



OPEN ACCESS

EDITED BY

George Tsalidis,
Brunel University London, United Kingdom

REVIEWED BY

Anupam Khajuria,
United Nations Centre for Regional
Development, Japan
Maria Bakatsaki,
Technical University of Crete, Greece

*CORRESPONDENCE

Rebecca K. M. Clube
✉ r.clube@ucl.ac.uk

RECEIVED 23 September 2023

ACCEPTED 21 February 2024

PUBLISHED 07 March 2024

CITATION

Clube RKM and Hazemba M (2024) From
waste to resource: demystifying the policy
challenges and identifying opportunities for a
circular economy in Zambia.
Front. Sustain. 5:1300904.
doi: 10.3389/frsus.2024.1300904

COPYRIGHT

© 2024 Clube and Hazemba. This is an open-
access article distributed under the terms of
the [Creative Commons Attribution License
\(CC BY\)](#). The use, distribution or reproduction
in other forums is permitted, provided the
original author(s) and the copyright owner(s)
are credited and that the original publication
in this journal is cited, in accordance with
accepted academic practice. No use,
distribution or reproduction is permitted
which does not comply with these terms.

From waste to resource: demystifying the policy challenges and identifying opportunities for a circular economy in Zambia

Rebecca K. M. Clube^{1*} and Malonga Hazemba²

¹Institute for Sustainable Resources, University College London, London, United Kingdom, ²Emerging Themes Unit, Zambia Institute for Policy Analysis and Research, Lusaka, Zambia

Policy plays a significant role in accelerating or hindering a circular shift; Governments can set long-term visions and drive legislative change to create an enabling environment. Reflecting the regional picture, Zambia is experiencing increasing waste burdens due to a growing population and economic development. The current management approach is linear, characterized by low collection rates, inadequate disposal, and limited waste revalorization. From a sustainable development perspective, how waste is managed impacts pressing issues such as climate change and public health. The concept of the Circular Economy (CE) has gained global and regional interest given its potential to transform how resources are viewed and managed. Circular strategies may help to reduce waste burdens and create local socioeconomic opportunities while safeguarding the environment. This qualitative study uses document review and expert interviews to explore the current waste management regime in Zambia and understand *if* and *how* circularity is embedded into the policy approach. The findings suggest that the CE is potentially highly relevant for Zambia, but there are various policy challenges that could impede its successful integration into the national agenda. These challenges relate to ownership and coordination; gaps in implementation and enforcement; a restrictive licensing approach; obstacles to innovation and new entrants; as well as the role of informal sector actors. The challenges point to opportunities to overturn these policy shortfalls, which also presents future research avenues.

KEYWORDS

circular economy, municipal solid waste, policies, sustainable resource management, green economy, Zambia, recycling

1 Introduction

1.1 Context setting

Transitioning to a sustainable model of resource use, including moving away from linear solid waste management to a circular approach, represents a major development challenge for Low-and Middle-Income Countries (LMICs) (Sharma et al., 2021; Abunyawah et al., 2023). Following rising resource use, global waste burdens are expected to disproportionately impact African countries in the future (Godfrey et al., 2019). The World Bank estimates that the

Sub-Saharan region will experience the most significant increase in waste globally, with the annual generation rate of 174 million tonnes to almost triple by 2050 (Kaza et al., 2018). This is due to rapid population growth, urbanization, and other socio-economic shifts. For example, when GDP *per capita* grows it is traditionally coupled with higher waste generation rates as well as increased complexity of composition (Powell et al., 2018).

Zambia, the national context explored in this article, is undergoing demographic and socio-economic shifts (Republic of Zambia, 2021). For example, the Zambian population has grown from approximately 13.1 million people in 2010 to slightly over 19.6 million as of September 2022. In the same time period, the capital city, Lusaka, has seen its population grow from 2.2 million people (2010) to over 3 million people (2022) (Zambia Statistics Agency, 2022). Such changes are contributing to an increasingly challenging solid waste management landscape, characterized by growing waste volumes, inadequate collection services, lack of sanitary landfilling, coupled with associated environmental and public health concerns (Mupedziswa and Kubanga, 2017; Banda et al., 2023). Accurate waste statistics are also difficult to obtain. The World Bank estimates that in 2016 the daily waste generation was 0.51 kg/capita in Zambia, which is likely to continue to rise considering the global average was approximately 0.74 kg/capita/day (Kaza et al., 2018). Figures for collection are typically based on urban centers, namely Lusaka, where statistics reported in 2007 suggested a collection coverage rate of 45 per cent (UN-HABITAT, 2010). However, at the time of writing – over 15 years later – this is still referred to as the official collection figure for Lusaka, and often used in assumptions at the national level (Kaza et al., 2018; AGS, 2022a,b). Given the growth in the population and associated demographic shifts, more recent data are required to ascertain if this remains accurate. With growing waste volumes, the direct costs of waste management may be above the handling capacities of mandated institutions, so waste is typically viewed as a political and economic burden. However, there may be social (e.g., poverty alleviation, public health) and environmental issues (e.g., energy, land use) that could be synergistically addressed through improved management (Sharma et al., 2021; Dickson et al., 2023; Yang et al., 2023).

In certain jurisdictions, particularly Europe and China, the notion of the Circular Economy (CE) has emerged as an important concept whereby waste is reconceptualized as a resource by building on the earlier coined 3R principles (reduce, reuse, recycle) (Halog and Anieke, 2021). The CE framing has commercial and political appeal due to its promise of creating new economic opportunities while aligning with broader development goals (Bocken et al., 2016; Halog and Anieke, 2021; Yang et al., 2023). Policy can be an enabler and accelerator of circularity, and so countries are developing policies, including national strategies, legislative provisions, and instruments to support this transition (EMF, 2021a; Asare et al., 2023). In Africa, the CE is beginning to gather pace. This is illustrated by the emergence of coalitions, such as the African Circular Economy Alliance (ACEA) (Desmond and Asamba, 2019; Lemille, 2021), and Africa's inaugural hosting of the World Circular Economy Forum in 2022 in Rwanda. The CE is only beginning to diffuse into private and public sector discourse in Zambia (AGS, 2022a). Nevertheless, circularity could support the country's development and climate mitigation priorities. For example, the Green Growth agenda will include the promotion of sustainable consumption and production following CE principles and

norms. Also, Zambia's Nationally Determined Contribution (NDC) commitments include reducing greenhouse gas emissions from waste (Powell et al., 2018; Republic of Zambia, 2021).

1.2 Study purpose and structure

Despite the growing interest in the potential for a CE in Africa, there remains an underdeveloped literature base with few studies focused on Zambia. This research gap must be addressed as context-specific evidence is required; strategies that are suitable in high-income regions are not directly transferrable to LMIC regions due to different political, economic, environmental, and social factors (Milios, 2018; Desmond and Asamba, 2019). There is need for descriptive and exploratory research to better understand the policy landscape in Zambia. To the authors knowledge, no academic study has yet focused on exploring the CE policy perspective in waste management. Thus, this study collects primary data in the form of expert interviews, supplemented by a review of secondary sources (policy documents), to understand the current situation with regards to waste; establish the relevance of a CE for Zambia; and identify the key relevant policies. In doing so, the study will identify existing policy challenges. This will enable discussion of empirically grounded future opportunities.

This article is structured as follows. In section 2, key literature themes are introduced relating to the CE. Then, the methodological approach is presented in section 3. After, the findings are presented in section 4, including identification of policy challenges with reference to existing literature. Then, section 5 discusses some policy opportunities to overturn the challenges identified, before concluding the research in section 6.

2 Literature background

This section introduces relevant literature surrounding the CE concept, its relevance for Africa, and in particular for Zambia. Then, the importance of policy for a CE is introduced, with reference to the existing research encompassing Sub-Saharan Africa.

2.1 Introduction to the CE concept

The CE is an umbrella concept encompassing various strategies and principles to transform how waste and resources are viewed and managed. In the prevailing linear “take-make-waste” approach, products and resources are rarely proactively designed to enable revalorization at the end-of-use, so little value is recovered (EMF, 2021a). Hence, linearity is often associated with negative environmental impacts (e.g., pollution, resource depletion) but also economic (e.g., cost of cleanup) and societal externalities (e.g., public health impacts). On the other hand, advocates suggest that a CE can transform the system to deliver significant value-creation and sustainability benefits that are compatible with meeting the Sustainable Development Goals (SDGs) (Schroeder et al., 2019; EMF, 2021a; Yang et al., 2023). Circular strategies often surround adoption of the 3R principles (reduce, reuse, recycle) to close, slow, and narrow resource loops while using cleaner production approaches, including

renewable energy adoption (Bocken et al., 2016). Since pollution from solid waste can be high, circularity strategies can also help reduce the final greenhouse gas emissions profile compared to traditional disposal methods (Powell et al., 2018; Desmond and Asamba, 2019). For example, organic wastes (including food wastes) could be used as a feedstock (e.g., for composting, fertilizer production and energy generation).

Advocates, such as EMF (2021b), argue that CE adoption can enable economic growth to be decoupled from resource consumption, thereby delivering various environmental benefits (e.g., reducing pressure on ecological systems, increasing climate resilience, safeguarding biodiversity and improving air quality) while creating new socioeconomic opportunities (e.g., new industries, businesses and employment prospects). Some scholars also argue that the CE could potentially deliver more equitable social outcomes (Desmond and Asamba, 2019; Clube and Tennant, 2023).

2.1.1 Relevance of the CE for Africa

Despite growing global interest, studies focused on LMICs, including Africa, are sparse (Schroeder et al., 2019). Through a systematic mapping of articles exploring the CE concept in the Global South, Muchangos (2022) found that Sub-Saharan Africa was the least represented sub-regional group in terms of research outputs. At the country level, most studies focus on South Africa within this sub-region, but no articles on Zambia were found in their analysis. The focus on certain countries reflects observations of Desmond and Asamba (2019), who suggest that in Africa, the CE agenda has primarily been adopted in Nigeria, South Africa, Rwanda, and Kenya. However, interest is growing elsewhere due to growing awareness demonstrated by the formation of networks and coalitions.

