

CIRCULAR ECONOMY AND SUSTAINABILITY: EVIDENCE FROM SMALL BUSINESSES OF MILWAUKEE

Alyssa M. Markley Konopa, University of Wisconsin-Superior
Dr. Sakib Mahmud, PhD, Mentor

Consumerism guided by linear economic principles that emphasize the extraction, use, and waste of material resources for financial capital gain has proved unsustainable as staggering resource exploitation and ecosystem degradation threatens a global sustainability crisis that cannot be reconciled in a linear society. This research proposes the paradigm shift to a nonlinear, circular economy (CE) as a solution for local communities around the globe to meet their global sustainable development goals (SDGs). The circular economic model represents a zero-waste, closed-loop system that builds environmental, economic, and social capital while significantly impacting global sustainability initiatives.

The integration of circular business models (CBM) into local small business operations is identified as a key leverage point in supporting the paradigm shift to a circular economy and achieving global sustainable development goals. Data indicated that the integration of circular management practices into local small business models can act as a catalyst for the paradigm shift to a circular society. This research investigated current applications of circular economic management practices within small business models in Milwaukee, Wisconsin and explored the challenges and barriers faced by local small businesses. Case studies were conducted to analyze sustainable management practices amongst small businesses in Milwaukee. Representatives of local small businesses and industry experts were interviewed and surveyed in order to collect qualitative data regarding the status of current sustainable management practices. The subsequent comparative analysis addressed the infrastructure barriers that create sustainability challenges in Milwaukee. The concluding research findings indicated the need for both community support and systemic reforms in the successful integration of circular economic principles.

Introduction

Without community support and systemic reforms, one can expect a lack of application of sustainable management practices within small business models of local communities. To test the hypothesis, this study applied a mixed-method approach of qualitative and quantitative analyses

based on case studies and online surveys of small business owners and industry experts in Milwaukee, Wisconsin. The mixed-method research approach was conducted for the primary purpose of (1) identifying current sustainable management practices and applications of circular economic principles within local small business models; and, (2) to develop a better understanding of the sustainability challenges and barriers that hinder the progression of widespread application of sustainable small business management practices in Milwaukee. The secondary purpose of this research is to investigate the ways in which local small business management was impacted by the COVID-19 pandemic, and how those impacts relate to the resiliency of circular business models. The research findings provided evidence indicating that Milwaukee small businesses can achieve triple-bottom line sustainability while contributing significantly to Sustainable Development Goals (SDGs) through the application of Circular Economic (CE) principles at key leverage points, such as the development of circular business models and sustainable local supply chains. However, findings also indicated that community support and systemic reform are both necessary for the widespread application of CE principles that encourage sustainable small business management practices in Milwaukee, Wisconsin.

Background

Consumerism in developed nations has led to material resource exploitation and natural ecosystem degradation worldwide. These unsustainable patterns of consumption are guided by linear economic principles that emphasize the extraction, utilization, and eventual waste of material resources for financial capital gain. This linear economic model has proven unsustainable as consequences threaten resource availability and supply chains across the globe. The circular economy represents the framework for a system that decouples economic activity from finite resource consumption to build environmental, economic, and social capital.

The fundamental difference between the linear economic model and the circular economic model is reflected by the ways in which “value” is perceived, created, and maintained. According to the Ellen MacArthur Foundation (2017), “the circular economy seeks to redefine growth, focusing on posi-

tive society-wide benefits,” by “looking beyond the current [linear] take-make-waste extractive industrial model.” In a CE, industry and development are driven by maximizing the lifecycle value of materials, products, and services, thereby creating incentive for ecological products and consumer goods, eco-design principles, waste recovery, recyclable packaging, dematerialization, and energy efficiency at every point in a product’s lifecycle. CE models are based on three principles: (1) design out waste and pollution; (2) keep products and materials in use; (3) regenerate natural systems (Ellen MacArthur Foundation, 2017). This CE model maximizes the potential for reuse and recycling of products and embedded materials while simultaneously reducing the consumption of natural resources, thereby closing resource material loops and eliminating waste streams.

