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## Transitioning towards a Circular Economic Model: Opportunities for Sustainable Industrialisation in Uganda

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#### Keywords:

*Circular Economy,  
Sustainable Industrialisation,  
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Resource Efficiency,  
Waste Valorisation.*

This study examined the potential of transitioning towards a circular economic (CE) model to foster sustainable industrialisation in Uganda. The country's prevailing linear economic model is characterised by unsustainable resource extraction, an escalating waste burden, and a lack of integration of circularity within industrial processes. Through a comprehensive analysis of academic literature, policy documents, and secondary data, this research highlights the potential of a CE model to address these challenges. Key findings reveal significant opportunities for resource efficiency gains, waste valorisation through recycling and remanufacturing, and innovation-driven growth in green industries. In addition, the study identified critical success factors for a circular transition, including the need for a supportive policy framework, investment in circular infrastructure, technical capacity building, and fostering collaboration between stakeholders. While acknowledging challenges such as integrating the informal sector and promoting behavioural change, this research underscores the potential of CE to drive inclusive and sustainable industrialisation in Uganda. By strategically adopting CE principles and practices, Uganda can unlock a pathway towards long-term economic prosperity while safeguarding its environment and promoting social equity.

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**INTRODUCTION**

The pursuit of sustainable development has become a global imperative in the face of unprecedented environmental degradation, resource depletion, and persistent social inequalities. The concept of sustainable development, popularised by the Brundtland Report of 1987 (Dănescu et al., 2021), seeks to harmonise economic growth with environmental stewardship and social equity. It necessitates "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Borowy, 2021). However, the prevailing linear economic model, based on a *take-make-dispose* approach, has limited the country's ability to achieve economic growth and improve living standards. This model, reliant on continuous resource extraction and finite disposal capacity, has led to severe ecological disruption, including climate change, biodiversity loss, and pollution (Neves & Marques, 2022).

Despite the country's youthful population and abundant natural resources, this approach is driving unprecedented environmental degradation and exacerbating social inequalities. It depletes finite resources, strains waste disposal capacities, and concentrates economic benefits, leading to critical issues like widespread land degradation (41% of land degraded, costing 17% of GDP), a rapid decline in forest cover (2.6% annually), and increased vulnerability to climate change impacts. While the circular economy presents a compelling alternative to foster economic growth, improve living standards, and safeguard natural environments by minimizing waste, maximizing resource efficiency, and promoting repair, reuse, remanufacture, and recycling, the specific barriers

and opportunities for a systemic transition from a linear to a circular economic model within Uganda's key industrial sectors remain largely unexplored and unaddressed. This lack of understanding hinders the strategic implementation of circular principles, preventing Uganda from fully realising the potential for new green economic opportunities, reducing environmental pressures, and fostering greater inclusivity in its industrial value chains for truly sustainable and equitable development.

The adoption of circular economic principles holds immense potential for countries such as Uganda. As Joensuu et al. (2020) note, integrating CE strategies into industrial development could mitigate the country's reliance on virgin materials, optimise resource utilisation, and mitigate environmental impacts. Additionally, a circular model encourages innovation in materials science, product design, and the development of new circular business models, potentially leading to employment growth in green sectors. This transition, if implemented strategically, could assist Uganda in achieving its national development aspirations while adhering to the principles of ecological sustainability.

**Uganda's Development Context**

Uganda has made remarkable progress over recent decades, with significant poverty reduction and an expanding middle class. This socioeconomic transformation has been accompanied by urbanisation and growing industrialisation (Pozhidaev, 2020). While this progress is encouraging, critical challenges remain. According to the World Bank, Uganda's economy continues to rely heavily on primary sectors such as agriculture and extractive industries, characterised by resource intensity and vulnerability to global commodity

price fluctuations (Magunda, 2020). Efforts towards value addition and industrial diversification are crucial for sustainable economic growth and creating decent employment opportunities for a largely youthful population (Mutenyo et al., 2022). It should be noted also that Uganda's rapid development has not been without adverse environmental implications. The country faces issues such as deforestation, soil degradation, wetland degradation, and water pollution (Lubaale, 2022). Environmental pressures from industrial processes, inadequate waste management, and unsustainable consumption patterns threaten ecosystem health and human well-being. These environmental challenges, along with climate change vulnerabilities, pose a risk to the resilience of Uganda's development aspirations.

To address these complexities, Uganda has incorporated sustainable development principles into its national policy frameworks. The Uganda Vision 2040 outlines a vision of "*A Transformed Ugandan Society from a Peasant to a Modern and Prosperous Country within 30 years*" (Odokonyero et al., 2020). Key development priorities include promoting inclusive growth, sustainable urbanisation, and environmental conservation. The National Development Plans (NDPs) guide medium-term development strategies, with the current Third National Development Plan (NDP III) emphasising industrialisation, infrastructure development, and harnessing the potential of natural resources for socio-economic transformation (Hazemba & Halog, 2021).