There are a growing number of studies focused on revalorizing certain waste streams in this region, such as plastics and e-waste (Desmond and Asamba, 2019; Joshi et al., 2019; Oyinlola et al., 2022; Schröder et al., 2023). However, the CE is also likely of broader relevance given predominant approaches to waste are organized in such a way that no or little value is *officially* recovered. In general, formal services may be limited; where they do exist, a linear outlook typically means waste is transferred from the point of generation to its final disposal destination (e.g., at a dumpsite or landfill). African countries may also receive waste from other nations as part of a global waste trade based on unfavorable dependencies, which adds further burdens in terms of environmental management (Desmond and Asamba, 2019; Oyinlola et al., 2022). However, aspects of circularity are already organically embedded in Africa and other LMIC contexts since informal economies often *unofficially* adopt CE principles as they recover and recycle materials, usually driven by poverty rather than by proactive design (Velis, 2017; Wright et al., 2019; Abunyawah et al., 2023; Marks et al., 2023). Nonetheless, these activities involve health risks, social stigmatization and low remuneration (Barford and Ahmad, 2021). Here, the typical recovery and revalorization approach is retrospective, and certain waste streams, such as low-grade plastics and organic wastes, are of high volume but are not currently valuable for the informal sector so they still end up in the environment (Velis, 2017; Marks et al., 2023). Hence, there are calls for more formalized strategies to capture high value revalorization opportunities and deliver job creation, health, and wider development benefits (Wright et al., 2019).

2.1.2 The CE in Zambia

The CE is a nascent phenomenon in Zambia, and so there are very few studies explicitly focused on this topic in this context. There are a handful of peer-reviewed studies covering municipal waste management issues. For example, studies have sought to understand the ecological and public health externalities caused by inadequate waste regimes (Chibwe et al., 2021; Muleya et al., 2021). While, in terms of social research, Chileshe and Moonga (2019) critically discuss the political factors behind lagging progress of the “Keep Zambia Green, Clean, and Healthy Campaign.” They conclude that political will has not been strong enough to deliver substantial change in green behaviors.

There is also some exploration of circular principles or business models, such as waste recovery or recycling. For example, Oyinlola et al. (2022) present a case study of Zambian digital innovation, Recyclebot, which provides a decentralized platform for waste exchange, connecting generators and buyers of recyclables. They identify that such innovations are relevant since centralized systems often fail to reach buyers, and such platforms can better capture the value of recyclables. Mwanza and Mbohwa (2019) explore the barriers to effective reverse logistics to enable plastics recycling in Zambia, identifying various social, economic, and political obstacles, including lack of regulations. It has been claimed that circular approaches can simultaneously solve more than one development challenge; for example, waste-to-energy technology adoption can satisfy energy needs while reducing waste (Shane et al., 2017; Banda et al., 2023; Tembo et al., 2023). Bwalya et al. (2022) studied the potential to use tire waste as an aggregate for the construction industry to overcome waste and resource challenges.

AGS (2022a) produced the first comprehensive CE report focused on Zambia, which identified ten opportunities for value creation using circular principles. For example, trading valuable wastes and waste-to-energy generation were among the stated opportunities. The study suggests that embracing these ten prospects could add US\$712 million *per annum* to the economy. More recently, Banda et al. (2023) explicitly explore the CE and its relevance for Zambia, arguing that circularity could provide an “antidote” to persisting waste management challenges. They suggest that circular strategies which embrace the 3R approach can contribute to development objectives by delivering various social (e.g., job creation), environmental (e.g., reduced pollution) and economic benefits (e.g., financially viable opportunities). The authors argue that for the benefits to be fully realized in line with the Zambia Vision 2030, the country needs to fully embrace a CE. Although the literature base is beginning to emerge, more general waste policy analysis or studies with a specific-CE framing are missing.

2.2 Policy for a CE

Policy actors at international, national, and local levels are recognized as key proponents in supporting transitions to more sustainable resource regimes (UNEP, 2016; Fitch-Roy et al., 2021; Halog and Anieke, 2021). Governments can set long-term policy goals and have the authority to implement laws and instruments to operationalize these pathways. These topics are garnering interest in

the academic literature but have thus far been limited in the Sub-Saharan African context. Zambia has not yet been explored in existing studies focused on CE policy.

2.2.1 Policy approaches

Globally, governments are developing CE-specific policies or embedding the principles into existing policy domains (Fitch-Roy et al., 2021). Supportive policy is framed as an enabler of the CE, while a lack of policy may hinder circularity. No single policy intervention is sufficient; rather multiple interventions concurrently can be designed to deliver a strategic and coordinated approach (Milios, 2018; Fitch-Roy et al., 2021). Policy goals can be supported through instruments, which incentivize circularity or disincentivize linearity. A combination of regulatory, economic and soft strategies can produce a comprehensive and coherent instrument mix (Borrás and Edquist, 2013). The importance of taking a lifecycle approach has been highlighted, so policies should cover the total value chain (Milios, 2018; Zhu et al., 2019). This deviates from traditional waste policy, which typically targets the end-of-life with less focus on product design, distribution, and consumption phases (Syberg et al., 2021).

The influential Ellen MacArthur Foundation (EMF) have identified a set of universal policy goals aimed at providing a framework for national governments, cities, and businesses to accelerate the transition (EMF, 2021a). These goals focus on stimulating design to eliminate waste and pollution; promoting business models and resource management systems to preserve material/ product value; ensuring economic viability through deliberate incentives and regulatory requirements; investing in innovation, infrastructure, and skills development; and fostering collaborations for system change at local, national, and international levels.

Literature has described the formation of CE-specific policy and the wider uptake of strategies as being closely linked. According to Rweyendela and Kombe (2021, p. 1,064), a country's regulatory regime "exerts enormous influence on the speed and direction of the CE transformation." For instance, China and the European Union are widely studied as cases in the academic literature; both were early to develop comprehensive CE policy packages (Zhu et al., 2019; Fitch-Roy et al., 2021; Rweyendela and Kombe, 2021).

2.2.2 Policy for CE in Africa

It has been claimed that LMICs are well-placed to introduce CE policies: they can establish frameworks from less developed legislative foundations whereas high-income nations often have to retrofit circularity into already engrained systems and policy perspectives (Fitch-Roy et al., 2021). Scholars claim that LMICs can proactively design effective waste systems that are conducive to CE and deliver so-called *leapfrog* benefits (Preston and Lehne, 2017; Wright et al., 2019). The leapfrogging perspective suggests that more sustainable development pathways can be realized from the outset, avoiding unsustainable impacts and technological lock-in associated with the linear economy (Preston and Lehne, 2017; Lemille, 2021). There is, however, sparse research on policy aspects in the African context (Nijman-Ross et al., 2023), although some studies are emerging, for example, focused on Ghana (Asare et al., 2023); Kenya (Muriithi and Ngare, 2023); Rwanda (Ogutu et al., 2023); South Africa (Godfrey

et al., 2019, 2021); and Tanzania (Rweyendela and Kombe, 2021). The limited literature reflects of the nascent diffusion of CE-specific terminology into policy. However, circularity principles may already be nested in more general waste frameworks or other policy domains (e.g., green economy agendas) (Desmond and Asamba, 2019; Fitch-Roy et al., 2021).

There are studies exploring policy approaches or legislative instruments emerging in the region, in particular Extended Producer Responsibility (EPR) instruments and bans of certain plastic products. EPR frameworks are "becoming a core part of the circular economy narrative" (Velis, 2017, p. 331), and are increasingly being established, including enactment in Zambia (Syberg et al., 2021; Schröder et al., 2023). Policies can target specific waste streams, and plastics are a major focus due to pollution concerns, global awareness campaigns and international pacts (Nielsen et al., 2019; Behuria, 2021; Oyinlola et al., 2022). Rwanda was an early adopter of regulations to reduce the use of single-use plastics and is considered to be a regional frontrunner, so this context has garnered interest (Behuria, 2021; Shomuyiwa et al., 2023). Rwanda implemented a plastic bag ban in 2008 and later introduced economic instruments, such as tax incentives to stimulate the recycling sector (Adebiyi-Abiola et al., 2019; Syberg et al., 2021; Ogutu et al., 2023). Interventions focused on product design, and aspects such as remanufacturing, are rarely covered by specific policies in Africa. However other jurisdictions (e.g., the European Union) advocate for a full lifecycle perspective (EMF, 2021a). Upstream policies are relevant as they can determine the durability and the ability for effective reuse and recycling at the end-of-use phase. Schröder et al. (2023) note the necessity of a systemic outlook by taking a regional *and* material-specific analysis to identify policy for Africa's transition to a circular plastics economy. They suggest that a policy framework should include EPR; common regional recycling standards; support for innovation into business models and decentralized technologies; and social support for informal sector inclusion. The latter suggestion reflects the important role of the informal sector in waste regimes (Barford and Ahmad, 2021).

Despite a growing interest in policy adoption, studies have shown that the existence of CE-specific policies alone is not necessarily enough to deliver transformative impacts (Desmond and Asamba, 2019; Nijman-Ross et al., 2023). Existing waste frameworks may not be robust, so the development of CE policy might be inappropriate if layered on weak waste policy. Implementation and enforcement can also be lax or delayed (Adebiyi-Abiola et al., 2019; Desmond and Asamba, 2019; Behuria, 2021; Ogutu et al., 2023). For instance, Godfrey et al. (2021) note that in South Africa, despite various regulatory interventions, policies between sectors are not aligned so enactment has not delivered intended results. In Kenya, there is a clear policy agenda, but there remains a lack of financial incentives, which must be enhanced to improve institutional participation. A top-down, prescriptive approach means there is limited collaboration with other relevant stakeholders (e.g., the private sector) (Muriithi and Ngare, 2023).

Reflecting the global picture, there is need for research to understand optimal policy approaches that account for contextual specificities (Fitch-Roy et al., 2021). There is extremely limited work on these policy aspects in the Zambian context. Hence, this study adds

to this knowledge gap by focusing on CE policy and its potential, especially with regards to municipal solid waste.

3 Methods

This research takes an exploratory qualitative approach, which is appropriate given research on the topics of waste and the CE are sparse in the Zambian context (Azungah, 2018). The methodological approach combines policy document review and semi-structured interviews. This is described in the following sections.

3.1 Review of key policies

To begin with, a scoping review of Zambian waste related policies and legislative documents was conducted. Document review enables researchers to obtain insights developed independently of the research study, and hence is particularly useful for contextual as well as cross-checking purposes (Azungah, 2018).

The approach involved browsing government ministry websites, Google searches, scanning news articles and applying snowball searching techniques, enabling a list of potentially relevant policies to be developed. This list was updated throughout the research process (Table 1). As policies were identified, they were briefly reviewed for familiarization purposes. For example, to understand how waste is defined, whether CE is referenced in the agenda, and the prescribed management approach. During the interview process (see section 3.2), it became clear that some policies were considered more relevant to the CE agenda than others. Therefore, during the later analysis phase, these policy documents were revisited for closer reading alongside the interview data.