CE principles applied at the micro, meso, and macro levels of small business operations, community initiatives, and systemic reforms can create a sustainable system of local businesses, consumer communities, and organizational structures. Implementing circular economic systems at these identified leverage points can support both local and global sustainability goals by reducing, and even reversing, the ecological impact of human activity.

(CBM) into local business models represents one of the key leverage points in changing patterns of consumption and moving toward the circular paradigm shift. Sabina Scarpellini, et al. (2019) identified this key leverage point by concluding that there is significant environmental, social, and economic benefit in the regional by measuring the impact of local circular management practices. Schoeder, Anggraeni, and Weber (2019) support this claim while describing the application of CE at key leverage points as one of the most effective measures in achieving a significant number of the U.N. Sustainable Development Goals. Further research describes the global impact of local CE and CBM applications and “the [significant] extent to which (CE) practices are relevant for the implementation of the (SDGs)”



(Schroeder, et al., 2019).

Figure 2

Circular Economy Facilitating Sustainable Development Goals

Note. Patil, R., et al. (2019). Circular Economy Facilitating U.N. Sustainable Development Goals [Image].

THE LINEAR ECONOMY



THE CIRCULAR ECONOMY

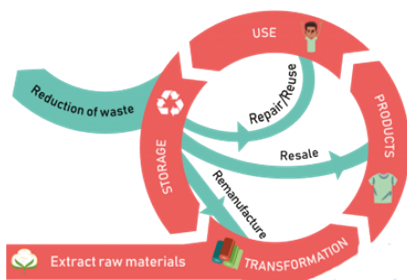


Figure 1

Linear Economy and Circular Economy

Note. Aurialt, C. (2019). The Linear Economy and The Circular Economy [Image].

The integration of Circular Business Model

Literature Review

This research is based on existing literature that analyzes the local application of sustainable management practices and circular economic principles amongst small businesses while identifying challenges, opportunities, and potential sustainability solutions. This review analyzes literature sources to determine how community support and systemic reforms can support the wider application of circular economic practices amongst business enterprises in Milwaukee.

Review of existing literature indicated that integration of circular economic principles into the business models of local enterprises has the potential to create society-wide benefits while positively impacting small businesses and stakeholders by supporting triple bottom line success. The Ellen MacArthur Foundation (2017) defines CE as an entirely sustainable system that builds economic, environmental, and social capital by eliminating waste streams, closing resource loops, and regenerating natural ecosystems. Further, the University

of Wisconsin Sustainable Management Program (2021) describes the ways in which CBM aligns with the triple bottom line sustainability framework, which expands business success metrics to include environmental health, social wellbeing, and an equitable economy (Milios, 2018). Integrating circular economic principles into sustainable management models involves decoupling business activity from finite resource consumption and transitioning to renewable energy sources (The Ellen MacArthur Foundation, 2017). As researcher Marcel C. Hollander (2017) reasoned, CBM included design and management practices that preserve the value of resources by increasing the lifespan of products and recycling materials indefinitely to eliminate waste streams. The University of Wisconsin Sustainable Management Program (2021) found that CBMs are proven to be more resilient and more effective in achieving triple bottom line success by supporting positive social, environmental, and financial performance. Circular economic theory can be applied in small business management to develop sustainable business models and supply chains that align with the triple bottom line framework and support the CE paradigm shift. According to McKinsey Quarterly's analysis of Carnegie Mellon University's Carbon Disclosure Project, more than 85% of environmental impact within the consumer sector is attributed to supply chains; supply chain management was 10-20 times more impactful than direct business operations. Menon, R., et al. (2021) identifies the main barriers to sustainable supply chain management: (1) lack of commitment from top management; (2) financial constraints; (3) organizational culture inhibitive; (4) "lack of new technology/materials and processes; (5) "lack of awareness of benefits; (6) lack of green purchasing; (7) lack of regulations; (8) lack of R&D; (9) lack of human expertise; (10) resistance to change; and (11) lack of performance metrics/evaluation standards.