### **The Case for a Circular Model in Uganda**

While Uganda's development plans acknowledge the imperative of sustainable and inclusive growth, the current emphasis on industrialisation within predominantly linear economic paradigms necessitates scrutiny. Conventional linear processes in industry often lead to inefficient resource utilisation, escalating waste volumes, and limited end-of-life product management (Awan & Sroufe, 2022). They also tend to foster reliance on imported

virgin materials and components, adding to Uganda's vulnerability to external shocks and hindering domestic value creation (Ogunmakinde et al., 2021). The transition towards a circular economy offers a unique opportunity to re-envision Uganda's industrial development course in a way that safeguards its natural resource base, fosters innovation, and creates a resilient, equitable economy.

Awan and Sroufe (2022) observe that a CE approach prioritises resource efficiency and minimising waste. Circular principles emphasise designing products for longevity, durability, and ease of repair to maximise material use over time. This approach reduces demand for virgin resources and eases pressure on extraction activities, while creating opportunities for economic activity in repair, remanufacturing, and recycling sectors. Secondly, CE prioritises innovation and economic development. The shift to a circular economy necessitates rethinking product and service delivery models. It encourages innovation in materials, manufacturing processes, and business model design (Ratum et al., 2020). By embracing CE principles, Ugandan industries can improve their competitiveness, reduce operational costs due to efficient resource use, and tap into emerging global markets for sustainable products and services. Finally, CE emphasises job creation and inclusive growth. A circular economy has the potential to create new employment opportunities throughout various value chain segments. Skills development in repair, remanufacturing, waste valorisation, and the development of circular services can address unemployment challenges, particularly among the youth. As such, a CE promotes local value chains and decentralised production models, potentially benefiting historically marginalised communities and contributing to equitable wealth distribution.

### **Study Objectives**

The paper explores the compelling potential of the circular economy model as a strategic framework

for achieving sustainable industrialisation in Uganda. It addresses three key objectives;

- To evaluate the limitations of the linear economic model.
- To assess the potential of a circular economy for Uganda's development.
- To explore how adopting CE strategies can foster sustainable industrialisation in Uganda, addressing resource efficiency, waste reduction, innovation, competitiveness, and inclusive growth.
- To identify key pathways and recommendations for CE transition.

The paper proposes policy interventions, enabling infrastructure, capacity-building initiatives, and

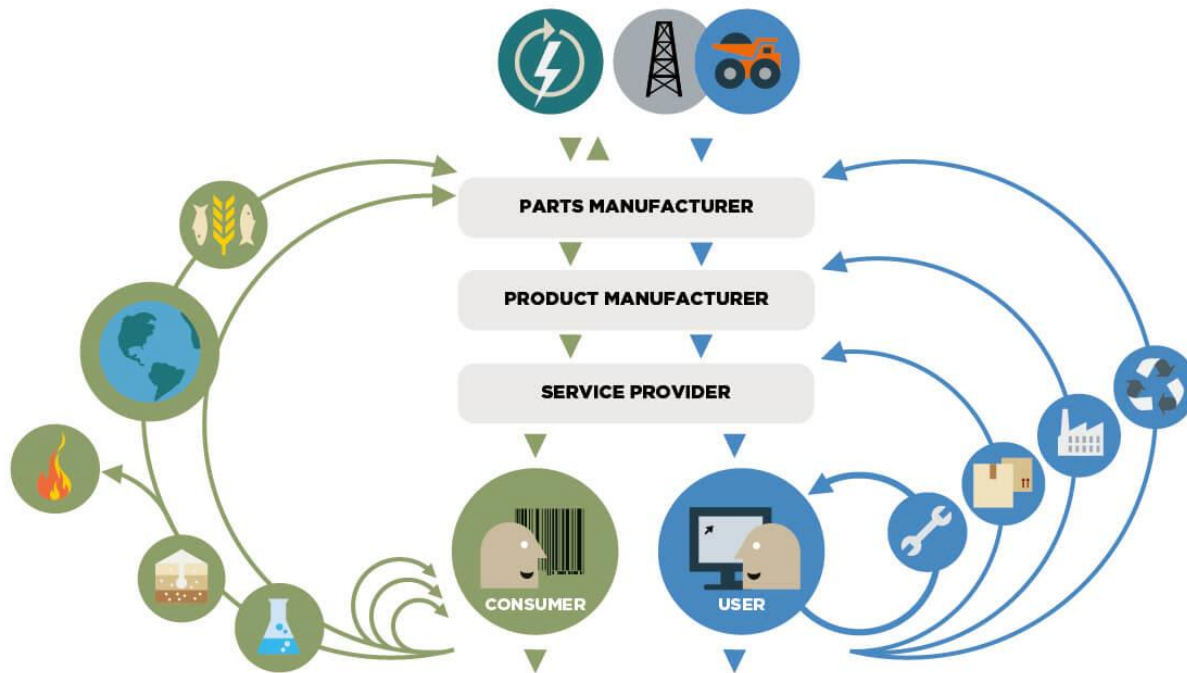
collaborative mechanisms needed to drive Uganda's transition towards a circular model, drawing insights from successful case studies and best practices.