TABLE 1 List of participants.

Participant number	Stakeholder type
P1	Private sector
P2	Private sector/ social enterprise
P3	Private sector
P4	Private sector
P5*	Private sector/social enterprise
P6	Private sector
P7	Social enterprise/NGO
P8	Private sector/NGO
P9	Government affiliated entity
P10	NGO
P11	Private sector
P12	NGO
P13	Association
P14	NGO

*Interview conducted over two sessions with two different experts from the same organization due to internet-connection challenges. These participants have been included and analyzed as a single representative as there was overlap in the questioning due to the aforementioned difficulties.

3.2 Semi-structured interviews

Interviews were conducted with key informants. Since there are very few exploratory studies covering the subject matters of waste and circularity in the Zambian context, semi-structured interviews were deemed appropriate to gain rich and diverse insights from participants with context-specific expert knowledge of the sector (Azungah, 2018; Creswell and Creswell, 2018).

In total, 14 interviews were conducted with 15 stakeholders (Table 1). Participants were recruited through various means, such as via the professional networks of the authors; through identification and contact with experts from relevant reports; as well as using snowball search techniques. Most of the interviews were conducted via video conferencing, which was cost-effective and enabled the participant sample to extend beyond Zambia's capital city (Lusaka). Each interview lasted approximately 30–70 min. The interviews were recorded after informed consent was obtained verbally or in advance by email. The only exception was P13, which was not recorded but instead comprehensive notes were taken during the interview. The participants were all based in Zambia and represented a range of stakeholder groups, including waste management companies; non-government organizations (NGOs); small and medium sized enterprises (SMEs) with involvement in circular manufacturing or waste management; quasi-government entities; as well as waste and environmental consultants.

A topic guide was developed in line with a semi-structured interview approach (Knott et al., 2022). The guide covered various lines of inquiry to elicit discussion on topics such as: the current waste landscape; the relevance of a CE; the existing policy agenda; and policy challenges and opportunities. However, a flexible approach was adopted to enable both the researchers and participants to divert from the set line of questioning and open new lines of inquiry (Berry, 2002; Knott et al., 2022). Interpretation and reflexivity were embedded in the research process. Additional topics emerged that were included in some of the later interviews. This iterative approach is suitable in exploratory research since the aim is to extend knowledge rather than to generalize from data (Berry, 2002; Creswell and Creswell, 2018). As such, diversity of responses can support data richness. Furthermore, when necessary, the topic guides were altered to tailor the questioning to the expertise of the participants.

3.3 Approach to analysis and interpretation of findings

The analysis and interpretation phases took place in parallel with data collection, which is common in qualitative research since it supports an iterative process (Knott et al., 2022). The interviews were transcribed, and the participants were pseudo-anonymized by allocating participant numbers to maintain confidentiality of the individuals.

The database NVivo was used for data management and analysis (Yin, 2017; Creswell and Creswell, 2018). More specifically, a systematic, code-based thematic analysis approach was adopted, using both deductive and inductive coding strategies (Azungah, 2018; Knott et al., 2022). The analysis was iterative and interpretive, and sought to identify themes of convergence as well as deviance, enabling representation of a wide spectrum of understandings and

perspectives presented in the interviews (Berry, 2002; Knott et al., 2022). In this respect, the sub-headings used in section 4 are broadly reflective of the core discussion points and elicited themes in line with the NVivo coding structure. The analysis of interviews was also coupled with revisiting and reviewing the earlier identified policies (section 3.1) to ensure that the findings were synthesized reliably.

A presentation and feedback workshop was held in Lusaka, Zambia in November 2023, enabling the findings to be presented to some of the interviewed participants and additional stakeholders. The purpose was to ensure the findings and discussion points were reflective of the situation on the ground.

4 Findings

The first part of this section begins by describing the contemporary Zambian policy approach by highlighting the most relevant interventions. Then, from the interview data, the status and relevance of the CE in Zambia is presented. Finally, the identified policy challenges are described. Throughout the analysis, example extracts from the interviews are provided.

4.1 Policy approach

The policy scoping identified various documents that are potentially relevant to the waste and CE agenda in Zambia (Table 2). Some of these determine how waste is viewed and managed; identify relevant stakeholders; and include reference to circular principles (i.e., 3Rs). They include policy strategy documents and visions, legislations and associated statutory instruments (SI). Although Table 2 identifies 10 policies, the interviews suggest that the Environmental Management Act (EMA) of 2011 and the Solid Waste Regulation and Management Act (SWRMA) of 2018 are the two most substantive enacted legal documents of relevance, whereas the EPR is the most pertinent SI associated with a CE approach (P1, P4, P9).

The EMA (2011) reiterates the principles of the earlier National Solid Waste Management Strategy (NSWMS) of 2004 to reduce, reuse and recycle wastes. The EMA was identified as fundamental since it supersedes previous environment and waste legislations. It covers a variety of waste types, including household, municipal and hazardous and reiterates the fact that disposal should be a last resort after other principles (e.g., reduce and recycle). It included the establishment of the Zambia Environmental Management Agency (ZEMA) and provides them the ability to issue licenses to private sector collectors (P12).

The SWRMA reiterates that principles of the waste hierarchy should be applied so wastes should be responsibly managed through the creation of an enabling environment for reduction, reuse, and recycling. The Act excludes hazardous waste, which is dealt with under the EMA. Although explicit CE terminology is not used, the sentiment of the SWRMA is well-aligned with circularity and establishes the roles of different actors (e.g., generators, communities, local governments, waste collectors, utilities etc.) (P1, P4, P9). For example, separation at source is mandated in the Act. P12 pointed out that a key point of progress and differentiation is that the SWRMA states that

waste is a *resource* whereas the preceding EMA treats waste as a *pollutant*. Importantly, as reiterated in the Local Government Act (LGA) of 2019, the SWRMA devolves the mandate of municipal solid waste management to the Ministry of Local Government and Rural Development (MLGRD) and enables them to sub-contract collection services by issuing licenses to the private sector (P12). The Act also enables local governments to set up public-private sector partnerships to manage waste. For example, Lusaka City Council recently established the Lusaka Integrated Solid Waste Management Company (LISWMC), which is essentially a utility to deal with waste issues for the Council (P9, P11).

In the same year, SI no.65, the EPR, was introduced by ZEMA. This is perceived as well-aligned with a CE approach due to its focus on the polluter-pays-principle by encouraging producers of wastes, including plastics, to take responsibility for their packaging at the end of life (P1, P3, P4, P5, P8, P9). The EPR also contains a ban on plastic bags under 30 microns and enables retailers to charge a fee for bags that meet the required standard.

The Eighth National Development Plan (8NDP) of 2022–2026 was referenced by some participants. To the authors knowledge, this is the first official policy document to *explicitly* mention the CE: it does so in relation to the promotion of sustainable consumption and production.

4.2 The status and relevance of CE concept

4.2.1 Status of waste management and the CE

From participant descriptions of the current waste situation across the country, the approach to waste management is predominantly linear in nature. The landscape is characterized by increasing waste streams that are growing in complexity (e.g., proliferation of plastics); low collection rates; limited recycling; underdeveloped revalorization activities; and inadequate final disposal. Due to limited collection and proper landfill options, other technically illegal strategies, such as burning or burying waste, are commonplace (P1, P4, P6). The landfill situation was described as an “enormous problem” for the Government (P5). For example, it was claimed that “*we lack an engineered or proper disposal site in most parts of the country*” (P6). Furthermore, Lusaka’s landfill, Chunga, may have originally been classified as *engineered* but due to population growth and increased waste, it is now overcapacity, so is essentially a dumpsite (P1, P4, P9, P11). The dumpsites were highlighted as causing environmental (e.g., pollution) and social impacts (e.g., hazardous working conditions) (P4, P10, P14). This reinforces existing concerns, such as Chibwe et al. (2021) who found that communities in the vicinity of the Chunga site suffer high incidences of illness (e.g., malaria, respiratory disease, diarrhea).

Accurate data regarding waste is not available; the volumes and compositions of waste received at disposal sites is not known since equipment (e.g., the weighbridges) are often broken (P1, P9). Since licensed companies only collect mixed wastes, recycling is limited and based on retrospective material recovery. This recovery usually is carried out by informal workers at landfills or in public places. The interviews revealed that circular principles and business models are being applied, although often at a small scale. Examples include material recycling across various waste streams; upcycling into new products (e.g., often at the micro, artisan level); repairing goods;

TABLE 2 List of relevant policies introduced in the last 20 years.

Policy	Year	Type	Relevance to CE
Environmental Management (Amendment) Act No. 8, <i>EMaA</i> (Government of Zambia, 2023)	2023	Legislation	<ul style="list-style-type: none"> Amends the EMA of 2011. Notably, redefines “waste”, including to clarify that municipal solid wastes are handled by local authorities, whereas commercial and industrial wastes are ZEMA’s responsibility. Allocates new duties to ZEMA (e.g., driving the green economy, eco-labeling and promoting sustainable production and consumption).
The Eighth National Development Plan, <i>8NDP</i> (Ministry of Finance and National Planning, 2022)	2022	Strategy	<ul style="list-style-type: none"> Sets broad national vision for period 2022–2026. The document explicitly utilizes CE terminology as a strategy for integrated resource management, including sustainable production and consumption; reuse and recycling; as well as resource use reduction.
The National Energy Policy, <i>NEP</i> (Ministry of Energy, 2019)	2019	Strategy	<ul style="list-style-type: none"> Acknowledges that waste can be used to produce energy, electricity and other byproducts.
The Local Government Act No. 2, <i>LGA</i> (Government of Zambia, 2019)	2019	Legislation	<ul style="list-style-type: none"> In line with decentralized duties, local governments must deal with refuse, including removal, management of dumpsites and disposal.
Extended Producer Responsibility Statutory Instrument No. 65, <i>EPR</i> (Ministry of Water Development, Sanitation and Environmental Protection, 2018)	2018	Instrument	<ul style="list-style-type: none"> Extends responsibility to producers of certain product categories (incl. Packaging and plastic waste) to the post-consumer stage. Plastic bags of <30 microns are banned, and retailers can charge a levy to citizen for other bags.
Solid Waste Regulation and Management Act No. 20, <i>SWRMA</i> (Government of Zambia, 2018)	2018	Legislation	<ul style="list-style-type: none"> Establishes the <i>waste is a resource</i> principle; the priority is to prevent, reduce, reuse, recycle and compost before energy recovery and disposal. Enables the formation of solid waste service providers and defines their functions, outlining licensing provisions, tariffs etc.
Licensing Regulations Statutory Instrument No. 112, <i>LR</i> (Government of Zambia, 2013)	2013	Instrument	<ul style="list-style-type: none"> Provides for the application of a waste management license by persons who intend to reclaim, re-use, recover, recycle, transport, dispose of, transit, trade in, export waste or collect and dispose of waste from industrial, commercial, domestic or community activities or own, construct or operate a waste disposal site/ facility for the permanent disposal or storage of waste.
The Environmental Management Act No. 12, <i>EMA</i> (Government of Zambia, 2011)	2011	Legislation	<ul style="list-style-type: none"> Supersedes previous environmental laws; re-names existing Council as ZEMA, who are responsible for environmental protection and sustainable natural resource management. Waste should be minimized and (in order of priority) be reused, recycled, recovered and disposed of safely. Enables ZEMA to issue licenses to operate, relating to various wastes (incl. Household, hazardous) and sets out licensing terms.
The National Policy on Environment, <i>NPE</i> (Republic of Zambia and Ministry of Tourism, Environment and Natural Resources, 2007)	2007	Strategy	<ul style="list-style-type: none"> Encourages adopting systems that sort industrial, clinical, domestic, and other waste at source to facilitate recycling of materials when possible.
National Solid Waste Management Strategy, <i>NSWMS</i> (Environmental Council of Zambia, 2004)	2004	Strategy	<ul style="list-style-type: none"> Outlines the principles to be adopted in the management of all waste streams whether domestic, mining or agricultural through waste minimization, re-use, recycling, treatment and disposal.

