable solution for reducing the environmental impact of beer distribution. Future work should explore optimization strategies for concentration technologies—particularly energy demand—alongside economic viability assessments and policy incentives for sustainable beverage logistics.

**Keywords:** beer, life cycle assessment (LCA), sustainability, ultra-high gravity beer, environmental impacts

## **Bloody Good Food for the Planet and Human Health - Sustainability Implications of Upcycling Slaughterhouse By-Products to Food**

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### **Abstract**

Waste and losses in the food chain has been identified as a major sustainability issue both globally as well as in Sweden, exacerbating environmental degradation from the food system, alongside with causing negative impacts on food security. The focus of this study is on the Swedish meat industry where around half of the slaughterhouse by-products such as blood and organs, that potentially could become food, instead currently are sourced to biogas production or used as animal feed, mainly due to lack of profitability. To overcome this, food innovations using by-products has been highlighted as a way of increasing demand. The aim of this study was to investigate the sustainability implications of upcycling slaughterhouse by-products to food to be sourced within the Swedish public meal sector. We used Life Cycle Assessment to calculate the environmental pressures associated with using blood and organs in upcycled food products in the Swedish public meal sector compared to relevant reference products, as well as accounted for these not going to waste or feed. Moreover, we assessed the nutritional implications of including the blood and organs in foods in the Swedish public meal sector through calculating the nutritional content of the products, compared to relevant reference cases. Important parts of the work include sensitivity analysis of methodological choices such as the allocation of the environmental burden between beef and the different by-products at the slaughterhouse, as well as the choice of reference products for comparison of the sustainability to the upcycled foods. The hypotheses of the results are that using raw materials produced to become food directly for human consumption instead of secondary alternatives, has the potential to decrease environmental pressures both with regards to climate impact as well as being in synergy with limiting other important environmental areas, although the results will vary based on the partitioning of the different slaughter cuts. Moreover, a hypothesis of the results is that increasing the amount of blood and organs in foods served in the Swedish public meal sector could improve the nutritional quality of the meals, by increasing contents of important nutrients such as iron and folate. The paper will conclude on the sustainability implications of currently underutilized resources within the Swedish food sector. The choice of beef and its by-products is highly relevant due to the high environmental burdens associated with beef, making it of uttermost importance to, alongside with decreasing the overall consumption of beef, increasing resource-efficiency within the production. Moreover, apart from the potential decreased environmental impacts and nutritional benefits, enabling more food to become food instead of going to waste would likely be an important step in increased resource-efficiency within the Swedish food sector, creating an important bridge for increased domestic food readiness.

**Keywords:** food waste, sustainability, upcycling, resource efficiency, food readiness

## **Unpacking the Problem: Food Waste from Bundled Products in the Grocery Sector**

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### **Abstract**

Bundled packaging of perishable food items, particularly fresh fruits and vegetables, is a significant yet underexplored contributor to food waste in the retail sector. This form of packaging often leads to entire packages being discarded when only part of the content is spoiled, resulting in unnecessary waste of otherwise edible food. In our recent analyses of grocery store data from major Swedish retailers reveals that bundled items account for 30-50% of the total food waste by weight and up to 57% by value for key product categories. The problem is exacerbated by consumer expectations on appearance, short shelf life, as well as economical and practical challenges in separating damaged and intact food items from the packaging. In addition, the issue is closely linked to everyday store-level practices, where time constraints, task ownership, and procedural routines shape the feasibility of waste-reducing interventions.

Drawing on a combination of quantitative waste data analysis, qualitative interviews with store personnel, and intervention tests in large retail stores/chains, this study identifies and evaluates a range of mitigation strategies targeting the product groups identified as contributing significantly to food waste and lost value. The interventions discussed include dynamic pricing of damaged packaging, selective unpacking of edible items, re-selling in loose formats, and internal repurposing of surplus produce in store kitchens. However, due to challenges in data availability and implementation, only a subset of these measures—primarily the sale of “food waste prevention bags”—were systematically tested and quantified in participating stores. Preliminary findings from the ongoing project suggest that stores with more structured waste reduction routines—such as regular sorting of damaged goods, sale of “food waste prevention bags,” and proactive markdown systems—report significantly lower spoilage rates, in some cases less than 1% for fresh produce.

These early results coincide with the implementation of Sweden’s updated packaging regulation, which is based on the EU Packaging and Packaging Waste Regulation (PPWR). While PPWR primarily sets design requirements for recyclability, the national regulation places increased responsibility on retailers to separate packaging from food waste in order to improve material recycling. This study highlights the need for operational routines and business models that make such activities economically viable. By exploring retail-based strategies that enable the resale of partially damaged bundled products, the project offers practical, in-progress insights into how regulatory compliance and reduced food waste can be jointly addressed—and how such efforts may impact profitability. The project is ongoing and currently testing several mitigation strategies in retail settings. Final results will be available in autumn and presented at the conference. So far, the findings point to simple, scalable changes in packaging handling routines—supported by improved staff engagement across different roles and clear retailer guidelines—as promising pathways to reducing fruit and vegetable waste while improving economic margins.

**Keywords:** food waste, packaging, business models, retail, bundled

## **Decarbonizing Healthcare: A Focus on Glove Procurement and Consumption in Danish Hospitals**

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### **Abstract**

The healthcare sector plays a pivotal role in safeguarding human health but has a substantial environmental footprint. Over the past decades there has been an increased reliance on single-use plastics as they are versatile and considered more sterile and safer. The normalisation of disposable plastics has resulted in bulk purchasing, overuse and misuse, especially during and after the COVID-19 pandemic, which consequently increased the amount of waste generated and the associated carbon emissions, nearly 4.4% of global greenhouse gas emissions. There is growing evidence that single-use items do not improve hygiene and may be a risk to patients if misused. Chemicals of concern have been found in some of the plastics while recent studies have found microplastics in the human bloodstream. This study aimed to evaluate the consumption of the most used consumable in healthcare, the examination gloves, to identify key hotspots within the hospitals, the associated carbon emission impact and identify reduction areas. Procurement data was analysed from healthcare centres in three Danish regions between the year 2019 to 2023. Approximately 850 million gloves were purchased in the three regions, with 63% made from nitrile rubber, a synthetic polymer. The estimated carbon footprint was significantly high, ranging between 13,840t CO<sub>2</sub>-eq to 51,580t CO<sub>2</sub>-eq, depending on the glove type. With the highest emissions coming from the glove production stage, this study discussed intervention opportunities and barriers such as substituting coal with natural gas and increasing domestic glove manufacture to reduced emissions from transportation.

There was a significant variability in glove procurement across different hospital groups and services, and particularly between larger university hospitals and smaller or specialized facilities. At the consumption phase, a material flow analysis of gloves for the year 2023, showed that 22.2% of the gloves procured were used outside patient contact zones but ended in mixed waste streams and eventually incineration. These findings emphasize the need for an effective waste sorting and recycling scheme coupled with optimised glove usage to avoid overuse and misuse while promoting hand hygiene. This study acknowledges that while single-use examination gloves are useful in healthcare, it is crucial to reduce their environmental impact, by incorporating tools and strategies such as LCA data to purchase gloves with the lowest environmental impact and incorporating reduction strategies at the use phase. Future studies should not only analyse the increase in glove procurement, but also the use phase, which is of significant impact.

**Keywords:** procurement, healthcare, single-use gloves, carbon footprint

## **Necessity-Driven Sustainability: Popular Material Reuse Practices in the Global South to Overcome Resource Scarcity**

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### **Abstract**

This study investigates if the global south's cultural manifestations of material reuse are aligned within the framework of Sustainable Consumption and Production (SCP). Often born of necessity, these practices of frugal innovations exemplify localized ingenuity, particularly among low-income populations, in transforming discarded materials into functional solutions. Despite their prevalence, these forms of innovation remain underexplored in SCP research, which predominantly emphasizes industrialized approaches. This paper seeks to bridge that gap by examining how such innovations align with SCP principles and contribute to resource efficiency and sustainability. Using a literature review methodology, the study analyzes six examples of popular frugal innovations that emphasize reuse: Brazil's *gambiarra*, India's *jugaad*, Kenya's *jua kali*, Guinea-Bissau's *dubriagem*, Chicano *rasquachismo*, and Cuba's technological disobedience. Furthermore in the methodology, a case study was used for each case, aiming to validate the theory with practical examples found in literature. For that, one practical case from each manifestation was selected to illustrate how these practices operate within cultural and socio-economic contexts, highlighting adaptive strategies for overcoming resource constraints. The case study analysis compares the characteristics of each practice with a checklist of the concept of reuse in SCP, applying theoretical frameworks to explore their cultural and environmental dimensions. Preliminary findings indicate that all six manifestations are fundamentally rooted in material reuse, aligning closely with SCP principles. These practices serve as both survival mechanisms in contexts of scarcity and pathways to sustainability by reducing waste, and promoting the reuse of materials. While SCP is not the explicit goal of these practices, they demonstrate the potential for reuse to extend product lifecycles and reduce unnecessary consumption, by focusing on the accurate solution of local problems through material reuse and vernacular production. However, mainstreaming these innovations faces challenges due to their informal nature and societal perceptions of inferiority compared to industrial solutions. The paper concludes that integrating local vernacular frugal innovations into SCP frameworks could enhance global sustainability efforts. Recognizing the value of these practices necessitates a paradigm shift in how innovation is defined, moving beyond industrial paradigms to embrace localized, user-centered solutions. The study also underscores the potential for industry to adopt insights from these practices, such as designing durable products, reducing wasteful consumption through frugality and focusing on local solutions. By spotlighting the innovative potential of material reuse in the Global South, this research highlights the importance of culturally embedded practices in shaping sustainable futures.

**Keywords:** sustainable consumption and production, frugal innovation, material reuse, global south, resource scarcity

## Carbon Footprint Calculator for Hospitals

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### Abstract

Healthcare contributes to ca. 5% of global greenhouse gas emissions and the emissions have increased alongside with healthcare spending. Carbon footprint analyses and life cycle assessments have been conducted for healthcare systems, products and processes. However, climate impacts of hospitals have gained less attention, although majority of healthcare sector's emissions stem from activities in hospitals. Healthcare provision takes place in hospital; thus, the climate impacts could be effectively managed at the hospital level. We aim to provide an easy-to-use but comprehensive carbon footprint calculator for hospitals. A hybrid life cycle assessment method that combines environmentally extended input-output modelling with bottom-up life cycle assessment data from hospital operations and healthcare products is developed. The top-down input-output approach is based on the Finnish ENVIMAT model. Product-specific carbon footprints can be taken into account if good quality information exists. Special attention is paid to the changes that the product-specific carbon footprints cause to the product-group-specific emissions factors of the input-output model. The hospital carbon footprint calculator is then used to calculate emissions of the Hospital District of Helsinki and Uusimaa (HUS) and the North Karelia Central Hospital, both located in Finland. The carbon footprint results are categorized according to the scopes 1-3 of the Greenhouse Gas Protocol and presented using various comparable functional units. Our case study demonstrates development and application of a hospital carbon footprint calculator. The carbon footprint results present the wide spectrum of emission sources within a hospital and the most important determinants can be identified. The case studies of two hospitals allow for a relevant comparison of climate impacts through the choice of functional units. We hypothesize that the majority of greenhouse gas emissions in the case hospitals stem from the indirect emissions from the supply chain of products and services, namely from scope 3. However, we also hypothesize that scopes 1 and 2 can contribute significantly to the carbon footprint of hospitals should the energy be sourced from carbon intensive sources. The hospital carbon footprint calculator can guide decision-makers and healthcare professionals in hospitals towards more sustainable hospital operations. The limitations of the developed calculator include bottom-up data availability and the accuracy of the top-down data.

**Keywords:** hospitals, carbon footprint calculator, healthcare, hybrid life cycle assessment, greenhouse gas emissions

## **Progress in Eco-Industrial and Circular Business Parks: Updated Framework and Cases from the Netherlands**

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### **Abstract**

To transition to a circular economy, eco-industrial parks (EIPs) and Circular Business Parks (CBP) are needed. However, developing EIPs and CBPs is complicated. Nevertheless, some EIPs that are successful with industrial symbiosis and utility sharing activities happening. For instance, there are only few case on EIPs and CBPs in the Netherlands reported. Therefore, the progress on EIP and emergence of CBP in the Netherlands is addressed in this paper asking: "How to facilitate the implementation of industrial symbiosis and utility sharing activities in EIPs in the Netherlands? To answer this question, the factors for the success of industrial symbiosis and utility sharing in EIPs were identified through the literature review to update the framework of Eilering & Vermeulen (2004). Three new factors were added, leading to ten factors important to implement industrial symbiosis and utility sharing when developing an EIP or CBP. The factors are: (1) vision and ambition, (2) location-specific physical features, (3) location-social specific features, (4) business-specific features, (5) proposed measures, (6) organisation of decision-making, (7) policy instruments, (8) economic features, (9) external context, and (10) serendipity.

The refined framework was applied to three successful parks in terms of industrial symbiosis and utility sharing: InnoFase in Duiven, Industrial Park Kleefse Waard in Arnhem, and Biopark Terneuzen in Zeeland. Data collection took place via semi-structured interviews with respondents for each case study. Findings show that industrial symbiosis and utility sharing activities could be identified at all three parks. InnoFase is engaged in many industrial symbiosis activities by exchanging different types of flows such as biomass, biogas, water, electricity and heat, while other synergies are ;under development. At IPKW mainly utility sharing activities were found, including a gas-fired power plant fed by the on-site wastewater treatment plant. Other smaller flow exchange activities include plastic, biomass, and wood reuse by some of the companies. The case of Biopark Terneuzen revealed that the exchange of flows ass typically used in the literature is not accurate because some intended exchanges never materialized. A cross-case analysis was conducted to identify what sub-factors or barriers were present in every case. In total, 63 sub-factors could be identified that influenced the success of the park. It appears that social innovation is key to implementing industrial symbiosis and utility sharing.

**Keywords:** circular economy, eco-industrial parks, industrial symbiosis, circular business parks, social innovation

## **Influence Entrepreneurial Ecosystems of Forest-based Resources to a Transition of Bioeconomy in Indonesia**

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### **Abstract**

Indonesia's rich forest resources, especially teak and bamboo, hold significant promise for advancing a sustainable bioeconomy. However, micro-enterprises in these sectors face challenges in adopting sustainable practices and advancing innovative bio-based products. This study investigates the role of entrepreneurial ecosystems (EES) in supporting bioeconomy transformation among micro-enterprises engaged in bamboo and teak wood processing. Understanding how EES influence such transformations is essential for designing strategies that promote sustainable innovation and circular economy practices in rural, resource-based industries. The research applies SEM-PLS methodology, based on data from 150 micro-entrepreneurs in the rural landscapes of Indonesia, which includes business proprietors focused on teak wood and bamboo. This method provides a robust framework to analyse complex relationships between EES components and bioeconomy transformation outcomes, allowing for sector-specific comparisons. The results demonstrate that EES significantly influence bioeconomy transitions for both bamboo and teak wood enterprises. Specifically, bamboo-based enterprises benefit from EES through enhanced support for innovation in bio-product advancement for driving the creation of eco-friendly and value-added bamboo products. Enhanced access to market knowledge, technical support, and collaborative networks empowers these enterprises to explore new bio-based product designs and production techniques. This innovation-driven pathway highlights the role of EES in promoting the bioeconomy through product diversification and market competitiveness. Conversely, teak wood enterprises benefit from EES through the promotion of circular bioeconomy practices. EES support in this sector focuses on resource efficiency, waste reduction, and sustainable material reuse. Access to information on sustainable production techniques, partnerships with environmentally conscious stakeholders, and institutional incentives drive these enterprises to adopt circular business models. This pathway emphasises how EES can enable micro-enterprises to optimise resource use while minimising environmental impacts, contributing to circular bioeconomy transitions. The study concludes that strengthening entrepreneurial ecosystems tailored to the specific needs of bamboo and teak wood sectors can accelerate bioeconomy transformation in Indonesia's rural micro-enterprises. A generalized model of EES development could fail to acknowledge sector-specific distinctions and diminish the impact of interventions. Instead, policies and programs should recognise and leverage the distinct innovation and sustainability pathways identified in this study. The findings offer significant scientific and practical implications. Scientifically, the research advances the understanding of sector-specific bioeconomy transitions, providing empirical insights into how EES drive innovation and sustainability in resource-based micro-enterprises. Considering practicality, the report outlines beneficial proposals for government officials, sector contributors, and support institutions. For bamboo enterprises, targeted interventions should focus on enhancing innovation capabilities, product development support, and market linkages. For teak wood enterprises, policies should prioritise promoting circular economy practices, improving resource efficiency, and facilitating partnerships that encourage sustainable production models.

**Keywords:** bioeconomy transition, entrepreneurial ecosystems, Indonesian forest-based resources, micro-enterprises, rural development

## **Fe-Enriched Biochar for Selenate Removal: Advancing Circular Solutions for Water Treatment**

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### **Abstract**

Serious risks to human health and the environment are posed by selenium's toxic and highly mobile oxyanion, selenate ( $\text{SeO}_4^{2-}$ ). Because of mining operations, industrial processes, and agricultural runoff, it is commonly found in groundwater and other aqueous systems. In order to stop its bioaccumulation and ensure water safety, effective remediation techniques are necessary. The potential of a sustainable iron-based biochar composite for the removal of selenium from contaminated water is studied in this work. Red mud, a by-product of the alumina industry rich in iron oxides, and sugarcane bagasse, an abundant agricultural residue, were used to produce the biochar. Using a fixed-bed reactor, the red mud-impregnated bagasse mixture was pyrolyzed for 30 minutes at 700°C in an inert nitrogen atmosphere. The resulting red mud-bagasse biochar (RM-BB) was evaluated for its adsorption performance through a series of batch experiments. Parameters such as pH, adsorbent dosage, initial selenate concentration, and contact time were systematically varied to determine optimal conditions. Results revealed that selenate removal is quite pH-dependent, with a maximum removal efficiency of up to 60% under acidic to neutral pH conditions. High surface area, active iron sites, and the presence of functional groups added by red mud modification all contribute to the improved adsorption performance. This study highlights the potential of red mud bagasse biochar as a cost-effective, eco-friendly adsorbent for the remediation of selenium-contaminated waters. Its dual benefit of utilizing agricultural and industrial waste further supports its application in sustainable water treatment technologies.

**Keywords:** selenium, water treatment, waste management, adsorbent

## **Biomass Utilization Through Torrefaction for Sustainable Agriculture**

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### **Abstract**

Crop residue is regarded as solid waste and poses serious disposal challenges due to its high moisture content, heterogeneous composition, low bulk density, and large volume. Farmers have traditionally used crop residue burning to dispose of vast amounts of agricultural waste, resulting in the release of significant amounts of particulate matter, carbon dioxide, and other greenhouse gases. This study explores into torrefaction as a long-term solution for crop residue management and soil amendment. Torrefaction of rice straw was performed at 300 °C in a partially oxidative medium. Torrefied biomass was mixed with 1%, 3%, and 5% (w/w) in pot soil tests. Following the seeding of the *Vigna Radiata* (green gram) seeds, different levels of chemical fertilizer (100%, 75%, and 50%) were used. Soil parameters such as pH, EC, organic carbon, and WHC, as well as crop growth parameters, were measured following harvest. Torrefied biomass treatment increased soil pH slightly, increased EC moderately, and significantly improved soil organic carbon and water holding capacity. Torrefied with a 3% application rate in combination with 75% fertilizers resulted in an increase in plant height and grain production of 16.1% and 11.3%, respectively, as compared to the completely fertilized sample. These findings showed that torrefied biomass has the potential to reduce fertilizer demand by around 25% while preserving soil health. Waste biomass can be converted into solid goods that help with waste management and soil amendment. The study focuses on the utilization of waste biomass to improve soil health, to achieve the Sustainable Development Goals (SDGs) of Zero Hunger, Responsible Consumption and Production, and Climate Action.

**Keywords:** crop residue, solid waste, torrefaction, biochar, soil fertility

## **Strategies and Measures to Reduce and Recycle Post-Industrial and Pre-Consumer Textile Waste**

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### **Abstract**

Significant quantities of industrial textile waste are generated as 'post-industrial waste' (e.g. leftovers such as offcuts, fibre and yarn remnants) and 'pre-consumer waste' (e.g. surpluses, faulty production). The figures range considerably, from 25-40% in India or Bangladesh (Aus et al. 2021) to 18% in the EU 27 (Decker et al. 2024), depending on the country of production in question. The avoidance and high-quality utilisation of these textile waste streams harbours considerable potential for a circular textile industry, while at the same time adding value to previously worthless streams and thus opening up economic opportunities for textile companies. The UEBER-AUS project is described in the presentation. This project aims to reduce these textile waste streams by adapting business models, product designs and production processes. At the same time, waste management, collection/sorting and recycling are to be improved through better cascade utilisation, tracking and recycling. These adaptations will be developed and tested using the example of various textile companies in south-west Germany in order to realise the potential for promoting the circular economy through regional networking and new partnerships and to strengthen resilient value chains. To this end, textile companies in this region are being analysed in semi-structured interviews and a database for recording textile waste is being created. On this basis, adjustments to the business models and measures for prevention and utilisation are being tested as pilot projects in the technical textiles and clothing sectors. The testing includes various in-process analyses: criteria such as material composition or quality are recorded, measured and evaluated, material flows are clustered and optimised in terms of sortability and recyclability and logistics concepts are designed. A central approach is the life cycle assessment of the entire process with regard to the determination and assessment of environmental impacts. This is accompanied by an economic assessment of the concepts, future feasibility and the establishment of the concepts.

**Keywords:** circular economy, business models, textiles, textile waste, leftovers

## **Translation as a Bridge to “Common Enough” Understanding: A Novel Method for Eliciting Common Mental Models to Advance Sustainable Consumption and Production**

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### **Abstract**

Engagement in the formulation, design, and exploration of emerging circular economy systems is both increasing and diverse, shaping the language, terminology, and understanding of academics in different fields, practitioners from various industries, and different governmental bodies. At a fundamental level, the circular economy has been identified as a boundary object for sustainable consumption, representing the “*coherent whole*” that interactive interdisciplinary efforts attempt to understand (Lambiasi & Barbera 2024), or the “*common problem*” on which additive multidisciplinary efforts are mutually focused using their respective disciplinary perspectives. However, despite being a boundary object that connects diverse fields of research and practice, the circular economy has also evoked diverse mental models, specifications, expectations, and boundary conditions that suggest our “common” understanding and perspective of the circular economy is actually not “common” at all. We have yet to agree on how to integrate the many diverse mental models of (more or less) sustainable consumption that operate within the circular economy. We present a method for exploring and advancing diverse mental models of circular economy towards a “common enough” agreed model on which future visioning, understanding, operationalization, and assessment of material flows within a circular economy can be built and communicated, i.e., a translative process.

Using an iterative Delphi-like survey method, structured feedback was elicited from a multi-stakeholder group regarding using an applied example of mental models of the fundamental physical materials flows within a circular economy, hereafter called “Circular Economy Loops”, consisting of *reduce* (i.e., simplifying and narrowing loops), *reuse, refurbishment and remanufacturing* (i.e., slowing loops), *sharing and renting* (i.e., intensifying loops), and *recycling* (i.e., closing loops). Proceeding individually through a facilitated, systematic process of considering, evaluating and refining an externally-developed model (c.f., Moon and Browne, 2021), participant experts transition towards alignment about an emergent alternative, refined consensus mental model and common understanding, that are, de facto, translatable across disciplines and practice. The iterative results, points of tension, alignment, and resulting achievement of interdisciplinary consensus are presented to demonstrate the method itself, showing how it can elicit a “common enough” understanding - across disciplines and perspectives. We also present the resulting framework of refined consensus-achieving definitions and terminology for the Circular Economy Loops that result from the demonstration of this method.

This method, and the resulting framework can be used in further theorizing or operationalizing of the circular economy concept. Achieving increased clarity, common mental models, and more effective ‘translation’ of circular economy ideas and concepts across disciplines and practice is of critical importance to the operationalization of a just, sustainable ‘circular economy’. This methodology provides insight into much-needed effective “translation” and mental model convergence across disciplinary boundaries and the research-practice divide. Accordingly, we advance a methodology for eliciting, illuminating, exploring, negotiating, and sharing of our diverse processes of knowledge construction and mental models of both tangible and intangible aspects of

these complex systems - permitting and contributing to the overcoming of key challenges (Moon and Browne, 2021) in the CE transition.

**Keywords:** circular economy, interdisciplinarity, transdisciplinarity, translation, delphi

## **Circular Business Models for a Sustainable Blue Bioeconomy: The Case of Two Seafood Nations Norway and Iceland**

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### **Abstract**

A sustainable bioeconomy is the renewable segment of the circular economy. It relies on biological resources to produce goods and services and involves all sectors and systems which depend on biological resources such as agriculture, forestry, fisheries, aquaculture and biotechnology, among others. The blue bioeconomy, comprising aquatic resources and ecosystems, is a critical component for nations whose economies are heavily reliant on these resources. Advancing circularity in the blue bioeconomy entails new approaches for seafood value chains. Circular business models are a way for companies to create, deliver and capture value in ways that both advance circular economy objectives but also improve the sustainability performance of organizations. Norway and Iceland are traditional seafood nations and in both countries seafood industries are an important pillar of the economy. There is increased recognition among industry and government actors that value added activities to achieve full utilisation of seafood is an important objective for sustainability. Yet, the implementation of circular business models has in general been slow partly because of the dependence of businesses on linear models and partly because of resistance to change. This study seeks to understand how companies can adopt circular business models to enhance value creation, sustainability performance, and competitive advantage. The study will build on previous research analysing barriers to circularity in the seafood industries of Iceland and Norway and will: (a) analyse current business models, including exemplary circular business models, (b) through group model building with stakeholders from industry, academia and government, and using system dynamics structural thinking and diagramming tools, develop a conceptual model of the system in the form of a causal-loop diagram, and (c) using the model, qualitatively review and critically evaluate strategies and policies that encourage the transition to circular business models. The analysis will be based on interviews, focus groups, and the application of a qualitative system dynamics approach. The findings from the qualitative segment of the study will be analysed by structural thinking and diagramming tools to better understand the dynamics of new business model development and to identify motivation or resistance to system change to underpin policy. Results are expected to elucidate crucial leverage points, important governance actors and enabling policies and strategies to underpin the transition to a more circular and sustainable blue bioeconomy.

**Keywords:** blue bioeconomy, circular business models, sustainability transition, qualitative system dynamics, policy

## Systemic Work for Deep Circularity

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### **Abstract**

This contribution offers insights to the mission-based partnership TRACE (trace.dk) established 2022 for supporting circular economy (CE) of plastics and textiles in Denmark. It currently covers 20 projects of 180 million DKK with 120 partners across academia, the public sector, NGOs, and a broad range of industry partners.

According to recent critique of EU policies and strategies politically installed initiatives for CE such as TRACE risks focusing mainly on 'weak' approaches, emphasizing technocratic solutions at the lower levels of the EU Waste Hierarchy. Moreover, with 221 and expanding definitions of CE, TRACE recognizes that transformation work spans much wider than single technologies, product- or material innovation and therefore must encompass a multitude of approaches across the value chain and in respect of the Waste Hierarchy for reaching deep transformation. Hence, for the past 2,5 years, TRACE has been striving to become an engine for systemic change, asking how the partnership activities might form coherence, harvest and accumulate results, stimulate circular maturity of partners and society, and frame an overall direction that secures actual circular transformation?

To mitigate this, TRACE is driven by mission-based research together with approaches from collaborative design processes and network governance. This has been led by an abductive and open-minded investigation of ongoing insights and results for securing a synthetic sensemaking process that allows for a continuous and iterative hypothesizing, testing, reframing, and rethinking of possible pathways forward. For securing this, TRACE installed the "criteria 4" in all calls by 2023. This means that a crucial criterion for obtaining funding is to describe how the project contributes to already existing projects, and how project partners will dedicate time for synergy work. The assessment process this way includes securing that projects cover the entire matrix of the original TRACE roadmap that ties together three workstreams of plastics, common, and textiles, across the entire value chain. Furthermore, PI's leading TRACE projects meet one day per semester for sharing insights and results in thematic workshops that are discussed with the purpose of learning together in an ongoing process how to build up capacity for circularity across projects and workstreams.

So far, these initiatives have informed awareness of possible new roles and partnerships for both researchers and industry partners (here also counting municipalities), as well as informed overall barriers and pathways for transition such as policy, lack of skills, logistics, facilities and knowledge infrastructure for CE to be built up within the partnership. Next steps will be to engage the wider partnership in 'TRACE Academy' events and round tables, and to expand activities beyond Denmark to the Nordics and the EU. The 2025 2nd roadmap amendment of TRACE to be presented at the conference will elaborate on these ideas and ambitions.