## LITERATURE REVIEW

### Theoretical Review

The circular economy (CE) model challenges the prevailing linear approach to economic systems and offers a framework for decoupling economic growth from resource depletion and environmental degradation. The CE model's core principles can be visually illustrated through the "Butterfly Diagram" developed by the Ellen MacArthur Foundation (2013).

**Figure 1: The Butterfly Diagram Visualising the Circular Economy Shows the Continuous Flow of Materials.**



(Source: The Ellen Macarthur Foundation at [https://ellenmacarthurfoundation.org/circular economy](https://ellenmacarthurfoundation.org/circular%20economy))

The illustration highlights two primary cycles within a circular economy: the biological cycle, where organic materials, such as food and natural

fibers, are designed to re-enter the biosphere safely, and the technical cycle where products, components, and materials with technical value

(e.g., metals, plastics, and manufactured components) are continuously circulated through strategies such as repair, reuse, remanufacture, and recycling. This aims to retain their embedded value and minimise the need for virgin materials. Central to the success of a circular economy is the "3R" hierarchy; Reduce, Reuse, Recycle (Tserng et al., 2021). This approach emphasises preventative action by prioritising a reduction in resource consumption through efficient design. Subsequently, strategies such as repair, refurbishment, and repurposing extend product lifespans. When a product reaches its final end of use, recycling processes recover materials to re-enter the production cycles. Finally, industrial ecology further informs the CE framework. It views industrial systems as analogous to ecosystems, promoting the integration of industries to optimise resource flows and minimise waste (de Oliveira & Oliveira, 2023). Industrial symbiosis, a key tool within industrial ecology, involves the exchange of materials, energy, and byproducts between different industries, creating closed-loop material flows and resource efficiency (Ratum et al., 2020).

## Empirical Review

### *Potential and Applicability of CE in Developing Countries*

The circular economy concept has garnered significant interest in recent years, particularly within the broader discourse on sustainable development. A growing body of literature underscores the potential of CE models to address critical challenges faced by developing countries. Studies highlight the economic opportunities within CE transitions, such as job creation in new sectors like repair, remanufacturing, and recycling (Patwa et al., 2021). As labour costs tend to be lower in developing countries, these value chains could offer competitive advantages (Tserng et al., 2021). In addition, a CE can improve resource security by reducing reliance on imported virgin materials and fostering robust local material recovery and processing infrastructure. This mitigates

vulnerabilities to global price shocks and enhances supply chain resilience, crucial for sustainable industrialisation. Environmental benefits of a CE are also relevant to developing countries, where pollution and inefficient waste management pose significant public health and ecosystem threats. Circular strategies promote resource efficiency, waste minimisation, and cleaner production processes. This directly protects natural environments and improves local living conditions (Hazemba & Halog, 2021). Additionally, CE principles align with climate change mitigation goals by reducing greenhouse gas emissions associated with extraction and manufacturing activities.

Despite the robust theoretical development of the circular economy (CE) and its widely recognised potential, a significant gap exists in research, particularly concerning its practical application and socio-economic implications within developing countries like Uganda. Previous studies largely stem from developed economies, leaving a dearth of context-specific insights into the unique challenges and opportunities for CE adoption in nations with prevalent informal sectors, distinct resource endowments, and varying institutional capacities. This study specifically aims to bridge this gap by investigating the practical barriers and enablers for a systemic transition from linear to circular economic models within Uganda's industrial sectors, thereby offering nuanced, localised evidence and frameworks beyond generic recommendations.

### *Challenges and Barriers in Circular Transition*

While the benefits of the circular economy are promising, the transition from a linear model faces several challenges, particularly within the context of developing countries. One significant barrier is insufficient policy and regulatory frameworks. In many cases, existing policies may unintentionally promote waste disposal rather than prioritise resource recovery and circulation (Gedam et al., 2021; Ogunmakinde et al., 2021). Lack of



standards, clear targets, and financial incentives for circular business practices can create uncertainty and hinder investment. Secondly, informal economic sectors often play a substantial role in waste collection and recycling activities in developing nations. As Gedam et al. (2021) highlight, integrating informal actors into formal circular value chains presents challenges related to working conditions, capacity building, and ensuring fair compensation. Limited technical capacity and access to appropriate technologies are additional hurdles. The development of advanced recycling facilities, implementation of product design for ease of repair, and data-driven monitoring of material flows require investment and advanced skills often lacking in developing countries (Tserng et al., 2021). Besides, consumer behaviour and low awareness of CE principles can limit market demand for circular products and services. This necessitates public awareness campaigns and educational efforts to cultivate support for the transition.

