ISSN: 2338-8412 e-ISSN : 2716-4411

Ekombis Review – Jurnal Ilmiah Ekonomi dan Bisnis
Available online at : https://jurnal.unived.ac.id/index.php/er/index
DOI: https://doi.org/10.37676/ekombis.v13i3

Circular Economic Analysis Of The Goroho Banana Processing Industry At Smes In Manado City Towards A Green Economy: A Case Study Of Kios Saraba Doa Ibu

Steefra D. Mangkay [1], Angel Helda Semuruk [2], Yuliana Mose [3], Ingrid Novelia R. Sembiring [4]

[1]Study Program of Management Faculty Of Iptek & Keguruan, Universitas Trinita, Indonesia
[2] Study Program of Primary Teacher Education Faculty Of Iptek & Keguruan, Universitas Trinita, Indonesia
[3] Study Program of Computer Systems Faculty Of Iptek & Keguruan, Universitas Trinita, Indonesia
[4] Study Program of Public Health Faculty Of Health Science, Universitas Trinita, Indonesia

Email: [1] steefra.diane.mangkay@gmail.com ;[2] angel_semuruk@gmail.com
[3] yulimose@gmail.com ;[4] ingridnovelia.inrs@gmail.com

How to Cite :

Mangkay, S, D., Semuruk, A, H., Mose, Y., Sembiring, I, N, R. (2025). Circular Economic Analysis Of The Goroho Banana Processing Industry At Smes In Manado City Towards A Green Economy: A Case Study Of Kios Saraba Doa Ibu. EKOMBIS REVIEW: Jurnal Ilmiah Ekonomi Dan Bisnis, 13(3). DOI: https://doi.org/10.37676/ekombis.v13i3

ARTICLE HISTORY
Received [25 November 2024]
Revised [07 July 2025]
Accepted [09 July 2025]

KEYWORDS
Circular Economy, Goroho Banana, MSME, Green Economy.

ABSTRACT

This research aims to analyze the application of the circular economy concept in the Goroho banana processing industry at the Micro, Small, and Medium enterprises (MSME) level, with a case study of Kios Saraba Doa Ibu in Manado City. This study uses a qualitative approach based on in-depth interviews and observations to identify resource and waste management practices and development potential to improve business sustainability. The analysis results show that Kios Saraba Doa Ibu still faces various challenges in implementing the circular economy, primarily in handling banana peel waste and using cooking oil management. However, there are significant opportunities for waste utilization and the Development of value-added products that can support the transition of this MSME towards more sustainable business practices. Strategic recommendations include improving the owner's knowledge capacity, investing in waste processing technology, and developing circular business models suitable for the local MSME context. This study is the first to integrate circular economy approaches with waste management in goroho banana processing at Manado City urban, generating an innovative analytical framework for sustainable MSME development.

INTRODUCTION

Circular economy and sustainable Development are two concepts that have emerged in the past few decades. These two concepts concern academics, policymakers, and other stakeholders such as private companies striving to make their processes and products more sustainable. Schöggl et al. (2020) examined how these two terms are interrelated and how they have been discussed in the literature over the past two decades. Sustainable Development can be seen as aligned and consistent with the circular economy, as it is associated with social, environmental, and economic aspects. Even Aragon'es et al. (2024) cite Saidani et al. (2017) as stating that this concept actively pursues both financial benefits, such as value creation and cost savings from the use of fewer raw materials, and positive environmental and social impacts, such as reduced negative environmental impacts and the creation of new jobs.

In the transition towards a green economy, applying the circular economy concept is becoming increasingly important as a solution to address environmental and economic problems simultaneously. The circular economy is an economic model that emphasizes the efficient use of resources through the principles of reduction, reuse, and recycling and aims to minimize waste and negative environmental impacts. One sector with significant potential for the application of the circular economy is the food processing industry, particularly the processing of Goroho bananas (Musa acuminafe sp), which is a leading commodity in several regions of Indonesia.

Manado City, as the capital of North Sulawesi Province, has excellent potential for developing a local commodity-based food processing industry. One of the leading commodities that has become a culinary and economic icon for the community is the Goroho banana. Goroho banana processing MSMEs in Manado City have proliferated in recent years. However, the majority still operate on a conventional basis without fully considering the aspects of sustainability and resource efficiency.