**Keywords:** mission-based research, circular economy, collaborative design methods, systems thinking

## **A Novel Integrative Framework for Circular Strategies in the Wind Turbine Industry**

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### **Abstract**

Wind turbines have a significant environmental impact during both the manufacturing and end-of-life stages. Achieving the EU targets for wind energy necessitates the installation of an additional 453 GW capacity by 2030, while simultaneously decommissioning 5.6 GW as older turbines reach the end of their useful life. Implementing circular strategies can help manufacturers, wind farm operators, and other value chain actors to enhance process efficiency and reduce environmental impact. However, there is a lack of common definitions and frameworks for circular strategies in this industry, both in academic literature and practice. To address this gap, this study proposes a comprehensive and integrative framework for circular strategies in the wind turbine industry.

The study adopts a qualitative approach to identify novel empirical insights into value chain design and stakeholder collaboration necessary for circular strategies. Qualitative data were gathered through semi-structured interviews with 34 industry experts representing the wind energy value chain, from production to end-of-life. Themes discussed in the interview included the company's role in the wind value chain, collaboration for circularity, challenges and opportunities for circularity and specific circular strategies applied. The interviews lasted on average 35 minutes and were conducted in person or over videocall and were recorded and transcribed. The interview data were analysed based on a coding protocol derived from a literature review on barriers and drivers and emerging circular strategies in the wind turbine industry.

The study's findings were consolidated into a novel integrative framework for circular strategies in the wind industry, highlighting the distinct applications and differences between strategies in this context. Besides the framework, the results demonstrate that circular strategies are not fully implemented across the entire value chain and during all service-life stages. The results also highlight the differences in circular strategy implementation for steel and composite materials. Additionally, the study reveals a market shift from trading entire wind turbines to trading wind turbine components. This trend suggests a growing emphasis on component-level interventions for lifetime extension, potentially reducing decommissioning rates and maximizing the usage of existing wind turbines and their components.

The study makes three key contributions. First, a novel framework is presented for circular strategies in the wind industry. Second, this study emphasizes stakeholder collaboration, highlighting the roles and contributions of different actors, from wind turbine owners and decommissioning parties to specialized workshops and end-users. Effective collaboration and communication among these stakeholders are essential for optimizing the value chain and achieving circularity. Third and finally, the study provides new conceptual clarity on circular strategies in the wind turbine industry by offering clear definitions at both the component and full wind turbine levels.

By addressing material-specific challenges and fostering a shared language, the developed framework supports the industry's transition towards sustainability and circularity, offering practical guidance for practitioners, academics, and policymakers. The findings inform recommendations for future research, focusing on identifying barriers and drivers to circular strategy adoption and enhancing conceptual clarity in other industries.

**Keywords:** circular strategies, circular economy, wind turbines, wind industry, renewable energy

## **Circularity and Industrial Symbiosis in Industrial Parks: Tools for Green Transition in Romania**

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### **Abstract**

Industrial symbiosis (IS) and circular economy (CE) are emerging as transformative strategies to address global sustainability challenges. This study, conducted as part of the CATALYST project, examines how IS and CE principles can facilitate a green transition within Romanian industrial parks. The project focuses on enhancing resource efficiency, reducing waste, and fostering collaboration among co-located companies.

The research employed a mixed-methods approach, including literature review, surveys, capacity-building initiatives, and a pilot project. A survey of 30 Romanian industrial parks was conducted to assess stakeholders' perceptions of IS and identify opportunities and barriers. The results informed the design of targeted educational programs, leading to the successful training of 22 professionals on IS and CE principles and their practical application. The study also initiated a pilot implementation of IS practices in a selected industrial park, leveraging an extensive assessment of the park against the global framework of the eco-industrial parks criteria, resource mapping and stakeholder engagement, to identify actionable symbiotic opportunities. Key findings reveal a strong interest in IS among industrial park stakeholders, albeit with limited prior knowledge. The educational programs significantly enhanced participants' understanding of IS, equipping them to act as facilitators within their organizations. Preliminary results from the pilot implementation indicate potential for significant resource optimization and environmental benefits, including reduced greenhouse gas emissions and cost savings. This research contributes to advancing the European Green Deal objectives by demonstrating the scalability and impact of IS practices in emerging economies. It highlights the critical role of stakeholder engagement, capacity building, and policy support in mainstreaming IS practices. The study also underscores the importance of international collaboration, exemplified by knowledge exchange between Romanian and Norwegian partners, to adapt and implement IS practices effectively.

**Keywords:** industrial symbiosis, circular economy, resource efficiency, green transition

## **Current and Future Environmental Costs and Impacts of Grid-Scale Battery and Mechanical Electricity Storage**

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### **Abstract**

Limiting global warming requires up to 19.2 TWh of electricity storage by 2050 – yet research on Lithium-Ion battery alternatives overlooks environmental impacts and costs beyond climate change. This study applies method stacking by combining Life Cycle Assessment (LCA) and True Cost Accounting (TCA). First, an attributional prospective LCA (pLCA) using different Shared Socioeconomic Pathways (SSP) was conducted. Second, societal cost of all 18 ReCePi2016 impact categories were monetized. Results show storing solar photovoltaic (PV) electricity can raise climate impacts by +40-400% (+34-340 gCO<sub>2</sub>-eq./kWh-storing) and other environmental damages by up to +1100%, depending on technology, compared to direct solar PV use (85 gCO<sub>2</sub>-eq./kWh-delivered). However, all technologies exhibit significantly lower greenhouse gas emissions than the most commonly suggested alternative to storage, natural gas-powered peaking power plant (676 gCO<sub>2</sub>-eq./kWh). Today, batteries and mechanical options (compressed air, pumped hydro) have similar impacts, but future scenarios favour the more resource efficient (circular) mechanical systems. Societal costs via True Cost Accounting (TCA), dominated by non-climate harms (>90%), increase Levelized Costs of Storage (LCOS) by +50-100% (+0.05-0.60 €2024/kWh-storing) and change relative competitiveness. To avoid problem-shifting from climate to other impacts, practitioners should integrate TCA into LCOS, prioritise mechanical storage where feasible, and improve battery lifetime and production impacts.

**Keywords:** energy storage, prospective life cycle assessment (pLCA), true cost accounting (TCA), batteries, pumped hydro, compressed air

## Design for Repair: Key Aspects from a Product Life Cycle Perspective

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### Abstract

As the transition to a circular economy gains momentum, repair is emerging as a crucial strategy for extending product lifespan and reducing waste. A key concept in this shift is Design for Repair (DfRepair), which ensures that products are designed with repairability in mind. With increasingly stringent regulations on the horizon, businesses must adapt their design processes. However, many companies struggle to implement repair-friendly designs effectively. Finding the right balance at all stages of the product life cycle has become an urgent priority. Despite growing interest in repairability, a holistic approach to the entire product life cycle is still lacking. Many current design strategies focus on isolated stages, primarily on the use phase of products, leaving a critical knowledge gap in identifying key aspects from other stages designers must consider when developing repairable products. A comprehensive overview of design aspects that contribute to effective repairability remain unclear. This research addresses this gap by identifying and analyzing critical design aspects from all stages of the product life cycle, providing designers with guidance to create more sustainable and repair-friendly products. This study employed qualitative research methods to explore key aspects of DfRepair. Data was collected through structured assignments given to groups of scholars, generating insights into repair-friendly design aspects. The process consisted of two key steps. First, exploratory mind maps were created, informed by grey literature, to identify aspects of DfRepair and their interrelations, ensuring a comprehensive approach to DfRepair. Second, the aspects found through the mind mapping process were clustered based on the product life cycle, with an additional focus on who repairs what and where at different stages. The collected data was then reviewed, filtered, and structured into a meaningful dataset. The research resulted in a structured framework for understanding repairability across a product's lifespan and includes a comprehensive overview of various design aspects related to DfRepair. It emphasizes that more stages of the product life cycle, such as production and sale, play an important role in enabling repairability, alongside the use phase. Key design aspects include modular construction, availability of spare parts, accessibility of components, which provide valuable input for designers looking to integrate repairability into their product designs. This study contributes to the literature on design for circularity by offering new insights into the whole product life cycle in relation to DfRepair. Most importantly, it provides designers with a structured framework, offering practical guidance for incorporating repairability into their projects. Future research will focus on validating these findings with professional designers and developing and testing a specialized tool to further support the integration of repairability in design processes. By bridging the knowledge gap and equipping designers with actionable strategies, this research contributes to the broader goal of accelerating the transition towards a circular economy.

**Keywords:** repair, product life cycle, circular economy, circular design, design for repair

## **Energy Prices and Efficiency in the Renewable Transition: Regional Disparities in the Czech Republic and the EU**

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### **Abstract**

This paper examines the geographic dimension of the energy transition in the European Union, with an emphasis on the interrelation between energy prices and energy efficiency across countries and regions. While the deployment of renewable energy sources has accelerated across the EU in response to climate targets and geopolitical imperatives, the transition has unfolded unevenly, revealing spatial disparities in costs, consumption patterns, and infrastructural readiness. The Czech Republic serves as a focal case for analysing how regional variation in energy intensity and price exposure affects the country's capacity to transition effectively and equitably. The study poses three research questions. Firstly, how do electricity and gas prices vary at the national and regional level across the EU, and how do they impact the pace and form of renewable energy deployment? Secondly, what regional disparities exist in energy efficiency, and how do they correspond to price levels and socio-economic indicators? Thirdly, to what extent does energy efficiency mitigate the impact of high energy prices during the transition to renewable energy sources? The aim is to approach these questions through a spatially explicit analysis of Eurostat and national datasets. The primary indicators include energy prices for households and industry, energy intensity of GDP (as a proxy for efficiency), GDP per capita, and renewable energy shares in final energy consumption. Where available, data at the regional level are included to assess intra-national variations, particularly within the Czech Republic. Methodologically, the study employs spatial autocorrelation metrics, decoupling index calculations, and cluster analysis. The results are visualised using thematic maps and comparative graphs. Key findings suggest that energy prices and efficiency levels are spatially correlated but not always in the expected directions. Regions with high energy efficiency do not necessarily enjoy lower prices, due to systemic factors such as market regulation, taxation, and infrastructure costs. However, efficient regions tend to show more stable economic output during energy price shocks, indicating that efficiency acts as a form of resilience. In the Czech Republic, significant regional disparities exist, with industrialised regions exhibiting both higher energy intensity and greater exposure to price fluctuations. From a scientific perspective, this paper advances the integration of spatial thinking into the study of energy transitions, emphasising the co-evolution of economic structure, pricing mechanisms, and efficiency performance. The practical implications are twofold: first, that energy efficiency must be a priority not only for environmental reasons but also as a socio-economic safeguard against rising energy-related vulnerabilities; and second, that spatial differentiation in policy design is essential to avoid worsening existing inequalities during the energy transition. For EU-level and national policymakers alike, acknowledging the geography of energy efficiency and pricing is a prerequisite for a just and effective transition.

**Keywords:** energy prices, energy efficiency, renewable energy transition, regional disparities, economic resilience

### 3. Sustainable Consumption and Lifestyles for a Circular Society

#### The Effect of a Multi-Component Nudge Intervention to Promote Sales of Sugar-Free Plant-Based Milk Alternatives

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#### Abstract

Shifting dietary habits toward more sustainable and healthy food and drink choices can significantly reduce the environmental impact of food systems and improve public health. To support this transition, interventions targeting food purchasing behaviour are essential. In Belgium, where five major supermarket chains control 80% of the grocery market, retailers are uniquely positioned to influence consumer choices. Research shows that behavioural interventions, especially using choice architecture, work well. However, most studies focus on interventions consisting of only one technique, even though multiple techniques are often used simultaneously in practice—and combining them may enhance effectiveness of interventions.

This study evaluates a multi-component nudge intervention implemented in 10 supermarkets of a Belgian retail chain, aiming to shift consumer purchases from sugared to sugar-free plant-based milk alternatives. The intervention was co-designed and implemented with the retailer and product manufacturer. The intervention consisted of four components: (i) positioning adjustments, including left-right shelf restructuring—placing sugar-free alternatives on the left and sugared ones on the right of the shelf—and top-down restructuring based on ingredient base, with, for example, almond drinks placed on higher shelves and soy drinks on lower ones; (ii) visibility enhancements through the installation of shelf dividers; (iii) information provision via dispensers containing recipe leaflets for inspiration; and (iv) availability alteration through secondary product placement. This intervention was implemented during a 12-week intervention period, and results are benchmarked against a 4 week pre- and post-intervention period, as well as against average sales in the control stores from the same supermarket chain.

Preliminary descriptive results show a positive effect on non-sugared drink sales and a decline in sugared drink sales in intervention stores during the intervention period. However, the increase in non-sugared purchases did not fully offset the drop in sugared ones, leading to an overall decrease in volume and revenue. Effects varied by brand type (private label vs. national brand), store size, and ingredient base, with oat- and soy-based alternatives showing the most pronounced shifts.

For researchers, this study highlights the value of evaluating a multi-component intervention in a real-world setting and the importance of disaggregating effects by product and store characteristics. For practitioners, especially in retail and public health, the findings suggest that while nudging can effectively steer consumers toward healthier options, additional strategies may be needed to maintain overall sales and ensure long-term behavioural change.

**Keywords:** healthy consumption, co-creation, supermarkets, real-life intervention, nudging

## **Understanding Household Leftover Food Management: Insights for Sustainable Consumption and Waste Reduction**

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### **Abstract**

Food waste is a critical global issue with environmental, economic, and social implications. Household food leftovers are a major contributor to food waste; however, the underlying drivers of leftover food management practices remain insufficiently understood. This study explores these drivers using the Motivation-Opportunity-Ability (MOA) framework and investigates behavioural heterogeneity among consumers through Latent Class Analysis (LCA). Data were collected from an online survey of 1,007 Australian households. A confirmatory factor analysis (CFA) was conducted to validate the measurement scales, a final measurement model with 34 manifest variables measuring six latent constructs: motivation, opportunity, ability, competing goals, leftover food management, and leftover food waste. Structural Equation Modelling (SEM) was used to examine the relationships between these constructs. Findings reveal that consumers' motivation strongly influences leftover food management at home, particularly through their negative feelings towards waste and their awareness of its consequences. Abilities such as meal planning, efficient cooking, food inventory management, interpreting expiry dates, and food storage significantly enhance leftover food management, while opportunities related to time availability, access to information, and lifestyle showed a relatively weaker impact. Additionally, competing goals, such as prioritising food safety, health, and taste, diminish consumers' focus on leftover food management. The study identified four distinct consumer segments: 'Efficient Savers', who excel in meal planning and food storage; 'Unplanned Eaters', who have low motivation and skills in handling leftovers; 'Aspirational Savers', who aim to manage leftovers effectively but encounter challenges; and 'Time-Savvy Planners', who integrate efficient food management into busy lifestyles. Socio-demographic factors, including age, gender, employment, and household composition, significantly influence the membership of the consumer segment. Older individuals, females, and unemployed consumers are less likely to be 'Unplanned Eaters', whereas households with children are more likely to be 'Time-Savvy Planners'. These insights can guide interventions to promote behaviour change and prevent leftover waste. Mobile apps that calculate precise ingredient quantities for planned meals and provide a shopping list feature can encourage consumers to shop and cook more accurately, reducing unnecessary food purchases. Public campaigns promoting proper leftover storage and creative reuse strategies can enhance household food management practices. By addressing consumer heterogeneity and behavioural drivers, this study contributes to food waste reduction efforts and supports the United Nations Sustainable Development Goal 12.3.

**Keywords:** food waste, leftovers, households, consumer behaviour, structural equation modelling

## **Sustainable Intentions, Wasteful Realities? Analysing Food Waste Patterns of Farmers' Markets and Local Food Consumers**

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### **Abstract**

There has been a growing interest in responsible food consumption—encompassing its origins, production methods, and environmental impact. Recent research has explored consumer preferences regarding food origins in general and local food in particular. Identifying diverse food acquisition habits and preferences is crucial for designing interventions aimed at reducing food waste at the household level. However, the relationship between food acquisition preferences and household food disposal and waste remains largely unknown. This study examines the food waste patterns of farmers' market and local food consumers, comparing them with those who predominantly purchase from supermarket chains. It utilised a large, nationally representative sample based on an online survey of 5,272 Australian households. A binary logistic regression model and the Propensity Score Matching technique were employed to investigate the disposal habits of local food communities concerning fresh produce—fruits and vegetables. The binary logistic regression model analysed the characteristics of local food preferences as indicated by purchases from farmers' markets and local grocery stores. The PSM classified groups based on their fresh produce purchasing sources, with consumers buying fresh produce from farmers' markets forming the treatment group, while those who bought fresh produce from other sources were classified as the control or counterfactual group. The analysis revealed that 12% of respondents reported purchasing local food. The local food group (treatment group) displayed statistically significant differences in weekly grocery expenditure, preferences for fresh food, age, educational level, household composition, and household income. The findings also indicate that local food communities generate statistically significant and higher amounts of fruit and vegetable waste than their counterparts. Despite demonstrating environmentally friendly food disposal behaviours, buying local food is associated with increased food wastage. The results emphasise the diversity of food disposal habits across different food categories and the necessity to integrate such nuances into food waste reduction interventions to achieve Sustainable Development Goal 12.3 of halving per capita food waste by 2030.

**Keywords:** food waste, fruits and vegetables, consumer behaviour, propensity score matching, local food

## **Unaccounted Food Waste: The Resourcification of Carrots in Sweden**

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### **Abstract**

This study has responded to calls for research on food waste, particularly in the context of northern Europe, within agri-food systems research. In particular it has addressed research bridging disciplines, with a focus on synergies between actors and different stages of the food chain. Previous studies have expressed that ambiguous definitions of food loss and waste make it difficult to understand where exactly within the food chain the loss or waste occurs. Moreover, one study shown in a report in reference to Swedish carrots that “About a third of the carrots that are grown, sorted and packed in Sweden do not become food.” The report has focused on field losses using harvest machinery and storing, sorting and packaging losses through packaging industries. While these may be the *accounted for* sources of food loss and waste, the present study has aimed to highlight and detail less addressed and possibly *unaccounted* conditions. It has posited that these unaccounted conditions create and contribute to *hidden* waste. Further in addition to existing quantitative assessments on food loss and waste, a qualitative analysis contribution has been made. The focus is specifically on carrots, through data (as part of a larger project) from 480 hours of ethnographic observations (fieldnotes and photographs) on one small-scale agroecological farm in South Sweden. The data was thematically analysed. A Resourcification theory perspective is applied on carrots. This perspective helps to capture social constructions, meanings and processes by the involved actors related to the resource in question. The resourcification processes are illustrated through social interactions between the farmer, the farm team, and the restaurants that buy vegetables from the farm. It has further been detailed how restaurants may have specific requirements such as the presence of leaves on carrots, which signify *freshness*. It has been shown how such requirements lead to a chain of performative processes at the farm, in pursuit of this freshness. Tensions generated and the adaptations needed to deal with the requirement; but also to address the potential food loss it leads to; have been captured. The abstract may be relevant for researchers interested in sustainability, agri-food systems, resilient cities and regions, circular economy, sustainable resource use.

**Keywords:** food loss and waste, carrots, agri-food systems, Sweden, resourcification

## **Never Change a Running System: How System Justification and Psychological Distance Affect Environmental Concern**

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### **Abstract**

Building upon system justification theory and construal level theory, this study investigates the psychological barriers that affect environmental concern and behavior. We conjecture that system justification causes individuals to view environmental issues as more psychologically distant, thus reducing environmental concern. Additionally, we hypothesize that perceived system threats will amplify the negative effects of system justification on environmental concern through increased psychological distance. Three studies were conducted to test these hypotheses. The first study was a correlational analysis involving 200 participants from the US, which confirmed that system justification negatively correlates with environmental concern and that this effect is mediated by psychological distance. Individuals with higher levels of system justification perceived environmental issues as more distant and, consequently, were less concerned about these issues. The second study involved a sample of 111 US participants in two waves and employed an experimental manipulation of system threat. In line with our theorizing, the study corroborated that when participants perceived threats to the system, the relationship between system justification and environmental concern via psychological distance was exacerbated. This suggests that under perceived system threats (e.g., e.g. in the form of threats from notable environmental events), individuals with high trait system justification are more likely to justify the status quo and perceive environmental issues as distant problems, thereby reducing their concern. The third study, conducted with 300 US participants, used an experimental manipulation of the perceived proximity of environmental issues. The results indicate that when environmental issues were perceived as less distant, the negative impact of system justification on environmental concern was neutralized, thus demonstrating that actually decreasing psychological distance can mitigate the adverse effects of system justification on environmental concern. The results from these studies collectively support all the proposed hypotheses. They illustrate that psychological distance mediates the relationship between system justification and environmental concern. Moreover, system threats intensify this relationship, while interventions aimed at reducing psychological distance can effectively mitigate the negative influence of system justification on environmental concern. This indicates the potential for interventions that reduce psychological distance to counteract the hindering effects of system justification on pro-environmental attitudes and behaviors. In doing so, this research provides vital insights into ideological differences affecting environmental attitudes. It suggests that environmental messages and interventions can be more effective by targeting audience perceptions concerning psychological distances and ideological motivations. The findings have significant implications for the development of strategic communications and interventions tailored to enhance environmental concern and promote pro-environmental behavior. By addressing the psychological barriers that hinder environmental concern, such as system justification and psychological distance, this study contributes to the broader understanding of how to motivate individuals towards environmental sustainability. These insights are crucial for both academic research and practical applications in the fields of environmental psychology and communication, highlighting the importance of psychological factors in shaping environmental attitudes and behaviors.

**Keywords:** sustainable consumption, psychological distance, system justification, ideologies, construal level

## The €3.5k Environmental Burden of the EU Rich's Consumption Patterns

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### Abstract

The environmental pressure of human activity has reached a critical juncture, with widespread consequences for ecosystems, biodiversity, and human well-being. Research shows that the wealthiest are the segment of society contributing the most, through their consumption patterns, to climate change and environmental degradation (Chakravarty et al. 2009, Chancel 2022, Dietz et al. 2020). Yet it is still unclear whether this is due to larger economic means or different consumption choices, due to a lack of granular data. Moreover, the existing focus of scholarly debate on GHG emissions neglects the different planetary boundaries that the rich are disproportionately transgressing. Most studies have focused narrowly on carbon and energy footprints, overlooking broader environmental pressures such as water use, land consumption, and resource depletion. The present research aims at estimating and explaining inequality in the distribution of carbon and other environmental consumption footprints in Europe across economic classes. It does so based on a novel granular micro-level dataset across 27 countries combining household-level expenditure data from the EU-HBS provided by Eurostat with product-level impact factors produced by the European Commission Joint Research Centre. We estimate the total annual cost that society incurs due to the environmental consequences of the consumption patterns of the rich to be 3490 euros greater than the one of the poor. The data reveal that the contribution of the rich to climate change and environmental degradation is almost double (+82%) that of the poor. This figure is rather consistent across the different environmental dimensions we explore, except for the depletion of mineral and metal resources, where the contribution of the rich is 2.64 times greater. The rich have transgressed seven planetary boundaries, while the poor only four. Freshwater and marine eutrophication as well as the depletion of mineral and metal resources are the areas where only the rich are living beyond the safe space for humanity. Across the different environmental dimensions, food is the area contributing the most (53%) to footprint inequality, except for the dimension of the depletion of mineral and metal resources, where mobility is prevalent (52%). Footprint inequality is due to both a "size" effect, meaning that the rich consume more and therefore pollute more, but also a "selection" effect, meaning that the rich select products with greater environmental impact to a greater extent. The area of food, they consume slightly more or almost as many potatoes, bread, and milk (all products featuring low impact) as the poor, but much more meat, fish, and cheese, which are more impactful. In the area of mobility, the rich tend to opt for modes of transport that are more impactful, notably cars instead of public transport. This research highlights the urgent need for a paradigm shift in consumption patterns among high-income households, particularly in the areas of food and mobility, to mitigate climate change and environmental degradation, and to promote more sustainable lifestyles that support a circular and equitable society.

**Keywords:** sustainability, consumption, inequality, environment, footprint

## **Shaping Sustainable Consumption Practices: Changing Consumers' Habits through Lifestyle Changes and Extended Producer Responsibility Schemes**

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### **Abstract**

Japan has long pursued a circular economy through the Sound Material-Cycle Society designed to reduce waste and promote reuse and recycling, yet the persistent use of low fees within Extended Producer Responsibility systems continues to undermine sustainable consumption and production practices. This research addresses the critical challenge of how to enhance these systems by examining whether increasing fees on energy-using goods (e.g. ICT equipment, households' appliances and cars) can effectively alter household behaviour toward more circular practices. To explore this issue, a comprehensive modelling framework was developed that integrates a dynamic general equilibrium model soft-linked to a lifestyle model and an integrated assessment model. This approach allowed for the simultaneous consideration of economic, environmental, and behavioral dimensions while capturing the heterogeneity among households based on their low-carbon cognitions, and their social and material contexts. The results reveal that higher and more visible fees can substantially reduce the demand for new energy-using goods by incentivizing consumers to engage in repair and shared services rather than resorting to frequent replacement with brand-new goods. The study further shows that the point in the product life cycle at which the fee is applied plays a crucial role; fees charged at the time of purchase rather than imposed at the end of the product's life strengthen incentives for waste reduction and resource use. In addition, households whose behaviour are driven by low-carbon cognitions respond more positively to the increased fees by adopting practices that contribute to waste reduction and resource conservation, while households motivated primarily by financial necessity exhibit less engagement in circular-related consumption activities. These findings suggest that aligning fiscal measures with targeted consumer education and complementary policy initiatives could drive significant improvements in waste management, resource use, and CO<sub>2</sub> emissions reduction. Overall, this research provides valuable insights to the discourse on sustainable consumption by demonstrating that well-designed EPR schemes, when integrated with awareness and education programs, can foster a sustainable and circular economic system.

**Keywords:** circular economy, extended producer responsibility, lifestyles, sustainable consumption, macroeconomic modelling

## **From Awareness to Action: A Household Circular Economy Predictive Model Across the 10Rs**

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### **Abstract**

Sustainable consumption policies have evolved to facilitate environmentally friendly choices for households and organizations. This trend has become evident with the implementation of the Right to Repair, the EU Green Claims Directive, and the 12<sup>th</sup> Sustainable Development Goal, as well as the international funds that support this transition. To facilitate it, the circular economy approaches and models propose practical frameworks capable of meeting these conditions. However, organizations and policy makers are unaware of how consumers will perceive and behave under a circular economy-oriented paradigm. Indeed, there is a knowledge gap on how awareness, and perception for the strategy with the highest circularity potential translate into intention and behaviour at the household level. Thus, this study aims to develop a conceptual model that gauges individual participation in household circular economy practices, in function of their perception and awareness over the circular economy strategies. Towards this end, it leverages on a questionnaire that is grounded in behavioural theories, such as the theory of planned behaviour, and the value-belief-norm model. The findings of the survey are subjected to complex statistical techniques, such as partial least squares-structural equation modelling, and exploratory factor analysis. The latter identifies key factors and refines the measurement model, whereas the former tests the relationship between those factors, to predict consumer behaviour. It establishes causal pathways between the behavioural theory constructs, while considering the refuse strategy. Expected findings of this research work includes an assessment of the current state of knowledge, perception, intention, and actions of the population over household circular economy practices. It outlines the most influential factors towards the circular consumption intention and behaviour. Building on these findings, it defines a predictive model that explains household circular practice adoption, in function of the attitude towards them. The results of this work hold several implications, including, from a theoretical standpoint, an advancement of circular consumer behaviour theory, by providing a quantitative validation of the relationships between knowledge, attitude, intention, and behaviour in circular economy. From a practical context, it can support policymakers to design targeted awareness campaigns and policies that foster circular behaviours in different consumer segments, and guide businesses towards circular business models. It helps corporations design better circular economy-aligned products and services, and adapt marketing strategies to different consumer groups, emphasizing knowledge-based nudges or emotional engagement. Overall, it provides a structured approach for multiple stakeholders to enhance circular consumer engagement and education.