## METHODOLOGY

This study aimed to understand the potential of a circular economic (CE) model to foster sustainable industrialisation in Uganda, recognising the complex relationship between economic growth, environmental stewardship, and social equity. Given the focus on analysing existing trends, policies, and potential applications of CE principles, a rigorous qualitative approach centred on secondary data analysis was deemed most suitable. The methodology adopted consists of a three-pronged strategy, each contributing to a holistic understanding of the complexities and opportunities inherent in this transition.

### Systematic Literature Review

A comprehensive literature review formed the foundation of this research, providing a systematic synthesis of existing knowledge and theoretical frameworks on the circular economy. It aimed to not only explore the general CE concepts but also to

delve deeper into their applicability to developing countries, paying particular attention to the unique challenges and opportunities faced by nations with similar socioeconomic profiles to Uganda. The review drew upon a broad array of sources, including peer-reviewed journal articles, reports from international organisations, and sector-specific research on circular practices. The search strategy entailed a meticulous exploration of prominent academic databases such as Web of Science, Scopus, and Google Scholar. By employing a combination of keywords including *"circular economy"*, *"sustainable industrialisation,"* *"developing countries,"* and *"Uganda"*, the search was refined to yield highly relevant publications. This varied approach allowed for the inclusion of diverse perspectives and research methodologies, contributing to a more comprehensive understanding of the subject matter.

Specifically, the search sought peer-reviewed journal articles that examined various facets of CE concepts, their application in diverse contexts, and the unique challenges faced by nations transitioning to a circular model. These articles, rigorously reviewed, provided a strong foundation for understanding the theoretical underpinnings of the circular economy and its potential impacts on various sectors. Reports and policy briefs from influential international organisations such as the United Nations Environment Programme (UNEP), World Bank, UNIDO, and the Ellen MacArthur Foundation were also analysed. These organisations often possess in-depth expertise and data on CE initiatives globally, offering valuable insights into best practices, policy frameworks, and recommendations tailored for different economic and geographic contexts. In addition to these broader perspectives, sector-specific research publications on circular practices relevant to Uganda's industrial landscape were incorporated into the review. These publications, often focused on sectors like construction, manufacturing, and waste management, provided a more granular understanding of how circularity can be practically

applied and the specific challenges and opportunities that arise within each sector.

The literature review process followed a systematic approach, including the identification of relevant keywords, database searches, selection of relevant publications based on predefined inclusion criteria, data extraction, and synthesis of findings. This rigorous process ensured the collection of comprehensive and credible evidence on the current state of CE knowledge and its application to developing nations, with a particular focus on Uganda's context.

### **Policy Analysis**

Recognising that policies play a pivotal role in shaping industrial practices and incentivising or hindering specific behaviours, a thorough analysis of Uganda's existing policy framework was conducted. This analysis involved a critical review of relevant national policies and frameworks to assess their alignment with circular economy principles and identify potential areas for reform. The analysis was multi-layered, spanning several key policy domains. At the national level, Uganda's National Development Plans (NDPs) were examined to discern the degree to which sustainable development goals, industrialisation targets, and environmental considerations were integrated. The analysis focused on identifying whether these plans explicitly promoted circular principles or primarily emphasised linear growth arcs. This examination is crucial in understanding the overarching vision for Uganda's development and whether a circular economy is recognised as a viable path.

Sectoral policies within key domains like industry, environment, trade, and investment were also meticulously scrutinised. This examination encompassed a close reading of waste management regulations, pollution control standards, industrial licensing requirements, and trade policies related to the import and export of secondary materials. The objective was to identify existing provisions that could either incentivise or impede the adoption of

circular practices, as well as potential policy gaps that need to be addressed to facilitate a smooth transition. In addition to national policies, regional frameworks developed by the African Union, the East African Community, and other regional bodies were analysed. These frameworks often provide a broader context for national decision-making and can influence Uganda's access to technology, finance, and expertise in implementing circular strategies. Understanding regional priorities and collaborations can inform Uganda's own CE approach.

The policy analysis employed a qualitative content analysis approach, systematically coding relevant policy documents to identify recurring themes, priorities, and areas of potential alignment or contradiction with CE principles. This analysis culminated in a comprehensive mapping of the policy landscape, highlighting opportunities for policy interventions to create a more enabling environment for a circular economy in Uganda.

