urban science

MDPI

Review

Barriers and Challenges to Waste Management Hindering the Circular Economy in Sub-Saharan Africa

Justice Kofi Debrah [1,*], Godfred Kwesi Teye [2] and Maria Alzira Pimenta Dinis [3,*]

[1] Faculty of Science and Technology, University Fernando Pessoa (UFP), Praça 9 de Abril 349, 4249-004 Porto, Portugal
[2] Key Laboratory of Integrated Regulation and Resource Development on Shallow Lakes, Ministry of Education, College of Environment, Hohai University, No.1Xikang Road, Nanjing 210098, China
[3] UFP Energy, Environment and Health Research Unit (FP-ENAS), University Fernando Pessoa (UFP), Praça 9 de Abril 349, 4249-004 Porto, Portugal
* Correspondence: 40511@ufp.edu.pt (J.K.D.); madinis@ufp.edu.pt (M.A.P.D.)

Abstract: More and more, waste generated in most parts of the Western world has been recycled and transformed into new circularity products. However, managing waste within Sub-Saharan Africa (SSA), such as in Ghana, has become a challenge due to the continued practice of the old traditional linear waste economy, that is, the taking, making and disposing methods of management, representing a threat to global environmental sustainability. Despite the need to revise current linear waste management (WM) in order to turn to the circular economy (CE) model, which consists of the concept of renew, remake and share, to advance sustainable development, a number of factors restrict the CE realization in practice, specifically in developing countries. An integrative methodology was used in this article to identify some of the challenges that hinder the achievement of CE in SSA countries. The results revealed the absence of educational programs and public awareness of waste management activities. The findings also highlight the lack of political will, funding and national policies on WM as some of the most significant issues. The study contributes to further encouraging policymakers and policy implementers, entrepreneurs and relevant interested groups to commit resources to sustainable WM services aiming to advancing CE in SSA countries.

Keywords: waste management (WM); circular economy (CE); Sub-Saharan Africa (SSA); sustainability

Citation: Debrah, J.K.; Teye, G.K.; Dinis, M.A.P. Barriers and Challenges to Waste Management Hindering the Circular Economy in Sub-Saharan Africa. *Urban Sci.* **2022**, *6*, 57. https://doi.org/10.3390/urbansci6030057

Academic Editor: Atiq Zaman

Received: 10 August 2022
Accepted: 29 August 2022
Published: 1 September 2022

1. Introduction

In recent years, waste management (WM) has become an issue in developed and developing countries [1], especially in the Sub-Saharan Africa (SSA) region [2–5]. The high volume of waste generated in SSA is attributed to rapid population growth and industrialization [6,7]. As shown in Figure 1, about 1.09 billion people were living in Africa in 2012 [8], producing about 125 million tons of waste [9], an increase resulting from the estimated growth rate by Tabutin [10], anticipating population growth to Africa, already in 1991, growth trend confirmed by the United Nations [11].

The volume of waste by SSA countries increased by 55 million tons from 2012 to 2019 [12], resulting in a population size of approximately 1.31 billion in 2019, while in 2025, the SSA waste is expected to increase to 244 billion tons, with an anticipated population size of about 1.50 billion [10–12], as shown in the Figure 2. According to the Water and Sanitation Program (WSP) 2012 report [13], improper waste disposal costs Ghana USD 290 million annually, equivalent to 1.6% of the country's gross domestic product (GDP) and USD 3 billion in Nigeria, representing 1.3% of GDP yearly. According to the same report, Zambia, Liberia, Madagascar and Kenya spend USD 195 million, 17.5 million, 103 million and 324 million, respectively, annually on indiscriminate waste disposal, representing a range of 0.9% to 2% of each country's GDP.