**Keywords:** behaviour modelling, household circular economy, stakeholder engagement, purchase intention

## **Design Matters: Identifying Consumer Preferences for the Design of a Subsidy Scheme for the Use of Repair Services**

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### **Abstract**

Repair plays a crucial role in the circular economy, offering a more sustainable alternative to the fast consumption-disposal cycles prevalent in modern consumer behaviour. However, despite its environmental and economic benefits, the use of repair services is not widespread. One of the main barriers for consumers is the (perceived) high cost of repair, especially compared to buying new products. In response, several European countries have introduced financial incentives to counteract this barrier, among them a broad variety of subsidy schemes varying in their design, including aspects like application procedures, funding levels or eligibility. Research suggests that consumer preferences for these financial incentives differ across segments, implying that the effectiveness of a subsidy scheme may depend on how it is designed. However, there is limited understanding of which specific design elements resonate most with consumers, especially across different consumer groups. In this study we therefore want to take up this aspect and analyse 1) how the most preferred design of a subsidy scheme for the use of repair services for consumer goods looks like, and 2) to what extent different consumer segments play a role in relation to the preferred design. We aim to analyse consumer preferences for different subsidy designs using adaptive-choice-based conjoint analysis and a post-task questionnaire among a representative sample of Austrian citizens. In our study, we present participants with a series of hypothetical subsidy schemes, each differing in attribute levels like cost coverage, application process, participating repair shops, funding levels and payment modalities to capture relevant operative dimensions of a subsidy scheme. Participants are primed that the government is introducing a subsidy scheme for the use of repair services but the design still is under debate. Thus, citizens are consulted which design they would support the most. In each choice-task, the participants have to decide for which scheme they would vote, if today would be a referendum deciding about the design of the scheme. Using hierarchical bayes modelling, we estimate the partial utility values to determine the relative importance of each attribute, allowing us to capture the trade-offs that consumers are willing to make. Additionally, we perform a cluster analysis to identify consumer groups resembling each other in terms of their preferences. We plan to present preliminary results of this ongoing research at the upcoming conference. We hypothesize that subsidies which directly reduce the invoice amount are preferred to subsidies with reimbursements due to the present bias. What is more, we suspect a trade-off between the effort of applying for the funding and the funding level. The new EU Right-to-Repair legislation mandates that member states must implement at least one measure to promote repair, explicitly mentioning vouchers and other subsidy schemes. Providing insights into preferred design options and customer segmentation can thus enhance future policy-making, consequently increasing repair subsidies efficacy and propagating repair in society.

**Keywords:** repair, financial incentive, design, consumer preferences, public policy

## Challenges in Industrial Production and Consumer Choice: The Case of Bioplastics

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### Abstract

Bioplastics, wholly or partially derived from renewable organic matter such as plants, bacteria, and food waste, are emerging as a viable alternative to traditional petrochemical plastics. These materials offer a more sustainable option, promoting the circular economy while reducing dependence on fossil resources and minimizing environmental and health impacts. However, their success relies heavily on acceptance from both industry and consumers. To better understand the challenges to bioplastic adoption, two literature reviews were conducted—one identifying barriers to bioplastic production and the other examining obstacles to consumer acceptance.

From an industry perspective, several barriers were identified, including technological and knowledge related challenges such as the limited properties of bioplastics and the need for further research. Economic factors, including high production costs and limited funding, also pose significant hurdles. Regulatory inconsistencies further complicate adoption, while raw material supply issues, such as seasonal availability and competition, add to the challenges. Additionally, behavioural factors like low inter-institutional collaboration and resistance to change hinder progress. On the consumer side, uncertainties and knowledge gaps make it difficult for individuals to recognize and understand bioplastics. Risk perceptions regarding raw materials, production technologies, and final product safety further contribute to hesitancy. Concerns about "greenwashing" and scepticism about environmental benefits add to consumer reluctance. Cost-benefit considerations, particularly regarding price versus quality and durability, also influence decision-making. Some consumers hold ambivalent or negative attitudes toward certain raw materials, while others have misaligned expectations regarding bioplastic products. A strong preference for biodegradable materials, regardless of their origin, also shapes consumer choices. The findings highlight a range of barriers that may hinder the widespread adoption of bioplastics by both industry and consumers. To address these challenges, recommendations include implementing best practices and developing effective communication strategies to promote bioplastics within the market. By enhancing awareness, aligning expectations, and addressing economic and regulatory concerns, bioplastics can gain broader acceptance and contribute to a more sustainable future.

**Keywords:** bioplastics, sustainability, barriers to bioplastic production and commercialization, industry and consumer perception, best practices

## **Sustainable Consumption - From Niche to Mainstream - A Preliminary Synthesis**

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### **Abstract**

This paper will present results from synthesising the 8-year research program Mistra Sustainable Consumption - from niche to mainstream, which is currently in its last year. It involves approximately 25 researchers from six Swedish universities and approximately 20 societal partners from businesses, local and national governments, and NGOs, with a budget of approximately 8 million euros. The synthesis project in the program asked all partners about their most important learnings on sustainable consumption. After that, all researchers were invited to present the most essential conclusions, resulting in a list of 93 conclusions, which were further prioritised and clustered. This process resulted in five overarching messages from the project presented below:

1. Sustainable consumption is more than choosing less polluting products. It is also about refraining from certain types of consumption and considering a broader set of sustainability aspects, including justice perspectives. Different groups will define sustainable consumption differently, and several perspectives are necessary.
2. For sustainable consumption, both technological development - including efficiency improvements -and changes in consumption - including reductions of certain types of consumption - are needed. Relying on one of these strategies is not enough. Increased efficiency must be combined with sufficiency.
3. *Individual* actions are not enough: Sustainable consumption requires structural changes. Sustainable consumption cannot focus only on individual consumption choices but must be seen from a more complex practice perspective. Values and frames and how they are integrated into policies are examples of aspects that influence consumption practices. Other examples are planning and infrastructure.
4. *Voluntary* actions are not enough; policy is also needed, and several aspects must be considered for policy development. Acceptance among the public and societal stakeholders is important, but should not be seen as carved in stone based on a priori attitude surveys. Instead, acceptance is better understood as something that can be developed by interaction and dialogue by which policy making may earn public trust. Policy packages where different changes are introduced in combination can be useful for reaching broader acceptance. Measures decreasing rebound effects are often necessary for effective policies.
5. There is an urgent need for reduced emissions of greenhouse gases, and several things can be done now to promote more sustainable consumption. Examples of policy interventions that are discussed in the program include:
  - Reduced tax on fruits and vegetables combined with increased tax on red meat, which results in environmental benefits, health improvements and economic benefits for lower income groups.
  - Product destruction ban and mandatory repairability.
  - Sustainability demands in product procurement
  - Subsidies and investment in night trains
  - Changed menus in school canteens resulting in reduced emissions of greenhouse gases with maintained costs, nutritional value and satisfaction among students.

- Setting up community-run spaces for sharing, reuse and repairing
- Working time reduction resulting in increased well-being but also increased worries among low-income groups.

These overarching conclusions are currently further discussed in the program with researchers, societal partners, our board and our international advisory board. Updated findings will be presented at the conference together with a broad set of possible actions.

**Keywords:** efficiency, sufficiency, policy packages, rebound effects, urgency

## The Role of Emotions in Pro-Environmental Behaviour

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### Abstract

Climate change is largely caused by human activities and has negative effects on the world such as temperature rise, sea level rise and warming oceans, easier spread of disease, increased species loss, more intense natural phenomena, food scarcity, forced migration and increased poverty. This can leave an emotional impact on people – people start experiencing climate change-related emotions or eco-emotions. These emotions can affect each other and people's environmental behaviour. Thus, it is important to understand how eco-emotions related to climate change (eco-anxiety, eco-anger, eco-sadness, eco-guilt) influence people's environmental behaviour. Therefore, in this paper, we comprehensively evaluate the relationships among eco-emotions and their influence on both individual and collective environmental behaviour, closing the research gap.

The data was collected via an online survey. The survey was conducted in, 2022, in Lithuania. In total, we received 306 responses. Respondents were asked to indicate how strongly they feel anxiety, anger, sadness, and guilt about each consequence of climate change and how often they carry out certain individual and public environmental actions. The answers had to be indicated on a Likert scale from 1 - "rarely or never" to 5 - "very often". Factor analysis was used to check the validity and accuracy of scales. Anova F test was used to see the difference between emotions and age groups. Multiple linear regression was used to determine how individual environmental behaviour is affected by the independent variables: anxiety, anger, sadness, guilt, and the totality of eco-emotions about climate change.

It was found that the differences between the three age groups at the level of eco-emotions were not statistically significant, except for the level of anger ( $F = 2.851$ ;  $p = 0.016$ ). Furthermore, there is a statistically significant linear relationship between individual environmental behaviour and anxiety ( $\beta = 0.349$ ;  $p < 0.001$ ) and sadness ( $\beta = 0.0226$ ;  $p = 0.014$ ), and the relationship is positive. Considering the collective environmental behaviour, only anxiety ( $\beta = 0.17$ ,  $p = 0.05$ ) and emotions about climate change ( $\beta = 0.368$ ,  $p < 0.001$ ) statistically significantly encouraged collective environmental behaviour. The higher beta coefficient shows that emotions about climate change are a stronger driver of collective behaviour than anxiety among Lithuanian people.

The analysis of environmental behaviour showed that individual behaviour is driven by anxiety and sadness i.e., as the levels of these emotions increase, so does the frequency of individual environmental behaviour. Collective behaviour is driven by anxiety and emotions about climate change, i.e., as levels of anxiety or emotions about climate change increase, the frequency of collective environmental behaviour increases. The study also revealed that people in Lithuania tend to engage in individual environmental behaviour more often than collective environmental behaviour. This paper highlights that when searching for the tools that help solve the climate change problem and promote climate-friendly behaviour, we could do it while taking eco-emotions into consideration because they could motivate people to change their behaviour.

**Keywords:** eco-emotions, pro-environmental behaviour, climate change, environmental awareness

## Environmental Claims in Advertising from a Consumer Perspective

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### Abstract

In my paper, I examine environmental claims in advertising from a consumer perspective. I focus on the definition of environmental claims not only in the Czech Republic but also within the European Union. I also focus on how strictly environmental claims must be evaluated and what requirements environmental claims must meet in order not to be labelled as false, misleading or otherwise capable of influencing consumer purchasing decisions. Finally, I examine whether it is possible to penalise problematic environmental claims under the current state of Czech law.

I use doctrinal research in order to answer these research questions. I focus on environmental claims within the European Union and selected Member States, namely the Czech Republic, the Federal Republic of Germany and the Republic of Ireland. The reason for this selection was the fact that in the Republic of Ireland, like in the Czech Republic, no legal standard regulating environmental claims has yet been adopted, but soft-law regulation is available. In contrast, in the Federal Republic of Germany, the courts have commented on environmental claims on several occasions and there is also soft-law regulation.

In my research, I came to the following conclusions. The characteristics that a competitor's claim must meet to be an environmental claim, are that it must be made voluntarily, be in any form, relate to the competitor itself or its product, relate to the competitor's business activities, and state or imply that the competitor or its product has no environmental impact, has only a positive environmental impact, has a less harmful impact on the environment than other competitors or other products, or has improved its environmental impact over time. I have also set out what I consider to be the key view of the German courts that advertising containing environmental claims is subject to special requirements and must be judged against strict criteria, similar to, for example, advertising relating to health. The requirements that an environmental claim must meet in order not to be considered false, misleading or otherwise liable to influence the consumer's purchasing decision are transparency, clarity and intelligibility, not using sustainability labels that have not been verified by an independent third party, not generalising, not presenting the requirements imposed by the legislation as a distinctive feature and not omitting any information that could influence the consumer's purchasing decision. Despite the aforementioned absence of legal regulation of environmental claims in the Czech legal system, problematic environmental claims may be punishable, in particular either as unfair competition or as unfair commercial practice.

I believe that my contribution is beneficial for the still under-researched area of environmental claims. Given the absence of actual legislation and judicial decisions in this area in the Czech Republic, I consider it capable of bringing new impulses and perspectives to further developments.

**Keywords:** environmental claims, unfair competition, unfair commercial practice, consumer protection

## **Access or Excess? Mapping Out the Interplay Between Food Accessibility and Household Food Waste: Exploratory Study in Gothenburg, Sweden**

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### **Abstract**

The paradox of food waste is glaring: millions go hungry, while tons of edible food are thrown away every day. Food waste is not only a social and ethical concern, but also a significant contributor to environmental degradation and inefficiencies within the food system. In Europe, households generate the most food waste, more than double from primary production and manufacturing. In 2022, over 59 million tonnes were discarded in the EU, with households accounting for 54%. Existing research on household food waste tends to focus on consumer behaviour and psychological factors, often blaming individuals. This viewpoint often neglects the influence of external and systemic factors that shape consumer actions. One such external factor is food accessibility- how easily healthy and nutritious food can be obtained. Research into food accessibility in Europe remains limited, as most existing studies have focused on North American towns. Even in these cases, the emphasis has been on spatial and physical factors, such as store location and density, rather than on the daily experiences and needs of residents. Given this, it's no surprise that research often treats food accessibility and household food waste as separate issues, likely because each topic is complex enough on its own. Considering the limited success in reducing household food waste globally, this study emphasises examining broader systemic factors affecting consumer behaviour, focusing on food accessibility and waste in Gothenburg. Methods include empirical data collected through observations, in-depth interviews (total = 12) with residents and experts, and an online resident survey (total = 45). The findings indicate that although physical proximity to food sources is undoubtedly important, it does not always guarantee actual food accessibility on its own. Other social and economic factors also seem to play an equally, if not more, critical role in shaping people's experiences of accessing food. On the other hand, household food waste patterns appeared to emerge from the interaction between broader systemic factors (physical, social, and economic) and individual or household behaviours. For example, the quantity and frequency of shopping, transport availability, store and product types, marketing strategies, and choices driven by convenience were often at odds with households' efforts and intentions to reduce food waste. Furthermore, households' perceptions, experiences, and strategies related to food consumption varied depending on factors such as neighbourhood characteristics, household composition, and storage facilities. In conclusion, the study suggests that household food waste is not only a consequence of individual behaviour, but a combination of external and personal factors; thus, it is necessary to examine them together, rather than separately, if we want to develop more effective long-term strategies for reducing food waste. It also highlights that achieving this would depend on coordinated efforts from various stakeholders, such as municipal planners, waste authorities, retailers, sustainability experts, designers, and household support systems. Their collective action is essential to create food environments that are physically, socially, and economically accessible, promoting a shift towards more sustainable food consumption habits and lifestyles.

**Keywords:** household food waste, food accessibility, urban planning, consumer behaviour, sustainable food consumption.

## **Slow Fashion and Inclusivity: A Systematic Literature Review**

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### **Abstract**

In our current economic setup, it is not surprising that our biggest industries stand behind the largest sustainability issues. While the above is widely known, many times people are not aware of the garment industries' pivotal impact, which is claimed to be in the top three polluting industries worldwide. To manage this widespread problem, slow fashion arose as a contemporary interpretation of a long-established concept. Many argue that the principle of slow fashion could serve as a foundation for addressing complex issues in the garment industry since it has an overarching, interconnected principle involving social and environmental sustainability altogether. Even though slow fashion's wide theoretical coverage in solving sustainability-related problems, a gap seemed to arise within the ethical and social dimensions. It was discovered that inclusivity regarding different socio-economic groups seems to be undiscussed in the current academic conversation. Therefore, the paper's research question focuses on whether the current academic comprehension of slow fashion can be inclusive. To answer the question, the paper explores the attributes of slow fashion and examines the potential for including stakeholders beyond those related to production in the academic discourse. To address this question, the research primarily utilised qualitative analysis with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis methodology, while also incorporating quantitative elements by software-assisted coding in NVivo. The systematic literature review provided an in-depth data analysis, including a vast body of scholarly work in the form of articles, all of which were coded to create a collection of elements. The mentioned code table included an immense number of references, further deepening the accuracy of the research. The research then focused on analysing the reference numbers and conducted a cluster analysis within NVivo, emphasising the relationships in regard to slow fashion. The paper successfully identified the elements of slow fashion that are currently discussed within academia. Based on the findings, slow fashion has the potential to embrace inclusivity, but the current discourse primarily focuses on a production-centred approach. By broadening the discussion beyond production-focused ideas and aligning with consumer needs and considerations, slow fashion has the potential to extend its application, moving out of a purely theoretical context. Ultimately, the paper contributed to the exploration of the main strata of current academic slow fashion discussions, next to highlighting possible limitations related to its practical implications.

**Keywords:** slow fashion, inclusivity, sustainable fashion

## **How consumer sustainability in the food domain is measured: a systematic literature review and future research directions**

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### **Abstract**

Food sustainability is a widely ill-defined term, used by distinct stakeholders throughout multiple disciplines. Consequently, sustainability within the food context is conceptually mis-specified, which also becomes apparent by a heterogeneity of scientific scales, measuring different sustainability aspects. This circumstance leads to a highly fragmented research body, failing to accurately capture the ecological, economic, and social dimensions, as proposed by the FAO (2014). Against this background, this research aims to assess how different dimensions of food sustainability have been theoretically conceptualized and operationalized in measurement models from a consumer perspective. Thus, this research aims to contribute by (i) systematically identifying extant scales addressing sustainability dimensions within the food context as well as by (ii) providing an in-depth analysis of their research foci and measurement properties for a synthesized conceptual understanding. For this purpose, a systematic literature review was conducted. Two separate search strings were developed for a literature search on a title- (n=5,388) and keyword-level (n=4,203) across four databases (i.e., Scopus, GoogleScholar, PubMed, and Web of Science). In total, 40 relevant scales that met all a priori defined inclusion criteria (e.g., peer-reviewed English publication) were identified. An in-depth analysis of these scales was conducted to assess their corresponding contexts, scale properties, sample characteristics, and statistical reliability and validity tests. Preliminary results show that there appears to be a mismatch between the vast amount of consumer research placed in the food sustainability domain, on the one hand, and the number of statistically validated measurement scales, on the other hand. In addition, extant consumer-focused sustainability scales differ both conceptually regarding the focal aspects considered as well as concerning their statistical robustness. Further, all the identified scales rely on respondents' self-reports, leading to potentially distorted consumer responses (i.e., concerns, attitudes or behavioural intentions) due to social desirability biases and thus, might exhibit limited external validity. Overall, this research contributes by aiding scholars in their search for valid and reliable measurement constructs within the food sustainability context to ensure a consistent quality of employed scales as well as to increase the comparability of research results across different studies. Further, building on the notion "you can't manage what you can't measure", this research advances the conceptual understanding of food sustainability and develops avenues for future studies concerned with the theoretical measurement of food sustainability from a consumer perspective.

**Keywords:** food sustainability, measurement, systematic literature review

## **Understanding Barriers to Residential Organic Waste Separation Behavior: A Quantitative Study on the Role of Collection Containers and Bags**

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### **Abstract**

To achieve a circular society, waste separation in general and specifically the separation of organic waste is of great importance. However, many Dutch municipalities struggle to meet national targets for waste separation, with organic kitchen waste being a key priority. Only 69% of organic waste in the Netherlands is separated and this percentage (at 26%) is even lower in neighborhoods with 50-100% high-rise buildings. Additionally, many municipalities report high contamination levels of the organic waste, like plastic bags.

Frequently cited challenges to proper organic waste separation relate to the type of container residents use for collection and disposal—specifically, the small bins and bags for organic waste. These findings come from small-scale studies and field experiments conducted in collaboration with municipalities, waste collectors and citizens. These studies often suffer from selection bias - around 10% of the approached residents tends to take part in these surveys/ interviews and most of them are high educated and already motivated to separate organic waste. Therefore, it remains unclear how widespread these problems are and how representative they are for the Dutch population.

The goal of the current study was to get a more representative and more accurate view of these problems with organic waste separation in the Dutch society. Together with the Ministry of Infrastructure and Water Management we had the following research questions: What challenges do Dutch residents experience with separating organic waste? How prevalent are these challenges and do they differ for specific bags and containers? And how much do these challenges affect if and how much organic waste residents separate?

To obtain a more representative sample, we used an existing panel (n=2211) of Dutch residents that are paid to fill in questionnaires on all kind of topics. The only selection criteria was that they have facilities to separate organic waste.

The study identified the most common issues experienced by respondents when separating organic waste, like fruit flies and smell, also in relation with their specific applied collection methods. These challenges led 4-11% of respondents to separate less organic waste, depending on the waste system in their neighborhood. However, for the respondents that stopped separating organic waste, fruit flies and smell were the main reason to do so. Many challenges bringing organic waste to the container outside were associated with the organic waste bags. The plastic bags caused the fewest issues, while using the container alone (without bags), held a middle position.

In general, the results confirm previous more anecdotal evidence regarding the biggest challenges with organic waste separation. The finding that plastic bags caused the least problems during use, may explain why they are widely used and are found as contamination in the container. The results could support municipalities to develop targeted behavioral interventions. These results are discussed in terms of their possible consequences and approaches for improving organic waste collection in the Dutch context.

**Keywords:** organic waste, sustainable behavior, waste separation, kitchen waste

## **The Great Technosphere Transformation: Planned Obsolescence and Dis-embedded Consumption of Electronics in the EU**

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### **Abstract**

The global generation of electronic waste in 2019 amounted to 52.6 million metric tons. This figure increased to 55.5 million metric tons in 2020 and reached 62 million in 2022. In 2022, the EU led by producing 17.6 kg of e-waste per capita. The Global E-Waste Monitor's latest report reveals that the generation of e-waste is increasing rapidly, at a rate five times faster than the reported recycling efforts. The increasing trajectory is projected to continue, with the generation of electronic waste predicted to exceed 82 million tonnes in the next six years. This underscores the urgent need for practical solutions to the e-waste problem. Numerous studies have pinpointed that lack of access to repair leads to the growing e-waste problem within the EU. There are several factors that contribute to the slowing down of repair practices in the EU, including planned obsolescence, in which devices are purposefully manufactured with low life expectancy and difficult to repair; high repair costs in certain EU member states. Planned obsolescence did not only make difficult to repair or reduce the lifespan of electronics, but it also transformed the consumption culture. While this transformation affected regions in specific ways, it stuck deep in developed countries. Repairing which has been central to many societies, was dis-embedded from consumption. "disembedded consumption," means that repairing and repairability are no longer considered as inherent condition in acquiring new electronics devices. Planned obsolescence separated the histories and materialities of techno-objects from owners and society. This great transformation separated spheres of consumption and production, it ushered the demise of acts of repairing and altering relationships with brokenness. In the process, repair was disconnected from consumption by design. Based in seven years ethnographic research on e-waste recycling and repairing in Tanzania, this presentation aims to juxtapose my research findings from Tanzania in relation to practices of repair in EU. As the EU struggles to encourage repairing in the region, could learn repairing practices from other societies like Tanzanian repairing culture.

**Keywords:** planned obsolescence, consumption, repairing, e-waste, brokenness

## **Everyday Circularity - The Past and the Future Opportunities of Deposit System in Sweden and Finland**

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### **Abstract**

The circular economy discourse is full of narratives in which new business opportunities, sociotechnical practices and solutions are supposed create value in terms of economic profit and reducing environmental burgeons. The discourse emphasizes novelties, but that framing can undervalue already established practices operating according to circularity principles. Perhaps the most significant of such practices is the deposit system. In Sweden and Finland, beverage container deposit systems have tens of years histories, and returning bottles and cans has become a part of everyday life for citizens of both countries. Beverage containers used to be made mostly from glass, which supported reuse. Nowadays glass containers are by large replaced by plastics or aluminium ones, thus containers are recycled rather than reused. Drafting of EU regulation on sustainable packing (COM/2022/677) has brought demands for ten per cent of beverage containers to be reuseable by 2030, which has raised uproar from stakeholders of deposit systems. Some are even suggesting EU regulations to be end of deposit system. Even if extreme arguments are put aside as overdramatization, deposit system is currently under pressure of transition. The purpose of this study is to understand the pressure, and whether potential transition could further circularity practices of consumers, for example, by bringing more containers under deposit system or act as example for similar arrangements. During spring of 2025 we will analyze professional and news media discussion on the temporal development deposit systems and the narratives it involves. Based on these results we will interview relevant stakeholders (food and packing industry, deposit system management companies, retail, authorities and non-governmental organizations) during the fall of 2025 of deposit systems in Sweden and Finland. The interviews will examine future images and narratives about what kind of role deposit system relevant stakeholders envision. More specifically, how the stakeholders expect markets, policies, technologies, and consumer behaviors to shape the future stature of the deposit system. The results of the study will provide contextual understanding of deposit systems in Finland and Sweden and explore pathway options of the deposit system in the future. Is the system deposit system losing its significance, remaining more or less the same, or could it serve the making of a circular society even more?

**Keywords:** deposit system, circularity, narratives, future images, stakeholders

## **Towards Strong Sustainable Consumption and a Circular Economy Through Transformative Social Innovation: A Case of Social and Solidarity Economy Cooperatives in Greece**

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### **Abstract**

The consumption of natural resources by modern societies, the environmental and social impacts that are associated with it, and the possible pathways to reach more sustainable patterns of consumption, constitute a significant field of study in environmental, economic, and social sciences. With the majority of scientific researches approaching sustainability while keeping economic growth as a central prerequisite, the following research adopts an alternative pathway, connected to the concept of strong Sustainable Consumption. The research project aims to investigate how Greek society can be transformed towards strong Sustainable Consumption by the agency of the alternative economic model of Social and Solidarity Economy.

The emergence of Social and Solidarity Economy in Greece, during the economic and social crisis that the country faced from 2008 onwards, presents itself as an opportunity to investigate how such an alternative economic system may contribute to the expansion of strong Sustainable Consumption. As there is a lack of scientific studies addressing the transition towards Sustainable Consumption under Social and Solidarity Economy, the paper addresses the following research question: How do Social and Solidarity Economy initiatives in modern Greece contribute to the transformation of Greek society towards 'strong' Sustainable Consumption?

The methodology proposed to implement the TSI framework derived from Transformative Social Innovation (TSI) using a multiple case study approach. Based on the literature review on the state of Social and Solidarity Economy in Greece, it was revealed that cooperatives comprise the most active and legally contextualised form of Social and Solidarity Economy in the country. Consequently, the selected cases were cooperative ventures operating in different areas of Greece. The cases include a self-managed factory that produces household cleaning products (VIO.ME.), a social consumer cooperative, (Bios Coop), a cooperative involved in fair and solidarity trade (Syn Allois), and a cultural café - grocery store (Bedreddin). The first two case are in Thessaloniki, the third in Athens and the last one in the small city of Orestiada. Data were collected by desk study, interviews with individual members of each initiative, and direct and participant observation.

All cases practice Social and Solidarity Economy with respect to their values and visions, while their actions are directed not only towards their respective economic activities, but also to increase their impact in the society. All cases either organise or participate in different events, workshops, festivals and networks to exchange knowledge and gain support from other cooperative entities, or the part of the society they interact mostly with, their beneficiaries. Learning on cooperative matters and the various economic activities that the ventures are involved with is also achieved through these channels. The empirical findings indicate that the cases have achieved some transformative change. Their transformative ambition can be found in the narratives of change and vision of each case. All cases show that they have transformative potential and that they have accomplished transformative impact.

The research results enrich the knowledge on the different ways that cooperatives develop new social relations and new ways to frame, organise, do and know Social and Solidarity Economy. The analysis revealed that all cases relate to strong Sustainable Consumption concepts or practices and they have accomplished some level of transformative change, while all cases exhibit traits that can be described as innovative and that challenge the dominant institutions of production and consumption that exist under the current neoliberal context. This can challenge the current

consumerism paradigm and provide examples of alternative modes of consumption enhancing local communities and wellbeing and the potential of relevant social innovations.

**Keywords:** strong sustainable consumption, social and solidarity economy, transformative social innovation, Greece, cooperatives

## **Understanding Circular Consumption: Insights from a Cross-National European Survey on Consumer Behaviour in the Smartphone Sector**

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### **Abstract**

Smartphones have become the central interface for digital communication and our primary entry point into the digital world. Their omnipresence is evident in both work and private life, with the vast majority of users unable to imagine life without them. However, short usage cycles averaging just a few years and resource-intensive production processes result in significant environmental impacts. In response, policymakers in Europe have introduced a range of measures such as the Ecodesign Regulation, the Right to Repair framework, a standardized USB-C charging requirement, and the new Battery Regulation, all intended to promote durability, reparability and recyclability of devices. Meanwhile, market dynamics around circular economy models such as reuse, repair and refurbishment are increasingly observable, but have yet to scale up significantly. While existing research provides initial evidence that consumer behaviour and the acceptance of circular business models play a key role in enabling longer product lifecycles and more sustainable resource use, a robust empirical foundation for circular consumption across European countries is still lacking—particularly with regard to citizens' awareness and use of newly introduced or forthcoming policy and market measures. This research aims to address this gap by examining how consumers across different European countries perceive and engage with circular economy strategies related to smartphone use. It draws on a large-scale representative online survey conducted in five European countries (i.e., Germany, France, the United Kingdom, Sweden and Spain, with thousand respondents in each country). The study provides insights into consumer behaviour across the smartphone lifecycle, with a focus on upper-tier circular strategies such as reuse, refurbishment and repair, and examines how awareness, behavioural patterns, motivators, and barriers correlate with national policy frameworks and market conditions. The survey design was informed by an extensive literature review and contextual research on circular economy strategies, consumer behaviour in the electronics sector, and country-specific policy and market dynamics, enabling the identification of relevant policy instruments and market-based interventions in each national context. Data collection is currently ongoing and will be completed in May 2025. The presentation at the ERSCP conference will share results on consumer behaviour across the lifecycle, national differences in the uptake of circular practices, levels of awareness regarding political measures and initial insights into the evaluation of future regulatory and market instruments. The study will conclude with stakeholder-specific recommendations to support more sustainable smartphone consumption. The cross-national perspective of this research contributes to a better understanding of how behavioural insights can inform multi-stakeholder efforts in advancing the circular economy across Europe.