This list is not exhaustive but highlights some key policies identified by the authors and/or participants.

digitally enabled waste collection or measurement systems; waste-to-energy technologies; and other bioeconomy approaches. Many of the activities are private sector, NGO or social enterprise led. For instance, large manufacturers such as [Zambian Breweries, 2022](#) have a comprehensive recycling program that operates alongside NGOs, while start-up digital platform, [ebusaka](#), seeks to facilitate circularity of municipal wastes via a mobile app ([AGS, 2022b](#)). The leading role of the private sector has been observed elsewhere in the region ([Rweyendela and Kombe, 2021](#); [Asare et al., 2023](#)). There are also numerous organizations that deliver campaigns, educational

initiatives, and advocacy to encourage better waste behaviors and community recycling activities since currently wider knowledge regarding these issues may be missing (e.g., citizen understanding).

Recycling is the most common CE principle being applied in Zambia, mainly at the post-consumer phase and centered on certain waste streams (e.g., plastics, cardboard, paper) (P1, P11). Plastics appear to receive the most attention, although participants expressed concerns about emerging waste streams (e.g., Waste from Electrical and Electronic Equipment – WEEE). The examples of plastics being recycled into pellets or flakes were described, as was the country’s

wastepaper-to-eggtray value chain (P1, P3, P5, P6, P7, P11). From a critical perspective, some scholars stipulate that these activities are more closely aligned with downcycling strategies rather than closed-loop circularity (Bocken et al., 2016). A participant expressed concerns that recycling plastic into pellets is socially and ecologically undesirable since it enables the circulation of harmful chemicals (P14). Higher value addition and scaled recycling of materials into finished products, on the other hand, may happen outside of Zambia where there are more advanced value chains (P1, P5). For instance, some plastics may be exported for value-addition processing. Both South Africa and China are destinations of this plastic from Zambia, while there are also Chinese-owned enterprises running recycling facilities within the country (P1, P4, P5, P6, P7, P10, P11). For other waste streams, circularity is limited. Even though up to 60% of Zambia's waste is organic, it is rarely revalorized aside from small-scale exceptions, such as composting and anaerobic digestion (P1, P7, P12). Similarly, it was suggested that there are few options when it comes to recycling glass due to an undeveloped supply-chain (P1, P5, P11).

Since most activities surround recycling, there is less discussion on other principles that could be formally applied along the value chain (e.g., reuse, repair), and efforts for absolute waste reductions are missing (P6, P14). This does not mean these activities are non-existent but rather indicates that *recycling* is the most developed of the so-called 3Rs in the Zambian CE discussion, reflecting the nascent agenda.

4.2.2 Relevance of the concept

Generally, there was a belief that the CE is a relevant concept for Zambia. Circularity was viewed as having the potential to reduce the negative environmental impacts associated with the current waste regime, while providing opportunities aligned with sustainable development, climate mitigation, and economic resilience (P5, P8, P9, P10). For instance, P10 suggested that existing approaches have had a misbalance between the three pillars of sustainability, whereas *“circularity would help us [Zambia] because it will bring a balance between social, economic as well as environmental growth.”*

Some participants acknowledged that the CE concept is useful as it can overturn the prevailing assumption that waste is a burden by reframing the sector into a value-creation opportunity. The CE therefore was associated with creating new industries, business opportunities and employment prospects (P1, P5, P7, P8). Thus, a CE may fit with the emerging green economy agenda (P1), which is aligned with the suggestion of Banda et al. (2023). The extract from P8 explains the appeal:

“[in Zambia] when we talk about waste management system, we think it is the collection and the disposal of waste. Pretty much that's it...[] but CE changes the perspective of that. It's not just about collecting it and taking it to the dumpsite. It's about recycling, reusing. It's about policy developments around that that area. It's about growing the country's GDP.”

From a practical perspective, recycling was most discussed and seen as highly relevant to improve the current state of waste management. Economically, this approach can reduce the waste being transferred to final disposal sites by extracting recyclables

proactively. Recycling can lower management costs by extending lifespans of landfills and may have wider systemic benefits, such as for public health or economic benefits (P1, P3, P6, P8, P9, P10). P3 explained that *“We [Zambia] are actually losing billions and billions of kwachas because of our poor solid waste management”*. For example, public health implications of sub-optimal management have emerged; cholera outbreaks in recent years were linked to waste and sanitation challenges in combination with flooding that was exacerbated by blocked drainage systems from waste, particularly plastics (P7, P10, P11). A participant noted that, without improving the waste situation, it could negatively impact other industries, such as tourism if the landscape aesthetic deteriorates (P7). However, actors may not always draw connections of poor waste management inducing wider systemic impacts (e.g., P7: “bed burden” from waste-related disease), which could explain why waste issues are not prioritized.

4.3 Policy challenges

The findings illuminate a range of policy challenges, including relating to ownership and coordination; implementation and enforcement; the licensing approach; lack of incentives for innovation and new entrants; as well as related to informal sector actors. These are discussed in the following sub-sections.

4.3.1 Policy ownership and coordination

The interviews revealed that, for some, it is not completely clear who *owns* the waste sector and its activities (e.g., P1: *“it is a bit confusing”*). Depending on the waste stream (e.g., hazardous versus non-hazardous) or context in question (i.e., residential versus commercial), different government entities were named as involved in oversight (P1, P3, P6, P8, P10, P14). For example, household waste is assigned to the MLGRD, which devolves duties to local councils who typically engage the private sector to collect waste on their behalf, whereas hazardous waste is under the mandate of ZEMA (P1, P6, P7, P10, P12). The mandated institutions have changed overtime, from the EMA of 2011 where ZEMA had the predominant role, to the SWRMA of 2018 where greater responsibility is placed on local authorities. Further, the SWRMA enables local authorities to open designated utilities, demonstrated by the recently formed Lusaka Integrated Solid Waste Management Company that will manage the capital city's waste (P5, P6, P11, P12). Hence, there is a developing approach that adds additional complexities on top of more general concerns relating to limited co-ordination between entities (e.g., claims of ministries working in silos) (P5, P14).

The involvement of other stakeholders, such as the private sector, NGO, wider citizenry and informal workforce, further contributes to horizontal and vertical policy integration challenges. The decentralized, devolved approach has been previously highlighted as a cause of sub-par waste approaches in Zambia (e.g., Wragg and Lim, 2015). According to some participants, policies may not adequately target all the relevant players across the supply-chain, have limited embeddedness, or may lack guidelines completely. When new policies are enacted, this may result in harmonization issues emerging, causing conflicting or confusing policies:

“..we have got different pieces of legislation that are speaking to waste management, some are conflicting, some are speaking to the same thing” (P12).

For example, private waste collectors require licenses from governing entities to collect waste on behalf of the local councils, but some participants suggested that the rules for recyclers were less clear (P11). There may be ambiguity about which ministry is responsible for licensing different aspects of waste, as this has changed over time (P12: “..people are confused, they do not know where to get the license”). The recent legislation implies that ZEMA is responsible for licenses associated with industrial wastes, whereas the local authorities can grant licenses for household collection.

Relatedly, it was not always completely clear to participants who owns or *should own* the activities required for a CE, such as encouraging separation of waste streams at the household level and recycling activities. Some believed that the MLGRD should be responsible due to their extensive physical presence across the country, whereas others suggested it should be ZEMA. From a practical perspective, those advocating for improvements in the sector suggest that as the roles span different ministries, it can lead to coordination and agency challenges (P8):

“..if you really want to influence a particular policy, you really cannot approach one institution and ignore the other because eventually you are just going to find yourself going back there.”

It was noted by some participants that other ministries need to be involved, such as the Ministry of Energy, Ministry of Green Economy and Environment and the Ministry of Technology and Science (P14). The Ministry of Health should also have interests in these issues (e.g., due to public health linkages) (P3).

4.3.2 Implementation and enforcement

Participants were generally positive about the policies that exist on paper. However, legal provisions are not always translated into action. Inadequate implementation was an almost unanimous concern amongst the participants. Even when there is evidence of implementation (e.g., by the introduction of a SI) little or no enforcement may persist:

“..I think we have very good policies, which of course are just on paper... but the reality is different and if maybe our government could improve on enforcement, I think it will help.”

Possible reasons behind implementation gaps were put forth, including limited political will or leadership; lack of SIs or specific guidelines; financial and capacity constraints; shortage of skillsets (P6, P6, P10, P12, P14). It was also suggested that the impacts of recently enacted legislations may not have yet materialized, so it is too early to judge their efficacy (P12). Further, participants noted that key policies are under review, and there is anticipation that amendments will be announced in due course.