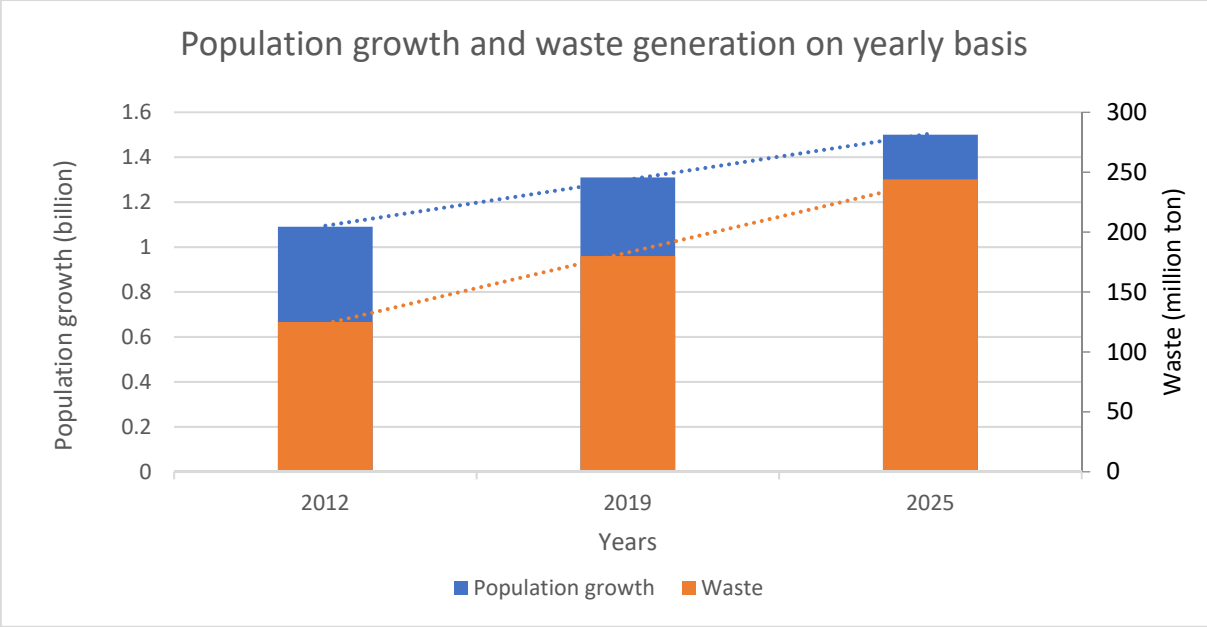

Figure 1. Anticipated trend of population growth and waste generation from 2012 to 2025 within SSA, data from Tieso [8], Scarlat et al. [9], Tabutin [10], United Nations [11] and Ayeleru et al. [12].

It should be recognized that there are efforts being made to deal with the challenges of WM in SSA through various development international partners. For instance, Galan [14] indicated that the United Nation's Environment Programme (UNEP), in collaboration with the Global Environment Facility, Government of Nigeria, is promoting CE through recycling to minimize waste generation. Specifically, the partnership supports self-sustaining CE approaches for the electronics WM in Nigeria. The objective of this action is to address the challenges represented by the current electronic waste management practices which affect the environment and human health. The project was to process half a million tons of electronic waste annually. In addition, it aims to encourage electronic producers to assume responsibility for their products' end-of-life and support related regulations and legislation.

In Ghana, Zoomlion Ghana Limited [15], a private WM company backed by the Ghanaian Government and the Hungarian Government, built a composting and recycling plant to enhance WM services to protect the environment, as well as to contribute to CE. In Kenya, the Ministry of Environment and Natural Resources have started a project named nationally appropriate mitigation action—CE municipal solid WM approach for urban areas in 2017 [16]. The essence is to move away from the huge volumes of wastes from the disposal sites, towards recycling. Similarly, South Africa has a CE guideline for a development project in partnership with UNEP [17] This was for the South African government to focus on CE for sustainable consumption and production.

Waste generated is grouped into decomposable either chemically or biologically, i.e., organics, partially degradable, for example, sludge [18], and non-degradable, i.e., electronic, metal, and plastics [19]. However, waste in SSA has a large composition of organic (57%) and other partially degradable contents of 22% [20] as shown in Figure 3. This type of waste can undergo anaerobic and aerobic decomposition [21,22]. Therefore, when waste is improperly managed, it has a negative influence on both human health and the environment by serving as grounds for infections and emitting gases, among many other diverse types of pollution [23–25].