### **Supplemental Data Analysis**

To complement the qualitative insights derived from the literature and policy review, a targeted analysis of secondary data sources was conducted to contextualise the findings within Uganda's specific development landscape. This involved utilising statistical data on resource consumption, waste generation rates, material flows, and industrial production indicators. Available data from government agencies such as the Uganda Bureau of Statistics (UBOS) and international datasets from organisations like the World Bank were meticulously compiled and analysed. This analysis aimed to quantify the scale of current challenges related to resource depletion and waste management, thereby providing a clearer picture of the potential impact of a circular economy transition. By examining statistical trends over time, potential areas for resource recovery and circular value creation could be identified, contributing to a more data-driven understanding of the potential for a circular economy in Uganda. Similarly, a focused

review of news articles, company reports, and other relevant media sources was undertaken to gauge public discourse and emerging trends related to environmental sustainability and industrial practices in Uganda. This analysis allowed for the identification of potential grassroots initiatives, stakeholder perspectives, and evolving public awareness regarding circularity.

## DATA ANALYSIS AND SYNTHESIS

### Data Analysis

**Thematic Analysis:** A thorough thematic analysis was conducted on the qualitative data gathered from the literature review, policy documents, and media sources. This rigorous methodology involved a systematic process of identifying, analysing, and reporting patterns (themes) within the data (Kiger & Varpio, 2020). The initial phase involved familiarisation with the data through repeated reading and coding of relevant text segments. Subsequently, codes were grouped into broader themes that reflected recurring patterns or concepts related to CE opportunities, challenges, and implementation strategies. These themes were then reviewed, refined, and defined to ensure clarity and relevance to the research questions. Thematic analysis allowed for a deeper exploration of the underlying factors influencing the potential for a CE transition in Uganda. It revealed commonalities and disparities in perspectives across different sources, providing a nuanced understanding of the challenges and opportunities. For instance, the theme of "policy gaps" emerged consistently in the literature and policy analysis, highlighting the need for stronger regulatory frameworks and incentives to promote circular practices. Thematic analysis also helped identify potential tensions and trade-offs, such as the challenge of balancing the need for formalising the informal sector with ensuring social equity and inclusivity.

**Policy Mapping:** Relevant policies identified through the literature and policy analysis were systematically evaluated and categorised based on

their direct or indirect alignment with CE principles. This process involved mapping the policy landscape, identifying existing provisions that support circularity, as well as gaps and inconsistencies that could hinder the transition. This comprehensive mapping served as a valuable tool for policymakers, providing a visual representation of the current policy environment and areas that require attention and reform. The policy mapping exercise revealed that while some policies, such as those promoting renewable energy and sustainable agriculture, indirectly align with CE principles, there is a lack of explicit integration of circularity within broader industrial and environmental strategies. This highlights the need for a more focused and coherent policy framework to incentivise circular practices and create a level playing field for circular businesses.

**Comparative Analysis:** A comparative analysis was undertaken to examine best practices and lessons learned from other developing countries that have pursued CE transitions. By drawing upon case studies from various regions, such as South Africa, Rwanda, and Chile, this analysis aimed to identify successful strategies that could be adapted to the Ugandan context. The comparative approach proved valuable in highlighting common challenges faced by developing countries in transitioning towards a CE, such as the need for capacity building, technology transfer, and addressing informal sector dynamics. It also highlighted innovative solutions and policy approaches that have proven effective in specific contexts, providing valuable insights for Uganda's own CE journey. For instance, the case of Rwanda's Green Fund, a dedicated financial mechanism supporting green investments, showcases a potential model for Uganda to finance its CE initiatives (Banerjee et al., 2020).

### Synthesis of Findings

The synthesis of findings from the literature review, policy analysis, and supplemental data sources provided a comprehensive understanding of the



current state of CE in Uganda. It revealed a complex landscape where the limitations of the linear model are evident, but the potential for a circular transformation remains largely untapped. While policy gaps and infrastructure deficits present significant challenges, the analysis also highlighted emerging opportunities for innovation, job creation, and resource efficiency gains. By strategically addressing these challenges through a combination of policy reforms, infrastructure investments, capacity building, and public awareness initiatives, Uganda can embark on a sustainable industrialisation journey that is both economically prosperous and environmentally responsible. The comparative analysis underscored the importance of learning from successful CE models in other developing countries while adapting strategies to Uganda's unique context and needs.

Overall, the methodology employed in this research, with its multi-layered approach to data collection and analysis, provided a robust foundation for understanding the complex dynamics of CE implementation in Uganda. The findings, though subject to the limitations of secondary data, offer valuable insights for policymakers, industry leaders, and other stakeholders to chart a course towards a more circular and sustainable future.