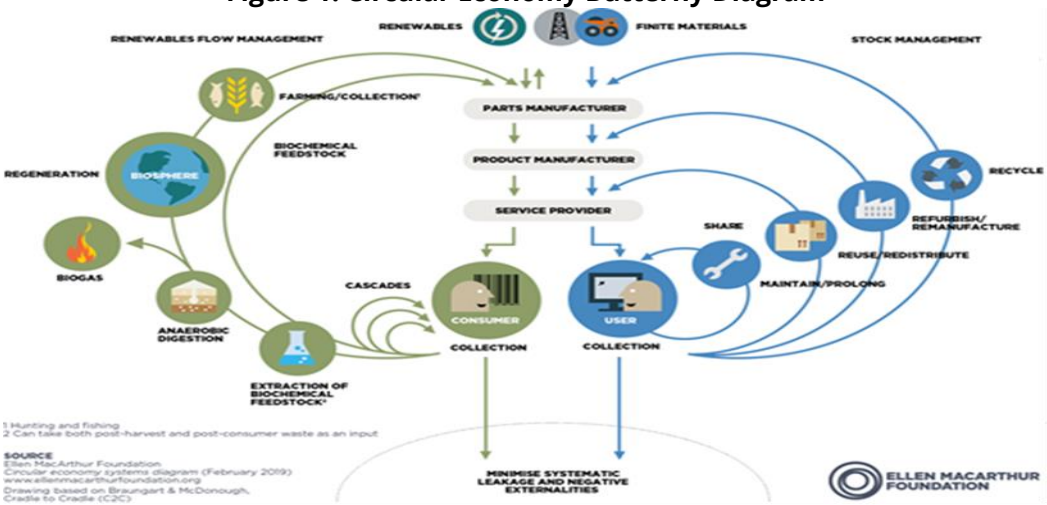
This research aims to analyze the application of the circular economy concept in Goroho banana processing MSMEs in Manado City, with a case study of Kios Saraba Doa Ibu, one of the critical MSMEs in the North Manado region. The analysis will cover identifying resource and waste management practices, the potential for waste utilization, and developing more sustainable business models.

LITERATURE REVIEW

The circular economy is a system in which materials never become waste, and nature can regenerate itself. In a circular economic system, products and materials continuously circulate through various processes such as maintenance, reuse, repair, remanufacturing, recycling, and composting. The circular economy addresses climate change and other global challenges, such as the loss of biodiversity, waste problems, and pollution, by decoupling economic activity from the dependence on limited resources. In the current linear economic system, we take materials from the Earth, make products from them, and ultimately dispose of them as waste. In contrast, we prevent waste from the beginning in a circular economy. Figure 1 shows the 'Butterfly Diagram' that illustrates the continuous flow of materials in a circular economy.

The diagram of the circular economic system, known as the Butterfly Diagram, illustrates the continuous flow of materials in the circular economy. There are two primary cycles - the technical cycle and the biological cycle. In the technical cycle, products and materials circulate through various processes such as reuse, repair, remanufacturing, and recycling. In the biological cycle, the nutrients from naturally biodegradable materials are returned to the Earth to regenerate nature (Ellen Macarthur Foundation, 2024).

Figure 1. Circular Economy Butterfly Diagram



Ravikumar et al. (2024) cite the core ideas of Wiprächtiger et al. (2023), who state that the circular economy is becoming increasingly popular because it applies principles that are well-established in industrial ecology, waste management, and systems thinking (Reike et al., 2018; Winans et al., 2017; Gertsakis & Lewis, 2003; Ghisellini et al., 2016). Specifically, the principles of the circular economy about closing material cycles by using waste materials from one product for another, minimizing material and energy consumption, and reducing waste during the product life cycle, shifting to renewable energy sources, and maximizing product lifespan, are deeply rooted in industrial ecology (Wiprächtiger et al., 2023; Saidani et al., 2020).

The circular economy is also popular because it is accessible to practitioners and industry (Saidani et al., 2020; Lüdeke-Freund et al., 2018), can generate environmental and economic benefits by reducing the material intensity and waste associated with economic activities (World Economic Forum, 2024), and can generate social benefits such as increased employment, health benefits, and reduced exposure to pollution (Andooz et al., 2023).