The EPR was a key point of discussion. Participants shared a common view that it is a positive development (e.g., P9: “*the intention of that piece of legislation is good*”), which reflects support for uptake of this instrument in the literature (Velis, 2017; EMF, 2021a; Schröder et al., 2023). However, the SI is limited in terms of transformative

impacts since there is no enforcement, or accountability for players who fail to comply (P5, P6, P14). For the EPR’s mandated plastic bag restrictions, participants conceded that only large incumbents (e.g., ShopRite) typically obey the requirements and technically *banned* bags are widely used (P3, P4, P5, P6, P7, P14). There was no consensus as to the reasons behind the EPR’s poor enforcement, but there were concerns regarding lack of guidance (e.g., re possible role of Producer Responsibility Organizations) and unclear wording in the SI; strong powers of industry players; failure to address all stakeholders in the value chain; low awareness of its existence; narrow stakeholder participation during its formation; and financial and capacity constraints (P4, P5, P6, P8, P10, P12, P14). For instance, some participants noted that the responsible entity (ZEMA) does not have personnel across the country, limiting their ability to enforce the instrument.

The enforcement gap pertaining to the EPR instrument was also viewed as a missed opportunity. It was not clear how the SI is structured as to where any potential EPR fees were intended to go (e.g., P5: “.. it was very vague on a lot of critical issues”). For instance, retailers charge fees to the citizen for a bag when shopping, which may be recouped by the retailer rather than utilized for public good (P1, P8, P9, P14). If operationalized, properly defined and enforced, then it could provide a new government revenue stream, and so the funds collected could be used to enhance the waste sector (P4, P9, P10).

4.3.3 Licensing approach

The current approach, which enables local governments to sub-contract waste services to private companies via licensing, was viewed as somewhat restrictive. For some participants this represents a form of monopoly since it limits the number of companies that can collect waste from an allocated zone and transfer it to landfill in exchange for the collection fee paid by households (P11). It may contribute to inconsistent servicing; cash management issues; limited incentive for sectoral innovation; as well as data and measurement challenges. For example, there were claims that some licensees run inefficiently (P3, P4), but “*if those companies are not performing, basically there’s really nothing that happens.*” (P11). Also, if a household cannot afford or has no willingness to pay the fee, then waste is not collected. There are no supportive government mechanisms (i.e., subsidies) (P1, P10, P13), so these households may have no alternative other than to revert to illegal disposal (e.g., dumping, incinerating, or paying a non-licensed entity).

Separating waste at source is outlined in the legislation but is not implemented. There is no impetus for the licensed collector to empower households to separate waste since collecting multiple segregated streams would be more costly and cumbersome (P11):

“*So these companies are not willing to recycle or to basically have their clients separated for that because the main focus is revenue.. and then their revenue is dependent on how many collections they actually make per day. So if they are going to recycle then it’s going to be become a huge logistical nightmare for them.*”

It emerged that there is no clear space for recycling companies in the policy. Anecdotal evidence suggested that it is difficult for companies to collect recyclables from households since they may not be able to get a license. In fact, when referring to the LGA of 2019, which enables the local authorities to issue waste licenses, the Act

states the role of local government is to oversee refuse collection, management of dumps and disposal. Hence, it does not refer to mandating recycling per the SWRMA. For companies seeking to revalorize waste in a CE, scaling up can be difficult since access to quality recyclable materials can be a limiting factor (P1, P4, P8). It was suggested that it is much easier to be a conventional waste management company than a recycling company. Recyclers adopt alternative strategies to obtain materials. For example, they can carry out retrospective material recovery services, which are often limited to commercial settings (i.e., sorting through mixed waste bins to recover recyclables before being collected by licensed waste collection companies) (P11), while informal waste pickers can unofficially obtain access to landfill sites. Consequently, the recovered materials are of inferior quality, so have limited usability as a feedstock for recycling (P1, P4). This may be a barrier to expansion of domestic high-value recycling activities, as explained by P4:

“..the recycling industry is at an infant stage in Zambia because the quality of the raw materials, the quality of the waste that we have is not really like very good because its mixed, we do not separate waste properly.”

The challenge is compounded as there is no deliberate mechanism to incentivize the citizen to separate their waste and it is not embedded in the societal mindset (P7, P9, P12). There is a general lack of widespread education and understanding around waste issues, which is missing from the policy agenda (P3, P5, P8, P10). If separation was enforced, it is likely that households would have to pay for more than one collection and to obtain extra bins (P8, P9). This would place additional financial burdens on households, which is problematic given affordability barriers. At the same time, these licensees pay the local governments to dispose of this waste at the landfill and so if volumes were reduced, then this might have a negative impact on the responsible authorities' revenues. Hence, the incentives appear misaligned.

4.3.4 Lack of support for innovation and entrepreneurship

Despite the principle that *waste is a resource* outlined in SWRMA (2018), waste is still mainly treated as a burden in practice. Reinforcing observations in the literature (Banda et al., 2023), there were concerns among participants that there are no specific policy instruments, such as tax exemptions or incentives, that proactively encourage the emergence of circular businesses (P8, P12). This was perceived as a shortcoming (e.g., P11: “*there is need for some privileges or deliberate steps to just to stimulate the private sector around circular economy*”).

In particular, acquiring funding is difficult, and a lack of top-down support was deemed to hamper innovation, especially since “*not a lot of people look at recycling or recovery of waste as a lucrative industry where they could proudly invest*” (P10). The waste sector is neglected compared to other industries (e.g., agriculture, mining etc) (P5). Without strong political support for relevant waste-related infrastructure, skillsets and technology, the status quo will continue. The sentiment emerged that both the lack of accurate data on waste and sub-optimal volumes of quality of feedstock may represent bottlenecks to private sector investment in large-scale recycling facilities. New entrants can face uncertainty as to whether enough

feedstock is available to enable to maintain a viable recycling business in Zambia (P1, P5).

Even when private sector appetite exists, political barriers can prevent their acceptance as “*they [the policymakers] are not always open to innovations*” (P4). For example, it emerged that disruptive circular start-ups may struggle to obtain backing. Similar challenges have been identified in other countries (Oyinlola et al., 2022), and in other sectors in Zambia, such as energy (Tembo et al., 2023). Possible reasons behind limited appetite for innovation were put forth, including: system inertia; no incentives; low understanding of value potential; and inflexibility in the legal framework (P3, P4, P12). It was claimed that waste has been overly politicized in Zambia, with more than one participant sharing the example where external actors have expressed interest in developing a waste-to-energy plant at the Chunga landfill. This proposal could reduce waste burdens while generating energy, yet these investment efforts have thus far been curbed. For instance, because there is no policy or precedent as to how this energy could be distributed to the grid, and how the associated revenues would be allocated. Since improved treatment technologies can help overcome unsustainable waste regimes (Shane et al., 2017; Asare et al., 2023; Dickson et al., 2023), such hesitancy may hinder innovation.

Entrepreneurs; SMEs; social businesses; and informal actors may especially struggle to thrive (P2, P3, P4, P8). For instance, bureaucracy and red tape disincentivize attempts to formalize activities (P3; P11), while SMEs are faced with the same compliance regimes as larger industrial incumbents. There are no separate registration codes, which was also viewed as a roadblock for new entrants. More appealing business registration procedures for social enterprises and circular businesses could improve attractiveness of entering the sector (P2, P3). Although not expanded upon, there were references to the Constituency Development Fund (CDF) as a potentially relevant finance mechanism to support local initiatives (P7, P8, P14).

4.3.5 Lack of inclusion of informal sector

The policies target different stakeholders, including businesses, citizens, and local level governance actors. However, a notable omission is that the informal sector workforce is not mentioned in the core policy and legislative documentation (P14). Informal waste workers are ubiquitous in Zambia and provide “*a valuable service in recycling or circular economy activities*” (P9). Excluding this group was viewed as problematic: it means workers are not protected, exposed to hazardous conditions, and are vulnerable to exploitation (P3, P6, P7, P14). NGOs or private entities may try to support these groups by providing protective equipment and training. Given there is high participation of women in these activities (P3, P5, P8, P14), there is an additional gender dimension to consider (Gutberlet, 2021). The exclusion of the informal sector has been raised as a policy shortfall in other LMIC contexts and so is by no means unique to Zambia (Barford and Ahmad, 2021; Marks et al., 2023).

Informal workers typically participate in the sector due to poverty (P10), so they are vulnerable to financial exploitation. For example, these actors collect wastes, such as plastics, to sell to material aggregating intermediaries who subsequently sell to processors or recycling companies. Aggregators often pay extremely low rates (P14: “*unsafe wages*”) for the materials, which do not reflect the true cost of the labor involved (P3, P7, P13). As an example, a participant claimed

that 50 kg of plastic bottle waste might only be worth c.25 Kwacha (c.US\$1.2). It was argued that the price paid to the informal workers “needs to be regulated and increased” (P3). NGOs demonstrated that they train this community, particularly women and youths, to improve their standing (P5, P8, P12, P14). For example, teaching them how to make products out of waste (e.g., jewelry) to sell at markets to improve earnings.

Participants put forth that some level of formalization is needed to prevent exploitation of these workers (P7, P13, P14). For example, strategies could include incentivizing registration; creating transfer stations for waste sorting and exchange; and, setting minimum pricing. There are potential benefits for the government too (e.g., revenue collection) but formalization may not always be appealing for informal actors given top-down monitoring implications. Nevertheless, participants widely agreed that the informal sector should be better included (P3, P4, P5, P9, P10, P14); the extract summarizes the sentiment (P6):

“I think there should be a way to be able to bring them on board and to recognize what they do and appreciate what they do.”

5 Discussion: from policy challenge to opportunity

Although the CE is in a nascent stage in Zambia, there is growing stakeholder interest in the concept and positive developments in the policy approach. A subtle but promising change is the fact that waste is now framed as a resource in SWRMA, whereas it was previously viewed as a pollutant. Nevertheless, there are clearly various challenges and complexities, which suggests that – in practice – a reactive rather than proactive approach persists. There is opportunity to develop a more explicit agenda to fully embrace, implement and enforce relevant policies. Many of the policy challenges are not unique to Zambia, so countries in the region and beyond are likely to face comparable issues (Joshi et al., 2019). Many of these *challenges* present *opportunities* for policy development. The discussion does not provide definitive answers, but rather provides tentative suggestions stemming from the findings (including directly from participant discussions) and existing literature, while pinpointing avenues for future research.