## FINDINGS AND DISCUSSION

### Limitations and Challenges of the Linear Economic Model in Uganda

The analysis of secondary data sources paints a compelling picture of the linear economic model's inherent limitations and challenges within the Ugandan context. Primarily, the relentless pursuit of economic growth under this model has exacerbated resource depletion, leading to significant environmental consequences. Studies reveal that Uganda's natural resource base is facing mounting pressure from unsustainable extraction practices. The country's rich reserves of minerals, such as gold, copper, and cobalt, are being extracted at rates that far outpace natural replenishment (NEMA,

2020). The forestry sector, crucial for both economic activity and ecological balance, is also under strain due to illegal logging and unsustainable harvesting practices, contributing to deforestation and biodiversity loss (Ministry of Water and Environment, 2019). Agricultural practices, while essential for food security, often rely on intensive monoculture farming and excessive pesticide and fertiliser use, leading to soil degradation and water pollution (FAO, 2018).

The linear model's emphasis on consumption and disposal has also contributed to a mounting waste management crisis in Uganda. Rapid urbanisation and industrialisation have led to increasing volumes of waste, which often overwhelm the capacity of existing waste management systems. A study by the Observer (2024) reveals that a substantial portion of waste in Kampala, the capital city, ends up in informal dumpsites or is inadequately managed, leading to environmental pollution and public health risks such as the 2024 Kitezi landfill disaster where heavy rainfall led to the collapse of the garbage dumping site in Kampala that resulted in the death of 21 people. The lack of robust recycling infrastructure and limited waste segregation practices further exacerbate the problem, as valuable materials that could be reintroduced into the economy are lost.

Furthermore, the analysis of policy documents indicates a misalignment between Uganda's industrial development strategies and circular economy (CE) principles. While the National Development Plan (NDP III) emphasises industrialisation as a key driver of economic growth, the Ministry of Finance, Planning and Economic Development (2020) observes that it lacks explicit provisions for promoting resource efficiency, waste minimisation, and closed-loop systems. Existing environmental regulations primarily focus on "end-of-pipe" pollution control measures rather than proactively incentivising circular practices (NEMA, 2020). This policy gap hinders the adoption of CE principles and

perpetuates a linear mindset that prioritises resource extraction and disposal over resource recovery and regeneration.

### Untapped Potential of the Circular Economy in Uganda

Despite the challenges posed by the linear model, the research findings also highlight the significant untapped potential of a circular economy in Uganda. Transitioning towards circularity could unlock opportunities for resource efficiency gains, waste valorisation, innovation-driven growth, and inclusive development. The potential for resource efficiency gains through circular strategies is substantial. By adopting design principles that prioritise durability, reparability, and material efficiency, industries in Uganda can reduce their reliance on virgin materials (Ghisellini et al., 2016). This not only conserves natural resources but also reduces the environmental footprint associated with extraction activities. Similarly, circular business models that prioritise product-as-a-service, sharing platforms, and leasing arrangements can extend product lifespans and maximise resource utilisation (Stahel, 2016). By embracing these approaches, Uganda can move towards a more sustainable industrial model that minimises its ecological impact while ensuring resource security for future generations.

Waste, often viewed as a burden, can be transformed into a valuable asset within a circular economy framework. Research indicates that a significant portion of Uganda's waste stream, including organic waste, plastics, metals, and construction debris, has potential for recovery and valorisation, a process of "*repurposing waste materials into more useful products or energy sources*" (Mugagga et al., 2021). Investing in appropriate recycling infrastructure and technologies can divert waste from landfills but also create new economic opportunities. Organic waste can be composted to enrich agricultural soils or utilised in biogas production, while recyclable

materials can be reprocessed into new products, fostering the growth of secondary industries.

The adoption of CE principles can also spur innovation and economic development in Uganda. By rethinking product lifecycles and embracing circular design principles, businesses can create new products and services that are inherently more sustainable. The Ellen MacArthur Foundation (2015) points out that the shift towards a CE necessitates innovation in material science, manufacturing processes, and business model design. This can drive technological advancements, create niche markets for sustainable products, and enhance the overall competitiveness of Ugandan industries in the global marketplace. Finally, the circular economy has the potential to create decent employment opportunities and foster inclusive growth. Studies conducted by the International Labour Organization (ILO, 2018) indicate that the transition to a CE can create jobs across various skill levels, from waste collectors and sorters to skilled technicians in repair and remanufacturing industries. These jobs can benefit marginalised communities, such as women and youth, who are often disproportionately affected by unemployment. By promoting local value chains and decentralised production models, a circular economy can contribute to a more equitable distribution of wealth and empower local communities to participate in and benefit from sustainable industrialisation.