**Keywords:** circular economy, circular consumption, smartphones, cross-national consumer survey, circular economy policy instruments

## **Eco-taxes and Sustainability Information on the Menu: The Combined Influence of Fiscal and Informational Cues on Meat Selection**

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### **Abstract**

Reducing excessive meat consumption is key to mitigating climate change, as meat production significantly contributes to greenhouse gas emissions. While eco-taxes and sustainability information aim to promote sustainable consumption, their combined effects remain unclear. This study examines how the salience of eco-taxes and sustainability information on restaurant menus influences consumer choices.

A 2x2 between-subjects experimental design was implemented in two studies: a pre-study (N=125) and a main study (N=176). Austrian participants were randomly assigned to one of four groups, receiving menus that varied in eco-tax labels and sustainability information. The eco-tax was marked by an asterisk and a note on a 30% meat surcharge, while sustainability information detailed meat's environmental impact. Participants chose a three-course meal, with meat consumption measured by meat-based dishes selected. The pre-study, conducted via snowball sampling, found eco-taxes alone ineffective and linked to psychological reactance, while sustainability information slightly reduced meat choices. The main study, with a more diverse online panel, found no significant main effects. However, their combination paradoxically increased meat consumption. Gender played a key role, with men consistently eating more meat than women.

To validate and extend these findings, a third study with approximately 300 participants from Germany is underway. Using the same 2x2 experimental design, it examines whether the observed interaction effects persist in a different cultural and demographic context. While results are pending, the larger sample and cross-national comparison will help assess the robustness of the findings and deepen insights into consumer responses to fiscal and informational sustainability interventions.

These findings challenge the assumption that fiscal and informational interventions necessarily reinforce each other. Instead, the observed interaction suggests that combining eco-taxes and sustainability information may provoke resistance due to perceived pressure or information overload. This aligns with psychological reactance theory, which explains how perceived restrictions can trigger counterproductive behaviors. The ongoing German study will clarify whether these effects are context-dependent or generalizable.

From a policy perspective, the findings suggest that combining eco-taxes and sustainability information requires careful design to minimize resistance. A sequential approach—introducing informational nudges first to build awareness, followed by fiscal measures—could be more effective. Tailoring interventions by demographic factors, such as gender, may also enhance their impact, as men and women respond differently to sustainability messaging.

For businesses, especially in food service, the results indicate that while menu labelling can influence choices, its design is crucial. Sustainability information alone may be more effective than fiscal measures, particularly when framed positively rather than as a restriction. Restaurants and policymakers should test alternative framing techniques and refine strategies through further research.

Overall, this study provides insights into sustainable food choices, highlighting the need to balance intervention effectiveness with consumer autonomy. The ongoing German study will help refine these findings, guiding policymakers and businesses in implementing sustainable interventions. Future research should explore alternative approaches to combining fiscal and informational cues, including longitudinal studies that assess long-term behavioral changes and qualitative analyses to better understand consumer perceptions and motivations.

**Keywords:** sustainable meat consumption, eco-taxes, menu labelling

## **The Carbon Cost of Happiness: Exploring the Relationship Between CO<sub>2</sub> Emissions and Well-Being in Europe**

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### **Abstract**

In high-income countries like European Union, where materialism culture is prevailing, people often associate happiness with the ability to afford and consume a large number of goods, with the ability to travel faraway, with the ability to live in big houses. The richer people are, the happier they are—at least according to this logic. If this assumption holds, it would suggest that a higher happiness index leads to higher CO<sub>2</sub> emissions due to energy use, transportation, material use. But is the happiness index truly directly linked to CO<sub>2</sub> emissions? Higher economic activity may lead to higher emissions, but in some developed countries, emissions decrease due to green technologies. In this study, we examine how a country's life satisfaction correlates with consumption-based CO<sub>2</sub> emissions by analyzing CO<sub>2</sub> emissions, GDP in PPS and HDI. Furthermore, we analyse whether the developed countries propagate reduce and reuse behaviour. This approach provides a more accurate picture about the cost of happiness, whether it is related to higher consumption level and carbon emissions.

In this analysis the data of all European Union countries were analysed. The data of consumption based carbon footprint was referred to Ecological footprint network. The GDP data was gathered from Eurostat database, Human development index was collected referring to Human Development Report, and the life satisfaction index and the levels of reduce and reuse behaviour were used from Eurobarometer survey. The relationships between all analyzed variables were calculated applying the Spearman correlation method and using the panel data of separate European Union countries. The results showed that the correlation between CO<sub>2</sub> emissions and GDP in PPS is moderate. Data link between human development index and the share of reduce and reuse actions were positive and statistically significant. Therefore, despite the high development index, people in some countries try to reduce consumption of new products by buying second-hand goods, using repaired products, and avoiding waste. Meanwhile, analysing the relationship between life satisfaction, GDP and consumption-based CO<sub>2</sub> emissions, revealed that these indicators are related positively and statistically significantly. Thus, despite people declaring that their behaviour is more environmentally friendly, the pollution level caused by consumption level is increasing. The GDP also is related to Europeans life satisfaction, thus we did not decline the Easterlin paradox in this case.

Through this research, we aim to understand which countries achieve higher happiness at a lower "carbon cost" and why, providing insights into sustainable happiness. The answer, whether the happiness in Europe cost high price of carbon emission, referring to our results of analysis was positive. Countries where HDI is higher, promotes behaviour of reduce and reuse to a greater extent. However, the level is still low and it is important to search for new alternatives how to reduce carbon emissions of each person's lifestyle.

**Keywords:** CO<sub>2</sub> emissions, happiness, well-being, Europe, climate change

## **Repair or Replace? Legal Remedies and the Decline of Repair Culture in Eastern Europe**

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### **Abstract**

Repair is increasingly recognized as a key enabler of the transition to a circular economy, alongside activities such as refurbishing, recycling and reusing. Despite this, the past two decades have seen Europe move steadily toward a throw-away society. Statistical evidence reveals a substantial decline in both the demand and supply of repair services of consumer products. This negative trend is especially evident in Eastern Europe, where the COVID-19 pandemic has further strained the repair sector.

Current literature actively debates the causes of the supply-side decline, citing factors such as limited access to spare parts, repair-unfriendly product design, intellectual property constraints, and cybersecurity concerns. On the demand side, issues like consumer convenience and cost are frequently discussed. However, little attention has been paid to the legal right of consumers to opt for product replacement in the event of defects - a remedy enshrined in both European and national legislation.

This paper argues that consumers' preference for replacement over repair is a critical, yet underexplored, factor contributing to the decline in repair demand in Eastern Europe. This "replacement culture" is reinforced by voluntary business practices and the marginalization of repair within legal warranty frameworks - conditions permitted under the current legal regime. By examining these two structural barriers, rooted in Directive (EU) 2019/771 on consumer sales, the paper assesses whether the newly adopted Directive (EU) 2024/1799 on the repair of goods can effectively promote repair-oriented consumer behaviour in the Visegrad 4 countries.

This study contributes to the broader academic discourse on fostering circular consumption patterns, with a particular emphasis on the role of legal frameworks. The findings from the Visegrad 4 are intended to inform future research and policy development across Europe.

**Keywords:** circular economy, sustainable consumption, right to repair, replacement, commercial guarantees

## **Consumer Perceptions of Upcycled Clothing: The Impact of Labelling, Brand Association, and Manufacturer Identity**

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### **Abstract**

Upcycling is a production process that transforms existing materials or products into items of equal or greater value. The success of upcycled clothing in the market largely depends on consumers—their perceptions and beliefs about such products. Consumer perceptions also play a crucial role in determining whether upcycling harms the manufacturers of the original products, particularly when branded materials are used. This is especially relevant if upcycling creates confusion about a product's origin or transfers positive brand associations from the original manufacturer. This research project examined the perception of upcycled clothing by integrating perspectives from consumer behavior and trademark law. Using two studies (N=1200) with an experimental between-groups design, we investigated how consumers perceive upcycled clothing across different dimensions and how these perceptions vary based on the information provided. The first study explored three key questions: a) Does labelling a garment as upcycled influence the consumer perception; b) Does revealing that the upcycled garment is made from clothing by a renowned brand affect its appeal and recognition of the manufacturer? c) How does the use of branded material influence perceptions of the upcycled product, particularly regarding its commercial origin and brand recognition?

To test this, we created several versions of upcycled garments (jackets and sweatshirts) presented as designs by niche designers. Depending on the test condition, the garments included information—either in the product description or via a visible logo—indicating that the materials came from well-known brands. Analyses showed that incorporating a visible logo from a well-known designer's clothing enhanced the garment's perceived attractiveness and increased purchase willingness. However, the presence of a visible logo also led to a misperception that the garment's manufacturer was a well-known company, even when a different manufacturer's name appeared in the product description.

The second study expanded on these findings by investigating how information about the manufacturer's identity—a niche designer, a niche designer collaborating with a reputable brand, or a reputable brand alone—affects evaluations of the upcycled garment. As in the first study, the results showed that using material with a prominent logo from a well-known brand led to higher ratings for the upcycled garment. Additionally, the highest rating was given to a garment described as a collaboration between a niche designer and a well-known brand.

By combining approaches from consumer psychology and trademark law, we not only uncovered how consumers assess upcycled products based on information about the manufacturer and materials used, but also examined whether emphasizing the use of materials from a reputable brand increases the potential for consumer confusion.

**Keywords:** upcycling, trademark law, consumer confusion, reputable brands

## **At the Intersections of Influence in the Sustainability Transition: Proposing an Application for Mapping Actor Roles Using Two Case Studies on Plant-Based Eating and Product Repair**

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### **Abstract**

**Problem & Project Rationale:** Transitioning to sustainable production and consumption systems requires the involvement of multiple stakeholders located at different parts of the system; e.g., local politicians' commitment to zero-emission transportation impact the decisions of local public transportation operators (Tamler et al., 2020). However, the sustainability transition at large is plagued by a blame game or "responsibility ping-pong" among the different actors (Mamut et al., 2025), where a few actors are identified as influential – leaving their joint responsibilities largely unaddressed. In the literature, this is noticeable in the "micro-macro" or "structure agency gap" (e.g., Bengtsson et al. 2018). Considerations for actors' overlapping roles and responsibilities in the transition are necessary to enable effective actor coordination, but current transition and governance theories and applications lack systematic processes for mapping such intersections of spheres of actor influence (Wallnoefer, Svensson-Hoglund, et al., in preparation). To fill this gap, the "Intersections of Influence (IoI)" has been proposed as an analytical approach; it encourages the mapping of actors' spheres of influences over a certain issue within production- and consumption systems (e.g., reducing emissions from transportation) and considers the actors' joint influence over this issue, such as that between actors at the supply vs. demand side (Wallnoefer et al., 2024). However, sequential, structured methods for applying this IoI Approach to develop effective transition strategies, such as multi-stakeholder cooperation, are missing (Wallnoefer, Svensson-Hoglund, et al., in preparation). **Method:** We use two case studies to develop and test the application of the IoI Approach. In the first case study, we map the intersections of actor influence in the context of plant-based eating, using leverage points (i.e., point to intervene in a system) as the point of departure. The second case study looks at product repair and takes a process-oriented and thereafter a multilevel system perspective (Svensson-Hoglund et al., 2023). The first investigation starts at the higher system level (i.e., more abstract leverage points like social norms and mindsets) and the other at the lower system level (i.e., the more concrete experience of the consumer, or end-user when attempting to repair a broken product). **Preliminary Results:** We aim to identify intersections of actors' influence spheres within sustainable consumption and production systems, specifically in the context of plant-based eating and product repair. In addition, these two case studies demonstrate two different approaches to: 1) identifying relevant actors, 2) discerning the actors' respective influence over the specific transition issue, and, 3) the intersections of all the actors' combined influences. These two approaches to applying the IoI Approach are assessed for the usefulness of guidance for cooperative strategies derived. We also discuss appropriate applications and future research. **Implications & Contributions:** The IoI Approach is designed as an add-on for a systematic analysis of the actors at the structure-agency nexus. The two case studies for applying the Approach outlined in this presentation can support better actor coordination in the sustainability transition as it can reveal synergies, contradictions, and trade-offs between multiple stakeholders' activities and decisions.

**Keywords:** multi-actor process, stakeholder collaboration, blame-game, micro-macro gap, structure-agency nexus

## Advancing Circular Lifestyles in Cities

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### Abstract

Despite growing policy interest and numerous local initiatives, circular lifestyles and offers in cities often remain in their niche, only seen by small engaged communities. Their broader implementation is hindered by fragmented policy frameworks, limited institutional embedding, economic fragility, and social exclusivity. Therefore, this session addresses the central question:

➔ "What political and practical conditions are necessary for circular urban lifestyles to become mainstream?"

This dialogue-debate session focuses on both enablers and policy framework conditions that support circular lifestyles in urban contexts.

For that, we will look at different political levels and emphasise which ones bring which strengths. And why it makes sense to work on certain topics at different levels.

Findings from the Interreg CENTRAL EUROPE project 'From Niche to Centre - City Centres as Places of Circular Lifestyles' (NiCE) will serve as a key knowledge base. During the project the consortium developed different helpful tools for cities, which will support them in fostering circular lifestyles in their city centres. For example:

- The Monitor Tool, an analytical instrument that evaluates the status quo, challenges, and opportunities for circular lifestyles.
- A Strategy Framework for the promotion and establishment of circular lifestyles in urban centres.
- By the end of the project (April 2026) and drawing on pilot experiences from eight cities<sup>1</sup> a comprehensive Solution Box will be developed, including 4 solution guides.

Relevance for SCP and the conference theme:

This session directly addresses the conference theme: "Sustainable Consumption and Lifestyles for a Circular Society." Cities are key consumption hubs and laboratories for new sustainable practices. Urban circularity requires integrated strategies that foster resource conservation, reuse, and inclusive business models supported by policy, the economy, and civic society.

Perspectives:

Policy Perspective:

- From a policy perspective, the session acknowledges that supranational institutions (such as the EU) and frameworks are critical for implementing circular economy principles. Many of the challenges – ranging from raw material flows and energy consumption to pollution – transcend national boundaries, thus requiring higher-level governance.
- Simultaneously, cities, as consumption hubs and public service providers facing rapid urbanization, play a pivotal role in implementing circular practices.

Implementation perspective:

- Circular transitions are often narrowly interpreted as recycling and waste management, overlooking broader value retention strategies that prioritize resource efficiency, reuse,

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<sup>1</sup> Bologna and Porto-Saragozza in Italy, Brzeg Dolny in Poland, Budapest and its eleventh district, Újbuda in Hungary, Jihlava in Czechia, Graz in Austria, Košice in Slovakia, Ptuj in Slovenia, and Würzburg in Germany

and environmental sustainability (preservation of natural resources and ensuring that ecosystems remain healthy and productive for current and future generations).

Intended outcome:

- Facilitated knowledge exchange on strengths, weaknesses, and challenges faced by cities in promoting circular lifestyles
- Knowledge exchange on gaps and opportunities from policy perspective
- The organisers of the workshop will actively facilitate and document discussions, analyse outputs of the breakout groups, and integrate key insights into the refinement of the upcoming NiCE deliverables.
- Dissemination of selected NiCE project results that may support decision-makers, practitioners, researchers, and citizens in advancing urban circularity

Target Audience:

Municipality and regional representatives, business leaders, NGOs, citizen associations, policymakers, academics, and individuals interested in circular transitions.

Session structure, schedule and speakers:

The session begins with two short presentations (total 20 minutes):

- Introduction to the NiCE project and its approach by Mariann Szabó
- Policy framework conditions by Noémi Csigéné Nagypál, where EU level and national and local policy documents related to CE and lifestyles will be presented briefly, as well as organisations of EU, national and city/district level. The typical policy gaps and opportunities will be introduced to enable discussion. Participants will be able to overview policy gaps and opportunities, exchange experiences and ideas from their own cities. Similarities and differences will be identified.

This is followed by moderated discussion groups (depending on the number of participants) focused on:

- What are successful local and national policies to promote circular lifestyles in cities?
- Which urban initiatives and business models show potential for broad adoption?
- How can circular offers be made more accessible to more citizens and marginalized groups?

Each group will then present their key findings and conclusions in a final wrap-up.

**Keywords:** circular economy, lifestyles, sustainable consumption, cities, policy framework

## Motivations for Circular Behaviour - Results from Structural Equation Modelling

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### Abstract

The circular behaviours are the important way of implementation of circular economy idea into the households' sector of the economy. In the implementation of these behaviours, the main focus is on reducing the demand for resources by reducing the demand for products and moving towards the satisfaction of needs. The main research question concerns the motives for which these behaviours are undertaken by household members. In this case, it seems reasonable to distinguish between motives related to the desire to protect the environment (*environmental motives*) and its resources and those driven by the financial savings of household members (*savings motives*). The main aim of the presentation is to identify the factors and main motives (environmental vs. savings) that significantly influence on the adoption of circular behaviours by households. In order to achieve this goal, the Theory of Planned Behaviour concept was used. Based on the assumptions of this theory, the following elements were adopted for analysis: *attitude, subjective norms, perceived behavioural control, intention* and *circular behaviours*. Considering the above, the following research questions were asked for the purpose of the presentation:

- Which element of Theory of Planned Behaviour has the greatest impact on the uptake of circular behaviour in households?
- Which motive (*environmental* or *savings*) has a greater influence on the adoption of circular behaviour?

In order to answer these questions, the following research hypotheses were adopted.

*H1: Due to the nature of the Theory of Planned Behaviour, attitude, subjective norms and perceived behavioural control have the similar impact on intention.*

*H2: The undertaking of circular behaviours is motivated by environmental aspects in greater manner than by savings motives.*

Based on that assumptions a structural model was developed whose latent variables were the mentioned items (the covariance-based Structural Equation Modelling - CB-SEM with the reflective variables were used to verify the hypotheses;  $\alpha=0.05$ ,  $p<\alpha$ ).

The representative sample from Polish households (1,200 respondents) was used to obtain the results. For each item, a set of statements presented to respondents for rating was used (a Likert scale). The model demonstrated the significance of the effects of attitude and perceived behavioural control on the intention to perform the behaviour and the significance of intention on the behaviour itself. As a result, detailed variables shaping individual latent variables were identified. The *environmental motive* investigated was shown to be superior to the *savings motive* of the circular behaviours undertaken.

**Keywords:** circular behaviours, motives, SEM

## **Individual Motivation and its Relevance for Climate-Friendly Behavior within High-Impact Domains**

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### **Abstract**

While the call for profound behavioural and demand changes to combat climate change is growing louder, research on shaping climate-relevant behaviours at the individual level still often focuses on low-effort, low-impact behaviours. Instead, various researchers have argued that in addition to voting behaviour and support for climate policies, there should be a greater focus on promoting high-impact behaviours on the individual level as well, such as low-carbon mobility behaviour or plant-based diets. Among the various relevant factors influencing behaviour, self-determined motivation, based on the self-determination theory, was shown to have a significant impact on pro-environmental behaviour. The self-determination theory is a framework for understanding individuals varying types of motivation and self-regulation and their relation to action. It can be divided into six sub-areas representing different degrees of self-determination, namely (i) intrinsic, (ii) integrated, (iii) identified, (iv) introjected, (v) external regulation and (vi) amotivation, often summarized as autonomous motivation (i - iii), external motivation (iv - v) and amotivation (vi). However, while it is assumed that self-determined motivation plays an even more important role in more difficult behaviours such as car-free living (mobility domain) or a completely vegan diet (diet domain), its influence on high-impact climate-friendly behaviour is still largely unexplored. This study extends existing research on the self-determination theory and pro-environmental behaviour by applying it to two high-impact domains that are typically less studied in this context. Therefore, we focus on the relationships between various relevant factors associated with pro-climate behaviour, with particular attention to the role of self-determined motivation. By applying structural equation modelling to a quota-representative, cross-sectional national sample (n = 883), we hypothesized that self-determined motivation as well as past behaviour and, to a lesser extent, biospheric and transcendental values play a central role in climate-friendly behavioural intentions in the domains of mobility and diet. The preliminary results can only partially confirm the role of self-determined motivation as discussed in previous studies and also indicate certain differences between the two high-impact areas. While external regulation, i.e. acting to obtain a reward or avoid a punishment, is positively related to both types of behavioural intentions, higher introjected regulation (involving feelings of guilt or conditional self-esteem as a behavioural drive) increased climate-friendly dieting. In addition, higher identified regulation, i.e. when the outcomes of a behaviour are seen as personally beneficial and important, increased intentions for climate-friendly mobility behaviour. However, the most important factor for behavioural intention in both areas was past behaviour, confirming previous research on the central role of established routines and habits. We contribute to the scientific field by linking research on self-determined motivation and its various sub-domains

to high-impact areas, highlighting the complex interplay of various factors in shaping climate-friendly behaviour, and providing practical implications and recommendations for future research.

**Keywords:** self-determination theory, climate-friendly behaviour, high-impact behaviour, motivation, structural equation modelling

## **From Intention to Action: Generation Z's Food Waste Behaviour and the Effectiveness of a Targeted Intervention**

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### **Abstract**

Despite a growing interest in sustainability, Generation Z remains the demographic cohort that wastes the most food. The *Wasteful Generation* project investigates this paradox by examining the behavioural patterns of Generation Z in relation to household food management. The overarching aim is to promote a shift toward more sustainable food consumption practices among young consumers. This research was initiated in response to the inadequacy of previous food waste reduction initiatives, which often failed to resonate with this cohort due to a lack of personalised, targeted communication strategies.

The study adopts a multidisciplinary approach, combining quantitative and qualitative methods to obtain a comprehensive understanding of food waste behaviour. Data were collected through structured questionnaires, in-depth interviews, food waste composition analysis based on municipal mixed waste sampling, food diary studies, and advanced social media data mining techniques. The triangulation of these methods provided a nuanced perspective on both the subjective perceptions and objective realities of food waste among Generation Z.

Findings revealed a significant disparity between perceived and actual levels of waste. While respondents estimated an average of 30 grams of food wasted per person per day, objective measurements indicated a real value of 43.4 grams. The divergence became even more pronounced in subgroups living independently, where waste levels were found to nearly double compared to those residing with parents. The most frequently cited causes of waste included poor meal planning, over-purchasing, storage-related spoilage, and a general lack of accountability rooted in a consumerist lifestyle.

To address these behaviours, an intervention was implemented combining a gamified mobile application with the social media campaign "Don't Be Trash." The campaign leveraged influencer marketing and interactive digital content tailored to Generation Z's media consumption habits. With over 1.5 million social media users reached, the initiative demonstrated high engagement rates. Preliminary outcomes suggest that financial incentives and pro-environmental values serve as the most compelling motivators for reducing food waste.

This study contributes robust empirical evidence to the field of sustainable consumption, highlighting the importance of behavioural interventions tailored to specific generational characteristics. It offers actionable insights for policy-makers, educators, and practitioners aiming to design effective strategies to mitigate food waste in high-risk demographic groups. By understanding the psychosocial and situational drivers of food waste in digital-native populations, interventions can be more precisely crafted to support the Sustainable Development Goals, particularly SDG 12 on responsible consumption and production.

**Keywords:** food waste, generation Z, behavioural change, digital intervention, sustainable consumption

## **The Complexity of Gender Differences in Sustainable Consumption: Implications for Promoting Sustainable Lifestyles**

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### **Abstract**

Numerous studies show women to consume more sustainably than men. However, they usually operationalize sustainable consumption in its weak form (e.g., purchasing “green” products). Truly sustainable lifestyles require strong sustainable consumption, which also considers consumption levels and the systemic embeddedness of consumption patterns in societal dynamics. As these often lead to interactions of different socio-demographic characteristics as indicators of multifaceted social identities, treating gender as single independent differentiating factor can be misleading. Thus, supposedly gender-sensitive measures to promote sustainable lifestyles may not adequately address the diversity within gender groups and the variety of consuming sustainably. Accordingly, studies are needed that reflect the intersectionality of gender with other social dimensions based on a holistic view on sustainable consumption. Against this background, the aim of this study is to explore the interaction of gender, age (as proxy for generation), and income (as proxy for socio-economic status) in all phases of consuming clothes in terms of efficiency, consistency, and sufficiency. I use clothing as application area because gender differences are very pronounced here and it's also riddled with grave socio-ecological issues. Data was gathered through a survey with 3,254 participants of whom 45.9% were male, 53.5% were female, and 0.6% identified as diverse. Age ranged from 14-82 years (M: 38.2, SD: 13.5). The survey was distributed via social media in local community groups of minor and major German cities and rural districts. Questions revolved around consumption patterns in clothing from acquisition to disposal, with an emphasis on sustainability. For high validity, items addressed behaviours directly, asking for actual frequencies, quantities, expenditures etc. Due to the ordinality of response scales, I used Bayesian statistics for data analysis, which has the added advantage of being able to reject as well as accept null hypotheses. To test for interactions between gender and age or income I compared the HDIs of all interaction terms to zero. Evident interactions were probed by a combination of the Johnson-Neyman technique and the Bayesian ROPE approach to determine regions of credible gender differences and similarities for varying ages or incomes. Results reveal a major influence of age, but not income, on the existence and strength of gender differences in sustainable clothing consumption. These are particularly pronounced among young participants, but while men's behaviour remains rather constant with rising age, women's behaviour changes significantly and approaches that of men. As a result, it's mainly young women who overconsume but who are also more attentive to socio-ecological criteria when consuming, whereas men and women from middle age onward consume clothes rather sufficiently but barely consider socio-ecological criteria in what they consume - with some behaviours deviating from these general tendencies, though. Overall, this indicates that gender differences in sustainable consumption are more complex than currently assumed. Consequently, uniform measures to promote sustainable lifestyles focusing solely on gender are not suitable. To be properly targeted, they must also account for the intersectionality of gender and generation (among other socio-demographics) and the specificity of certain behaviours where required. For sustainable clothing consumption in particular, it follows that young women should be supported in consuming clothes more sufficiently (e.g., by deconstructing the prevailing gender role of the “female fashionista”), while older women and men in general should be supported in preferring eco-friendly and socially compatible produced garments when consuming (e.g., by increasing their availability and affordability in styles preferred by these groups).

**Keywords:** sustainable consumption, sustainable lifestyles, gender, intersectionality, moderation analysis

## **A Language for Our Common Future: A Workshop Inspired by the Forthcoming Book Vocabulary for Sustainable Consumption and Lifestyles (SC+L)**

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### **Abstract**

This workshop invites researchers and practitioners to engage with the content of our forthcoming book, *Vocabulary for Sustainable Consumption and Lifestyles—A Language for Our Common Future*, as a starting point for deepening dialogue and collaboration among change agents in the field. Recognizing that diverse perspectives and conceptual framings influence how sustainability transitions and transformations unfold, the session will explore synergies, conflicts, and implementation challenges within the discourse on sustainable consumption and lifestyles (SC+L). The workshop consists of two main parts, one focusing on reflection on the concepts and the other on their implementation.

In the reflexive part, we present an overview of the book's thematic clusters (i.e., (A) Daily household decisions and lifestyles, (B) Concepts, frameworks, and applied theories, (C) Political economy, (D) Value shifts and social activism, (E) Governance, policy, and choice architecture) and the 87 included concepts ranging from Alternative Hedonism and Buen Vivir to Ubuntu and Wellbeing Economy.

Participants will be invited to share their expectations and experiences, followed by a collective reflection on (1) the most frequently used concepts in the field and (2) the concepts that practitioners and researchers associate with and apply together. A short survey will help identify key concepts, followed by a fishbowl discussion about the four most used concepts regarding their synergies, interdependencies, and potential applications. We will also explore 10 to 20 concepts that are less frequently used or weakly linked to others, to uncover potential conceptual gaps, isolated, siloed research efforts, and conflicts that might present barriers to collective actions.