Review of existing literature also finds that for most small businesses, legislation is the most important factor in implementing sustainable management practices (Schaper, 2002). Authorities at local levels can implement CE activities with more ease than their federal counterparts, and thus can encourage transition away from the global linear model through a bottom-up approach. A survey conducted by Revell et al. (2009) found that 60% of small business operators believed there should be more legislation to control the environmental and social impacts of businesses. By identifying leverage points at micro, meso, and macro levels, local authorities and initiatives can act as catalysts for the global transition away from linear economic models. The findings of the literature review indi-

cate that local applications of circular small business management require both community support and systemic reform.

Thesis statement

Based on the findings from the literature review, this study will examine the following thesis statement using small businesses of Milwaukee as the focus of the study.

Without community support and systemic reform, wider application of sustainable management practices that are built around circular economic principles would be lacking amongst small businesses in Milwaukee.”

Research Objectives

- Explore: current instances of sustainable small business management in Milwaukee
- Investigate: circular economic principles within local small business models
- Analyze: impact of COVID-19 related to local small business management
- Determine: local sustainability barriers
- Identify: leverage points for sustainable business development in Milwaukee
- Evaluate: opportunities for community support and systemic reform

Methods

To examine the thesis statement, this study applied mixed-method approach featuring both qualitative and quantitative analyses. Eight (8) interviews and an online survey involving small business owners and industry experts in Milwaukee were conducted to gather primary research data. Institutional Review Board (IRB) approval was granted to conduct the interviews and the online survey. Interview requests were submitted to twenty (20) local small business operators and five (5) industry experts via email or phone call using the purposive sampling method. Online survey requests were emailed to nearly one hundred (100) small business operators using the simple random sampling method. The interviews were conducted using Zoom, an online meeting platform, and the survey was conducted using Qualtrics, an online data collection platform. Interview subjects included six (6) operators of local small businesses and two (2) local industry experts. The six (6) case study subjects were chosen based on sustainability initiatives demonstrated by the small businesses; whereas, the industry experts were chosen based on their knowledge of sustainable management practices relative to the small business industry of Milwaukee. The interviews with local small business operators consisted of an average ten (10) questions presented over a dura-

tion of thirty (30) minutes; the interviews with local industry experts consisted of an average eight (8) questions presented over a duration of twenty (20) minutes. For the Qualtrics survey, subjects were chosen using random sampling of Milwaukee business owners registered with the U.S. Small Business Administration. The chosen subjects, then, received an email link to the Qualtrics survey featuring five (5) multiple choice questions and fifteen (15) short answer questions.

Limitations of the study

The results of this research were limited by the small number of interview and survey results, which may not adequately represent small businesses and/or industry experts in Milwaukee. Interview proposals were sent to twenty (20) small business operators and five (5) industry experts with a moderate response rate. However, the online Qualtrics survey, where the survey link was sent to nearly one hundred (100) small business owners in Milwaukee generated a low response rate of roughly 10%. Furthermore, responses from the surveys show varying levels of completion rates. Although 78% of the survey participants responded to all of the first five multiple choice questions, only 44.4% responded to the remaining short answer questions. Responses to interview and survey requests may have been low due to local small businesses grappling with the current worker shortage, and the reintegration of in-person shopping and dining due to shifting pandemic restrictions. Also, this experience indicates that online surveys with more multiple-choice questions than short answer questions might lead to higher response rates in the future. A post-pandemic world might allow more primary data collection through interviews and online surveys of local small business operators and community experts.

Results

Sustainable Business Operations. Analysis of case study interviews and surveys of small business operators in Milwaukee indicated sustainable business management practices based on eight focus categories: (1) supply chain, (2) energy & water, (3) pollution & emissions, (4) solid waste, (5) materials, (6) labor, (7) sustainability education, and (8) community engagement. Table 1 lists the categories of sustainable business management practices identified based on the research findings.