### Contrasting the Linear Model with the CE Framework

The findings reinforce the core critique highlighted in the literature: the linear economic model, based on continuous extraction, consumption, and disposal, is fundamentally incompatible with long-term sustainable development objectives (Geissdoerfer et al., 2017). In the Ugandan context, this model's unsustainability manifests through accelerating resource depletion, escalating waste generation burdens, and a lack of systemic approaches to resource circularity within policy frameworks. These patterns create ecological

threats, impose economic costs, and ultimately risk disrupting the very resource base upon which industrial growth depends. Conversely, the potential benefits of a CE framework align with the foundational principles of sustainable development (Ellen MacArthur Foundation, 2013). By prioritising resource efficiency, extending product lifespans, and closing material loops, CE strategies promise to reconcile economic growth with ecological safeguards and enhanced social equity. The research findings identify resource security, the transformation of waste into an economic asset, and innovation-driven green industries as key pathways through which a CE transition in Uganda could contribute to addressing core development challenges while fostering long-term resilience.

### **Strategies and Success Factors for Circular Economy Implementation in Uganda**

Examining successful CE transitions in other developing countries provides valuable insights for Uganda. These case studies highlight the critical role of supportive policy frameworks, strategic investment in infrastructure, and the cultivation of a knowledge-sharing and collaborative environment. The adoption of robust policy frameworks has been instrumental in driving CE transitions in various contexts. For instance, Rwanda has developed a comprehensive Green Growth and Climate Resilience Strategy that outlines clear targets for resource efficiency, waste reduction, and the promotion of green industries (Ministry of Environment, Rwanda, 2019). South Africa's National Waste Management Strategy (2020) includes provisions for extended producer responsibility (EPR) schemes, which hold manufacturers accountable for the end-of-life management of their products. These policies provide a clear direction for businesses, incentivise circular practices, and attempt to create a level playing field for circular enterprises.

Investing in the necessary infrastructure is another critical factor for enabling CE transitions. Case studies from countries like China and India

demonstrate the importance of developing comprehensive waste management systems, including collection, sorting, and recycling facilities (Ghisellini et al., 2016). Additionally, the creation of eco-industrial parks, where industries collaborate to share resources and minimise waste, has proven effective in fostering circularity at a regional level (Chertow, 2000). In Uganda, investments in such infrastructure can unlock the potential of waste as a resource, create new economic opportunities, and reduce the environmental burden associated with uncontrolled waste disposal.

Building a skilled workforce and promoting knowledge exchange are essential components of a successful CE transition. Many developing countries have initiated capacity-building programs to train professionals in circular design, resource recovery technologies, and sustainable business models (World Bank, 2022). Collaboration with international organisations, research institutions, and private sector leaders in the CE field can facilitate the transfer of knowledge and best practices, accelerating Uganda's progress.

### **Challenges and Potential Barriers**

While the CE model offers significant promise, several challenges and potential barriers must be acknowledged and proactively addressed in the Ugandan context. The informal sector, which plays a crucial role in waste collection and recycling in Uganda, presents both challenges and opportunities. While informal actors possess valuable skills and knowledge, they often operate in precarious conditions with limited access to resources and technology (Wilson et al., 2006). Integrating this sector into a formal CE framework requires a refined approach that addresses social and economic concerns. This could involve providing training and capacity building, ensuring fair compensation, and creating avenues for participation in decision-making processes.

Changing consumer behaviour and raising awareness about CE principles also pose significant

challenges. In many developing countries, a *"throw-away"* culture prevails, with a preference for cheap, disposable products (EEA, 2020). Overcoming this consumer mindset requires a concerted effort involving public awareness campaigns, educational programs, and policy interventions that incentivise sustainable consumption patterns. This could include measures such as product labelling schemes, eco-taxes on disposable products, and support for businesses offering repair and reuse services.

Another challenge lies in the availability and quality of data for decision-making. Limited data on material flows, waste characterisation, and the economic potential of specific CE sectors in Uganda pose a challenge in accurately quantifying the benefits of a CE transition. To address this, collaborative efforts involving government agencies, research institutions, and the private sector are needed to establish robust data collection and monitoring systems. This would enable evidence-based policymaking, targeted investments, and tracking the progress of CE implementation.

### **Addressing the Complexities of Circular Transition**

While the findings paint a compelling picture of the potential benefits of a CE in the Ugandan context, the identified challenges necessitate a clear and pragmatic approach. The integration of the informal waste sector, often overlooked in CE discourse, demands careful attention. Deliberate policies that ensure equitable participation, safe working conditions, and access to technology for informal actors will be crucial for socially just and efficient material recovery systems (Wilson et al., 2006). The findings reiterate the importance of shifting consumer behaviours, a challenge highlighted in both industrialised and developing country contexts (EEA, 2020). Public awareness campaigns and education on how circular models support a healthier environment and sustainable economies should be prioritised. Coupled with policies that

promote sustainable consumption, such as 'green' procurement practices within the government and private sectors, these efforts can gradually shift market demand towards circular products and services.