The implementation part will shift the focus to practical applications of the concepts, examining (3) which concepts have seen broad implementation across different action areas—households, businesses, institutions, and civil society—as well as across consumption domains such as housing, mobility, food, and fashion. Participants will be asked to map widely applied concepts to relevant actors and consumption domains, discussing factors that drive or hinder their adoption. This will be followed by a second fishbowl discussion exploring (4) how more abstract, visionary concepts can be moved toward implementation, identifying key barriers and strategies for overcoming them. Drawing from best practices and real-world examples, we will discuss conflicts and confluences between theoretical frameworks and practical experiences and outline how concepts can be made actionable, ensuring their relevance in policy, industry, and daily life.

In the concluding mapping exercise, participants will collaboratively identify (i) action areas and application fields (e.g., synergies between key concepts), connect them to (ii) key stakeholders and networks (e.g. influential actors), and (iii) available resources (e.g., funding opportunities), highlighting how a common language can empower change agents to effectively communicate, share ideas, and drive transformative change in sustainable consumption and lifestyles. To close the workshop, each participant will be invited to share three key takeaways and propose a concrete next step, with the potential to establish a follow-up working group. By fostering a deeper understanding of the conceptual landscape of SC+L and exploring both conflicts and confluences, this session aims to strengthen collaboration in the field.

**Keywords:** change agents, interdependencies, fragmentation, application strategies, networking

## **From Overconsumption to Sufficiency in Fashion: A Systematic Literature Review**

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### **Abstract**

The fashion industry generates significant waste and pollution, raising urgent concerns about its environmental sustainability. As a response, sufficiency-oriented consumption—which emphasizes not only reducing overall consumption but also changing behaviour towards more sustainable alternatives—has been proposed as a promising approach (Sandberg, 2021). However, current research on sufficiency-oriented fashion remains fragmented. Numerous studies have examined specific practices aligned with sufficiency principles, such as repairing of clothes (McQueen et al., 2023) or buying second-hand items (D’Adamo et al., 2022), while not embedded in a broader conceptual framework. As a result, the comprehensive understanding of sufficiency-oriented fashion consumption remains limited. This presentation will provide the results of a systematic literature review which addresses the research question: What motivates and hinders consumers to adopt sufficiency-oriented behaviour in fashion consumption?

We conduct a systematic literature review following the PRISMA guidelines to ensure transparency and replicability. Our data sources include peer-reviewed articles and book chapters relevant to sufficiency-oriented fashion consumption. We use Web of Science, Scopus and Emerald Insight as databases, with the following search string: (sustain\*) AND (fashion OR clothing OR garment OR textile OR apparel) AND (sufficien\* OR simpli\* OR minimal\* OR slow OR anti-consumption OR reduc\* OR collaborative OR second-hand OR shar\* OR swap\* OR rent\* OR refus\* OR rethink) AND (consum\* OR behaviour OR purchas\* OR buy\* OR shop\*) AND NOT (self-sufficien\*).

The preliminary analysis of the articles identifies three main categories of factors influencing consumers' engagement with sufficiency-oriented fashion consumption. First, intrinsic motivators, such as voluntary simplicity, environmental concern, emotional sensitivity, personal responsibility, and education, form the internal foundation that encourages individuals to adopt sufficiency-oriented fashion behaviours. Second, structural barriers, including difficulty in repair, lack of facilitating conditions, and distrust in service providers (e.g., concerns about hygiene or maintenance), present external obstacles that can limit actual behavioural change. Third, and most notably, a set of context-dependent factors that can act as either motivators or barriers depending on specific circumstances. These include, for example, fashion-consciousness, hedonism, price sensitivity, social influence, etc. Fashion-conscious consumers may be drawn to second-hand or upcycled clothing if it aligns with current trends, but may reject such options if they are perceived as outdated. Similarly, price may serve as an incentive when second-hand products are cheaper; however, lower prices may also be associated with negative social signals, such as poverty or low status, discouraging some consumers.

This literature review is still ongoing and will offer a conceptual framework that highlights the multifaceted nature of sufficiency-oriented fashion consumption. The findings will offer a structured perspective on how different types of factors interact in shaping behaviour. This research may serve as a starting point for future empirical work and provide insights for researchers and practitioners interested in promoting sufficiency-oriented patterns of fashion consumption.

**Keywords:** sufficiency, sustainable fashion, sustainable consumption, slow fashion, behaviour change

## **Beauty That Costs the Earth: A Scoping Review of Sustainable Practices in Cosmetics Operations and Supply Chains**

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### **Abstract**

The European Commission launched the Corporate Social Responsibility Directive (CSRD) and the Corporate Social Due Diligence Directive (CSDDD), which aim to foster sustainability and extends the responsibility of companies to their global value chains. The cosmetics industry faces pressure due to environmental issues. Consumers are increasingly choosing green or natural cosmetics due to environmental concerns. Assessing the environmental impact of cosmetic products is crucial, considering factors like CO<sub>2</sub> emissions, energy consumption, and alternative sources. Integrating sustainable business practices throughout the whole value chain poses considerable challenges to this industry, and it is not always clear which interventions have the most impact.

Through a scoping review, this study aims to analyze the current state of the art concerning sustainability in the cosmetics sector. We focus on three perspectives: (i) the core operations related to the product life cycle (including design, manufacturing, packaging); (ii) the supply chain perspective (including sourcing of raw materials, distribution, upstream and downstream flows of information); and (iii) the consumer perspective (including purchasing behavior, consumer use and post-consumer use). We map the field and identify future developments and challenges, to further develop sustainability in the cosmetics industry.

In line with literature reviews in the same research field, our scoping review was conducted using the Databases "Scopus" and "Web of Science", which extensively cover the field of studies in business and economics. The search query consists of terms which are closely related to sustainability and cosmetic industry. The application of the search strategy in October 2024 resulted in an initial sample of 1,978 articles. After applying inclusion and exclusion criteria (e.g. excluding papers solely focusing on chemicals), the final sample consisted of 26 articles.

The preliminary results show that cosmetic companies face challenges in sourcing raw materials, manufacturing, distribution, consumer behavior, and sustainability. There is no uniformity in defining organic, natural, or sustainable cosmetic products, which varies by geographical area, country, or regulation agency. Key sustainability concerns include production waste, greenhouse gas emissions, energy consumption, water consumption, and water pollution. Solutions include using renewable energy sources, optimizing cleaning procedures, production planning, and responsible building design. Consumer behavior is influenced by market and consumer requests, and sustainable practices can be improved through product development, and better consumer education. Setting focus on circularity, multinational cosmetics companies focus on switching to natural and organic compounds, and raising consumer awareness about reuse and recycling.

In clarifying such approaches, our scoping review contributes to the identification of opportunities and best practices to address sustainability challenges within the cosmetic industry.

**Keywords:** sustainability, cosmetic industry, supply chain management, scoping review

## Prosumption of Renewable Energy: Motivations and Sustainability Aspects

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### Abstract

Prosumption is the active engagement of consumers in the production of products and services (Ritzer, 2013). While certain forms of prosumption have been around since early human history, novel fields of prosumption are also emerging and inducing new, collaborative business models. One typical example of prosumption is the installation of renewable energy generating equipment in households. Governments often promote energy prosumption activities, thus a better understanding of motivation factors behind household energy prosumption as well its sustainability implications are needed. Previous research has already uncovered several important factors. Conradie et al. (2021) examined participation in energy communities in Belgium and found that attitudes and subjective norms are strong factors while perceived behavioural control is significant, but with a low strength. Liobikiene et al. (2021) examined the use of renewable energy sources in Lithuania and came to the conclusion that the development of renewable energy systems and financial capabilities are the most important determining factors. Gamel et al. (2022) found that consumer characteristics and investment experience also play an important role. After analysing the literature we used the survey method to collect and analyse data regarding the motivation factors of energy prosumers in Hungary using the theory of planned behaviour (TPB). Additionally, we also prepared interviews with organisational stakeholders to better understand the impacts of energy prosumption on their operations and business models. Our research database includes responses to a survey questionnaire by 262 respondents from Hungary, who have utilised solar panels, solar collectors, a heat pump or a pellet furnace during the last 12 months before the survey (end of 2022). We measured the attitudes of prosumers regarding environmental issues, as well as subjective norms and perceived behavioural control, which may influence intentions to engage in energy prosumption and actual behaviour. Our preliminary results show that most prosumers agree that the protection of our natural eco-systems is everybody's personal responsibility, and the problem of climate change is an important one. We found that the most important motivation factor to install household energy systems is financial benefits followed by environmental reasons. Social compliance and an increase in energy security are also motivating factors but to a lesser degree. While financial motivations are important, we found evidence that personal factors also play a role. For example, respondents agree that those who can produce energy for their own requirements are creative people and producing one's own energy can provide a certain satisfaction to the producer. Regarding the intentions of prosumers, we found that many are eager to invest further into renewable energy systems in the future and that a lack of knowledge and the technical limitations of their homes are usually not important factors. Our presentation will provide a detailed map of motivation factors of prosumers in the household energy production field and thus will be useful for both policy makers and businesses engaged in the renewable sector.

**Keywords:** prosumption, household energy production, motivations, renewable energy, innovative business models

## Mapping the Regional Patterns of Prosumer Behaviour in Hungary

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### Abstract

Prosumer behaviour is a key factor for a longer-term resilience and sustainable transition of societies. Despite some controversial features regarding their contribution to sustainability, prosumption options and activities provide viable alternatives to consumer society' habits, they open new perspectives to change the production and consumption structures, to enhance sustainable lifestyles and sufficiency-oriented consumer behaviour. Prosumer activities are pursued from a variety of intrinsic and extrinsic motivations which are partly specific to the type of prosumer behaviour. Our study aims to provide an overview of the main drives and patterns of various prosumer behaviours in Hungary, in the light of regional characteristics. Six types of prosumer behaviour will be analysed: short-term own apartment rental, food production for own and other's use, renewable energy production for own use, do-it-yourself (DIY) activities, creative handicraft activities and participation in online communities. The main research question is whether there are unique features of prosumer behaviour, based on where prosumers live within the country: in which region and in what type of settlement (capital, city, smaller town, village).

To answer the research question, a country-wide quantitative survey was conducted in 2022-2023 in Hungary, resulting in a sample of 2511 respondents who pursue prosumer activities. Beyond general attitudinal questions towards reasons, as well as environmental and social impacts of prosumption, prosumer behaviour has been surveyed in detail, regarding the six specific prosumption type.

Preliminary results suggest that socio-economic and development-related characteristics of regions have a significant influence on how prosumers consider the reasons and impacts of prosumption, in general and how they perceive their own prosumer behaviour, specifically. In Budapest and Central Hungary, the importance of pleasure caused by prosumer activities in general for the individual prosumer proved to be significantly higher than in the countryside, but this is not necessarily the case when it comes to prosumer behaviours separately. The perception of financial necessity behind prosumption is peculiar in the Eastern region, compared to the significantly wealthier Western region where this motivation factor is reported to be less important. Respondents of various regions and settlement types also significantly differ in their attitudes to environmental responsibility. Prosumers from Eastern regions stress companies' (rather than the society's) responsibility for a more frugal resource use in the first place, compared to more balanced opinions of the Central and Western regions. In smaller towns and villages, environmentally conscious consumption is of lower priority than in bigger cities.

The analysis of subsamples according to the six specific prosumer behaviour types are expected to show further regional characteristics. The research is conducted by multivariate statistical methods. Factor analysis helps identify the main patterns of the motivational structure of each prosumer activity, cluster analysis is applied to classify the respondents according to their motivations, and all those features are analysed in regional context. The research aims to produce a comprehensive mapping of regional characteristics of prosumer behaviour patterns in the country and provide policy implications to inspiring and supporting various activities of prosumption, for the sake of more sustainable societies.

**Keywords:** prosumption, sustainable lifestyle, consumer motivations, regional characteristics

## 4. Resilient Cities and Regions

### **Solid Waste Management in Rural Areas of Global South: Status Assessment Framework Creation**

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#### **Abstract**

Solid Waste Management (SWM) in Rural Areas of the Global South represents an urgent challenge to be tackled at a global level. Waste mismanagement is a widespread yet perilous phenomenon for the environment and public health generated at a local level, with effects accounted for globally. Recent studies conducted on a community level offer insight into some of the common challenges rural communities in the Global South face. These studies, however, differ in terms of background, methodology, and objectives. This paper, presented as a Master's thesis, proposes a status assessment framework to measure four dimensions across different communities: legal, infrastructural, socio-political-economical, and knowledge-behavioural. The objective is creating an assessment framework to map, monitor, and assess solid waste management factors and elements in a community to understand how they interplay in the mismanagement of waste. The framework is constructed by combining the insight from previous studies and the experience of scientists and waste management professionals gathered through interviews and questionnaires. To provide an empirical application of this investigation tool, the framework is later applied to the North-Western Senegalese rural community of Gandiol, affected by waste mismanagement in a context of environmental degradation and socio-economic precariousness. The data collection consists of a mixed-method approach, quantitative and qualitative, involving legislative review, interviews and questionnaires to local waste experts, and a survey shared among locals to understand the current situation by focusing on household waste management and popular perception of the issue. The combination of the four areas of focus is named Multidimensional Analysis Framework (MAF), a tool that enables reporting data in a structured and detailed manner. By combining the data collected for each dimension, an overview of the current state of a given community is produced, highlighting the main features of the waste management process in a given community. Applied to the case study, MAF provides a detailed overview of the structural challenges in Gandiol within the frame of an ambitious national waste management program in Senegal, that still leaves rural areas marginalised. With the research considering different geographical, cultural, political, and situational conditions of rural communities, collected from previous studies, MAF is proposed as a general format that allows flexibility to incorporate findings and perspectives from different communities around the world; thus, if applied to multiple communities, it fosters comparison among them. Cross-study comparisons offer evidence for policy decisions. Ultimately, having more comparable data can enhance the quality of research in the context of waste management in rural areas of the Global South, enhancing the opportunity to co-create localised opportunities for sustainable transitions and environmental preservation.

**Keywords:** solid waste management, rural areas, global south, household waste management, Senegal

## **Phasing Out and In (POI): Mapping Frames, Concepts, and Communication Strategies across Knowledge/Action Networks and Communities of Practice on Phasing Out Fossil Fuels**

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### **Abstract**

Considering the increasing threats of climate change and plastic pollution, one of the most critical and bold sustainability goals today is phasing out the consumption and production of fossil fuels; this requires phasing in major systemic transformations of cultural and political habits, values, and behavior as well as policies and infrastructure. In addressing that goal, a spectrum of social networks and communities of practice (CoPs) are *exploring the diversity of communication approaches and strategies*. From its start in July 2025 through December 2026, the Phasing Out & In (POI) project employs a transdisciplinary approach linking policy discourses with communication strategies on climate change and plastic pollution petropolitics, focusing on the long-range transition from fossil fuel consumption and production systems to a post-carbon, post-plastics, sustainable future. Through a series of video interviews and exchanges, the POI Project highlights frames, concepts and strategies among communication researchers and practitioners across several different knowledge/action networks and CoPs (in particular, the International Environmental Communication Association (IECA), Association for the Study of Literature and Environment (ASLE), Rhetoric Society of America (RSA), Popular Culture Association (PCA), Global Plastics Treaty CSOs / Break Free From Plastics (BFFP), Future Earth Sustainable Systems of Consumption & Production Knowledge Network (SSCP KAN), and other CoPs, given time and opportunity.) The POI project draws upon ISF's experience and relationships with each CoP and involvement in SCP policy, initiatives, UN agencies and networks since the 1990s. Limitations include the short time period and funding challenges during this period of upheaval in the US. The POI Project maps alternative frames, concepts and approaches promoted, used, and/or taught within different research/education networks and communities of practice in generating communication strategies and tactics. Sharing methods, approaches, and experiences across disciplines and CoPs is essential to the ambitious common goal of phasing out fossil fuels and phasing in post-carbon, sustainable consumption and production practices and systems. As climate and plastics discourses and initiatives increasingly become major targets of disinformation campaigns, we hope to build and strengthen knowledge-sharing relationships with and between the different networks and communication scholars and practitioners, including indigenous and frontline scholars and activists.

**Keywords:** fossil fuels, SCP, communities of practice, communication strategies, post-carbon

## **Towards a Tool to Bridge the Strategy-Operation Gap in Cities: A Case of Circular Soil Management in Danish Municipalities**

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### **Abstract**

The consumption and production patterns of modern society cause significant negative impacts on the global environment including waste generation, resource exploitation, environmental degradation, and GHG emissions. These impacts are caused by industrialization, urbanization, economic growth, population growth etc., and with an increasing percentage of the global population living in cities, cities are major contributors to these impacts. Many cities are developing strategies targeting sustainable development to initiate local solutions. Furthermore, a variety of sustainability frameworks have been proposed over the years, however, most of these are conceptual and limitedly addressing implementation. To secure implementation in cities, a move from conventional planning to strategic urban planning is stressed. This implies balancing multiple objectives in multidimensional processes. Thus, a transition towards sustainable cities, calls for research on how to adopt new practices in municipal organizations, engaging the relation between the strategic and operational level across disciplines. This article proposes a tool to engage organizational transformation in municipalities securing alignment between strategies and plans, tactic procedures and operational action. Based on a study of circular soil management, the tool is developed and tested in collaboration with municipalities in the Capital Region of Denmark. The study consists of i) a series of interviews with construction clients, authorities, advisors, and entrepreneurs to identify the barriers and potentials for circular soil management, ii) a series of interdisciplinary workshops in municipalities addressing strategic, tactic and operational measures for organizational transformation towards circular soil management and iii) continuous follow up meetings to secure sustained commitment. Furthermore, a continual group was established all together avoiding a fall-back to business as usual. To secure a strategic commitment, both the managerial and operational levels in the organizations were involved in all relevant departments. Based on these activities, the article discusses lessons learned and how the tool can function as a holistic contextual framework for sustainable transition in local governments. Finally, it is concluded how such transition can bridge vertical and horizontal alignment between hierarchical and disciplinary structures in relation to the specific context of development at hand.

**Keywords:** organizational change, strategic planning, local government, recycling, construction waste

## **Advancing the Transition Towards Innovative Sustainable Economy in the Mediterranean: The Power of Long-Term Territorial Cooperation**

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### **Abstract**

In an ideal world we would have biological and technical closed cycles. Instead, increasing resource use is the main driver of the poli-crisis. Material use has increased more than three times over the last 50 years, and it continues to grow. We are realising and predicting that the Planet cannot sustain more growth. In the meantime, the Mediterranean basin holds global strategic importance and faces a series of transboundary challenges that require strategic concerted joint actions. Therefore, we need to keep fighting for a systemic transformation of the economic system. The Interreg Euro-MED Innovative Sustainable Economy (ISE) Mission represents a new generation of territorial cooperation, catalysing systemic economic transformation in the Mediterranean by integrating circular economy, bioeconomy, and circular bioeconomy models within a coherent, cross-sectoral governance framework. The Mission unifies diverse thematic projects under a single mission-driven structure, enabling strategic alignment and policy coherence across the Mediterranean. The Mission convenes the expertise and results of numerous thematic projects—amplified by two dedicated governance projects—and currently connects 155 partners from 18 countries into a vibrant Community of Practice. This structure ensures vertical integration, linking territorially tested innovations directly to national and international policy agendas and Mediterranean strategic action plans. A core novelty of the ISE Mission lies in its ability to cluster project outcomes around four interlinked focus areas—Marine Resources, Agri-food Systems, Industrial Transition, and Resource Valorisation—ensuring cross-fertilization of solutions and reinforcing innovation pathways. Through a set of transformative and mutually reinforcing activities—including Mapping Resources, Community Engagement, Capacity Building, and Policy Impact—the Mission goes beyond experimentation and focuses on scaling and embedding innovation into governance systems. This is operationalized through a multi-sectoral virtual platform—the ISE Community Hub—which serves as an engine for coordination, knowledge exchange, and policy interface. It offers a replicable model for mission-oriented governance that builds on territorial cooperation but introduces a strategic shift toward systemic policy integration and ecosystem activation. With a seven-year timeframe (2023-2029), the ISE Mission seeks to build on successful territorial cooperation, ensuring that innovation funding mechanisms empower regions as core implementation actors.

**Keywords:** results amplification, mediterranean governance, community

## Co-designing the Future of a Danish Innovation Network

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### Abstract

Business networks can be catalysts in bringing innovation not only to individual organisations but to whole ecosystems, which has the potential to positively influence regional development. These networks are thereby relevant arenas for multi-stakeholder cooperation for sustainability. While there is a common agreement on their relevance for partnering for sustainability, the value they create for its members remains under-researched. Shedding light on these values can further the understanding of the motivation and drivers for networking. In this research, we analyse the current and potential value creation of a Danish innovation network to better understand the motivation and drivers for multi-stakeholder cooperation and partnering for sustainability. The focus is on investigating how collaboration might be improved through value creation from a member perspective. Our research questions is: Which value dimensions are the most important drivers for active participation and member loyalty as well as future intention to engage in the network? The study builds on a Danish innovation network consisting of almost 200 organisations in different sizes and varying industries. The network's goals are to work for more collaboration, synergy and sustainability. The latter goal is linked to SDG12 (sustainable production and consumption) and sustainable regional development. With our study, we aim to better understand the perceived individual and organizational value dimensions that the Danish innovation network creates for its members. We further aim to understand how the value creation is related to network loyalty (willingness to stay in the network) and future engagement in the network, and its roles and activities of stakeholders as drivers for local and regional sustainable development through innovation networks. Our study follows a mixed methods approach. In a first stage, primary data through interviews and meeting observations were collected in addition to secondary data such as network reports to better understand the perceived member value of individuals and member organisations. In a second stage, a survey distributed to all member organisations was designed and will be send out to all members to gain further insights into the perceived member and network value. The third step will be a future workshop (in late spring 2025) to co-design the future of the network with more engagement of the members. The results are both relevant from a practical and theoretical perspective as well as for policy makers. Our results of the three-stage research design will be presented to the board in a research-results presentation to inform the decision-makers of the network. This will be supplemented with guidelines for strengthening the motivation for multi-stakeholder collaboration for sustainability facilitated by innovation networks. We contribute to the (sustainable) innovation management literature by redefining the network value that has previously been described in the literature. While there has been a focus on the company perspective in the past, our study takes an ecosystems perspective to better understand the different individual and organisational value dimensions, which are important in driving change from a local/regional perspective, and results in a more comprehensive understanding of what drives multi-stakeholder collaborations for sustainable development.

**Keywords:** value creation, innovation network, sustainable production, sustainable consumption, mixed methods

## Developing Transformative Capacities in Rural, Peripheral Regions

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### Abstract

Historically, most of the innovation and sustainability transitions literature has focused on urban regions as the – presumably – most revealing geographical entities for observing and understanding innovations. This “urban bias” mostly comes along with a classical, techno-economic conceptualisation of innovations. In this sense, researchers are mostly interested in the interconnected industries, (economically productive) knowledge, well-educated, mobile professionals and financial capitals, which are concentrated in cities and agglomerations. In contrast, rural and peripheral zones are mostly perceived as laggards of novel developments. Only very recently, researchers have shown more interest in “non-core” regions and their transformative potential. With our contribution, we want to add to this emerging scholarly work, adopting a more encompassing perspective on innovation, which includes social innovations, understood as novel social practices, patterns of organising and framing as well as social relationships. With these lenses, it seems that many remote, rural areas are by no means dormant, stagnant or backward-looking, but highly relevant for making our societies more resilient and (socially and environmentally) sustainable. Among the many social innovations in rural areas are, for instance, on-demand, citizen-organised mobility services for isolated settlements; novel cultural formats and community places, which make social life and communities re-flourish; experiments with novel types of shared living and mobile work; community-based, ecological agriculture models; or new partnership models between local governments and civic groups leading to new services for citizens. These solutions appear crucial for addressing typical challenges of non-core regions, such as the downgrading of public infrastructures and services, the decline of social and cultural life, the outmigration of young people, social withdrawal and populist voting. In our contribution we ask how rural, remote regions can develop into highly dynamic, socially innovative areas providing a high quality of life to their citizens. Based on thinking from Social Practice Theory, we develop a dynamic conceptualisation of regional transformative capacities, understood as an ever-increasing repertoire of available “practice elements”, and suggest a process model of rural regional transformations. We illustrate our arguments with empirical data from two rural regions in the Eastern German federal states of Brandenburg and Saxony-Anhalt. Our data stems from documentary analysis of relevant press releases, websites, newspaper interviews and articles and 27 semi-structured qualitative interviews with representatives of social innovation initiatives, social innovation network organisations, municipality and district governments, local councils, as well as mayors. A common coding-scheme, combining theoretical deductive and inductively emerging codes, was developed, refined and “cleaned up” in repeated team meetings to ensure inter-coder reliability. Subsequently, all interviews and documents were coded according to the scheme, followed by thematic analysis of core categories. With our contribution, we shed light on rural regions, their specific challenges and solutions on the way to more resilient, sustainable societies.

**Keywords:** rural regions, social innovations, regional transformative capacities

## **Sustainability Through Resilient Cities and Regions - Case of Albania**

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### **Abstract**

The achievement of the Agenda 2030 for Sustainable Development Goals has become a priority for many countries around the world. Albania has become part of this agreement in 2015. Although, 10 years have passed since the signing of this agreement, Albania is still in the initial stages of the adoption and implementation of SDGs. The pandemic period of COVID 2020 has blocked the work process, which resumed in the year 2022. The Albanian government has also established a working group for monitoring the SDGs in recent years, as well as a parliamentary sub-committee for advancing the agenda. The objective of the paper is focused on: Can Albanian cities and regions become sustainable? Can they be efficient in raising and using funds to invest in the adoption and implementation of the SDGs, especially SDG 11? Based on the chosen topic, the study investigated how much information the Central and Local Governments have about the importance of adopting and implementing the SDGs, and it turned out that in many municipalities there is no information and their implementation has not yet begun. There are also large municipalities that have partially begun their implementation and have received funding from the European Union or other donors. It is very important to understand that the sustainable economic development of a country starts from the local, regional and then to national level. For this reason, sustainable growth must adapt to the socio-economic conditions of the areas. Cities and regions are already facing the high emigration rate of young people and the workforce; they are facing difficult climatic conditions (drought, floods, frost, etc.); with seismic fluctuations; with infrastructure deficiencies (roads, electricity, water, sewage, etc.). Therefore, it is very necessary for municipalities to start adapting the infrastructure of buildings, roads, and to support business and citizens, according to the new conditions and required standards, to achieve the fulfilment of the SDGs. Furthermore, regional cooperation will also be necessary, in order to increase the possibility of financing and benefiting from the European Union assistance. Albania needs experiences and concrete models from European Union countries, on how to build sustainable cities and regions. Also, sustainable cities and regions cannot be achieved, if financial decentralization and the independence of local government from the central government do not function. In Albania, this process has not yet been completed, which also complicates the implementation of the SDGs at the local level. The topic is of particular importance, as its discussion and debate can increase the attention of the government and municipalities for greater commitment.

**Keywords:** resilient, sustainability, cities, region, government

## **Application of the Circular Lifestyle Monitor Tool on District Level**

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### **Abstract**

The 'From Niche to Centre - City Centres as Places of Circular Lifestyles' (NiCE) project focuses on two main challenges: 1. a transformation of central places in cities that make it easy for their inhabitants to implement sustainable lifestyles and 2. at the same time to (re)animate centres in a more circular way. The project aims to change the architecture of our consumption through promoting new, sustainable consumption behaviour. During the project, NiCE partners introduce educational, inspirational, and exchange formats to municipalities, regions, providers of alternative consumption, citizen associations and policymakers. The circular lifestyle monitor tool - which helps to quickly analyse status quo, challenges, and potentials for circular lifestyle in cities - is one of these formats. The circular lifestyle monitor tool is an outcome of an iterative research and collaboration process, meanwhile partners of NiCE project have assessed sustainable consumption patterns and supporting business models that play a role in the circular development of NiCE pilot cities/ towns (Bologna and Porto-Saragozza district in Italy, Brzeg Dolny in Poland, Budapest and Újbuda district in Hungary, City of Jihlava in Czechia, Graz in Austria, Košice in Slovakia, Ptuj in Slovenia and Würzburg in Germany) and analysed the needs and visions of their target groups (cities and initiatives/ providers of new business models, existing networks) to identify transnational challenges and potentials. The "monitor tool" is an indicator-system with five thematic groups including 1. circular lifestyle ecosystem, 2. circular lifestyle actions, 3. performance indicators, 4. policy interventions, 5. result indicators and was developed based on reviewing existing indicator systems and primary research. In the current research, we aim to demonstrate the usage of the monitor tool on district level. Using mixed methods (data gathering by desk research, data providers and in-depth interviews) we will analyse two districts of Budapest (XI. and XXII.), capital of Hungary. The two districts - although situated on the Buda side of the city - hold distinct characteristics: District XI. as the most populous district of the capital represents a typical urban fabric with great variety in land use, including the largest university campus in the capital, meanwhile District XXII. is a typical suburban area with wine cellars and a champagne factory. Research suggest that the tool has the potential to provide guidance on developing urban portfolios even in significantly different settings. For circular transitions, the application of the quintuple helix innovation framework is inevitable.