(1) Supply chain management and sustainability: Qualitative and quantitative analyses of Milwaukee small business case study interviews and online survey responses revealed sustainable supply chain management practices among small business owners. This is done by selectively engag-

ing with suppliers and companies. The selection process involves consideration of environmental impacts, localization, fair trade products, humane animal products, organic products, and green-seal certified products. In addition, local sustainable supply chain management efforts include a reduction in the number of factory shipments received and a shift from frequent air freight shipments to annual sea freight shipments. Small business owners in Milwaukee's restaurant industry demonstrate gardening, purchasing produce from local farms, and collecting food donations utilizing the local food systems.

(2) Energy efficiency & water sustainability: The analysis based on expert and case study interviews and the online Qualtrics survey indicated a variety of practices among Milwaukee small businesses that prefer to conserve energy and water resources. Water sustainability practices include practices such as reclamation methods to capture hot water generated through refrigeration systems for reuse in water heater tempering. The case studies also revealed energy conservation practices in the form of private solar energy projects. Two of the small businesses featured facilities total power by solar arrays. One facility reported solar energy generation of 56.32 kW; whereas, the other disclosed an annual carbon offset of 1178 tons by utilizing 493 rooftop solar panels. A separate case study interview revealed the implementation of a solar energy project capable of powering the entire small business facility with the ability to sell excess energy back to the power grid. Further noted examples of sustainable energy and water management among local Milwaukee small businesses include:

- Installation of 18-zone HVAC systems;
- eGauge tracking and analytics for energy management;
- Energy efficient doors on freezers and dairy cases;
- Night curtains on open coolers;
- Air curtains over building entryways;
- Electric vehicle charging stations; and,
- Sanctuary sink to toilet greywater systems that ensure water circulation.

(3) Pollution & emissions control: Findings also revealed various pollution and emissions control strategies adopted by Milwaukee small businesses. These include:

- Xeriscaping with native prairie grasses;
- Wetland conservation;
- Utilization of green spaces; and,
- Introduction of porous pavement for stormwater diversion and irrigation.

Furthermore, a primary case study of a small grocery store chain in Milwaukee reported annual reduc-

Focus Category	Sustainable Business Practices (Milwaukee)
(1) Supply chain	Low carbon-impact suppliers Local and regional purchasing Ethical products Local food systems Sustainable shipments
(2) Energy & water	Solar power Hydronic heating Water reclamation Energy efficient building fixtures Electric vehicle charging
(3) Pollution & emissions	Renewable energy credits Organic products Compressed natural gas vehicles Xeriscaping Stormwater runoff diversion
(4) Solid waste	Food waste diversion Plastic and cardboard recycling Plastic-free business models Recycling drop-off sites
(5) Materials	Repurposed building materials Reusable containers and dishes Packing material reduction and reuse Compostable materials Recycled marketing material
(6) Labor	Fair, competitive wages Benefits for part- and full-time employees Equal opportunity throughout structure Safe and healthy workplace Cooperation with unions Employee training programs
(7) Sustainability education	Solar energy education sites Public education of landfill diversion Internal and external education programs Sustainable community services
(8) Community engagement	Sponsorships, donations, and partnerships Community food security efforts Support for diversity and racial justice Development of cooperatives City-wide reusable food container system

Table 1

Findings: Sustainable Business Practices in Milwaukee

tions in greenhouse gas emissions through the use of refrigerated trucks that are fueled by compressed natural gas. The case study also revealed a significant annual carbon offset in the form of renewable energy credits for the grocery store chain, which decreased its emissions from 2,980 CO₂e to less

than 430 CO₂e.

(4) *Solid waste management*: The interview and survey analysis of Milwaukee small business owners revealed solid waste management practices including solid waste reduction and landfill diversion. One small business demonstrated a circular

solid waste management model along with their recognition as a plastic-free business by the Plastic-Free MKE coalition. Noted recycling efforts among Milwaukee small businesses include:

- Baling soft plastic and shrink-wrap for recycling;
- Separating and recycling mixed plastics 1-7;
- Recycling natural corks, clear plastic films, and corrugated cardboard; and
- Providing recycling drop-off sites for community collection of household recyclables.