The acceptance of the circular economy by policymakers (European Commission, 2020; Geng et al., 2012) and industry has driven research on the identification and classification of indicators, for example, End-of-Life Recycling Rate, resource duration indicators (Saidani et al., 2019; Moraga et al., 2019; Parchomenko et al., 2019; Padilla-Rivera et al., 2021; Galatti & Baruque-Ramos, 2022; Pitkänen et al., 2023; Luthin et al., 2023; Niero et al., 2021), to measure the material, environmental, and social benefits of the circular economy. Circular economy indicators provide objective measures, as well as rapid guidance and feedback (Alaerts et al., 2019; Franklin-Johnson et al., 2016) to help stakeholders, such as policymakers, conservationists, technologists, and companies, align their conservation strategies, product design, government policies, and corporate performance with the principles of the circular economy.

METHODS

This research was conducted from August to September 2024 using a qualitative approach with a case study method. Qualitative research is research that intends to understand the phenomena of what is experienced by the research subjects, such as behavior, perceptions, motivations, actions, etc., holistically and using descriptions in the form of words and language in a specific natural context and by utilizing various natural methods (Moleong, 2014; Sugiyono, 2015). The qualitative approach was chosen to obtain an in-depth understanding of how the circular economy concept is applied and interpreted by MSME actors in the context of the Goroho banana processing industry. The case study method was used to comprehensively analyze the application of the circular economy at Kios Saraba Doa Ibu in Manado City as a

representation of MSMEs in this industry.Knowing the application of the circular economy principles at the MSME level is expected to create added value, improve resource efficiency, and support business sustainability. Recent studies show that adopting circular economy practices in food MSMEs in developing countries still faces challenges, such as limited knowledge, infrastructure, and economic incentives. Here is the translation into academic English:

Data Collection

The research data was collected during August 2024. The research data was collected through three data collection techniques, namely:

1. In-depth Interviews
   a. Interviews were conducted with the owner of Kios Saraba Doa Ibu to understand the perspectives, experiences, and practices of implementing the circular economy from the perspective of MSME actors.
   b. The interview questions covered the business background, production processes, waste management, challenges, and development potential related to the circular economy.

2. Field Observations
   a. The researchers conducted direct observations at Kios Saraba Doa Ibu to see firsthand the processing, waste management, and other practices related to the circular economy.
   b. Field observations allowed the researchers to obtain additional data and verify interview information.

3. Document Review
   a. The researchers reviewed relevant documents, such as government regulations, MSME development programs, and other initiatives supporting the circular economy's implementation.
   b. The document review was conducted to enrich the analysis of the context and policy framework that influences MSMEs in implementing the circular economy concept.

Data Analysis

The data analysis in this study uses a combination of three techniques, namely:

1. Thematic Analysis
   a. Interview, observation, and document review data were analyzed inductively to identify patterns, themes, and meanings that emerged regarding applying the circular economy concept in the Goroho banana processing industry.
   b. This technique helps researchers explore in-depth the practices, challenges, and potential for implementing the circular economy experienced by MSMEs.

2. Narrative Analysis
   a. The interview data with the owner of Kios Saraba Doa Ibu was analyzed using a narrative approach to understand how MSME actors interpret, narrate, and frame their experiences in implementing the circular economy concept.
   b. Narrative analysis can reveal the personal, contextual, and interpretative aspects of the phenomenon under study.

3. Content Analysis
   a. All qualitative data, including interview transcripts, observation notes, and related documents, were systematically analyzed to identify the dominant or hidden concepts, ideas, and narratives related to implementing the circular economy.
   b. This technique can complement the understanding obtained from the thematic and narrative analyses.

Combining these three qualitative data analysis techniques allows researchers to understand the application of the circular economy concept in the Goroho banana processing industry at the MSME level. The results of the data analysis will produce wealthy and in-depth findings regarding the practices, challenges, and potential for implementing the circular economy in the specific context studied.