Figure 2. SSA countries.

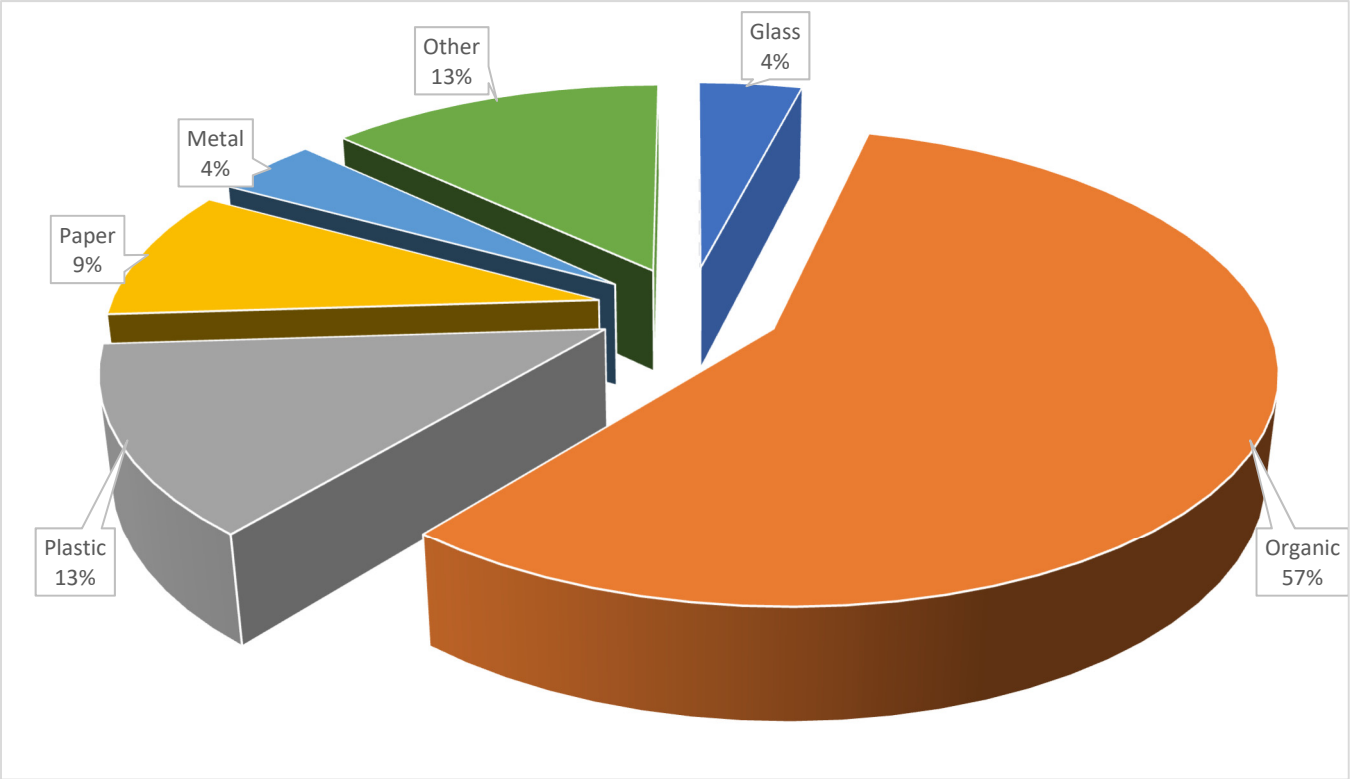

Figure 3. Waste composition in SSA, data from United Nations [20], Hoornweg and Bhada-Tata [26].