All the efforts listed above achieved a landfill diversion rate of 71% for one local grocer. The same local grocer also diverted over 170 tons of food waste from landfills by composting 100% of their food waste. Findings show that food waste diversion efforts of small businesses in Milwaukee include both internal composting programs and external composting services. One small business reported utilizing an external service that processes meat waste and another external service to process plant-based food waste. The meat waste is collected, reclaimed, and reintroduced into the consumer marketplace as tallow, protein, leather, and biofuels; whereas, the plant-based food waste is collected, processed into compost soil, and sold back to local residents and businesses. One case study of a Milwaukee grocery store chain reported an annual composting total of over 170 tons in 2020. Another case study of a local small business that provides external plant-based composting services to local restaurants has helped establish community partnership between a restaurant and its composting service program that led to the creation of the largest annual diversion of restaurant food waste in the entire nation. The impressive community partnership effort in Milwaukee received official recognition from the U.S. Environmental Protection Agency (US-EPA).

(5) *Repurposed building materials and sustainable food packaging*: The case study interviews revealed the sustainable use of material resources such as the use of repurposed building materials in the construction of new facilities and the use of reusable/recyclable food packaging. Other case studies of small businesses in Milwaukee found:

- Utilization of reusable food containers;
- Compostable food containers;
- Compostable produce bags;
- Washable dining dishes;
- Drop-off sites for glass jars;
- Recyclable and compostable packing materials; and,
- Recycled and locally printed marketing materials.

(6) *Employee management and sustainability*: The case study analysis of Milwaukee small

businesses found various sustainable business management practices associated with employee stakeholder management. These include:

- Commitment to provide opportunities for employees to learn new skills to improve their social and economic status (this is implemented by a local grocery chain which is part of the small business case study);
- Opportunities included leadership training programs;
- Professional and skill development programs; and,
- Apprenticeship programs.

(7) *Sustainability education*: a significant number of case study interviews reported sustainability education efforts amongst small businesses of Milwaukee. One small business is currently constructing a solar array which will power the entire facility and serve as a solar energy education site. Another small business, which offers a drop-off site for household recyclables, also uses these recycling centers to educate the public about landfill diversion. Further interviews found several small businesses offering internal and external sustainability education programs for their employees as well as members of their community. For example, the case study analysis identified a cafe offering sustainability education classes for its community members. The classes focus on healthy diets and food preparation, gardening and food cultivation, composting, canning, and other practices or skills to attain self-sufficiency. Survey findings also indicated small businesses in Milwaukee providing services and education to customers interested in composting, native planting, and sustainable home gardening.

(8) *Community engagement for sustainability*: primary analysis of both survey and interview results showed a strong desire for community engagement and mutually beneficial community partnerships among small businesses in Milwaukee. Results reveal a greater desire for participation in community coalitions, networking events, and sustainability initiatives. A noted example of current community engagement involves a cafe, which features a “pay-what-you-can” business model that supports community food security. This business model allows customers to pay what they can for any amount of food from a menu with a variety of options. Alternatively, customers can trade a half hour of work for a meal. This cafe was also found to employ youth interns, equip them with skills and training, and then, offer the option to hire them upon high school graduation. Findings also include:

- Circular food donations among community gardens, local farms, and small businesses;

- Community sponsorships;
- Fundraisers for youth lunch programs;
- Voucher programs enabling food donations to those in need;
- Sustainable agriculture partnerships; and,
- Youth outreach program partnerships.

Interviews with local co-ops showed discounted co-op membership fees for community members who receive government assistance. There are also co-op community funds to ensure sustainable development of local cooperatives. One co-op reported that it supports diversity and racial justice through public statements and recognizes black, indigenous, and people of color (BIPOC) suppliers and businesses through their website. Case study interviews also revealed how the city-county Task Force on Climate Change and Economic Equity is currently conducting research and reviewing proposals for the creation of a circular, community-wide reusable food container system in Milwaukee.