5.1 Proactive policy approach

Despite progression in the legislations (e.g., SWRMA) and later national plans (e.g., 8NDP) with better alignment to CE goals and principles, there is still opportunity to ensure a more deliberate shift. The findings suggest that most enacted policies are focused later on in the value-chain, representing incremental updates to earlier waste management perspectives. The interest in recycling is especially clear, but this is a relatively late phase in the value chain to capture value and recycling may simply delay leakage into the environment. There are opportunities to transition toward a total lifecycle policy perspective (including absolute reduction strategies) with mutually reinforcing policies for a deliberate and harmonizing approach

(UNEP, 2016; Milios, 2018; EMF, 2021a). For instance, improving the quality of feedstock will be essential to support a strong recycling sector, so separating wastes will of course be a prerequisite. However, this can be complemented by upstream interventions, such as design guidelines, material standards and green procurement policies (Milios, 2018). A positive development in the recently updated EMA(A) is the emergence of eco-labels, which could support demand-side behavior change.

There are also clear linkages between CE goals and other areas, such as renewable energy development, which could be fostered in future policies to support green growth. Current activities are focused on recycling certain wastes, such as plastic, but there will be opportunities to embrace circularity elsewhere. For instance, the organic fraction of waste is significant and underutilized but could be used as a feedstock for energy generation and by-products for the agriculture sector, reducing reliance on fertilizers that are exposed to oil price fluctuations (EMF, 2021b; Yang et al., 2023). Hence, there are opportunities for policymakers to develop cross-industry CE roadmaps and guidelines for waste streams.

5.2 Clearly define roles and coordinate

A CE requires that roles and costs are shared appropriately and fairly among all stakeholders (UNEP, 2016; EMF, 2021a). This includes national and local governments, businesses, and communities. The roles of government institutions in the identified laws and policies are laid out, albeit with some confusion and debate regarding the effectiveness of the current distribution of responsibilities (e.g., between ZEMA, and MLGRD). There is opportunity for top-down leadership to produce a clear, long-term and co-ordinated policy approach across relevant sectors and ministries. This must incorporate clear signposting of the responsibilities of different actors (e.g., ZEMA, LISWMC, local councils) since some participants noted ambiguity regarding these aspects.

The findings also suggest that the role of other stakeholders, particularly recycling companies, is not clear so there is an opportunity for these roles to be better defined and communicated. Best practice examples indicate that cross-ministry interest groups or steering committees can support effective communication and co-ordination (Fitch-Roy et al., 2021). A potential cause of poor enforcement was suggested to relate to limited physical presence of ZEMA across the country. There is potential to explore whether ZEMA could delegate some responsibility to other agencies or contractors with better local level reach.

Moreover, the activities at national government and local government level should be designed so that they allow institutions to remain productive and mutually self-building, as misaligned priorities can hinder progression and reduce the legitimacy of policies (Chileshe and Moonga, 2019). The national government can empower businesses to adopt a CE approach, as well as encouraging citizens to participate in the CE. Such laws and policies would serve to encourage the coordination of programs among stakeholders from local government, business, and the citizenry at large. This includes ensuring relevant knowhow is embedded in the citizen mindset by fostering softer governance approaches (e.g., through supportive educational policy) (Borrás and Edquist, 2013).

5.3 Ensure fundamental systems support circularity

Although complex and multifaceted, there are opportunities to reform how the existing systems operate to create an enabling environment for a CE. The findings point at economic, environmental, and social benefits by increasing collection rates; segregating wastes streams; and recycling. Most fundamentally, bolstering collection rates is imperative to reach the NDC targets, which were built on the assumption of 80% collection and landfilling by 2050 (Republic of Zambia, 2021). There are opportunities for policymakers to support uptake of innovative approaches to improve affordability, as this appears – according to the findings and the literature – to be a limiting factor to improving basic waste servicing (Wragg and Lim, 2015; Chileshe and Moonga, 2019). Various avenues worthy of exploration emerged in the findings. For instance, properly enforcing the EPR might involve mandating the formation of Producer Responsibility Organizations (e.g., see AGS, 2022a, p. 9) or proper government collection of recovered fees (e.g., from the plastic bag levy), which could be injected into collection or circularity activities. Moreover, it was identified that there is potential to use existing payment services (e.g., pre-paid mobile phone credit mechanisms) to enable citizens to accessibly contribute to waste services. Socially inclusive policies have also been identified in the literature. For instance, Colombia has a stratum system where wealthier geographic zones cross-subsidize lower income neighborhoods (Calderón Márquez and Rutkowski, 2020) whereas in Cameroon the collection fee is based on total household earnings (Sotamenou et al., 2019).

Accurate data systems are missing. Data could be improved by embracing novel technologies, such as digital systems and mobile business models. These approaches have gained support in the academic literature as both a source of community economic opportunity (e.g., digital platforms can connect waste collectors to buyers) and institutional value (e.g., providing real-time volume and composition data) (Oyinlola et al., 2022). Hence, if championed by policymakers, these digital tools could be cost-effective and inclusive. Furthermore, accurate data is needed to set objectives and monitor progress (Fitch-Roy et al., 2021), including for international agendas, such as NDCs and SDGs. Quantification of waste flows is also essential for prospective investors: if accurate data was available – and fundamental collection services were in place – then this could help stimulate new value chains to emerge. For example, if glass was collected and measured, then investors would be able to make informed decisions about the viability of starting a glass recycling plant. Therefore, developing fundamental systems will also foster circular innovation (discussed in section 5.5).

5.4 Strong implementation and enforcement

There was a sentiment that the general policy and legislative approach *on paper* could be compatible with the goals of the CE, but implementation has so far lagged. For instance, SWRMA's *waste is a resource* umbrella principle is fundamental but requires

implementation of complimentary measures (e.g., SIs). Similar challenges have been identified in Zambia, such as regarding sustainable infrastructure (Zulu et al., 2022) and the Zambia clean-up campaigns (Chileshe and Moonga, 2019).

Furthermore, low enforcement of implemented legislations can hinder the transformative impacts of policy. In this study the introduction of the EPR, which is well-aligned with circularity (Velis, 2017), has not had much impact since enforcement has been lax. This agrees with previous observations regarding this SI (e.g., AGS, 2022a). However, policy reforms must be accompanied by consistent enforcement to be effective (Chileshe and Moonga, 2019; Asare et al., 2023). Some possible reasons behind low enforcement could link to capacity and financial constraints, for instance a lack of physical presence of government ministries and agencies. This finding mirrors that of Zulu et al. (2022) who also found that the lack of physical presence of ZEMA means that there are no repercussions for non-compliance. The findings of this study are preliminary so it is important to fully examine the reasons behind these gaps, as studies indicate that they can be wide-ranging and intertwined (Chileshe and Moonga, 2019; Behuria, 2021). Hence, this presents a valuable topic for more nuanced research.

5.5 Foster circular innovation

The findings indicate limited policy support for entrepreneurship and new entrants, which stifles innovation. Nonetheless, there are a growing number of empirical case studies of the commercial successes in the region, so investing in circularity may become more politically palatable overtime. Oyinlola et al. (2022) suggest that the growing diffusion of innovations will demonstrate the viability of business models as the market grows. Further, Godfrey et al. (2021), suggest that these business models will become more attractive as market dynamics shift, such as when the costs of alternative management approaches increase; sustainability goals become more institutionalized; and regulation is enacted.

As noted by other scholars in an African context, there is an opportunity for more proactive governance to foster circular value creation (Muriithi and Ngare, 2023). In agreement with Banda et al. (2023), the findings point to opportunities to support investment interest through SIs for sector-specific tax exemptions and benefits; tariff-free imports on equipment; investment funds and other fiscal incentives; and dedicated registration codes. Alongside capitalizing on existing mechanisms more strategically (e.g., CDF), the creation of dedicated investment schemes could harness circular innovation to complement other policy goals, as demonstrated by other strategies applied in the region (e.g., Rwanda introduced incentives for recycling in harmony with plastics reduction instruments) (Adebiyi-Abiola et al., 2019; Syberg et al., 2021; Ogutu et al., 2023). A key question remains as to where funds might come from, and identifying effective finance mechanisms is important. It was suggested in the interviews that if the EPR was fully enforced then associated fees could be a readily available source of finance. Participation in regional programs (e.g., ACEA) may open-up funding opportunities, while providing case studies for entrepreneurship, knowledge transfer and collaborations (Desmond and Asamba, 2019).

5.6 Embrace an inclusive approach

Many CE advocates stress the importance of a multistakeholder approach for inclusive circularity (Barford and Ahmad, 2021; EME, 2021a; Muriithi and Ngare, 2023). In agreement with suggestions in the literature (Schröder et al., 2023), the findings point to the importance of including the informal workforce in a future CE agenda. This is necessary as the existing waste policy omits these players, which is reductive given their prominence in practice. For instance, SWRMA of 2018 effectively excludes these workers as only licensed waste management companies can participate. However, according to Velis (2017, p. 329) the informal sector is inevitably “*here to stay*” in LMIC settings, while Barford and Ahmad (2021) stipulate that inclusion of these workers can result in a socially restorative CE.

There are successful cases, especially in Latin America, where policy has supported the integration of informal workers into waste regimes, often through the formation of cooperatives and associations (Gutberlet, 2021). In Brazil several policies over the past 20 years have enabled significant improvements in the socio-economic standing of these groups. Fundamentally, waste picking was recognized as an official occupation and the formation of cooperatives was stipulated. The legitimacy of these cooperatives was augmented at the local authority level since municipalities were encouraged to engage these groups to collect recyclable wastes on their behalf (Gutberlet, 2021). There are learning opportunities from such cases, as the Zambian policy approach could seek to proactively embrace the knowledge and skills of workers and engage them officially, complementing the role of licensed waste companies. The findings point to the potential for informal groups to legitimately collect recyclables, while the development of waste transfer stations could provide spaces for subsequent sorting and consolidation. Although these are just nascent ideas, such inclusive strategies could concurrently enhance the development of the domestic recycling sector, as the feedstock will be of improved quality. If well-designed, the impacts of an inclusive approach can deliver other sustainable development benefits, such as “*gender equality, improvement of occupational health, reduce inequalities, eradication of poverty and hunger*” (Sharma et al., 2021, p. 14).

5.7 Limitations of the study

There are some limitations, which should be acknowledged. Methodologically, in terms of participant recruitment, potential interviewees were mainly identified through the professional networks of the researchers, online search strategies, and snowball techniques. This approach may incur selection bias. For instance, the final sample were mainly located in the capital city of Lusaka, which could present an unintended focus on the capital and/or urban environments. Focusing on rural regions, for example, may have illuminated other policy challenges and opportunities that were not identified in this analysis. In addition, certain stakeholder groups were not represented in the sample. Notably, attempts to interview government ministry and agency representatives were unsuccessful, which could be viewed as a shortcoming. However, there was representation from various ministries and institutions at the presentation and feedback workshop.