**Keywords:** circular lifestyles, urban areas, planning, international cooperation

## **Sustainable Business Models for Agri-Food Entrepreneurs in Rural Areas: The Case of Norway**

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### **Abstract**

To tackle the urgent global challenges, agri-food firms need to find innovative sources of value to absorb shocks and contribute to resilience and self-sufficiency at the national level while being profitable. This is even more demanding in rural ecosystems (REs) as they are characterized by scattered settlements outside cities and urban centers, primarily based on agriculture. To this end, they must use their resources efficiently through circularity, diversification of business towards food processing, sale and marketing of local food, and collaborative networks at the local or regional level within and across the agri-food sector. Sustainable business models help rural agri-food entrepreneurs (RAFEs) harness the potential of local resources, identify innovative income opportunities, and facilitate economic, social, and environmental value creation. However, current research on REs is fragmented and often focuses on developing countries, overlooking the unique conditions of developed countries like Norway. This study aims to explore sustainable business models in rural agri-food ecosystems and how they can ensure value creation in Norway. About 75% of Norwegian food producers are micro-firms, mainly rooted in rural areas. They contribute significantly to the economy and culture through agri-food production, enhancing rural life quality, boosting competitiveness, and attracting new business opportunities. Nevertheless, RAFEs are challenged by isolation, limited resource access, and inadequate business development services. They must balance innovative solutions, targeted customer engagement strategies, creative value creation methods, and new business concepts capable of transforming existing markets. Yet, RAFEs often suffer from poor autonomy, are marginalized in concentrated systems dominated by large companies and retailers and lack an entrepreneurial culture. These factors push entrepreneurs to diversify into activities such as agritourism and value-added agriculture, synergistically tapping into unutilized resources, creating new job opportunities for family members, and preserving local culture. Indeed, the food system is increasingly linked to other industries related to the concept of lifestyle and can also play a crucial role in circular bio-economy development (Falcone and Fiorentino, 2024; Carraresi and Bröring 2021). Research is needed on the factors influencing farmers' decision-making and on new opportunities for sustainable value creation. This study aims to analyze barriers and enablers of innovative sustainable business models of RAFEs to increase resource valorization in Norwegian REs. The study is ongoing, and we are in the process of collecting data. We are conducting in-depth interviews with RAFEs in Norway to gather primary data on their business models and analyze the characteristics that make them sustainable. Data will be analyzed with content analysis and elaborated to be presented at the conference. The research is expected: i) to enhance the understanding of sustainable business models and advance state of the art towards rural contexts by providing empirical data on Norwegian REs; ii) to delineate specific barriers and enablers faced by rural entrepreneurs; iii) to identify how resources unique to rural Norway can be used to create economic, social and environmental value, also in supporting sectors such as tourism. The selected sample of RAFEs is located in Akershus and Østfold, two regions in the South-East of Norway. Preliminary results indicate that RAFEs in these regions operate according to individual initiatives, but they do not contribute to the overall competitiveness strategy of the region. Although idiosyncratic resources have been detected, there is still untapped potential to valorize them by networking with other partners in the region in a concerted action to create a RE generating mutual benefits. For example, there is potential to promote traditional food products through sustainable tourism, which could lead to extra value added both for RAFEs and the RE, but collaboration among

RAFEs and between them and local municipalities and other institutions is still missing. We will provide insights for policymakers and support organizations by developing a conceptual framework to support rural entrepreneurship and ecosystem development in Norway, as well as managerial recommendations for RAFEs on valorizing resources through sustainable business models.

**Keywords:** sustainable business models, rural ecosystems, agri-food sector, Norway, diversification

## **A Democratic Design as a Way to Innovation and Sustainable Development**

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### **Abstract**

The global population is experiencing the consequences of an unsustainable production and consumption system, based on the excessive exploitation of natural resources, high levels of energy consumption and increase in waste generation. The dominant economic growth model ignores the ecological limits of the planet, leading to environmental degradation, climate change and an increase in social inequalities. Design, as a process of creating and planning objects, systems or experiences with the aim of solving problems and meeting human needs, has tools and approaches that can contribute to mitigating the effects of current production and consumption systems. This study adopt a systemic view of the product, as a sign, bearer of value and result of a production system that cannot be separated from it. It is, therefore, design focused on the product's life cycle and the well-being of the population, hence its necessarily democratic character, aimed at the transition to a model of designing sustainable products and production systems. In this scenario, the perception of a globally effective technology must be questioned, in view of local needs and characteristics. This seems particularly appropriate in developing world, which have social, cultural, environmental and economic characteristics that significantly differentiate them from developed countries. This research is based on the hypothesis that a solution to current social and environmental problems involves a democratic approach to design and innovation processes, with local solutions that are appropriate for users, environmentally sustainable and socially fair. In this sense, this study presents some experiences seeking participatory and democratic design to solve basic problems of the population and improve their living conditions, from a circular, technodiverse, slow and systemic perspective. Studies carried out in Brazil will be presented, notably related to traditional products and production systems, in view of their cultural and social importance, in addition to their economic relevance. The results demonstrate that an adequate approach to design processes, which robustly incorporates the participation and decision-making power of the populations involved, can lead to innovative solutions that are appropriate to the local context, reducing negative impacts and increasing benefits for the communities involved.

**Keywords:** democratic design, social design, design for sustainability, frugal innovation, design for the territory

## **Modelling Resilience with LCA - A Case for Expanding Urban Agriculture in Nordic Cities for a More Robust and Sustainable Food System**

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### **Abstract**

Current agricultural practices are contributing significantly to global greenhouse gas emissions, land use, and freshwater consumption, among many other impacts. At the same time, increasing global average temperatures and extreme weather events due to climate change will have a drastic impact on what food we are able to produce and where, leading to increased instability in global food production and supply chains. In the face of these challenges, resilience has emerged as an important aspect of sustainability. However, resilience has proven to be difficult to define in literature and even more difficult to quantify, meaning it has been used in a mostly qualitative, descriptive capacity to date. The growing use of the tool of Life-Cycle Assessment (LCA) for quantifying environmental impacts shows promise for clarifying aspects of an increasingly complex and interconnected world. However, the tool only considers a static system and is not designed to account for system dynamics, which would be necessary for incorporating resilience. This work aims to operationalise a theory proposed by Pizzol (2015) for how to account for resilience in a life-cycle assessment. This approach involves assessing likely disturbance scenarios and modelling both the standard system and the system as it would operate under these disruptive conditions. The total impacts are calculated by combining the two systems based on different probabilities of disturbance. An alternative scenario is then built and modelled for a system that would maintain its function under these disturbances. Results show at what level of disturbance a resilient system would have lower overall environmental impact than a vulnerable one. This work applies this theoretical framework using the example of lettuce demand in Stockholm to compare the environmental impacts of a vulnerable system to a resilient one. It also aims to add more nuance to the methodology by differentiating various types of disturbance and applying real world scenarios. Currently, Sweden imports almost all its lettuce from Spain, a country severely impacted by drought and rising temperatures. The proposed scenario is that in the event of crop failure or supply-chain disruption, Sweden would import its lettuce from an alternative country. For comparison, this work proposes a resilient system in which a large proportion of lettuce is grown locally with vertical farming techniques, allowing for a period of self-sufficiency in the event of disturbance. Indoor vertical farming, especially in the Nordics, can be very energy-intensive due to lighting and heating requirements. Preliminary results indicate that regional systems can be more resilient despite having potentially higher direct impacts. In most instances, the systems show high sensitivity to both the type and probability of disturbance, and there are scenarios where, even under a relatively low probability of disturbance, it is more environmentally beneficial to increase self-sufficiency rather than depend on imports. Giving a quantitative value to resilience in a life-cycle assessment, even if highly simplified, will make it easier for it to be incorporated in decision-making and planning practices, allowing for increased adoption.

**Keywords:** life-cycle assessment, resilience, food system, preparedness, disturbance

## EnergyFuture WEIZplus

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### Abstract

The vision of EnergieZukunft WEIZplus (Energy Future WEIZplus) is to supply the entire region around the city of Weiz in eastern Styria / Austria with 100 % renewable energy from local generation and thus show the way to regional climate neutrality. EnergieZukunft WEIZplus was founded as a cooperative to drive forward the energy transition and create a sustainable, self-determined energy system in the WEIZ region.

The flagship project Fossilfree4Industry is a pioneering initiative within the framework of EnergieZukunft WEIZplus, which aims to enable the phase-out of fossil gas using five large-scale model solutions, known as demonstrators, in industrial and commercial energy sectors in the region. The overarching goal of Fossilfree4Industry is to demonstrate the technical feasibility and economic viability of decarbonising industry through integrated regional energy solutions. The project aims to promote the regional symbiosis of industry, city and countryside and is modelled on the European "Hubs for Circularity (H4CS)". These H4Cs are economic ecosystems that close energy, resource and data cycles. Companies of all sizes are involved in achieving the region's climate neutrality and circular economy goals, sharing resources and jointly identifying regional needs.

In order to achieve this goal, five approaches have been defined which, when combined and viewed synergistically, should ensure that the overarching goal is achieved:

- Energy supply for industry at two temperature levels
- Utilisation of waste heat from industry
- Increasing the yields of green gas production
- Utilisation of regionally available energy sources for district heating
- Strengthening the energy supply infrastructure

Energy communities give everybody the opportunity to become an active part of the energy transition and benefit from the advantages of a sustainable energy supply. By joining forces with other citizens, companies or municipalities, one can jointly utilize locally generated renewable energy - for example from photovoltaics, wind power or biomass.

By participating, one not only reduces the energy consumption costs, but also actively contributes to climate neutrality and independence from fossil energy sources. The added value remains in the region, local energy cycles are strengthened, and the local energy supply becomes future-proof and stable.

Forum Mobility: The main aim of this project is to improve, connect, expand and roll out environmentally friendly mobility services across the board. The focus area here is on the region of Eastern Styria, where there is a lack of mass mobility chains that are reasonable in terms of time and continuity. Unfortunately, poor accessibility of the so-called first and last mile as well as great dependence on motorised private transport are currently the status quo here.

**Keywords:** renewable energy, industrial decarbonization, regional energy transition, sustainable mobility

## Unique Project on CE Local Networking

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### Abstract

The future of a developed society is inextricably linked to adherence to the principles of sustainability. One of the key tools to ensure sustainable progress is the implementation of circular economy principles at all levels of human activity. This process requires not only a switch of a mindset, but also innovative technological solutions and strategic cooperation between science, industry and public sector. One element that links these aspects is the CirkArena project, which supports the development and implementation of advanced technologies for resource efficiency.

CirkArena brings innovative approaches to recycling materials, processing industrial waste and developing new technological processes that minimise the environmental impact of production. A key area of research is the transformation of waste materials into valuable secondary raw materials, their integration into the circular economy and the effective alignment among concerned stakeholders, especially at the local level.

Successful implementation of the circular economy at the regional level requires a systematic analysis of local needs and effective coordination between scientific, industrial and municipal actors. CirkArena focuses on identifying the main factors necessary to achieve circular efficiency through industrial symbiosis, optimization of material flows and shared infrastructure.

This paper is devoted to defining the key conditions for the emergence of a functional model of circular economy at the regional level. Aspects of the legislative framework, technological infrastructure, economic sustainability of activities and the role of research capacities in the development of innovative solutions will be analysed. We will also focus on strategies to promote sustainable waste management and efficient use of material resources.

The paper will also include the presentation of concrete examples that demonstrate how the effective networking of scientific institutions, industrial enterprises and municipal structures brings practical solutions for waste management, materials recycling, utilization of secondary-raw materials and negative environmental impact reduction. Special emphasis is focused on how regional strategies can contribute to achieving the European Union's circular economy objectives and what tools are needed to implement them.

**Keywords:** circular efficiency, regional cooperation, material flows, sustainability, municipal sector

## The Global Environmental Impacts of Dutch Dietary Change

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### Abstract

The environmental impacts of a nation's food system are not only confined within its borders but extend across an international food supply chain. These impacts are highly food-dependent and a dietary transition towards plant-based consumption is a key pillar for reducing global environmental pressures, especially in high-income countries. As such, we assess Dutch food consumption, which is heavily involved in international food trade, as a case study to better understand the global implications of local dietary change. Here, we explore the environmental impacts of a Dutch dietary transition for six categories: blue water, green water, land use, greenhouse gas (GHG) emissions, nitrogen application and phosphorus application. We use the Food and Agriculture Biomass Input Output (FABIO) database to quantify global changes in these six environmental impact categories brought about by shifting Dutch food consumption to an EAT-Lancet diet against the average diet in 2020. We found that a Dutch dietary shift towards the EAT-Lancet diet results in reductions across all impacts, with the greatest reduction in GHG emissions (-58%), the lowest in blue water (-16%). The Netherlands itself shows a higher proportional decrease in environmental impacts (over 58% reductions in six impacts) than its global food suppliers, which is driven by reducing animal sourced foods demands (including bovine meat, pigmeat, lamb, fish, eggs and dairy products). However, the absolute environmental reductions remain limited compared to major global food suppliers. This is largely due to the fact that a substantial portion of the environmental pressures—particularly those related to animal feed production and livestock farming—occur outside the Netherlands, in countries that supply inputs to the Dutch agricultural sector. Analyzed from a production perspective, some animal feed suppliers benefit more environmentally than the Netherlands as a result of the reduced demand for bovine meat consumption. For instance, grazing land use in Brazil for exports to the Netherlands decreases by more than twice the reduction observed within the Netherlands. Furthermore, environmental resources saved from reduced animal-based consumption in the Netherlands could be redirected to offset land use for increased legume production abroad. This study contributes to discussions on Dutch dietary habits and their broader environmental implications. It highlights the global environmental benefits but also accounts for trade-offs across six impacts in plant-based food supplying countries, that can occur if a nation implements policies that promote more sustainable diets.

**Keywords:** dietary change, environmental impacts, input-output model, sustainable food system, trade-offs

## 5. ESG and Financing Sustainability

### The Critical Role of Middle Managers in ESG Implementation, a Scoping Review

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#### Abstract

Executives from major companies expanded their organizations' purpose to include societal interests, incorporating Environmental, Social, and Governance (ESG) themes into their strategic plans. However, its implementation necessitates changes the way organizations run their business and beget tensions that require effective management, communication and strategies to address (Hahn et al., 2015). Middle managers are essential in executing strategies and organizational transformations (Hermkens & L. Romme, 2020) as they act as conduits between upper management and frontline employees, (Harding et al., 2014; Keys & Bell, 1982). Their interpretations, enactments and translations of sustainability policies influence the organization's overall sustainability performance (Balogun, 2003; Isabella, 1990). The extant literature on ESG implementations addresses resolution strategies for managing tensions (Hahn et al., 2015; Van der Byl & Slawinski, 2015) but is not clear about the role of middle managers as agents in this context. This study focuses on the ways middle managers internalize corporate ESG values, strategies they employ to implement ESG, how they translate strategic goals into operational practices, and leadership they show implementing ESG. The concept of sustainable business development lacks clear definition which results in interpretations that dilute its effectiveness as a guide (Christen & Schmidt, 2012). This highlights the importance of studying how middle managers manage ESG implementations, considering their role as change agents. We designed a scoping review to offer an overview of key concepts, map evidence, and find gaps in this research area (Arksey & O'Malley, 2005), instead of providing a critical and synthesized response to a specific question. To maintain methodological rigor, we utilized the framework from Arksey & O'Malley (2005). Organization studies became differentiated and are a complex field of research with various schools of thought (Scherer & Steinmann, 1999) whereby organizational changes ontologically are viewed through a process- or entity-based lens (Langley et al., 2013). Further exploration of process-based theories could enhance our understanding of organizational change and the role of middle managers (Wenzel & Koch, 2018). This study maps ESG implementation research, focusing on middle managers. Search strings based on preliminary review of the literature found 10635 articles published on the Web of Science (WoS) database. Refining the search resulted in 71 articles included in this review. Preliminary findings suggest that the involvement of middle managers in ESG implementation has become increasingly noteworthy, with a considerable number of articles on this topic published since 2020. While the literature to date mostly assumes an entity-based view, identifying activities middle managers should do for ESG strategy implementation, a handful of articles adopt a process-based view to explore how middle managers assume these activities (e.g., translation of ESG policies) and why these activities are important to the overall success of ESG strategy implementation (e.g., shared organizational sense making). Based on the findings of this scoping review we developed a framework to clarify how middle managers' triggers, leadership, and processes could facilitate ESG strategy implementation. This research provides practical insights for organizations implementing ESG strategies and theoretical insights on middle managers' roles in organizational change and ESG strategy execution.

**Keywords:** ESG, middle manager, tensions, strategy implementation

## Scope 3 Challenge and PACT

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### Abstract

The World Business Council for Sustainable Development (WBCSD), one of two creators of the GHG Protocol, a global standard for accounting and reporting greenhouse gas emissions, issued its first product carbon methodology under the Partnership for Carbon Transparency initiative (PACT) during COP21 in Glasgow in November 2021, see <https://www.carbon-transparency.org/pact-methodology>. Its core purpose is to provide a harmonized and transparent framework (the PACT Standard and PACT Methodology) for the calculation, verification, and exchange of supplier-specific, cradle-to-gate product carbon footprint data across value chains, i.e., for the most challenging Scope 3 GHG emissions.

The session delivered by Petr Dovolil, Vice-president of the Czech Business Council for Sustainable Development (CBCSD), a Czech national association affiliated with the WBCSD and its Implementing Partner for the PACT Methodology, provided the fundamentals on the third version (April 2025) of this industry-leading product carbon methodology, including the following features:

- **Standardized Methodology:** It builds on existing international standards, such as the GHG Protocol Product Life Cycle Accounting and Reporting Standard and ISO 14067, but provides specific rules to reduce ambiguity and increase consistency and comparability of data.
- **Enhanced Data Accuracy:** It promotes the use of primary (supplier-specific) data rather than industry averages. This allows companies to get more accurate, granular insights into their Scope 3 emissions (emissions from sources not owned or controlled by the company, but linked to its operations) and make more informed decisions for decarbonization.
- **Interoperability:** Its key goal is to enable seamless data exchange between different software solutions and businesses, much like how different email providers can communicate with each other.
- **Industry Agnostic:** It is designed to be applicable across various sectors, ensuring collaboration and alignment throughout complex supply chains.
- **Transparency and Credibility:** It includes step-by-step verification pathways, with third-party verification expected to be mandatory from 2025, which enhances the credibility of the reported data.
- **Practical Application:** Over 2,500 businesses, including large corporations like BASF, Unilever, and Fujitsu, have participated in pilot programs to calculate and exchange over 4,500 product carbon footprints (PCFs) using the PACT Methodology so far.

The new version of the PACT Methodology provides a harmonized, transparent, and practical framework for product-level carbon accounting. Developed through two years of global consultation, the new version expands to include:

- Guidance on land sector emissions & removals;
- improved electricity accounting and technological capture, storage & utilization;
- Service-based businesses; and
- Step-by-step verification pathways and stronger data reliability.

In essence, the PACT initiative is a bottom-up collaborative effort to move beyond estimations and enable the reliable, efficient exchange of actual emissions data, which is crucial for achieving global net-zero targets and complying with emerging regulations.

The CBCSD is the first implementing partner for the PACT Methodology among the WBCSD Global Network of daughter associations. It plans to translate the new version of the methodology into

Czech in Q1 2026 as the basis for its flagship capacity building program on product emissions for its members to be launched in spring 2026 under the new CBCSD Academy.

**Keywords:** greenhouse gases, product carbon footprint, scope 3 emissions

## **Drivers of Corporate Net-Zero Target Adoption: An Empirical Study of Taiwanese Listed Companies**

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### **Abstract**

As global climate change becomes increasingly serious, companies are being asked to assume more environmental responsibilities, especially in terms of energy use and carbon emissions management. Among them, Asian countries not only serve as the global manufacturing supply chain under the global industrial division of labor, but also account for 44% of global greenhouse gas emissions. Therefore, many Asian countries with high carbon emissions are under pressure from the international community to control their greenhouse gas emissions. Governments around the world have successively promoted carbon neutrality policies and required companies to take active carbon reduction actions in their operations. Stakeholders have even asked companies to propose a net-zero carbon emission target timeline for 2050. However, whether companies are willing to proactively set net-zero targets is still influenced by a variety of factors, among which business model innovation and sustained competitive advantage play a key role in this process. Hence, companies have invested in the construction of renewable energy and carried out low-carbon innovation, which is an innovation in business models. Therefore, this study aims to explore whether companies' setting of net-zero targets will be affected by their investment in renewable energy applications and low-carbon innovation. This study conducted a questionnaire survey in October 2024 targeting all listed companies in Taiwan that have disclosed their carbon emissions for three consecutive years (447 companies). A total of 181 companies responded, with a response rate of approximately 40%. This study used SAS software to conduct data analysis. This study found that when a company has carried out more types of low-carbon innovation, the odds of setting a net zero or carbon neutrality target are 2.568 times that of a company that has not carried out low-carbon innovation, and the difference is statistically significant ( $p=0.0048$ ). Moreover, the more renewable energy projects a company carries out, the more likely it is to set a net zero target than companies that do not carry out renewable energy, with a statistically significant difference ( $p=0.0094$ ). This study confirms that corporate investments in renewable energy and low-carbon innovation significantly influence the adoption of net-zero targets, with business model innovation and sustained competitive advantage emerging as critical factors. Future research should further explore sectoral heterogeneities and incorporate broader external contingencies, such as regulatory frameworks, consumer demand dynamics, and financial market pressures, to derive more comprehensive strategic recommendations for corporate sustainability transformation.

**Keywords:** renewable energy, net-zero targets, low-carbon innovation

## **Assurance in the Era of CSRD: Opening the Black Box of Double Materiality Assessments**

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### **Abstract**

The Corporate Sustainability Reporting Directive (CSRD) is the latest sustainability reporting regulation adopted in the European Union, considered one of the most advanced globally. At its core lies the double materiality assessment (DMA), a process through which companies define material sustainability topics and determine the disclosures to include in their annual reports. A key element of the CSRD is the requirement for companies to obtain third-party assurance of their sustainability reports, including the materiality assessment. This provision aims to enhance the credibility and reliability of disclosures. While assurance of sustainability metrics is not new, assuring DMAs presents significant challenges due to the novelty of the process and the lack of established best practices and standards. The lack of transparency in the execution and assurance of DMAs can potentially hinder the effectiveness of sustainability reporting and undermine the CSRD's objectives. This study aims to explore the assurance process of DMAs based on the experiences of key stakeholders involved. The primary research question guiding this study is: What are the main tensions in conducting and assuring a double materiality assessment? To address this question, a qualitative methodology is employed, relying on empirical data collected through semi-structured interviews with key actors involved in developing, facilitating, and assuring DMAs. An analytical framework is constructed by combining the main elements of the assurance processes (key actors, subject matter, standards, evidence, and assurance reports) with the three main stages of DMA (context understanding, identification, and assessment). Preliminary findings indicate that while DMAs are presented as standardized processes in the directive, there is significant room for discretion in their execution. Key decisions remain essentially black-boxed and inaccessible, even to assurance firms, which are forced to adopt a process-over-results approach, focusing more on procedures rather than content and outcomes. The challenges in assuring DMAs lead assurance procedures to place less emphasis on this cornerstone of the report and instead focus on more familiar and standardized elements, such as Greenhouse Gas inventories. Understanding the tensions in assuring DMAs is crucial for assessing the legitimacy of individual sustainability reports and the broader policy framework for sustainability disclosures in the European Union. This is particularly important in a business context where sustainability disclosures are linked to financial loans and remuneration policies. This study contributes to the field of sustainability disclosures by focusing on the assurance of DMAs, a critical yet underexplored aspect. It identifies the main challenges and tensions in this process and provides valuable insights for practitioners and policymakers. The aim is to enhance the overall quality and credibility of sustainability reporting in Europe.

**Keywords:** sustainability reporting, CSRD, double materiality assessment, assurance, non-financial disclosures

## **Decarbonisation, Circularity and ESG data**

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### **Abstract**

The paper focuses on key challenges in relation to the Clean Industrial Deal/CID/. Decarbonisation and Circularity are two key areas of the CID. To manage them, it is therefore necessary to have ESG data that can assess progress in both areas. However, ESG data is a major challenge. Most often, so-called proxy data are used, but they are not sufficiently telling. In addition, they do not allow to evaluate progress in decarbonisation within a company and their internal processes and products. It is therefore imperative to address the issue of primary and secondary data. Another major challenge is to quantify the impact of circular measures on decarbonisation. Again, this involves new methodological approaches and calculations. The paper will include a short case study.

**Keywords:** circular economy, ESG, decarbonisation

## **Navigating ESG Reporting in Manufacturing Challenges, Costs, and Circular Solutions**

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### **Abstract**

ESG is a key pillar of the modern approach to sustainability, helping companies achieve environmental and social goals, increase transparency, and manage their activities more effectively. We will share how Wistron integrates sustainability principles into its daily operations. You will learn about our goals and examples of best practices from implemented projects. We will also take a look into our data collection methodology, which forms the basis of ESG reporting. We will guide you through how we have dealt with the new EU requirements regarding ESG reporting. Furthermore, we will share the benefits ESG brings to our company, as well as the challenges we need to face. For us, ESG is not only a commitment to responsibility but also an opportunity for long-term growth and enhanced market competitiveness.

**Keywords:** ESG reporting, corporate sustainability, best practices

## Leveraging the 'EU Taxonomy' to Drive a Toxic-Free and Fully Circular Economy

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### Abstract

This presentation addresses the critical challenge of aligning the 'EU Taxonomy' with the zero-pollution ambition for a toxic-free environment and the aimed transition into a fully circular economy, as outlined in the 'Chemicals Strategy for Sustainability' and the 'New Circular Economy Action Plan'. The 'EU Taxonomy' serves as a unified classification system for environmentally sustainable economic activities, which aims to steer financial flows towards these sustainable activities. It holds enormous potential to financially support and enable the chemical industry transition to play a highly crucial role in the envisioned toxic-free and fully circular economy. However, it currently falls short in setting the right incentives for the chemical industry to align with this vision. Essentially, the adopted delegated acts for the environmental goals 'Pollution Prevention and Control (PPC)' and 'Transition to a Circular Economy (CE)' do not include economic activities and substantial contribution criteria aiming for the substitution of hazardous substances and the development of safer alternatives. Additionally, experts from academia and independent initiatives notice that already adopted criteria related to the chemical sector, particularly the crucial 'Do-No-Significant-Harm (DNSH) criteria on PPC', neglect important aspects of the 'Chemicals Strategy for Sustainability'. In contrast, industrial actors perceive the adopted criteria as overly stringent as well as misaligned with the chemical sector's capabilities. This resulted in a comparatively low percentage of taxonomy-eligible and -aligned activities within the chemical industry, limiting the differentiation of progressive companies and their access to green capital. The 'European Chemical Industry Council' has called for the 'EU Taxonomy' to consider sector-specific circumstances and technological requirements more strongly, advocating for fair starting conditions and better comparability across sectors. To overcome the discrepancies between the status quo and potential impact of the 'EU Taxonomy' on the transition pathway of the European chemical industry, the research employs a transdisciplinary Delta-Analysis. Via interviews and workshops, the project actively engages diverse actors from industry, academia, EU directorates and working groups to collaboratively develop practical solutions to bridge the gap. The study also cooperates with 'Independent Science Based Taxonomy (ISBT)' to jointly evaluate and propose new criteria for sustainable activities related to the chemical sector. Preliminary findings suggest that adjustments in the structure, mechanism and criteria of the 'EU Taxonomy' as well as tools promoting the assessment of criteria and activities can be valid options for improvements. The implications of this research are significant for policymakers, as they highlight the need for a more applicable regulatory framework and compatibility with other related regulatory frameworks and strategies. By providing actionable recommendations for better practicability and usability, the study aims to enhance the role of the 'EU Taxonomy' in promoting the development and implementation of safer and more environmentally sound chemicals. This not just impacts the manufacturing but also the downstream application of chemicals and provides a prerequisite for toxic-free value cycles.