Barriers that impede sustainable business practices. Primary interview and survey responses indicated barriers that hinder the integration of business models that are characterized by sustainable supply chain management, service and distribution, and resource use amongst small business in Milwaukee. Qualitative data analysis indicated that the most prevalent barriers in implementing sustainable business practices among local small businesses include:

- Lack of information, misinformation, and/or, information asymmetry regarding the process;
- Lack of resources to support small businesses in terms of access to financial, economic, and operating capital;
- Low eco-literacy;
- Ineffective regulations;
- Poorly developed municipal infrastructures; and,
- Disruptions in sustainable supply chains.

For many small businesses in Milwaukee, low eco-literacy results in a lack of understanding of laws, environmental management, and best practice strategies. In addition, many local small businesses perceive sustainability efforts as requiring additional resources, in terms of time and staff, that are beyond their capacity. Analysis also indicated that small businesses do not face significant external pressure from customers, suppliers, or stakeholders to implement sustainable management practices. Results also showed that voluntary approaches to sustainable business management and environmental regulation are ineffective, especially in situations where challenges outweigh the benefits, or when it is the only strategy used.

Discussion

Circular small business management has the potential to promote both local and global environmental wellbeing, social capital, and economic success. The application of circular economy (CE) and circular business models (CBM) in Milwaukee is identified as a leverage point with the potential to conserve natural resources and restore ecosystem health on a global scale. Local small businesses can practice circular business management to facilitate community and planetary sustainability, as well as the sustainability of their own business enterprises. These twin goals could be achieved by (1) closing loops in industrial ecosystems, (2) replacing production with efficiency, and (3) reforming business operations through waste minimization. Opportunities to support the application of circular economic principles in Milwaukee small businesses include:

(1) *Circular business models:* Milwaukee small businesses can integrate circular product design, which generally follows one of two design structures: product life-extension (PLE) and design for recycling (DFR). PLE focuses on reusable products over disposable products, and guarantees an extended service lifecycle through product maintenance, repair, upgrades, remanufacturing, and retrofitting. DFR focuses on recycling and dematerializing products that have reached the end of their functional lifecycle, so that secondary materials can be reintegrated into manufacturing processes. Further, local small businesses can practice sustainable supply chain management by creating environmentally preferable purchasing policies to ensure positive social and environmental impacts while shifting business purchases to local and/or low eco-impact suppliers; Milwaukee small businesses can utilize a green purchasing resource called the Green Procurement Compilation (GPC) to compare the sustainability of potential supply chain management models.

(2) *Community support:* Community ecosystem partnerships with flexible and adaptive roles demonstrate increased resourcefulness and resilience. Resourcefulness is defined as “a community’s capacity to engage with their local resource base,” and is positively correlated with system resilience. (Ulug, et al., 2018). Circular community connections can be established to support regional resource exchange systems, training platforms, awareness campaigns, and certifications for sustainable products, practices, and employees. Regional resource exchange systems function to distribute resources amongst local businesses and organizations in order to mitigate costs and shrink waste streams. Community support can also be fostered by the development of a community network directory, which

could facilitate community connections through a network structure that directly connects local small business owners, organizations, and community members. Establishing circular community connections could also enable business mentor programs, which allow local businesses to share knowledge and support new sustainability initiatives within local businesses. Small businesses can also act as community mentors through partnerships with youth internship and adult outreach programs, which provide skills training and employment opportunities for community members. Interviews with local industry experts described current circular community connections, including the Wisconsin Sustainable Business Council and the Plastic-Free MKE coalition.

(3) *Systemic reform*: Interview and survey analysis indicated Milwaukee's need for action plans that support local circular economic systems, such as governance measures including indicators, standards, and planning; measures may also include governmental updates and increased enforcement of regulations and codes. Further, government agencies and NGOs could create organized markets; sectoral cooperation could through cross-cutting measures, like grants, incentives, and eco-innovation promotion. Interviews with small business operators and industry experts in Milwaukee revealed that a poorly developed recycling infrastructure and the complete lack of any municipal composting infrastructure are both major sustainability barriers that must be addressed by systemic reforms. Small businesses in Milwaukee also reported a need for policy reform that supports sustainable supply chain management. Regional government funding can be made available to local sustainability nonprofits and organizations that implement voluntary sustainable management; incentivizing local, sustainable supply chain management may offset hesitation caused by financial factors. Research conducted by Mendoza, et al. (2017) identifies circular supply chain management as a leverage point for the successful integration of CBM; the research found that the successful integration CBM included innovations within local supply chain management must be supported by systemic change.