RESULTS

Profile of Kios Saraba Doa Ibu MSME

Kios Saraba Doa Ibu is one of the Goroho banana processing MSMEs operating for 7 years in Sindulang I District, Manado City. Mrs. Anisa owns and manages this business, which produces various Goroho banana-based products such as banana chips, fried bananas, and other traditional snacks. With an average production of 80 kg of Goroho bananas per day, this MSME is one of the many key players in the banana processing industry in the North Manado region.
Production Portfolio:
- Banana chips
- Fried banana products
- Traditional local snacks

Production Metrics:
- Daily raw material input: 80 kg Goroho bananas
- Daily product variety: 3-4 distinct product lines
- Estimated monthly production volume: Approximately 2,400 kg

Resource and Waste Management Practices

Solid Waste Management (Banana Peels)

One of the main issues Kios Saraba Doa Ibu faces is the handling of solid waste in the form of banana peels. Every day, this MSME generates around 20-25 kg of banana peels that have been discarded into the general waste. Meanwhile, Goroho banana peels have pectin and fiber content that has the potential to be processed into value-added products, such as raw materials for organic fertilizers or animal feed. The loss of economic potential from the disposal of banana peels is estimated to reach IDR 300,000 - IDR 400,000 per month.
Quantitative Waste Profile:
- Daily banana peel waste generation: 20-25 kg
- Current disposal method: General waste stream
- Potential value-added components:
  a) Pectin content
  b) Fiber composition
  c) Untapped biochemical potential

Economic Impact of Waste Mismanagement:
- Estimated monthly economic opportunity loss: IDR 300,000 - IDR 400,000
- Primary value streams left unexplored:
  a) Organic fertilizer production
  b) Animal feed supplement
  c) Biochemical raw material

Used Cooking Oil Management

In addition to solid waste, Kios Saraba Doa Ibu faces challenges in managing used cooking oil. Currently, the MSME owner adds new cooking oil to the used oil that has been reused repeatedly. This practice poses a health risk to consumers and harms the environment due to

improper disposal of used oil. This practice's estimated potential economic and environmental losses reach IDR 150,000 - IDR 200,000 per month.
Current Operational Practice:
- Repeated cooking oil reuse
- Incremental addition of fresh oil to used oil
- Lack of systematic oil replacement protocol
Risk Assessment:
- Health risks to consumers
- Environmental contamination
- Degradation of product quality
Economic and Environmental Implications:
- Estimated monthly economic and environmental losses: IDR 150,000 - IDR 200,000
- Potential negative externalities:
    a) Reduced oil quality
    b) Increased health hazards
    c) Environmental degradation

Analysis of the 7R Circular Economy

The analysis of resource and waste management practices at Kios Saraba Doa Ibu through the 7R circular economy approach reveals several findings:

1. Rethink
    a) Limited understanding of circular economy concepts
    b) Minimal awareness of waste valorization potential
    c) Need for strategic cognitive reframing
2. Reduce
    a) Inefficient waste reduction strategies
    b) Continuous addition of fresh cooking oil
    c) Lack of systematic waste minimization approach
3. Reuse
    a) Suboptimal utilization of banana peels
    b) Inefficient management of used cooking oil
    c) Missed opportunities for resource recovery
4. Recycle
    a) Absence of structured recycling mechanisms
    b) No established pathways for waste transformation
    c) Limited technical capabilities for waste recycling
5. Repair
    a) No systematic equipment maintenance practices
    b) Reactive rather than preventive maintenance approach
    c) Potential for increased operational efficiency through strategic maintenance
6. Refurbish
    a) No initiatives for equipment restoration
    b) Limited investment in technological upgrades
    c) Missed opportunities for operational modernization
7. Remanufacture
    a) Absence of product or component remanufacturing practices
    b) Linear production model predominates
    c) Potential for circular design transformation

Key Findings Summary:
    a) Significant untapped economic potential in waste streams

b) Critical need for circular economy knowledge transfer
c) Opportunities for technological and operational innovation
d) Potential for substantial economic and environmental value creation

DISCUSSION

Circular Economy Implementation and Practical Implications

The research findings reveal the strategic significance of Kios Saraba Doa Ibu in the context of MSME-level circular economy development. Compared to similar studies in the North Sulawesi coastal region, this enterprise demonstrates unique potential in Goroho banana waste management. Based on the 7R analysis, there are several opportunities to improve the implementation of the circular economy at Kios Saraba Doa Ibu, namely:

1. Banana Peel Waste Processing
   a) Production of bioenergy from banana peels (Chen et al., 2024)
   b) In the pharmaceutical sector to prevent chronic diseases and improve food quality (Hashim, Mehnaz, et al., 2024)
   c) Production of banana peel biochar, which is a solid carbon product produced through the process of pyrolysis (thermal decomposition under minimal or oxygen-free conditions) from banana peel waste (Mansoorsamaei, Zahra, et al., 2024).