**Keywords:** EU Taxonomy, sustainable finance, chemical strategy for sustainability, circular economy, policy recommendation

## Expanding the Global Circularity Protocol to Scope 4 Avoided Materials

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### Abstract

While Scope 4 emissions—defined as avoided greenhouse gas (GHG) emissions enabled by a product or service—remain outside formal carbon accounting standards, the conceptual framework offers valuable potential when applied to material use in the context of the circular economy. This paper proposes an adaptation of Scope 4 logic to quantify avoided material throughput, focusing on how circular strategies reduce reliance on virgin resource extraction and waste generation compared to linear production models.

The proposed framework defines Scope 4 material impact as the difference between material inputs in a baseline linear scenario and those required in a circular system, using the formula:  $\text{Avoided Material Use} = \text{Baseline Linear Input} - \text{Circular System Input}$ . This enables companies and policymakers to account for the resource savings resulting from circular interventions such as product reuse, remanufacturing, recycling, product-as-a-service models, and shared infrastructure. For example, remanufactured components can displace new material inputs (e.g., steel and aluminium), and reusable packaging systems can avoid cycles of single-use plastics or paperboard. This approach aligns with Material Flow Analysis (MFA), Life Cycle Assessment (LCA), and emerging EU metrics like the secondary material use rate under the Circular Economy Action Plan.

The benefits of this Scope 4-style accounting for materials include greater visibility into the systemic resource efficiencies enabled by circular practices, support for decoupling strategies, and better integration into policy and sustainability reporting frameworks. However, key challenges include defining credible baseline scenarios, addressing rebound effects, ensuring functional equivalence, and managing life-cycle trade-offs across environmental dimensions. To mitigate these risks, the framework recommends reporting avoided material impacts separately from operational resource use, disclosing all assumptions, and aligning with standardized LCA and MFA methodologies. The study concludes by calling for further development of sector-specific guidelines and integration into voluntary sustainability standards to formalize avoided material accounting in corporate and policy contexts. This contribution offers a conceptual and methodological foundation for expanding circular economy metrics beyond material intensity and recycling rates—toward a more impact-oriented, systems-level understanding of material decoupling.

**Keywords:** circular economy, global circularity protocol, circular scope 4, avoided materials

## **Bridging the Knowledge-Implementation Gap Between Academia and Business: The Global Circularity Protocol**

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### **Abstract**

The circular economy (CE) is increasingly recognized as one of the most promising paradigms for achieving absolute decoupling of economic growth from material consumption and environmental degradation, particularly when implemented in accordance with the waste hierarchy, the Ellen MacArthur Foundation's Butterfly Diagram, and the 10R framework (Reike et al., 2018; EMF, 2013). However, widespread adoption is hindered by the lack of standardised and widely accepted reporting frameworks that enable companies to measure and communicate the true environmental benefits of circular strategies. To address this, the World Business Council for Sustainable Development (WBCSD) is currently developing a Global Circularity Protocol, modelled after the success of its Greenhouse Gas Protocol, the world's most widely used voluntary GHG accounting standard—even in jurisdictions without mandatory disclosure (WBCSD, 2004; WBCSD, 2023). The Global Circularity Protocol proposes a multi-scope structure analogous to GHG accounting—Scope 1 (internal), Scope 2 (supply chain), Scope 3 (use phase), and Scope 4 (avoided virgin material extraction)—to track and report companies' circular material footprints across life-cycle stages. Yet, significant challenges remain in aligning this corporate reporting ambition with scientific standards of environmental impact quantification, particularly in translating CE actions into measurable life-cycle environmental outcomes.

This study explores the question: *How can the knowledge-implementation gap between academia and business be bridged in quantifying the environmental impacts of circular economy strategies?* The research employs a mixed-methods design combining a systematic literature review, expert interviews, and multi-stakeholder focus group workshops. Participants include members of the WBCSD Circularity Protocol Working Group, its scientific advisory board, and additional actors identified through snowball sampling. The study contributes to the co-design of an actionable, science-based CE accounting framework by integrating corporate needs with methodological rigour from environmental life cycle assessment (LCA) and material flow analysis (MFA).

Findings aim to inform the ongoing development of the Global Circularity Protocol and support broader efforts to embed CE principles into corporate sustainability and policy-making practices. Ultimately, the paper argues that robust, transparent, and comparable CE reporting—aligned with environmental impact metrics—is crucial to avoid rebound effects, greenwashing, and to steer investments towards genuinely circular business models. Further, the current academic contributions of developing more than five hundred frameworks and indicators to measure circularity are criticised as ineffective, since they happen mostly without broader corporate stakeholders or standardisation organisations. Future research should investigate further how to achieve more collaboration between the academic and corporate world around other environmental like all planetary boundaries and also social issues.

**Keywords:** global circularity protocol, corporate ESG reporting, circular metrics and indicators

## Financing Sustainability by Green Bonds

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### **Abstract**

Green Bonds play a crucial role in mobilizing capital for sustainable development, helping to address climate change and environmental challenges while providing financial returns.

The aim of the presentation will be to explain what green bonds are, how they work and how it is embedded in the present legislation in EU.

1. What are Green Bonds?  
Definition of Green Bonds: Explain what Green Bonds are and their purpose.
2. Standards for Green Bonds  
Certification and Standards: Explain the role of certifications like ICMA Standard vs EU GB Standard.
3. Regulatory specifics of the distribution of Green Bonds  
Verification and Compliance: The challenges related to ensuring compliance obligations.
4. European Green Bonds  
EU Green Bond Standard (EU GBS): framework providing clear criteria for issuers and investors to ensure that the funds are used for genuinely green projects.

**Keywords:** green bonds, green financing, EU GBS

## 6. Policies for SCP and a Circular Society

### **Agri-Food Systems in Sustainability Transition: Current Developments in the Use of the Multi-Level Perspective to Understand Local Contexts**

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#### **Abstract**

The transition to sustainable agri-food systems (AFS) is a critical global challenge that requires a comprehensive understanding of the socio-technical dynamics influencing change. The Multi-Level Perspective (MLP) has been widely adopted by scholars to analyze sustainability transitions studies. According to the Multi-Level Perspective, sustainability transitions result from interactive processes occurring within and between three analytical levels: niches, socio-technical regimes, and the socio-technical landscape. However, the rapid expansion of literature on Agri-food sustainability transitions, evolving discussions on interactions between Multi-Level Perspective levels, and persistent ambiguities in conceptualizing these levels necessitate a systematic review of literature.

This systematic review provides a comprehensive overview of how the Multi-Level Perspective has been applied in agri-food sustainability transition research. Specifically, it examines how the concepts of niches, regimes, and landscapes have been understood, conceptualized, and operationalized. Niches discussed in the reviewed literature include agroecology, organic agriculture, permaculture, conservation agriculture, integrated farming, and alternative food networks. Regimes are typically represented by industrial and conventional agriculture, although these are often poorly defined and inconsistently operationalized. Landscape level is frequently overlooked; when it is addressed it refers to international trends and developments.

Several scholars have noted the inadequacy of transition pathways in the Multi-Level Perspective for the agrifood sector. Furthermore, transition impacts are rarely examined, and the sustainability of niches and by extension, the transitions themselves tend to be overlooked. Much of the literature inherits the Multi-Level Perspective's generalizability while lacking robust empirical grounding in the application of the niche, regime, and landscape concepts.

This study employs the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) methodology to systematically analyze articles published between 2010 and the present in Scopus-indexed journals. A hybrid concept-driven and data-driven coding approach will be used to extract key insights. Many researchers noted, there is a clear need for a more integrated conceptualization and operationalization of Multi-Level Perspective elements to better reflect the complexity of sustainability transitions in agri-food systems. Combining the Multi-Level Perspective with complementary frameworks has proven valuable, particularly in advancing discussions of agency at the landscape level. Nonetheless, conceptual clarity around the regime and landscape levels remains limited, and deeper theoretical elaboration is required.

Preliminary findings suggest the MLP proves particularly useful in studies combining it with complementary frameworks, especially in exploring the concept of agency at the landscape level. The landscape level, however, typically receives the least attention, focusing mostly on immaterial characteristics. Persistent conceptual ambiguities around regime and landscape levels remain, highlighting the need for more robust theoretical elaboration. Moreover, analyses rarely address the impacts of transitions, and research frequently neglects the sustainability evaluation of niches and transitions. Policymakers should prioritize alignment across the different MLP levels when addressing grassroots sociotechnical innovation to enhance the efficacy and sustainability of agri-food transitions.

**Keywords:** sustainability, transitions, agriculture, food system, multi-level perspective (MLP)

## **Economic Incentives to Increase Consumer Repairs in Sweden: Perspectives from the Repair Sector**

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### **Abstract**

To enable the transition to a circular economy, one key strategy is to prolong the lifespan of products and components by supporting repair practices. However, the repair of consumer products has become increasingly rare in recent decades, and previous research has established that it is unlikely that consumer repairs will increase significantly without policy interventions.

One key barrier to consumer product repairs is high costs (Sonego et al., 2022). The European Union Member States have pursued different approaches to make these repairs more economically attractive to consumers. These interventions include repair funds, direct repair subsidies, and tax deductions (Reimann, 2024). Sweden has implemented tax deductions to support repairs, but there is limited evidence that this has increased repairs, and consumer awareness about the tax deductions still seems low (Almén et al., 2021). Furthermore, research on the topic is still limited. Alternative policies Sweden could pursue include a proposed general right to a tax deduction for repairs (“hyber deduction”).

To address research gaps, an interview study was conducted with Swedish repairers in three sectors: bicycles, smartphones, and white goods. The study aimed to examine if the number of consumer repairs is increasing or decreasing; if the current tax deduction has any effects, and; what kind of economic policy interventions repairers prefer as means of support. Furthermore, while policies supporting repairs are expected to stimulate growth in the repair sector, previous discussions with repairers suggest this may not necessarily be the case. Therefore, repairers were also asked if they were interested in expanding their businesses, and how the repair sector can attract more workers in the future.

Thirty-six semi-structured interviews were conducted with repairers in three Swedish cities. The results showed that smartphone repairs have decreased compared to five years ago, while repairs of white goods and bicycles are increasing. Several potential explanations exist for these trends.

The hyber deduction was the preferred policy intervention across all sectors. Repairers of white goods and smartphones are more interested in expanding their businesses compared to bicycle repairers, and several reasons for this were identified. There was widespread concern about the difficulty of attracting skilled workers to the repair sector, both now and in the future. Key factors for changing this include: increasing the status of the professions, higher profit margins, creating more attractive repair facilities, and better educational programs. While many policymakers expect that policies will increase repairs and drive growth in the repair sector, our findings suggest that this is not straightforward. Consumers need economic incentives that are easy to understand, guide them towards repairing, and make repairing the economically rational choice. The repair sector also needs supportive policies with low administrative costs, as well as policies that enhance the attractiveness of becoming a repairer. The study thus shows how challenging it is to mainstream new consumer behaviors, as well as the supply of these services to support the transition to a more circular economy, without a well-designed policy mix.

**Keywords:** repair, policy, circular economy, Sweden, European Union

## **Unpacking the Role of Cooperating Stakeholders in Promoting the Circular Economy Transition Through Building Regional Ecosystems: A Comparison Between Three Dutch Regions**

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### **Abstract**

Regions across the Netherlands abound in all types of bottom-up initiatives and activities to promote the circular economy (CE). In part, these efforts fit in - and are driven by - (sub)national CE strategies. However, many efforts also seek to push the circular transition beyond the scope and ambitions of (sub)national policy and regulations. This results in a mushrooming of active regional 'ecosystems', in which businesses, communities, authorities, intermediaries and other stakeholders cooperate in activities and projects to bring about a (more) circular economy within the region in question. These ecosystems facilitate new forms of advocacy, coordination, and exchange. Moreover, these ecosystems are instrumental in reconfiguring chains and loops of materials and goods, and in experimenting with new practices and standards.

We still lack a systematic understanding of how these collaborative efforts between proximate stakeholders at the regional level emerge and function. Furthermore, we still have insufficient insights into how they can best contribute to the wider transition towards a circular economy, and what may be done to fully realise their potential in this regard. This paper addresses these gaps by comparing the development and performance of three Dutch cases of such regional ecosystems (Arnhem-Nijmegen, Friesland and Twente), based on extensive fieldwork of stakeholder interviews, as well as document analysis. Our findings reveal that while exchange, advocacy and many often transcend regional boundaries, as sites of collaboration the ecosystems are strongly territorially rooted. We discuss the way this rooting manifests commonalities, as well as differences, zooming in on stakeholder roles, collaboration models, funding arrangements, and the underlying narratives and values that guide them. We use theories on 'collaborative governance' the 'effectuation' framework from entrepreneurial studies to interpret our findings, and draw lessons on how bottom-up initiatives and strategies may foster broader transition policies.

**Keywords:** circular economy, regional ecosystems, collaborative governance, effectuation

## **A Long Road Ahead? Evaluating the New R2R Directive**

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### **Abstract**

Repair, as a restorative practice that extends product lifespan, has gained significant importance in achieving a circular economy. In response, the European legislator introduced Directive 2024/1799 (hereinafter R2R Directive) to promote certain forms of repair among consumers and strengthen their role in the green transition. My main question is to what extent the R2R Directive has succeeded in making repair more accessible and appealing to consumers. To answer this, I apply a doctrinal legal analysis to explore the content and objectives of the R2R Directive, focusing on its provisions through the lens of consumer protection and competition law. The research also draws on selected policy papers and legal scholarship to contextualize the Directive within the broader EU regulatory framework for circularity. I first identified the major obstacles preventing consumers from accessing or choosing repair. These include a lack of information, limited competition, and legal barriers such as industrial property regulations and insufficient incentives in consumer protection rules. I then examined how two legal domains—consumer protection and competition law—intersect within the directive. The consumer protection provisions aim to improve transparency and establish repair as a more viable remedy, both as a liability option for sellers and as an obligation for manufacturers. On the competition law side, manufacturers are required to provide spare parts for a limited range of goods listed in the 2nd Annex and are prohibited from restricting repair for these products. The results of my analysis shows that although the Directive includes promising tools—such as enhanced consumer information obligations and a longer legal guarantee period following repair—these instruments are applied narrowly and lack the systemic force needed to shift consumer behavior or market dynamics. The limited product scope, the unaltered industrial property framework, and the lack of substantial reform to the legal guarantee regime mean that many structural barriers to repair remain intact. In conclusion, while the Directive contains important elements that may contribute to more repair-friendly consumer markets, it ultimately does not provide the legal depth or coherence required to make sustainable consumption a stable and enforceable principle within EU consumer law. The idea of sustainability, although present, remains peripheral rather than embedded in the foundations of the consumer protection regime.

**Keywords:** consumer protection, competition, right-to-repair, circular economy

## **Towards Adoption of Reusable Food Packaging Schemes in the EU: A Legal and Policy Analysis with Development Perspectives**

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### **Abstract**

The accelerating growth of food-related sectors, such as food delivery, increased the strategic importance of the food packaging industry while also raising concerns about the environmental impact of its waste. Packaging industries generate approximately 2% of the Gross National Product (GNP) in developed countries, half of which are food related. When it comes to food packaging, EU policies primarily emphasized food safety, overlooking environmental concerns and favouring single-use packaging. This trend is changing with new regulations such as the 2025 Packaging and Packaging Waste Regulation (PPWR) which repeals the Packaging and Packaging Waste Directive (PPWD). According to circular economy principles, the reuse of products emerges as a preferable approach over recycling or disposal. This research aims at analysing EU Reusable Food Packaging (RFP) current and future policies, favouring a consumer sustainable consumption. Literature analysis finds that currently RFP systems are relegated to small niche retailers and some barriers are regarding safety and quality issues, user behaviour and reverse logistic flow. The PPWD included and favoured reusable packaging policies but being a directive, the implementation was up to the member states (Thapliyal et al, 2024). This might change with the new PPWR, that includes more specific measures, also due to a harmonization necessity under art. 114 TFEU (European Parliament, A9-0319/2023). These systems do require a shared responsibility from public policies, business investments and consumer attitudes and social acceptance, which might be a challenging issue. The research adopts a qualitative interdisciplinary approach with a review of the past and current policy and regulatory frameworks. The proposed methodology is law-measurement for policy evaluation (Tremper et al, 2010), which combines social and legal sciences to measure the effects of governmental policies. The data will be empirically collected from (1) EU laws and policies, including the 2025 PPWR; (2) Implementation across member states; (3) Stakeholders influence in the policymaking process; (4) General observations related to the subject. These data provide valuable insights and findings on motivations, barriers, perceptions, influences on the adoption of RFP schemes policies and laws. This research is embedded in a broader three-level analysis of RFP schemes adoption in the EU that analyses also business and technological advancements and consumer behaviour and social acceptance. Expected results might indicate that (1) EU needs more specific policies to implement RFP at a mass level; (2) Policy gaps and differences between member states could delay the effective implementation of RFP schemes across the EU; (3) Stakeholders lobbying might be a barrier to the effective implementation of RFP schemes at least until they become economically sustainable. The objectives of this research are in identifying the critical areas where regulatory harmonisation and policy innovation are needed to foster the adoption of RFP schemes across the EU, considering that the PPWR will become applicable by August 2026. By offering a legal and policies analysis that considers the complexity of policymaking, this study contributes to advancing the EU's transition to a circular economy, addressing both the environmental and societal dimensions of sustainability.

**Keywords:** reusable food packaging, EU circular economy policies, EU food law and policies, sustainability social acceptance, ecological transition.

## **“How to Do Gender?” - Critical Policy Document Analysis of the Manifestation of Gender in Swedish, Icelandic, Finnish and Lithuanian Climate Policy Institutions**

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### **Abstract**

It is widely recognised that gender sensitivity and intersectional knowledge are essential for an equitable and just climate transition, and the goals outlined in the European Green Deal make European states key actors in realising a just transition. This study explores how gender, alongside with other additional social categories such as class and location, is made relevant and understood in Swedish, Icelandic, Finnish and Lithuanian national climate policies and climate institutions. The Nordic countries' public image as leaders in both gender equality and climate action makes them a compelling point of comparison. In contrast, Lithuania, due to its period of political suppression, has had a comparatively shorter timeframe to implement EU-aligned gender and climate policies and continues to require more time for these values to be fully internalized by society. Comparison of gender and climate policy interconnections of Baltic and Nordic countries remains rare in the literature, indicating a research gap. The study explores how governmental authorities responsible for energy and transport, understand and work with gender equality. The study is grounded on a critical policy analysis of 106 policy documents collected from 22 key climate policy-making institutions. The documents include climate-related national and EU-level regulation, strategies and reports. Through this comparative critical policy analysis, the research examines how femininities or masculinities are expressed and what type of knowledge is privileged in key climate policies to make silent practices and path dependencies visible. The policy documents were analysed using the qualitative data analysis software NVivo. The policy document data is supported by mapping gender representation of key climate institutions, which offers a way to explore the material aspect of gender equality in said authorities. The study relies on feminist institutionalist framework and scrutinises the manifestation of gender from the perspective of a change of paradigm in European climate policy. This is connected to the rise of circular economy in the EU's climate agenda, and the implications that the shift in paradigm has gender equality wise. The preliminary results of the analysis show that national climate policies in studied countries have limited gender perspectives. Gender seems to be even more invisible in national regulation, as most connections of gender and climate policy remain on the strategy level. The results indicate that despite the European Green Deal's goal of "leaving no one behind", the selected countries' national climate policies emphasise the technical nature of climate transition, neglecting not only gender equality but also comprehensive understanding of intersecting differences and their relevance in the face of the climate crisis.

**Keywords:** Nordic, Baltic, gender equality, national climate regulation, EU/The European Green Deal

## Talking Circular Economy in Hungary: Lessons from Citizen Science

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### Abstract

In general, the efficiency and productivity of Circular Economy (CE) approaches have been viewed as great contributions that have impacted the achievement of the Sustainable Development Goals, (SDGs), however with specific challenges from one country to another. For instance, in developing countries, circular economy has been characterized as the best way forward in the socio-economic transformation and in transition from the crises of global environmental change. On the other hand, developed countries such as the western European countries have used circular economy approaches as a means of economic remediation and consolidation on the gains of socio-economic development already achieved. While circular economy has provided the best alternatives with productive indicators in some European countries, it remained under-utilized in other countries. Though, based on obtainable realities, each country in the EU zone is expected to design its circular economy approaches but then not underestimating the overall agenda instituted in the EU circular economy model and Action Plan. Therefore, this ongoing research study was designed to scientifically evaluate the effectiveness and impacts of the Hungarian circular economy policy program. To do this, we examined the impacts of the circular economy policy on Hungarian waste management sector, and the general acceptance and involvement of citizen activities and pro-environmental behaviours. By evaluating citizen perspectives, the paper explores the interconnections between citizen science and circular economy approaches in Hungary. Pro-environmental behaviours were sampled among Hungarian residences. A quantitative research method was adopted; with the use of electronically designed semi-structured questionnaire which was randomly distributed across the Hungarian residences in a way that all residence has equal chances of participating in the survey. Through the public survey, we elicited information from the citizens, and examined how the Hungarian circular economy approach has contributed to sustainable waste management.

**Keywords:** circular economy, sustainable development, waste management, circular economy policy, environmental governance

## **How the Deposit Return Scheme (DRS) Changes Hungarian Attitudes on Plastic Waste Recycling**

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### **Abstract**

Plastic materials have become a commodity in our daily lives. Exposure to plastic waste and its antecedent negative impacts on environment and human health is evidently increasing and rapidly, on a global scale. Scholars have established elaborate data and experimental facts on global plastic pollution subjected to hit all year's highest by 2030. In the same manner, the challenges posed by this increasing plastic pollution have been scientifically proved to exceed current management capacity unless there is a globally unified policy framework to checkmate production of plastic materials; and institutionalize responsible and protected consumption. As a result, the European Union institutionalized the "European Strategy for Plastic in a Circular Economy in January 2018". This transnational strategy aimed at addressing plastic pollution and promote recycling through an effective extended producer responsibility that tends to put the responsibility of plastic waste management on both the manufacturer and the consumer. As a result, the Hungarian government in his 2023 Decree of the 450/2023 (X.4) initiated a policy framework on Deposit Return Scheme, (DRS). The Hungarian DRS was designed to checkmate plastic waste pollution by placing responsibility on manufacturers to embrace sustainable packaging, at the same time introduced a deposit refund of 50HUF on all plastic and glass packaged products. This ongoing research study was designed to investigate how the introduction of the DRS in December 2023, has been able to change Hungarian attitudes to plastic waste management, and sustainable consumption. The research survey is still gathering sample opinions across the country and is expected to be concluded by June 2025. Our research is scientifically bias to plastic waste management and Hungarian perspectives on the DRS. A quantitative research method was adopted; with the use of electronically designed semi-structured questionnaire which was randomly distributed across the counties and cities in a way that all residence has equal chances of participating in the survey. Through the public survey, we would elicit information from the citizens and examined how they perceived the DRS and how it has affected their attitude to plastic waste recycling, and sustainable consumption.

**Keywords:** deposit return scheme, plastic waste, recycling, sustainable development, Hungary

## **Let's Reshape EPR - For a Game Changing Policy Tool That Supports Prevention, Reuse, Separate Collection and High-Quality Recycling**

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### **Abstract**

Extended Producer Responsibility (EPR) has become a cornerstone of European environmental policy for managing post-consumer waste, based on the polluter-pays principle and shared responsibility between producers, municipalities and waste operators. While current schemes have contributed to improved separate collection and recycling performance, their real potential to drive circular economy outcomes remains largely untapped. In practice, the design and governance of EPR systems result in a narrow focus on end-of-life treatment rather than product redesign, waste prevention, reuse and high-quality closed-loop recycling. Weak regulatory oversight, limited stakeholder participation, fragmented implementation across Member States, inadequate cost coverage, and insufficient eco-modulation of fees undermine the incentives for circular product innovation. Furthermore, loopholes relating to exports and online marketplaces generate widespread free-riding and externalisation of waste management burdens outside the EU.

In this paper, we propose a redefinition of EPR as a systemic lifecycle policy tool rather than a downstream waste management mechanism. We outline legislative reforms needed within the ongoing revisions of the Waste Framework Directive and the Packaging and Packaging Waste Regulation to strengthen governance, harmonise fee structures, broaden cost coverage to include prevention and reuse, and ensure transparent, enforceable participation of all relevant actors in the value chain. We argue that PROs should adopt missions aligned with the waste hierarchy, supported by harmonised eco-modulation criteria, progressive fees discouraging overproduction, and mandatory reinvestment mechanisms for circular infrastructure. Finally, we highlight the need to integrate EPR with complementary instruments—such as deposit return systems and fiscal measures (e.g. virgin resource taxation and VAT modulation)—to ensure market signals are coherent and aligned with environmental objectives. Implemented together, these reforms would enable EPR to become a genuinely transformative lever for circularity, significantly reducing environmental impacts while accelerating Europe's transition to a low-carbon, resource-efficient economy.

**Keywords:** extended producer responsibility, circular economy, eco-modulation, product governance, waste prevention

## **Beyond Servitisation and the Right to Repair: Advancing Towards a Frugal Circular Economy**

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### **Abstract**

EU law has advanced less material-intensive consumption through, among others, servitisation and the right to repair. While these measures enhance resource efficiency, they primarily optimise existing consumption rather than reduce it. This paper explores whether Europe is ready for a circular economy integrating frugality and sufficiency. It assesses EU legislation, identifies policy gaps, and proposes regulatory innovations to enable a true low-consumption economy.

**Keywords:** sustainable consumption, frugality, sufficiency, European consumer law, right to repair.

## **Pillars of the Green Transition: Regulatory Architects and The Legal Imperative for a Circular EV Battery Value Chain**

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### **Abstract**

The global climate crisis has reached a critical inflection point, with 2024 poised to become the hottest year on record, temporarily breaching the 1.5°C warming threshold above pre-industrial levels. Transportation stands as one of the largest emitters of greenhouse gases globally, notably being the only sector where emissions have consistently risen since 1990. Decarbonizing this sector is thus a central pillar of global climate action, primarily driven by EV adoption. The EU's "Fit for 55" policy package and national incentives, underscore the bold climate action being undertaken in the transport sector. The pursuit of ambitious net-zero transportation goals by the European Union and Norway, primarily through widespread electric vehicle adoption, presents a critical, yet potentially overlooked, environmental vulnerability: the management of end-of-life batteries, that could inadvertently undermine the very success of this transition. Specifically, does the systemic mismanagement of end-of-life lithium-ion batteries constitute a material breach of environmental sustainability principles, thereby jeopardizing the legitimacy of the green transition itself?

However, the significant environmental benefits derived from EVs during their operational life are jeopardized by the inherent challenges within their battery value chain, particularly at the end-of-life stage. Projections indicate that over 12 million tons of lithium-ion batteries will retire globally by 2030. The production of these batteries necessitates the extensive extraction of critical minerals such as lithium, nickel, and cobalt through mining practices, which are associated with substantial emissions. As EV batteries reach their typical 8-10 year lifespan, current deficiencies in disposal systems threaten to generate vast quantities of hazardous waste.

The methodology of this paper utilizes established theoretical frameworks influential in legal systems. These interpretative theories elucidate underlying commonalities, subdivisions of legal institutions, and their position within the broader legal system. This contributes to a deeper comprehension of the legal order and fulfils a critical gap-filling role.

Addressing these issues mandates a robust transition from a linear "take-make-waste" economic model to a circular economy for EV batteries. This paradigm shift involves transforming end-of-life batteries from waste streams into valuable secondary resources through advanced recovery processes and maximizing their utility via second-life applications. This analysis contends that legal and policy instruments are pivotal in driving this essential systemic shift, thereby ensuring that transitional environmental impacts do not undermine broader climate goals. The EU Battery Regulation, which came into force in July 2023, represents a landmark legislative achievement, establishing the first comprehensive EU regulatory framework governing the entire battery lifecycle. While circular business models are undeniably essential, they operate within the constraints of market incentives, technological feasibility, and economic structures. Without a robust regulatory framework, business-led initiatives remain fragmented, voluntary, and vulnerable to market uncertainties.

This article argues that the Regulation is the true enabler of systemic change. This research aims to contribute to the development of a more coherent legal framework for a sustainable and circular EV battery value chain. The role of government, the state, or the EU in tackling this issue is paramount and multifaceted. Policymakers, through legislation and governance, serve as the architects of circularity, providing the legal certainty and economic incentives necessary for businesses to invest in sustainable practices. This article concludes that the EU Battery Regulation is the main driver in achieving a circular ecosystem for EV batteries, yet its ultimate success hinges on the collective efforts of all stakeholders. Policymakers not only address the immediate challenges of EoL battery management but also lay the groundwork for a more resilient and sustainable EV industry.