6 Conclusion

Zambia, like many countries across the globe, is experiencing growing waste burdens that are negatively impacting the economy, environment, and society. There is increasing appetite for CE adoption in Africa, yet diffusion of the concept is only recently gathering pace in Zambia. This study provides preliminary insights into the current waste approach and the relevance of the CE for Zambia with a focus on understanding the current policy context. In doing so, the study has identified policy challenges that might hinder the transition from a linear to circular approach. The findings suggest that the CE is considered a relevant concept given challenges with open-dumping, overcapacity landfills and limited circularity of waste streams. Nevertheless, although the policies contain many positive principles aligned with a CE, in practice the default approach is highly linear. Policy barriers may account for lagging progress compared to other countries in the region. Notably, there are ownership and co-ordination challenges; inadequate implementation and enforcement of existing legislations; a restrictive licensing approach; a lack of support for innovations and new entrants; and a failure to incorporate the informal sector. These challenges point to a variety of opportunities to improve the outlook through proactive governance and policy reform.

Since the CE remains a novel research theme in the Zambian context, it is hoped that these findings spark additional academic interest in the concept going forward. For instance, there is potential for more nuanced research into the trade-offs and opportunities related to specific CE strategies. Studies can undertake material, policy or sector-specific analysis. In addition, there is a need to assess possible incentives to encourage investment in infrastructure and business models to support a CE. Furthermore, research can seek to explore socially desirable policy pathways that are inclusive of the informal sector from the outset.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

RC: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Writing – original draft, Writing – review & editing. MH: Conceptualization, Data curation, Investigation, Project administration, Writing – original draft, Writing – review & editing.

Funding

The author(s) declare financial support was received for the research, authorship, and/or publication of this article. This research has been produced with support from the Climate Compatible Growth (CCG) program’s Southern Partner Fund. CCG is funded by UK aid from the UK government. However, the views expressed

herein do not necessarily reflect the UK government's official policies. It was possible to publish this article in open access format through the support of University College London.

Acknowledgments

The authors are grateful to all the interview participants for dedicating time to engage and provide their perspectives for the purpose of this study. Furthermore, the authors would like to express their gratitude to those who attended the presentation and feedback workshop in Lusaka in November 2023. Additionally, the authors would like to acknowledge and thank the reviewers for providing useful feedback during the review process. Finally, thanks to Janina Fuchs for support with proofreading the article.

References

- Abunyawah, M., Erdiaw-Kwasi, M. O., Okyere, S. A., and Boateng, F. G. (2023). Advancing a slum–circular economy model for sustainability transition in cities of the global south. *Nat. Sustain.* 6, 1304–1311. doi: 10.1038/s41893-023-01176-8
- Adebiyi-Abiola, B., Assefa, S., Sheikh, K., and García, J. M. (2019). Cleaning up plastic pollution in Africa. *Science* 365, 1249–1251. doi: 10.1126/science.aax3539
- AGS (2022a). “Zambia circular economy study” in *Accelerated growth for SMEs in Zambia (AGS) Programme* (Lusaka: AGS)
- AGS (2022b). *Southern African business delegation to slush. Accelerated growth for SMEs in Zambia (AGS) Programme*, Lusaka, Zambia: AGS. Available at: https://agsprogramme.org/app/uploads/2022/11/AGS003-SABDS_Rocket_digital.pdf (Accessed 12 December 2023).
- Asare, D., Abubakari, M., Mahama, M., Mensah, D. A. O., Amponsah, I. A., Kwakye, A. D., et al. (2023). “How can Ghana transition from a linear to a circular economy of waste management? A conceptual analysis of policy approaches” in *Circular economy strategies and the UN sustainable development goals* (Springer)
- Azungah, T. (2018). Qualitative research: deductive and inductive approaches to data analysis. *Qual. Res. J.* 18, 383–400. doi: 10.1108/QRJ-D-18-00035
- Banda, K., Mwanauo, E. M., and Mwanza, B. G. (2023). “Circular economy: an antidote to municipal solid waste challenges in Zambia” in *Recycling strategy and challenges associated with waste management towards sustaining the world*. eds. H. M. Saleh and A. I. Hassan (Rijeka: IntechOpen)
- Barford, A., and Ahmad, S. R. (2021). A call for a socially restorative circular economy: waste pickers in the recycled plastics supply chain. *Circ. Econ. Sustain.* 1, 761–782. doi: 10.1007/s43615-021-00056-7
- Behuria, P. (2021). Ban the (plastic) bag? Explaining variation in the implementation of plastic bag bans in Rwanda, Kenya and Uganda. *Environ. Plan. Polit. Space* 39, 1791–1808. doi: 10.1177/2399654421994836
- Berry, J. M. (2002). Validity and reliability issues in elite interviewing. *Polit. Sci. Polit.* 35, 679–682. doi: 10.1017/S1049096502001166
- Bocken, N. M., De Pauw, I., Bakker, C., and Van Der Grinten, B. (2016). Product design and business model strategies for a circular economy. *J. Ind. Prod. Eng.* 33, 308–320. doi: 10.1080/21681015.2016.1172124
- Borrás, S., and Edquist, C. (2013). The choice of innovation policy instruments. *Technol. Forecast. Soc. Change*, 1513–1522.
- Bwalya, T., Mulenga, M., and Chizyuka, C. (2022). Used tyre as a resource in concrete production in Zambia. *J. Civil Construct. Environ. Eng.* 7, 73–80. doi: 10.11648/j.jccee.20220704.14
- Calderón Márquez, A. J., and Rutkowski, E. W. (2020). Waste management drivers towards a circular economy in the global south – the Colombian case. *Waste Manag.* 110, 53–65. doi: 10.1016/j.wasman.2020.05.016
- Chibwe, W., Mbewe, A., and Hazemba, A. N. (2021). The health effects of Chunga dumpsite on surrounding communities in Lusaka, Zambia. *medRxiv*, 2021. doi: 10.1101/2021.12.21.21268110
- Chileshe, B., and Moonga, M. S. (2019). Achieving green behaviour in Zambia: political rhetoric, hypocrisy and duplicity versus political will. *Multidisc. J. Lang. Soc. Sci. Educ.* 2, 1–26.
- Clube, R. K., and Tennant, M. (2023). What would a human-centred ‘social’ circular economy look like? Drawing from max-Neef’s human-scale development proposal. *J. Clean. Prod.* 383:135455. doi: 10.1016/j.jclepro.2022.135455
- Creswell, J. W., and Creswell, J. D. (2018). *Research design: qualitative, quantitative, and mixed methods approaches*. Los Angeles, USA: SAGE Publications.
- Desmond, P., and Asamba, M. (2019). Accelerating the transition to a circular economy in Africa. *Circ. Econ. Glob. South*, 152–172. doi: 10.4324/9780429434006-9
- Dickson, E. M., Hastings, A., and Smith, J. (2023). Energy production from municipal solid waste in low to middle income countries: a case study of how to build a circular economy in Abuja, Nigeria. *Front. Sustain.* 4:474. doi: 10.3389/frsus.2023.1173474
- EMF (2021a). Universal Circular Economy Policy Goals. Ellen MacArthur Foundation. Available at: <https://www.ellenmacarthurfoundation.org/universal-policy-goals/overview/upg-paper> (Accessed 10 July 2023).
- EMF (2021b). *The Nature Imperative: How the circular economy tackles biodiversity loss*. Ellen MacArthur Foundation. Available at: <https://emf.thirdlight.com/file/24/FM9nvqPFM.IixvIFMZ6iFC9A.NLF/The%20Nature%20Imperative%3A%20How%20the%20circular%20economy%20tackles%20biodiversity%20loss.pdf> (Accessed 5 August 2023).
- Environmental Council of Zambia (2004). National Solid Waste Management Strategy for Zambia. Available at: [https://wedocs.unep.org/bitstream/handle/20.500.11822/9104/-NationalSolidWasteManagementStrategyforZambia-2004NationalSolidWasteManagementStrategy\(1\).pdf?sequence=3&isAllowed](https://wedocs.unep.org/bitstream/handle/20.500.11822/9104/-NationalSolidWasteManagementStrategyforZambia-2004NationalSolidWasteManagementStrategy(1).pdf?sequence=3&isAllowed) (Accessed 10 May 2023).
- Fitch-Roy, O., Benson, D., and Monciardini, D. (2021). All around the world: assessing optimality in comparative circular economy policy packages. *J. Clean. Prod.* 286:125493. doi: 10.1016/j.jclepro.2020.125493
- Godfrey, L., Ahmed, M. T., Gebremedhin, K. G., Katima, J. H. Y., Oelofse, S., Osibanjo, O., et al. (2019). “Solid waste Management in Africa: governance failure or development opportunity?” in *Regional development in Africa*. ed. N. Edomah (Rijeka: IntechOpen)
- Godfrey, L., Roman, H., Smout, S., Maserumule, R., Mpofu, A., Ryan, G., et al. (2021). Unlocking the opportunities of a circular economy in South Africa. *Circ. Econ.*, 145–180.
- Government of Zambia (2011). The Environmental Management Act No. 12. Available at: <https://www.parliament.gov.zm/sites/default/files/documents/acts/EnvironmentalManagementAct12of2011.pdf> (Accessed 12 December 2023).
- Government of Zambia (2013). Statutory Instrument No. 112 The Environmental Management (Licensing) Regulations. Available at: <https://www.zema.org.zm/wp-content/uploads/2023/03/The-Environmental-Management-Licensing-Regulations-2013-PT.pdf> (Accessed 28 August 2023).
- Government of Zambia (2018). The Solid Waste Regulation and Management Act No. 20. Available at: <https://www.parliament.gov.zm/sites/default/files/documents/acts/TheSolidWasteRegulationandManagementAct2018.pdf> (Accessed 12 August 2023).
- Government of Zambia (2019). The Local Government Act No. 2. Available at: <https://www.parliament.gov.zm/sites/default/files/documents/acts/TheLocalGovernmentActNo.2of2019.pdf> (Accessed 12 December 2023).
- Government of Zambia (2023). The Environmental Management (Amendment) Act. Available at: <https://www.parliament.gov.zm/sites/default/files/documents/acts/ACT%20No.%208%20OF%202023%2C%20The%20Environmental%20Management%20IAmendment%29.pdf> (Accessed 12 December 2023).
- Gutberlet, J. (2021). Grassroots waste picker organizations addressing the UN sustainable development goals. *World Dev.* 138:105195. doi: 10.1016/j.worlddev.2020.105195
- Halog, A., and Anieke, S. (2021). A review of circular economy studies in developed countries and its potential adoption in developing countries. *Circ. Econ. Sustain.* 1, 209–230. doi: 10.1007/s43615-021-00017-0