   Conversion of 20-25 kg of banana peel waste daily potentially generates:
   a) Biochar: Estimated economic value of IDR 500,000 - IDR 750,000/month
   b) Organic fertilizer: Potential additional revenue of IDR 400,000 - IDR 600,000/month
   c) Pharmaceutical raw materials: The projected economic value of IDR 300,000 - IDR 450,000/month
2. Used Cooking Oil Management
   a) Production of washing soap (Soni, Himanshi et al., 2024)
   b) Development of more regular cooking oil replacement procedures
   c) Sustainable biodiesel production from used cooking oil using banana peel-Fe2O3/Fe2K6O5 magnetic biochar catalysts (Mansoorsamaei, Zahra, et al., 2024)

   Recycling strategies for used cooking oil offer potential benefits:
   a) Soap production: Estimated revenue of IDR 250,000 - IDR 350,000/month
   b) Biodiesel: Potential economic value of IDR 200,000 - IDR 300,000/month
3. Increasing the Knowledge Capacity of MSME Owners
   a) Education on the concept of the circular economy and its benefits
   b) Technical training on waste processing and resource management
   c) Assistance in designing circular technopreneur business models for the MSME level (Adiningrat et al., 2023)

Comparative Analysis with Similar MSMEs:

Unlike Adiningrat et al. (2023), which focused on theoretical aspects, this study provides a practical framework for circular economy implementation with direct empirical evidence from a business operator.

Theoretical and Practical Implications:

a) Developing an adaptive circular economy implementation model for small-scale MSMEs
b) Demonstrating the potential for transforming waste into economic resources
c) Providing an analytical framework that similar MSMEs can adapt

Implementing these steps will help Kios Saraba Doa Ibu reduce waste, improve resource efficiency, and create additional economic value while supporting the government's program toward a more sustainable green economy. This study is the first to integrate circular economy approaches with waste management in goroho banana processing at Manado City urban, generating an innovative analytical framework for sustainable MSME development.

CONCLUSION

This research shows that applying the circular economy concept in Goroho banana processing MSMEs in Manado City, especially Kios Saraba Doa Ibu, still faces various challenges. The management practices of banana peel waste and used cooking oil have not been optimal, indicating a gap in implementing circular economy principles. However, there is great potential for waste utilization and the Development of value-added products that can support the transition towards more sustainable business practices. Strategic recommendations include increasing the capacity of MSME owners, investing in waste processing technology, and developing circular business models suitable for the local context. The results of this research are expected to provide an empirical basis for stakeholders in designing more effective mentoring programs and policies to support Goroho banana processing MSMEs in implementing the circular economy.

LIMITATION

The research was conducted exclusively within Manado City, explicitly focusing on Kios Saraba Doa Ibu, which limits the generalizability of findings to other regional or national MSME contexts in banana processing industries. The localized nature of the case study restricts the broader theoretical extrapolation of circular economy implementation strategies. The research predominantly employed qualitative case study methodology, which inherently limits statistical generalizability. While providing rich contextual insights, the approach may need to capture the full quantitative complexity of circular economy interventions in MSMEs.

REFERENCES

Adiningrat, Andi Arifwangsa., Warda, 2023. The Development of Intensity Model on Technopreneurship to Improve Turnover in Micro, Small and Medium Enterprises (MSMEs) Culinary in Makassar, Indonesia. International Journal of Economics Development Research, Volume 4(1), 2023 pp. 372-382

Alaerts, L., Van Acker, K., Rousseau, S., De Jaeger, S., Moraga, G., Dewulf, J., De Meester, S., Van Passel, S., Compernolle, T., Bachus, K., et al., 2019. Towards a more direct policy feedback in circular economy monitoring via a societal needs perspective. Resources, Conservation and Recycling 149, 363–371. https://doi.org/10.1016/j.resconrec.2019.06.004