### **Limitations and Future Research Directions**

The reliance on secondary data in this study implies certain limitations. Published reports and academic literature may not fully encapsulate the complexities of on-the-ground implementation challenges in transitioning from linear practices to CE systems in specific sectors of Uganda's economy. Therefore, primary research in the form of in-depth case studies, focused stakeholder interviews, and comprehensive material flow and waste characterisation analyses would be invaluable in painting a more detailed and accurate picture. In addition, the potential social and cultural dimensions of CE transitions in Uganda warrant further investigation. Research focusing on understanding prevailing consumption patterns, societal attitudes towards waste and resource conservation, and potential localised strategies for circular innovation would significantly enrich policy development processes and facilitate contextually responsive implementation plans. Quantitative analyses exploring the economic feasibility of specific CE interventions, the potential for job creation in various sectors, and thorough cost-benefit comparisons between traditional linear models and circular alternatives present avenues for impactful future research. Such robust quantifications, tailored to the Ugandan context, would serve as potent advocacy tools and inform targeted investments with the potential to maximise the economic appeal of circularity.

### **Contributions and Significance**

This research offers a valuable contribution to the growing body of knowledge on circular economy implementation in developing countries and, more specifically, within the East African context. By critically examining the limitations of the linear



model in Uganda and systematically assessing the potential, strategies, and challenges involved in a CE transition, the study advances the ongoing dialogue around sustainable industrial development pathways. Importantly, the findings hold significant implications for Ugandan policymakers and industry stakeholders. The research clearly outlines why a continuation of the current linear model is incompatible with the country's long-term development aspirations and environmental well-being. Still, by identifying key policy levers, infrastructure needs, and collaborative approaches necessary for the transition, the study demystifies the concept of a circular economy and provides actionable insights to decision-makers. The emphasis on inclusive approaches towards informal sector integration and the potential of CE to drive inclusive growth aligns with Uganda's National Development Plans, which prioritise social equity and poverty reduction alongside economic transformation. This research, therefore, can serve as a catalyst for further policy discourse and the development of concrete implementation plans that leverage the transformative potential of circular economy models.

### Recommendations and Future Directions

Building upon the findings and discussion, a number of core recommendations can guide Uganda's efforts towards a circular industrial transformation. The creation of a comprehensive CE roadmap, either as a standalone policy document or explicitly integrated into national industrial and environmental strategies, is crucial. This roadmap should establish clear targets, timelines, and performance indicators to track progress towards circularity, while defining sectoral roles and responsibilities. Secondly, there is a need to introduce fiscal mechanisms such as Extended Producer Responsibility (EPR) schemes, tax incentives for circular initiatives, and the phasing out of subsidies that inadvertently support linear production methods. This should also include aligning environmental regulations with CE

principles, focusing on preventative measures that foster design-for-recyclability, waste minimisation, and valorisation.

The study further recommends the prioritisation of strategic investments in modern waste collection and sorting systems, material recycling facilities, and eco-industrial parks. It is imperative to explore innovative financing models such as Public-Private Partnerships (PPPs) and leverage international development assistance programs focused on sustainable infrastructure. Additionally, programs should be set up within universities, research institutions, and vocational training centres to develop expertise in CE-related fields. The government should promote multi-stakeholder collaboration platforms and facilitate knowledge exchange with international networks for the transfer of best practices and technologies. Finally, authorities should implement targeted awareness campaigns to educate consumers about the benefits of a CE and the need to shift away from a *'throw-away'* culture. Sustainable consumption practices ought to be encouraged through policies that promote reparability, product labelling schemes, and green public procurement.

### CONCLUSION

The transition towards a circular economy model presents a transformative path for Uganda to reconcile its pursuit of industrial growth with the urgent imperatives of environmental protection and social equity. This comprehensive study underscores the limitations of the prevailing linear economic model, characterised by escalating resource depletion, pollution burdens, and a lack of integrated circularity within industrial processes. Conversely, the research highlights the potential of a circular economy framework to address these challenges, fostering resource efficiency, waste valorisation, innovation-driven green industries, and more inclusive economic opportunities. While a circular transition necessitates decisive action, careful planning, and collaborative efforts, the potential benefits far outweigh the costs of inaction.



By adopting supportive policies, investing in enabling infrastructure, building technical capacity, promoting collaboration, and raising public awareness, Uganda can set itself on a course towards a more sustainable and resilient future. This shift is not merely an ecological necessity; it presents a strategic advantage to position Uganda as a leader in sustainable industrialisation within the East African region and beyond. The findings of this research implore Ugandan policymakers, the private sector, civil society, and academia to jointly undertake this transformative endeavour. By prioritising resource stewardship, embracing innovation, and investing in a circular future, Uganda can achieve its national development aspirations while safeguarding the well-being of its people and the rich natural environment upon which its prosperity ultimately depends.

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