The interview results with both small business operators and local industry experts indicated unanimous desire to redistribute tax dollars to support sustainability programs and equitable access to city resources. Leonidas Milios (2018) proposes a potential policy mix that can be adopted by local governments for the transition to CE; the proposal outlines three policy areas: (1) policies for reuse, repair and remanufacturing; (2) green public procurement and innovation procurement and (3) policies for improv-

ing secondary materials markets.

Barriers to Introduce Local Circular Economic Reforms

Study findings also revealed potential problems related the application of local circular economic reform as a means for achieving global sustainable development goals are the challenge of scale and the concept of "circular economy rebound." Scale presents a challenge if the application of local solutions, even in sum, proves to be an inadequate means for reaching global sustainable development goals. If CE projects remain isolated, they may not create a large enough ripple effect to facilitate a paradigm shift and the transition away from global linear models. Hence, it is necessary to confront these challenges in order to achieve global sustainability through local economic reforms. Solutions to this challenge of scale can be generated through national and international efforts to globalize the CE. Governments, organizations, individuals, and entities across all sectors can cooperate to create an international platform for sharing experiences, strategies, and data to facilitate the exchange of knowledge and develop missions, incentives, and practices that support CE application across the globe. Furthermore, there must also be cooperative efforts in establishing markets for the exchange of secondary materials to address the current unsustainable demand for resources. By coordinating international industrial policies and reforming global trade structures to connect and support local CE systems, the circular economy may be globalized as an adequate response to planetary sustainability issues.

Additionally, Trevor Zink and Roland Geyer (2017) introduce the concept of "circular economy rebound," which also presents a potential problem in the local application of CE principles as a solution for global sustainable development. Similar to the concept of energy efficiency rebound, circular economy rebound occurs when CE activities increase overall production, thereby offsetting the potential environmental or economic benefit of low-impact consumer products. This rebound effect is caused by things like disruption in supply and distribution chains, as well as mismanaged price effects. Furthermore, many potential strategies to avoid CE rebound are not feasible with for-profit business models. In fact, critics speculate that even encouraging CE opportunities among these private, for-profit firms is likely to cause CE rebound in itself. In addition to reformation of business models, the successful disassembly of consumer culture requires a social paradigm shift supported by the integrated ideas of sociological consumption studies, consumer and cultural psychology, as well as issues related to

labor, wealth distribution, and social equity. Changing consumer behaviors and culture can address societal overconsumption and mitigate consumer waste. Moreover, labor conditions, wealth distribution, and social equity must be addressed to analyze current material and energy economic throughput and enable societal transition to CE models. In sum, paradigm shifts regarding sociological and economic principles are critical in circular, sustainable development because it defines, with clarity, who must bear the cost of economic activities.

Future Directions: Using Municipal Infrastructure as the Key Leverage Point.

Primary case study analysis identifies the underdeveloped municipal recycling and composting programs as major local sustainability barriers. The development of sustainable municipal waste management infrastructure would divert waste from landfills and lower the environmental impact of human activities. There are significant connections between recycling, composting, landfill diversion, stormwater management, and freshwater safety. The development of municipal infrastructure that diverts material from waste streams represents a key leverage point for sustainable reform.