**Keywords:** EU law, environmental law, sustainability, circular economy, electric vehicles

## **Elektrowin - 20 Years of Successfully Fulfilling the Obligations of Electrical Equipment Producers**

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### **Abstract**

ELEKTROWIN a.s. is the largest collective system for WEEE (waste electrical and electronic equipment) in the Czech Republic, operating as a non-profit producer responsibility organisation since 2005. It is authorised to handle all categories of electrical equipment and photovoltaic panels, fulfilling legal obligations under the End-of-Life Products Act.

Over two decades, Elektrowin established and continuously expands a national take-back network with more than 11,700 collection points, partnering with municipalities, retailers, service providers, NGOs, and voluntary firefighters. This outreach enables accessible and safe return of appliances across the country.

As of 2024, Elektrowin has collected over 730,000 tons of appliances (approx. 42 million units), achieving notable environmental impact: material recovery and reuse have led to the reduction of CO<sub>2</sub> emissions, prevented the extraction of crude oil, and saved hundreds of millions of kWh of electricity. Recovered metals, plastics, glass, cables, and other materials are reintroduced into production, reinforcing circular resource flows and reducing primary resource extraction.

Elektrowin's operations are grounded in transparent financing via visible fees, equal conditions for all producers, and competitive tendering of logistics and treatment partners. The organisation is guided by a robust integrated management system—certified to ISO 9001, ISO 14001, and ISO 27001—ensuring quality, environmental stewardship, data security, and process efficiency.

The company is committed to minimising environmental impacts, implementing smart digital processes, continuously improving recycling quality beyond legal requirements, and supporting innovative technologies that reduce its carbon footprint. It also issues environmental impact certificates to its partners, quantifying benefits such as the lower impact of recycling compared to primary extraction.

Beyond infrastructure, Elektrowin invests in societal engagement and social value through education and reuse initiatives. Over 4,000 schools participate annually in environmental awareness programmes such as „Recycle Games / Let's Clean Up the World“ project (Recyklohraní), and through „Recycle with firefighters“ (Recyklujte s hasiči), volunteer firefighters facilitate take-back in smaller communities. The innovative 'I Am Back' project redistributes fully functional, inspected appliances to social organisations—more than 1,200 appliances have been provided to date.

By integrating strategic take-back infrastructure, high-quality recycling, responsible governance, stakeholder education, and social reuse, Elektrowin exemplifies how collective systems can deliver substantial environmental and social outcomes. It demonstrates a model of circular economy that connects extended producer responsibility with measurable climate benefits, transparent governance, and the involvement of local communities. This model is relevant to the European framework aiming to strengthen sustainable patterns of production and consumption.

**Keywords:** take-back, WEEE, reuse, recycling

## 7. Education and learning for SCP and a Circular Society

### Using Behavioural Elements in a Circular Audit Course as Part of a Change in Approach to Sustainable Behaviour

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#### Abstract

The research community is increasingly pointing to the need to positively influence society, including enterprises, towards sustainable development. The author of the paper therefore wonders whether this positive impact can be achieved through the way the circular audit course is designed. This course (i.e. standardized training for auditors) would include, in addition to the classical elements of the circular audit that are necessary for its successful implementation, the use of behavioural elements to move the enterprises more effectively towards sustainable behaviour. Such use of psychological and sociological aspects would be found in particular in the identification of circular opportunities, in influencing towards positive material flows and a positive product life cycle, and in solving ethical dilemmas in circular auditing.

The main objective of the paper is to show the potential of preparing a circular audit course in the area of using behavioural tools in the moving enterprises towards sustainable behaviour. This objective corresponds to the basic question that the author asks, i.e. whether circular auditing can be implemented better, i.e. more efficiently. By this effectiveness is meant the aforementioned better influence of enterprises towards sustainable behaviour.

The main methods used in the paper are recherche, comparisons and descriptions. The author has analysed data from scientific articles, publications and similar sources focusing on soft elements of management and their applicability to sustainable development and sustainable business behaviour, circular economy, sustainability and legislative standards addressing sustainable business behaviour.

The preliminary results show that there is great potential for the use of behavioural methods to move enterprises towards sustainable behaviour when developing a circular audit course.

**Keywords:** circular audit, sustainable behaviour, behavioural elements, enterprise transformation, effectiveness in auditing.

## **Integrating Regenerative Design and Cultural Heritage: Advancing Sustainable Fashion Education**

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### **Abstract**

This study examines the evolution of sustainable “green fashion” knowledge using innovative pedagogy steps on upcycling, remaking and redesigning. The research explores the use of recycled textile waste in fashion design, using inspirations drawn from Hakka ceramics and glaze colours, combining elements of traditional culture with contemporary sustainable practices. The research is based on the principles of circular economy and Kolb's (1984) experiential learning theory, which promote the regenerative use of resources and learning through experience and reflection. These frameworks inform the pedagogical approach, encouraging students to dig deep into materials, culture, and sustainability. Through innovative clothing designs that are SDG (Sustainable Development Goals) aligned and reflect sustainable practices, students then hand weave using basic tools and manual weaving techniques. The methodology is a mixed-methods, action-research design that utilises participatory workshops, critical diaries, and pre-/post-intervention surveys. For 12 weeks students return piles of textile waste and design clothes based on Hakka ceramic patterns, and through reflexive journals chart their emotional and intellectual journeys. Surveys track changes in perceptions towards the environment, and creative self-efficacy, while material ethnography treats the garments as cultural artefacts that translate environmental and cultural narratives. They show significant improvements in students' creativity, environmental awareness, and cultural sensitivity. By enmeshing themselves with the waste materials and traditional domain of Hakka aesthetics, students develop an embodied kind of knowledge, an internal mechanism of permanence of understanding—the visceral and, at times, contrary to what they have been academically conditioned by, understanding of sustainability that goes beyond the confines of theory. The message of sustainability is also presented through cultural heritage acting as a catalyst. Hakka ceramic motifs of hexagonal patterns representing unity become metaphors for ecological interconnectivity, connecting past resourcefulness to present circularity. This cultural resonance bolsters students' empathy across generations and reimagines sustainability as a conversation across generations. Expected conclusions imply that this method not only promotes sustainability design teaching but also serves as a model for emotional sustainability education. By embedding abstract SDGs in tactile, culturally rich praxis, the study fosters sustainable becomings rather than providing sustainability as skill set. The study highlighted the novel potential of merging traditional cultural elements, such as Fijian dress practices with modern sustainable practice

**Keywords:** regenerative design, recycled textiles, green fashion, SDGs, hakka culture, innovative teaching strategies

## **Bridging the Knowledge Gap in Circular Economy: The Role of Education and Awareness for SMEs**

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### **Abstract**

Circular economy emerges as an innovative business model that promotes sustainable resource management, waste minimization, and long-term competitive advantage. For Small and Medium-sized Enterprises (SMEs), transitioning to circular economy practices is not only crucial for environmental sustainability but also essential for integrating into international markets, particularly within the framework of the European Green Deal. However, a significant number of SMEs lack sufficient knowledge about circular economy principles, which may create resistance in the implementation process. Awareness and education are, therefore, critical factors in facilitating SMEs' adaptation to circular economy models.

This study aims to assess the level of awareness among SMEs in Turkey regarding circular economy practices and analyze how the lack of awareness affects their transformation processes. To ensure comprehensive geographical and socio-economic representation, the study will utilize a stratified random sampling method. Turkey is categorized into seven geographical regions, each exhibiting distinct socio-economic development levels. From each of these seven regions, one province will be selected according to its socio-economic characteristics, resulting in seven provinces representing diverse developmental contexts. Within these provinces, SMEs will be randomly selected across different sectors to participate in the survey. This approach will enable the assessment of regional differences in awareness and preparedness for circular economy adoption, while ensuring data diversity from various sectors and company profiles. The structured questionnaire will include indicators related to knowledge levels, attitudes toward circular practices, perceived barriers, and readiness to implement circular solutions. Collected data will be analyzed using descriptive statistics and regression analysis to examine correlations between awareness levels and operational behavior. Furthermore, the study will explore the influence of sectoral characteristics, regional disparities, and technological readiness on awareness, providing a foundation for designing tailored capacity-building programs. In addition to measuring awareness, the research will also assess SMEs' willingness and capacity to adopt actual circular practices such as material reuse, eco-design, and cleaner production technologies.

Expected findings suggest that limited awareness and lack of structured training hinder SMEs' transition to circular business models, leading to slower transformation and potential loss of competitiveness. The results are expected to contribute to strengthening collaboration among industry, government, and academia in the development of sector-specific education strategies and incentive mechanisms. Moreover, by identifying regions and sectors where the knowledge gap is most critical, the study aims to enable more effective interventions and guide policy decisions to support real business transformation and circular economy integration.

Ultimately, this study aspires to provide valuable insights for policymakers, academics, and business stakeholders to enhance circular economy awareness and foster practical readiness among SMEs for circular transition.

**Keywords:** circular economy, SMEs, sustainability, awareness, education

## Repairing Products & Minds: The Case of ReuseLAB in Denmark

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### Abstract

The Die Kringwinkel model, a network of social enterprises in Belgium focused on reuse, recycling, and social employment, achieves the highest WEEE repair rate in Europe, refurbishing approximately 20% of collected products—compared to approximately 1% in Denmark.

The Danish ReuseLAB Bornholm initiative (2022-2028) is part of the EU-funded Circular Economy Beyond Waste (CEBW) project. It is a multistakeholder collaboration involving businesses, academia, civil society, and the public sector. ReuseLAB aims to adapt and assess the 'Kringwinkel Model' in Denmark, with the goal of exploring nationwide implementation. In addition to promoting reuse and waste prevention on Bornholm, the project supports labour market integration by involving students from FGU Bornholm, an institution that helps young people at the margins of education and employment.

Students assess and repair WEEE products collected from a local waste station, which are then resold by a local business—extending product lifecycles, reducing environmental impact, and reinforcing social values. By bridging the knowledge gap in technical repair skills and aligning with the Right to Repair movement, ReuseLAB exemplifies a circular transition that transforms waste into economic and social value.

A transition from a linear to a circular economy requires participatory approaches and real-life examples involving local communities. ReuseLAB builds on Aalborg University's internationally recognized problem-based learning (PBL) approach, which facilitates learning processes where students work directly to analyze and solve real-life problems—often in close collaboration with local communities and stakeholders.

The program is being evaluated through a mixed-methods approach, including surveys, logbooks, direct observations, and focus group interviews. Preliminary findings show that WEEE products are screened, repaired, and resold, while participants develop both technical and entrepreneurial skills through tailored educational materials. The experience has provided insights into brands, energy types, and the condition of the products. Additionally, the project has led to the establishment of a logistics process with the waste management company and the private sector, fostering new partnerships among traditionally siloed sectors. The focus for 2025 will be on increasing student enrolment and the number of machines available for sale, with an expectation of continuous deliveries of 3–5 units at a time, from the school to the local business.

Challenges remain, including high spare part costs, logistical limitations, and complex repairs. Additionally, many FGU students face personal challenges that impact their ability to fully engage in repair work. Therefore, success should be measured not only by the number of repaired products but also by students' personal growth, motivation, and readiness for education or employment.

The project demonstrates that cross-sector collaboration between municipalities, education institutions, and businesses can create viable reuse and resale models, actively involving young people in the green transition. To assess the model's full impact and explore its potential for nationwide implementation, further testing and data collection will continue until spring 2026.

**Keywords:** circular economy, waste management, repair, reuse, PBL in youth education

## **Sustainability and Sustainable Development Goals in Marketing Education: An Exploratory Study in Canada**

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### **Abstract**

Sustainability is a highly pressing issue as we face global challenges relating to climate change, natural resource depletion, poverty, and social inequality. The United Nations has championed the framework of 17 Sustainable Development Goals (SDGs) which require commitment from key stakeholders, including governments, businesses, communities, and higher education institutions. A new generation of business managers are expected to display sustainability competencies and leadership attributes to implement sustainability and address the SDGs. To stay relevant, business schools must integrate sustainability and the SDGs in their education programs. However, in business education, especially in marketing discipline, there is little research on how instructors interpret sustainability and the SDGs and whether and how they address and would like to address these concepts in their teaching. Although some past studies have shed light on some marketing instructors' opinions towards sustainability and its integration, their interpretation of sustainability and the SDGs in the context of marketing education is still under-researched. This study used one-on-one semi-structured interviews to explore the perspectives and practices of marketing instructors in higher education institutions across Canada. To ensure the quality of data collected, the research participants were chosen according to three criteria: they must be currently teaching at a higher education institution in Canada at the time of the interview, have taught marketing in their subjects for at least one year, and be a full-time faculty at the time of the interview. Participants were teaching at higher education institutions in Canada, comprising six from the west, two from mid-Canada, and seven from the east, thus providing a relatively representative sample. The thematic analysis using NVivo identified mixed understandings of sustainability and the SDGs in relation to marketing education. The misconception of sustainability as a concept embracing only or mainly environmental aspects still exists. Moreover, while some instructors see the SDGs as a guide for their syllabi, others see them as disconnected and unrelated to their course materials. Varied perceptions are translated into different practices with regard to whether and how they integrate sustainability and the SDGs into teaching. Of note, experiential learning is the most commonly used in teaching about sustainability and the SDGs. Based on different levels of interest and different approaches to teaching sustainability and the SDGs, we were able to categorize sustainability-active and inactive instructors. The study also provides insights as to the personal, institutional, and external factors affecting the transformation of marketing education towards sustainability and the SDGs. Of importance, factors motivating individuals to champion sustainability and the SDGs in teaching are identified. It is further noted that opportunities for transforming marketing education in light of sustainability and the SDGs could only be realized with adequate support, professional development, and leadership. How institutional and external factors interplay with personal factors and agendas is key. The study provides useful implications on sustainability integration in marketing education and offers strategic recommendations for marketing educators and business schools in revamping business programs to effectively address SDG 4: Quality education and to produce business graduates who can demonstrate sustainability competencies.

**Keywords:** sustainability, sustainable development goals, SDG 4: quality education, marketing education, Canada

## **Integrating Education for Sustainable Development (ESD) with Organic Box Scheme Deliveries: Perspectives of Early Childhood Care Facilities in a Multi-Stakeholder Co-Creation Process**

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### **Abstract**

In response to the global challenges of today, the United Nations Sustainable Development Goals (SDGs) highlight the need for education for sustainable development (ESD) (Goal 4) and the promotion of sustainable consumption and production (Goal 12). Aligning with these objectives, this research project explores business model innovation for organic box scheme providers, focusing on fruit and vegetable boxes while integrating early childhood ESD through collaborations with childcare facilities. In the presentation we will look at how to integrate the perspective of early childhood care facilities in a multi-stakeholder co-creation process to develop a collaborative service offering. Organic produce delivery via box schemes is a well-established business model in organic agriculture. Many providers already maintain relationships with childcare facilities, supplying food and occasionally offering educational activities. However, these initiatives are often ad hoc rather than integrated into a cohesive service offering. The overall research project seeks to develop an innovative marketing strategy and business model for organic box scheme services that aligns sustainable food consumption with early childhood education, hence creating economic and social value. In an explorative phase and as part of the multi-stakeholder process the research project applies a mixed-method approach to gain insights from relevant stakeholders - parents, box scheme providers and childcare facilities - on the proposed collaborative offering. The presentation shows preliminary findings from case studies and qualitative interviews with childcare facilities, exploring their experiences, attitudes, and expectations regarding the integration of organic box deliveries with ESD. Preliminary results reveal common and context-specific challenges, such as funding mechanisms, infrastructure gaps, and varying levels of staff engagement. These insights underscore the importance of localized yet scalable models. The study highlights the untapped potential of existing box scheme collaborations. Although many institutions already cooperate in either food provision or education, few integrate both in a structured way. This gap presents a significant opportunity for developing comprehensive, co-created solutions that promote sustainable habits early in life. Findings from the explorative phase, including that of the research with childcare facilities, will serve as the foundation for a subsequent co-creation phase that will later follow as a separate element of the overall research project. In a structured workshop key stakeholders - childcare facilities, organic box providers and parents - will collaboratively develop a viable business model using design thinking methodologies, leading to the creation of a prototype service that will undergo empirical evaluation for feasibility and effectiveness. As the study is of explorative character and still in process, findings are not intended to be representative. Instead, they offer depth and diversity by capturing perspectives from different institutional types and operational models. By focusing on real-world experiences and involving stakeholders in design processes, the research ensures that proposed service models are grounded in feasibility and shaped by those implementing them. The study also reinforces the role of early education environments in fostering lifelong sustainable behaviours and links education with tangible systems change in food delivery and consumption. Ultimately, this study offers valuable insights for policymakers, educators, and businesses seeking to align economic viability with sustainability and education goals.

**Keywords:** education for sustainable development, sustainable consumption and production, multi-stakeholder cooperation, organic box scheme services, sustainable business model innovation

## **Contributions of the Critical Theory of Technology and the Theory of the Social Construction of Technology to the practice of Slow Design**

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### **Abstract**

A contemporary design approach must bring together issues that address socio-environmental, political and economic concerns, as it seeks to reposition the design focus on the trinity of individual, socio-cultural and environmental well-being. The evolution of design practice from the perspective of the Critical Theory of Technology (CTT) and the Social Construction Theory of Technology (SCOT) can show some propositions to the design method that respect such influence. It considers both design action in a purely technical scope, as well as complex problems whose design development reaches a great influence of cultural tradition in the practice of design. Therefore, this research sought to identify issues that motivate the way in which the designer influences or is influenced by social, environmental, economic, political and cultural aspects in a society, when carrying out design project. The model presented has as an exploratory environment the group formed by master's students from two Brazilian Universities. In this methodological context of action, a proposed course aimed to investigate the applicability of knowledge learned in concepts previously structured and analyzed regarding issues related to CTT and SCOT under the approach of slow design of products and services. The actions were proposed through design exercises for methodological analyzes of the knowledge in question. The results were collected through exploratory research involving bibliographical research, individual interviews and focus groups, field research, observational case studies, which focused on work carried out in the classroom with the application of new methodological proposals regarding the design project, as well as action research. Content analysis allowed us to identify and analyze elements that corroborate with the proposal of this study. The presented action model based on previously structured research and concepts offers methodological, theoretical and practical suggestions and tools for evaluating and acting on current design issues related to sustainable production, to achieve environmental, sociocultural, individual and economic performance objectives. The study demonstrated that concepts such as CTT and SCOT, supported by the slow design approach, contribute to developing products based on a more sustainable production and consumption model when individual and historical-cultural performance are combined with environmental, social and economic performance. The analysis takes place based on the research carried out and the work developed, with the aim of discussing the relationship between slow design, CTT and SCOT for teaching design, in addition to showing how sustainable elements of a product can also be found in the rituals they provide. In this way, important aspects for teaching design are highlighted, such as the reinterpretation of materials and issues related to functionalities from the users' perspectives. The possibility of making users participants in the process allows their real motivations/needs to be met, making it possible to develop fluid changes that adapt to different cultural, social and economic scenarios. Furthermore, by offering visibility to the creative process to connect cultural and social values with individual values, it opens up spaces for new ways of perceiving other scenarios, people and technologies.

**Keywords:** design, sustainable consumption, project method, slow design, technology

## Training on Circular Design: The Experience of CIRCO Hub Portugal

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### Abstract

This presentation describes the results of an action-oriented training programme, CIRCO Hub Portugal, targeting manufacturing companies responsible for the design of their products, as well as professional designers. It followed a cooperation agreement between the project leader in Portugal, LNEG, and CLICKNL, the Dutch organization that had developed the CIRCO training method in 2015 under the motto "Creating business through circular design" and subsequently internationalized the programme. The objective of CIRCO is to apply design thinking to maximize circular economy impact among businesses, to support a successful transition to a circular economy.

In the case of CIRCO Hub Portugal, 96 companies from various sectors, represented by 274 professionals, participated in 12 training actions, which consisted of online trainings distributed in three days throughout one month, plus autonomous work, totalling 22 hours. The training was organized in three design phases: (i) initiation (to discover circular opportunities by describing an existing value chain and identifying hotspots in terms of environmental and economic losses and opportunities), ideation (creating circular business and design ideas and developing tangible concepts) and implementation (checking the feasibility and developing a roadmap for implementation).

A shorter version the training was conducted targeting designers; however, this presentation concerns the 96 companies' training only and it aims at presenting the results of a survey which objective was to understand the characteristics of the participants and the impact of CIRCO Hub Portugal, organised as follows: (i) characterisation of the company; (ii) description of the product selected as a departure point for the training; (iii) motivations to participate; (iv) benefits resulting from the participation (v) internal and external communication; (vi) status of implementation of the new solutions developed during the training; (vii) circular business models and design strategies applied to develop the solutions; (viii) obstacles for implementation; and (ix) recommendations.

The response rate was very high (75%, 71 companies). The replies are undergoing statistical analysis (frequency analysis as well as contingency tables to evaluate associations between variables in the surveys), but some preliminary results are:

- Most of the respondents (64%) were SME's.
- 63% met the three established success criteria (one related to the impact on knowledge and two related to implementation).
- Among respondents for whom there was a time span of at least 6 months between the training and the survey, 76% continued working in the solutions, out of which 34% were prototypes and 19% had reached the market.
- The majority (70%) of the developed new business models were related to repair, second-hand selling, and recovery of materials, followed by the classic long-life model (19%). Only in 11% of the cases the proposed solutions referred to performance- or access-based business models.
- There were identified obstacles for implementation related to the institution and market levels, to the value chain level and to the organizational level.

This presentation is expected to contribute better understand the determinants for success of training actions on design for circularity. Moreover, it will discuss obstacles and opportunities and provide recommendations for an effective implementation of circular products and business models.

**Keywords:** circular economy, design, business models, training, CIRCO project

## Exploring the Impact of Repurpose-Driven Design on Circular Economy Awareness and Competence Development

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### Abstract

The concept of the circular economy advocates for reusing and recycling materials to reduce reliance on virgin resources and minimize waste. However, current product designs are often not yet focused on circularity, and recycling systems are still developing. Research shows that repurposing discarded products and materials can extend the lifespan of materials and reduce the need for new resources. Repurpose-driven design presents unique challenges, such as variability in material availability and quality. Additionally, the design process begins with a material rather than a product idea. Therefore, a novel framework with innovative tools has been developed. These tools are well-suited for teaching circular economy design principles and emphasizing the importance of material reuse across multiple educational stages. This research explores how repurpose-driven design contributes to circular economy awareness and competence development among high school students, bachelor's degree students in design engineering, and design professionals. For high school students, a lesson pack was developed to support both teachers and students in exploring circular economy concepts. This pack was created in collaboration with six high schools and two national educational institutions, undergoing multiple iterations and testing throughout the development process. The lesson pack allows teachers to select from a variety of lessons and levels tailored to classroom contexts or individual student needs, thereby supporting differentiated instruction. The pedagogical approach combines collaborative and project-based learning, engaging students in meaningful, real-world tasks that foster both teamwork and individual development. Key learnings for students were an introduction to alternative design processes and core circular economy principles. The material is grounded in a constructivist approach, encouraging students to build knowledge through hands-on activities and reflection. Teachers also noted the value of the material in integrating design competencies into existing curricula. For bachelor's degree students in design engineering, a specialized course was developed to teach the process of repurpose-driven design. The course enhanced their design competencies and equipped them with the skills to apply circular economy principles in real-world design settings. Evaluations indicated that the course improved students' ability to navigate the evolving design landscape. For design professionals, a repurpose-driven framework, with design tools and masterclasses was developed to offer in-depth insights into the circular economy and equip them with tools to start the design process using discarded materials. These masterclasses impacted not only the designers but also the organizations they work for, motivating them to adopt circular design strategies. Key findings indicate that professionals gained practical insights into circular design methods, refining their design processes and strengthening their organizations' sustainability strategies. Both the lesson pack for high school students and the repurpose-driven design tools for design professionals are currently being developed into online lifelong learning modules, freely available in both Dutch and English. The lesson pack will initially be available in Dutch, with translations into additional languages planned. The professional tools will also be disseminated through a national network organization via train-the-trainer programs to ensure wider adoption and impact.

**Keywords:** repurpose-driven design, circular economy, circular design, education

## Acknowledgments



### **Komerční banka, a.s.**

Komerční banka is the parent company of the KB Group and a member of the Société Générale financial group. It ranks among the three largest banks in the Czech Republic, offering a wide range of retail, corporate, and investment banking services. As the strongest corporate bank on the Czech market, KB provides its clients not only with standard banking products and services, but also with tailored advisory, sophisticated banking solutions, and guidance in areas such as ESG and subsidies.

KB's strategic ambition is to be the leader in supporting and financing sustainable investments in the Czech market. In 2024, the bank concluded new contracts for investment loans classified as ESG-beneficial with a total value of CZK 20.4 billion. The integration of sustainability is reflected not only in the bank's own operations and in the financing of sustainable projects, but also in its support and partnerships with initiatives such as our conference.



### **SUEZ Group**

SUEZ Group faces growing environmental challenges and has been providing essential services that protect and improve quality of life for more than 160 years. The company delivers innovative and resilient water and waste management solutions that help cities, businesses, and communities safeguard resources and adapt to climate change. With 40,000 employees across 40 countries, SUEZ works closely with its clients to create value throughout the lifecycle of their assets and services, while supporting their transition to low-carbon technologies and more sustainable business models.

In 2024, the Group supplied safe drinking water to 68 million people worldwide and provided wastewater services for 44 million people, underlining its role as a global leader in water stewardship. It also generated 8 TWh of renewable energy from waste and wastewater, turning challenges into new opportunities for circularity and energy recovery. In the same year, SUEZ achieved revenues of €9.2 billion, confirming its strong position as a key partner in building a more sustainable future.



#### **AquaRD Sp. z o.o.**

For over 23 years, AquaRD has specialized in modern measurement and transmission technologies for the water and wastewater sector. The company delivers complete projects – from design and implementation to integration and long-term support – and has completed more than 2,800 projects with over 250 clients. For two decades, AquaRD has developed its proprietary CellBOX devices, providing full control over system performance and continuous optimization.

The company focuses on protecting water resources and minimizing losses, constantly refining algorithms to reduce pump energy use and limit water loss. By applying digital tools and integrating databases, AquaRD helps utilities manage assets more effectively and make informed decisions. Through sponsoring the conference, the company emphasizes its commitment to innovation and sustainable water management.



#### **Recovera Využití zdrojů a.s.**

Recovera Využití zdrojů, part of the Veolia group, represents its Waste division in the Czech Republic. The company provides advanced waste processing and utilization solutions for industrial enterprises and municipalities, combining multiple technologies. With over a thousand employees and a skilled team, Recovera offers complete outsourcing in waste management. Its Neutralization and De-emulsification station in Brno treats liquid waste and transforms it into safe outputs and usable components – the third such facility in the Czech Republic. Recovera prioritizes recycling and energy recovery.

Through Veolia, operating on five continents with 215,000 employees, the group supplied 111 million people with drinking water, 98 million with sanitation, produced 42 million MWh of energy, treated 65 million tonnes of waste in 2024, and achieved consolidated revenue of €44.7 billion.



#### **PSG Construction a.s.**

The PSG Group is a major general contractor and one of the leading suppliers of reinforced concrete prefabricated structures in the Czech Republic. Over the past year, it has further expanded its service portfolio to include technical building systems and its own design office. PSG's construction experts, operating production plants in Prague, Brno, Ostrava, and Otrokovice, specialize in building industrial, storage, and logistics halls as well as public facilities such as shopping centres, sports and cultural halls, schools, and healthcare or nursing facilities.

PSG also has experience in residential construction. Last year, the PSG construction group celebrated its 100th anniversary, as its roots can be traced back to the construction department of Tomáš Baťa's shoe empire.



**SEWACO s.r.o.**

SEWACO has been delivering modern and sustainable solutions in water management, energy, and digitalization for over 30 years. Its mission is to help cities, regions, and businesses use resources efficiently and reduce environmental impacts. With an experienced and flexible team, SEWACO provides services ranging from innovations in drinking water and wastewater management, energy audits, and advanced monitoring to digital tools and analyses. A key part of its work is also funding consultancy that enables clients to implement projects with tangible environmental benefits. By linking technical innovation with the principles of the circular economy and sustainable consumption, SEWACO contributes to a more resilient and sustainable future. The conference is further supported by



**ENVIROS, s.r.o.**

ENVIROS, member of the Komerční banka Group, is a consulting company providing advisory services in sustainability, ESG, energy management, environmental protection, and subsidies. The company helps industrial clients, state authorities, and financial institutions implement efficient, low-carbon, and sustainable solutions. ENVIROS operates across the Czech Republic, Slovakia, and other European and international markets, collaborating with major organizations such as the United Nations, European Commission, OECD, EBRD, and World Bank. With a team of over 70 experienced professionals, including certified energy specialists, the company combines technical expertise with practical experience to help clients implement and finance sustainable and efficient solutions worldwide.

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