Andooz, A., Eqbalpour, M., Kowsari, E., Ramakrishna, S., 2023. Ansari Cheshmeh, Z. Acomprehensive review on pyrolysis from the circular economy point of view and its environmental and social effects. J. Clean. Prod. 388. https://doi.org/10.1016/j.jclepro.2023.136021

Aragon´es, Marta Macias., F´atima Arroyo Torralvo., 2024. How to select the best approach for circular economy assessment? 3D positioning framework, decision support tool and critical analysis for bio-based systems. Environmental Impact Assessment Review. Environmental Impact Assessment Review 106 (2024) 107493. Available online 23 March 2024. https://doi.org/10.1016/j.eiar.2024.107493

Chen, Long., Zhi Tu, Yongdong Chen, Jian Hu, Hong Wang, 2024. Bioenergy and value-added chemicals of banana peel waste (BPW): Deeper insights from thermal kinetics, thermodynamics, in-situ volatile products analysis, and bio-chars application for Cd(II) highly-efficient removal. Biomass and Bioenergy Volume 185, June 2024, 107238 https://doi.org/10.1016/j.biombioe.2024.107238

Ellen Macarthur Foundation. What is a circular economy? 2024. https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview (accessed 2024).

Europian Union. Financing the circular economy. 2020. https://circulareconomy.europa.eu/platform/en/financing-circular-economy (akses 2024)

Franklin-Johnson, E., Figge, F., Canning, L., 2016. Resource duration as a managerial indicator for Circular Economy performance. J. Clean. Prod. 133, 589–598. https://doi.org/10.1016/j.jclepro.2016.05.023.

Geng, Y., Fu, J., Sarkis, J., Xue, B., 2012. Towards a national circular economy indicator system in China: an evaluation and critical analysis. J. Clean. Prod. 23 (1), 216–224. https://doi.org/10.1016/j.jclepro.2011.07.005.

Gebhardt, M., Spieske, A., Birkel, H., 2022. The future of the circular economy and its effect on supply chain dependencies: empirical evidence from a Delphi study.Transportation Res. Part E: Logistics and Transportation Rev. 157 https://doi.org/10.1016/j.tre.2021.102570.

Gertsakis, J., Lewis, H., . Sustainability and the waste management hierarchy. 2003.

Ghisellini, P., Cialani, C., Ulgiati, S., 2016. A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems. J. Clean. Prod. 114, 11–32. https://doi.org/10.1016/j.jclepro.2015.09.007.

Hashim, Mehnaz., Ali Akbar, Zareen Gul, Muhammad Bilal Sadiq, Jahangir Khan Achakzai, Nazir Ahmad Khan, 2024. Fermentation impact: A comparative study on the functional and biological properties of Banana peel waste. Heliyon 10 (2024) e36095 https://doi.org/10.1016/j.heliyon.2024.e36095

Lüdeke-Freund, F., Gold, S., Bocken, N.M.P.A, 2018. Review and Typology of Circular Economy Business Model Patterns. J. Ind. Ecol. 23 (1), 36–61. https://doi.org/10.1111/jiec.12763; https://onlinelibrary.wiley.com/doi/epdf/10.1111/jiec.12763

Luthin, A., Traverso, M., Crawford, R.H., 2023. Assessing the social life cycle impacts ofcircular economy. J. Clean. Prod. 386 https://doi.org/10.1016/j.jclepro.2022.135725.

Mansoorsamaei, Zahra., Mowla, Darush., Esmaeilzadeh, Feridun., Dashtian, Kheibar., 2024. Sustainable biodiesel production from waste cooking oil using banana peel biochar-Fe2O3/Fe2K6O5 magnetic catalyst. Fuel Volume 357, Part B, 1 February 2024, 129821. https://doi.org/10.1016/j.fuel.2023.129821

Moraga, G., Huysveld, S., Mathieux, F., Blengini, G.A., Alaerts, L., Van Acker, K., de Meester, S., Dewulf, J., 2019. Circular economy indicators: what do they measure? Resour. Conserv. Recycl. 146, 452–461. https://doi.org/10.1016/j.resconrec.2019.03.045.