Future research can be applied to Wisconsin's underdeveloped recycling program, which is plagued by insufficient government monitoring, ineffective legislative rules, and low consumer recycling education. Significant flaws in Wisconsin's recycling infrastructure were uncovered in a nonpartisan Legislative Audit Bureau (2020). The Wisconsin State Journal's Chris Hubbuch (2020) summarizes the findings of the audit: the audit found that the DNR inappropriately spent over \$807,000 in funds that were appropriated for recycling administration. It was also revealed that the DNR failed to perform required reviews of local recycling programs; analysis of these review results would have served the development of municipal recycling infrastructure by revealing trends and identifying potential solutions. Additional findings noted that the DNR has not updated its recycling rules to reflect consumer habits in nearly 30 years. Further, the audit reported that the DNR has not been following the recycling rules, which require municipalities to collect specified amounts of certain recyclable materials per capita. Instead, recycling was being sorted without an itemized inventory for each municipality, and local governments were only reporting a lump sum of all recycling material collected. The audit also found disparities in the number of state recycling grants afforded to municipal government expenses, due partly to a statutory formula that has not been updated in over 20 years. The audit report suggests

that the statutory formula be modified and updated by the Legislature in order to reflect current populations and the current body of sustainability research. It will be necessary to conduct further comparative research for the development of a Wisconsin recycling infrastructure based on circular economic principles. Future researchers can investigate the recycling programs of neighboring states, like Michigan, which provides sizable grants to upgrade material recovery facilities for the efficient sorting of recyclables and the development of new markets for recycled materials.

Further research regarding the integration of municipal composting infrastructure can be conducted and applied in order to develop local composting programs. Primary research revealed the complete lack of any municipal composting system in Milwaukee; this lack of city-wide composting system represents tons of food waste entering local landfills where it cannot decompose properly. The development of composting infrastructure could divert a massive amount of annual food waste from landfills while also supporting local food cultivation, gardening, and soil health. Due to the lack of municipal composting infrastructure, small businesses that wish to implement a composting program must create an internal composting system or hire a third-party service to manage compost material. Third party compost management services seek to fulfill the community need for composting services by gathering food scraps and yard waste from residences and businesses, delivering it to a local processing site, and then selling the finished product back to community members. However, these businesses are not equipped to service the entirety of Milwaukee, making composting inaccessible to many local small businesses. Primary interviews also revealed that the only commercial compost processor in southeastern Wisconsin is privately owned, and has not accepted compostable food containers since 2019. This lack of infrastructure has led to countless pounds of compostable goods diverted to landfills instead of compost processors; one case study interview with a local sustainability manager reported increased levels of greenhouse gas emissions associated with the landfilling of compostable food containers when compared to the landfilling of their conventional counterparts. To fulfill the community needs for a compost processor that accepts compostable food containers, a local small business has fundraised in order to construct a new processing plant in the Milwaukee area. While this plan is a step in the right direction, it highlights the need for an organized, effective municipal composting infrastructure. The Urban Development Series Knowledge Papers, organized by World Bank

Group and Climate and Clean Air Coalition provides sustainable financing and policy models for the development of municipal composting infrastructure. An interview with a small business owner of a local composting service revealed that the development of municipal composting infrastructure is the responsibility of the DNR Sustainable Materials Management Subcommittee; however, according to the case study interview, there has been little progress in the development of sustainable waste management infrastructure because the recycling and composting industries are not represented in the DNR Sustainable Materials Management Subcommittee. This representation would require the membership to be expanded to professionals in the recycling and composting industries; subcommittee membership relies on member nomination and a majority vote, which has yet to favor professionals from the recycling and composting industries. It will be necessary to apply systemic reforms in this situation to ensure that nomination and membership voting works in a way that fairly represents all industries involved in sustainable waste management. Future researchers can use this information to propose systemic reformation strategies to create a circular economy for recyclable and compostable materials.

Lastly, further research regarding large-scale circular container systems will be necessary for the creation and implementation of infrastructure that can support Milwaukee's proposed community-wide reusable food service container system. A recent virtual meeting agenda of the city-county task force featured preliminary concept proposals and notes with reference to research on the topics of "community-wide reusable food service container system," "construction waste recycling," "food waste initiative," "event waste diversion," "lake friendly business campaign," "organic waste," and "litter abatement." (City-County Task Force on Climate and Economic Equity, 2021, Waste and Sustainable Consumption Work Group).

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