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

- Joshi, C., Seay, J., and Banadda, N. (2019). A perspective on a locally managed decentralized circular economy for waste plastic in developing countries. *Environ. Prog. Sustain. Energy* 38, 3–11. doi: 10.1002/ep.13086
- Kaza, S., Yao, L. C., Bhada-Tata, P., and Van Woerden, F. (2018). *What a waste 2.0: A global snapshot of solid waste management to 2050*. Washington, DC: World Bank. Available at: <http://hdl.handle.net/10986/30317> (Accessed 12 December 2023).
- Knott, E., Rao, A. H., Summers, K., and Teeger, C. (2022). Interviews in the social sciences. *Nat. Rev. Methods Prim.* 2:73. doi: 10.1038/s43586-022-00150-6
- Lemille, A. (2021). Circular Africa: a model for us all? *Field Actions Science Reports. J. Field Act.* 23, 30–33.
- Marks, D., Miller, M. A., and Vassanadumrongdee, S. (2023). Closing the loop or widening the gap? The unequal politics of Thailand's circular economy in addressing marine plastic pollution. *J. Clean. Prod.* 391:136218. doi: 10.1016/j.jclepro.2023.136218
- Milios, L. (2018). Advancing to a circular economy: three essential ingredients for a comprehensive policy mix. *Sustain. Sci.* 13, 861–878. doi: 10.1007/s11625-017-0502-9
- Ministry of Energy (2019). National Energy Policy. Zambia. Available at: <https://www.moe.gov.zm/wp-content/uploads/2022/04/The-National-Energy-Policy-2019.pdf> (Accessed 5 August 2023).
- Ministry of Finance and National Planning. (2022). *Eighth National Development Plan (2022–2026)*. Zambia: Ministry of Finance and National Planning.
- Ministry of Water Development, Sanitation and Environmental Protection (2018). *Issuance of statutory instrument no.65 on extended producer responsibility regulations*. Lusaka, Zambia: Ministry of Water Development, Sanitation and Environmental Protection.
- Muchangos, L. S. (2022). Mapping the circular economy concept and the global south. *Circ. Econ. Sustain.* 2, 71–90. doi: 10.1007/s43615-021-00095-0
- Muleya, M., Hinchliffe, G., and Petterson, M. (2021). The environmental impact of landfill fires and their contaminant plumes at the Chunga landfill site, Lusaka Zambia. *Afr. J. Environ. Sci. Technol.* 15, 569–579. doi: 10.5897/AJEST2021.3008
- Mupedziswa, R., and Kubanga, K. P. (2017). Climate change, urban settlements and quality of life: the case of the southern African development community region. *Dev. South. Afr.* 34, 196–209. doi: 10.1080/0376835X.2016.1231057
- Muriithi, J. K., and Ngare, I. O. (2023). Transitioning circular economy from policy to practice in Kenya. *Front. Sustain.* 4. doi: 10.3389/frsus.2023.1190470
- Mwanza, B.G., and Mbohwa, C. (2019). Reverse logistics barriers: a case of plastic manufacturing industries in Zambia. Presented at the 2019 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM), IEEE, 1240–1244.
- Nielsen, T. D., Holmberg, K., and Strippel, J. (2019). Need a bag? A review of public policies on plastic carrier bags – where, how and to what effect? *Waste Manag.* 87, 428–440. doi: 10.1016/j.wasman.2019.02.025
- Nijman-Ross, E., Umutesi, J. U., Turay, J., Shamavu, D., Atanga, W. A., and Ross, D. L. (2023). Toward a preliminary research agenda for the circular economy adoption in Africa. *Front. Sustain.* 4:1061563. doi: 10.3389/frsus.2023.1061563
- Ogutu, M. O., Akor, J., Mulindwa, M. S., Heshima, O., and Nsengimana, C. (2023). Implementing circular economy and sustainability policies in Rwanda: experiences of Rwandan manufacturers with the plastic ban policy. *Front. Sustain.* 4:1092107. doi: 10.3389/frsus.2023.1092107
- Oyinlola, M., Schröder, P., Whitehead, T., Kolade, O., Wakunuma, K., Sharifi, S., et al. (2022). Digital innovations for transitioning to circular plastic value chains in Africa. *Afr. J. Manag.* 8, 83–108. doi: 10.1080/23322373.2021.1999750
- Powell, J. T., Chertow, M. R., and Esty, D. C. (2018). Where is global waste management heading? An analysis of solid waste sector commitments from nationally-determined contributions. *Waste Manag.* 80, 137–143. doi: 10.1016/j.wasman.2018.09.008
- Preston, F., and Lehne, J. (2017). *A wider circle? The circular economy in developing countries*. Chatham House. Available at: <https://www.chathamhouse.org/sites/default/files/publications/research/2017-12-05-circular-economy-preston-lehne-final.pdf> (Accessed 7 December 2023).
- Republic of Zambia (2021). *Nationally Determined Contribution (NDC) of Zambia for the timeframe 2015–2030*. Lusaka, Zambia.
- Republic of Zambia and Ministry of Tourism, Environment and Natural Resources (2007). *The National Policy on the Environment*. Available at: https://wedocs.unep.org/bitstream/handle/20.500.11822/9516/-The_National_Policy_on_Environment-2008Zambia_NPE_2008.pdf?pdfsequence=3&isAllowed=y (Accessed 12 July 2023).
- Rweyendela, A. G., and Kombe, G. G. (2021). Institutional influences on circular economy: a Tanzanian perspective. *Sustain. Product. Consum.* 26, 1062–1073. doi: 10.1016/j.spc.2021.01.013
- Schröder, P., Oyinlola, M., Barrie, J., Bonmwa, F., and Abolfathi, S. (2023). Making policy work for Africa's circular plastics economy. *Resour. Conserv. Recycl.* 190:106868. doi: 10.1016/j.resconrec.2023.106868
- Schroeder, P., Anggraeni, K., and Weber, U. (2019). The relevance of circular economy practices to the sustainable development goals. *J. Ind. Ecol.* 23, 77–95. doi: 10.1111/jiec.12732
- Shane, A., Gheewala, S. H., and Kafwembe, Y. (2017). Urban commercial biogas power plant model for Zambian towns. *Renew. Energy* 103, 1–14. doi: 10.1016/j.renene.2016.11.017
- Sharma, H. B., Vanapalli, K. R., Samal, B., Cheela, V. R. S., Dubey, B. K., and Bhattacharya, J. (2021). Circular economy approach in solid waste management system to achieve UN-SDGs: solutions for post-COVID recovery. *Sci. Total Environ.* 800:149605. doi: 10.1016/j.scitotenv.2021.149605
- Shomuyiwa, D. O., Onukansi, F. O., Ivanova, M., and Lucero-Prisno, D. E. III. (2023). The plastic treaty: what is in it for Africa? *Pub. Health Chall.* 2:83. doi: 10.1002/puh2.83
- Sotamenou, J., De Jaeger, S., and Rousseau, S. (2019). Drivers of legal and illegal solid waste disposal in the global south - the case of households in Yaoundé (Cameroon). *J. Environ. Manag.* 240, 321–330. doi: 10.1016/j.jenvman.2019.03.098
- Syberg, K., Nielsen, M. B., Westergaard Clausen, L. P., van Calster, G., van Wezel, A., Rochman, C., et al. (2021). Regulation of plastic from a circular economy perspective. *Curr. Opin. Green Sustain. Chem.* 29:100462. doi: 10.1016/j.cogsc.2021.100462
- Tembo, A., Rahman, M. M., and Jerin, T. (2023). Barriers to development and adoption of biogas in Mokambo peri-urban of Mufulira, Zambia: how does local government fail to provide renewable energy? *Biofuels* 14, 583–594. doi: 10.1080/17597269.2022.2156055
- UNEP (2016). *Guidelines for Framework Legislation for Integrated Waste Management*. United Nations Environment Programme. Available at: https://wedocs.unep.org/bitstream/handle/20.500.11822/31379/1/WM_Guidelines.pdf?sequence=1&isAllowed=y (Accessed 10 August 2023).
- UN-HABITAT (2010). *Solid Waste Management in the World's cities: Water and sanitation in the World's cities*. United Nations Human Settlements Programme. Earthscan. Available at: https://unhabitat.org/sites/default/files/2021/02/solid_waste_management_in_the_worlds_cities_water_and_sanitation_in_the_worlds_cities_2010.pdf (Accessed 12 December 2023).
- Velis, C. (2017). Waste pickers in global south: informal recycling sector in a circular economy era. *Waste Manag. Res.* 35, 329–331. doi: 10.1177/0734242X17702024
- Wragg, E., and Lim, R. (2015). Urban visions from Lusaka, Zambia. *Habitat Int.* 46, 260–270. doi: 10.1016/j.habitatint.2014.10.005
- Wright, C. Y., Godfrey, L., Armiesto, G., Haywood, L. K., Inglesi-Lotz, R., Lyne, K., et al. (2019). Circular economy and environmental health in low-and middle-income countries. *Glob. Health* 15:65. doi: 10.1186/s12992-019-0501-y
- Yang, M., Chen, L., Wang, J., Msigwa, G., Osman, A. I., Fawzy, S., et al. (2023). Circular economy strategies for combating climate change and other environmental issues. *Environ. Chem. Lett.* 21, 55–80. doi: 10.1007/s10311-022-01499-6
- Yin, R. K. (2017). *Case study research and applications: Design and methods*. Los Angeles, USA: SAGE Publications.
- Zambia Statistics Agency (2022). *Census of population and housing*. Zambia: Lusaka.
- Zambian Breweries (2022). *Manja Pamodzi champions recycling for better communities*. Available at: <https://www.zambianbreweriesplc.com/manja-pamodzi-champions-recycling-for-better-communities/> (Accessed 8 December 2023).
- Zhu, J., Fan, C., Shi, H., and Shi, L. (2019). Efforts for a circular economy in China: a comprehensive review of policies. *J. Ind. Ecol.* 23, 110–118. doi: 10.1111/jiec.12754
- Zulu, E., Zulu, S., Chabala, M., Musonda, I., Kavishe, N., and Chileshe, N. (2022). Challenges and advocated solutions for environmental protection legislation for building infrastructure projects in developing countries: evidence from Zambia. *Proj. Leadersh. Soc.* 3:100056. doi: 10.1016/j.plas.2022.100056