Moleong, Lexy, J.,2014. Metodologi Penelitian Kualitatif, Cetakan Ke-1, Bandung: PT Remaja Rosdakarya.

Niero, M., Jensen, C.L., Fratini, C.F., Dorland, J., Jørgensen, M.S., Georg, S., 2021. Is life cycle assessment enough to address unintended side effects from Circular Economy initiatives? J. Ind. Ecol. https://doi.org/10.1111/jiec.13134.

Padilla-Rivera, A., do Carmo, B.B.T., Arcese, G., Merveille, N., 2021. Social circular economy indicators: selection through fuzzy delphi method. Sustain. Prod. Consum. 26, 101–110. https://doi.org/10.1016/j.spc.2020.09.015.

Parchomenko, A., Nelen, D., Gillabel, J., Rechberger, H., 2019. Measuring the circular economy - A Multiple Correspondence Analysis of 63 metrics. J. Clean. Prod. 210,200–216. https://doi.org/10.1016/j.jclepro.2018.10.357.

Pitk¨anen, K., Karppinen, T.K.M., Kautto, P., Pirtonen, H., Salmenper¨a, H., Savolahti, H.,Schubin, E., Myllymaa, T., 2023. How to measure the social sustainability of the circular economy? Developing and piloting social circular economy indicators in Finland. J. Clean. Prod. 392 https://doi.org/10.1016/j.jclepro.2023.136238.

Ravikumar, Dwarakanath., Keoleian, Gregory A., Walzberg, Julien., Heath, Garvin., Heller, Martin C., 2024. Advancing environmental assessment of the circular economy: Challenges and

opportunities. Resources, Conservation & Recycling Advances 21 (2024) 200203. https://doi.org/10.1016/j.rcradv.2024.200203

Reike, D., Vermeulen, W.J.V., Witjes, S., 2018. The circular economy: new or Refurbished as CE 3.0? — Exploring Controversies in the Conceptualization of the Circular Economy through a Focus on History and Resource Value Retention Options. Resources, Conservation and Recycling 135, 246–264. https://doi.org/10.1016/j.resconrec.2017.08.027

Saidani, M., Yannou, B., Leroy, Y., Cluzel, F., 2017. How to assess product performance in the circular economy? Proposed requirements for the design of a circularity measurement framework. Recycling 2 (1), 6. https://doi.org/10.3390/recycling2010006.

Sch¨oggl, J.P., Stumpf, L., Baumgartner, R.J., 2020. The narrative of sustainability and circular economy - A longitudinal review of two decades of research. Resour. Conserv. Recycl. 163, 105073 https://doi.org/10.1016/J. RESCONREC.2020.105073.

Saidani, M., Yannou, B., Leroy, Y., Cluzel, F., Kim, H., 2020. How circular economy and industrial ecology concepts are intertwined? A bibliometric and text mining analysis. In: Online Symposium on Circular Economy and Sustainability, Alexandroupolis, Greece.

Soni, Himanshi., Monika Bhattu, Meenakshi Verma, Manvinder Kaur, Abdullah A. Al-Kahtani, Irfan Hussain Lone, Ajar Nath Yadav, Mohd Ubaidullah., 2024. From kitchen to cosmetics: Study on the physicochemical and antioxidant properties of waste cooking oil-derived soap. Journal of King Saud University - Science 36 (2024) 103483 https://doi.org/10.1016/j.jksus.2024.103483

Sugiyono, 2019. Metode Penelitian dan Pengembangan untuk Bidang Pendidikan, Manajemen, Sosial, Teknik. Cetakan ke-4. Bandung : CV. Alfabeta

Wiprächtiger, M., Haupt, M., Froemelt, A., Klotz, M., Beretta, C., Osterwalder, D.,Burg, V., Hellweg, S., 2023. Combining Industrial Ecology Tools To Assess Potential.

Winans, K., Kendall, A., Deng, H., 2017. The history and current applications of the circular economy concept. Renew. Sustain. Energy Rev. 68, 825–833. https://doi.org/10.1016/j.rser.2016.09.123.

World Economic Forum. Why the circular economy is the business opportunity of our time. https://www.weforum.org/stories/2022/05/why-the-circular-economy-is-the-business-opportunity-of-our-time/ (accessed 2024).