Though waste is considered a valuable resource [2,27–30] within the SSA region, countries like Somalia, Congo, Sudan, and Zimbabwe primarily practice WM linearly, i.e., take–make–dispose [31], while some of the countries such as Ghana, Nigeria, South Africa, Ethiopia, Kenya, Rwanda, Namibia, and Ivory Coast, among others, either fully or partially practice recycling [28] and some form of CE. Because of the linear material flow economy and the partial WM recycling practice, the SSA countries cannot fully recover waste materials and give them useful purposes. Hence, these countries cannot retrieve valuable resources from their waste and re-introduce them into the local economy. It, therefore, becomes challenging to enhance the growth of the local economy. Furthermore, the recovery of valuables such as plastics for recycling and organic components for composting from the waste, contributes to the reduction of the volumes to be disposed of. It also helps to break the chain of disease transmission which aids in the strengthening of public health [32]. It also, contributes to advance sustainable development goals (SDGs), good health and well-being for humans at all ages (SDG, 3), clean water and sanitation (SDG 6), sustainable cities and communities (SDG11) and responsible consumption and production (SDG 12) [33,34]. The CE strategy provides support to become closer to what other developed nations in the world are currently practicing [35].

The CE concept is considered a better efficiency to enhance sustainable WM [36], under which waste materials are transformed into new products. This is the best alternative way of transitioning from the traditional linear waste flow economy [37,38] towards the CE [39]. Therefore, the current linear model and the partial recycling of managing waste in some SSA countries needs to move towards material circularity, which will ensure the sustainable growth of the economy through optimization of resources, reduction of raw material consumption and recovering waste materials through recycling for second life [40–42], moving from the linear economy model built on a *take–make–consume–throw-away* pattern, as illustrated by Soysa [43]. In this way, waste materials could be managed more efficiently in a CE by reusing items and resources, while encouraging the use of renewable resources through sustainable ecological practices.

The CE is an economic model aiming to sustainably produce goods and services by reducing resource consumption and waste generation through recovered materials, water and energy production [44]. Studies by Kalmykova et al. [45], Ekins et al. [46] and Allen et al. [47] have shown that the CE will contribute to reducing the pressure on the environment and improve the safety of the supply of raw materials as well as increase the competitiveness among industry players, inspiring innovation and enhancing economic growth [48]. One of the best strategies to ensure sustainable WM is to adopt the CE business model [49]. This requires appropriate technology and simple tools and equipment to be used by well-trained personnel for the results to be attained.

Though CE is not fully practiced in some SSA countries, there is recognition of its potential to contribute to economic growth [50]. Therefore, governments, private organizations, and other social groups must implement the CE for sustainable development. Given that, this paper focuses on the barriers and challenges to WM practices hindering the realization of CE in SSA countries. An integrative methodological approach consisting of peer-reviewed journals and press releases from the internationally recognized organizations was used to collect data for analysis, from 2018 to 2021. The results are discussed based on the barriers and challenges associated with the transitioning from the traditional WM to a CE within SSA. This study points out specific recommendations for the possible operationalization of the CE implementation within a sustainable WM context in SSA, where this topic assumes a crucial importance. The results will be vital in helping SSA countries to develop CE policies and guidelines for the WM sector of the economy, including local government planning, education and research, thus moving closer to advancing the SDGs, specifically SDG's 3, 6 and 11 [51]. The study will also help policymakers, policy implementers, private entrepreneurs, researchers, non-governmental organizations (NGO's), and other social bodies in SSA to promote policies and standard frameworks for CE in order to advance sustainable development in this region.

The novelty of this study approach is evident within the existing and practiced traditional linear economy concept of WM, which needs to move towards CE, where waste materials are transformed and new goods and services are produced, contributing to overall sustainable development in the SSA. Therefore, raising awareness on this specific topic is essential in addressing the scope of sustainability in SSA countries, such as Ghana, supporting the reduction of consumption patterns, as pointed out by Romero-Hernández and Romero [52].

2. Methodology

An integrative research approach, suggested by Romero-Hernández and Romero [52] and Debrah et al. [53], was used in this study, as shown in Figure 4. Secondary data was obtained from existing primary data studies intending to solve issues of WM through CE for a greater level of awareness. For this purpose, an expert-driven literature review was performed [54]. The data collected was critically reviewed in order to generate new knowledge for a better assessment of the problems and barriers in this respect [53,55].

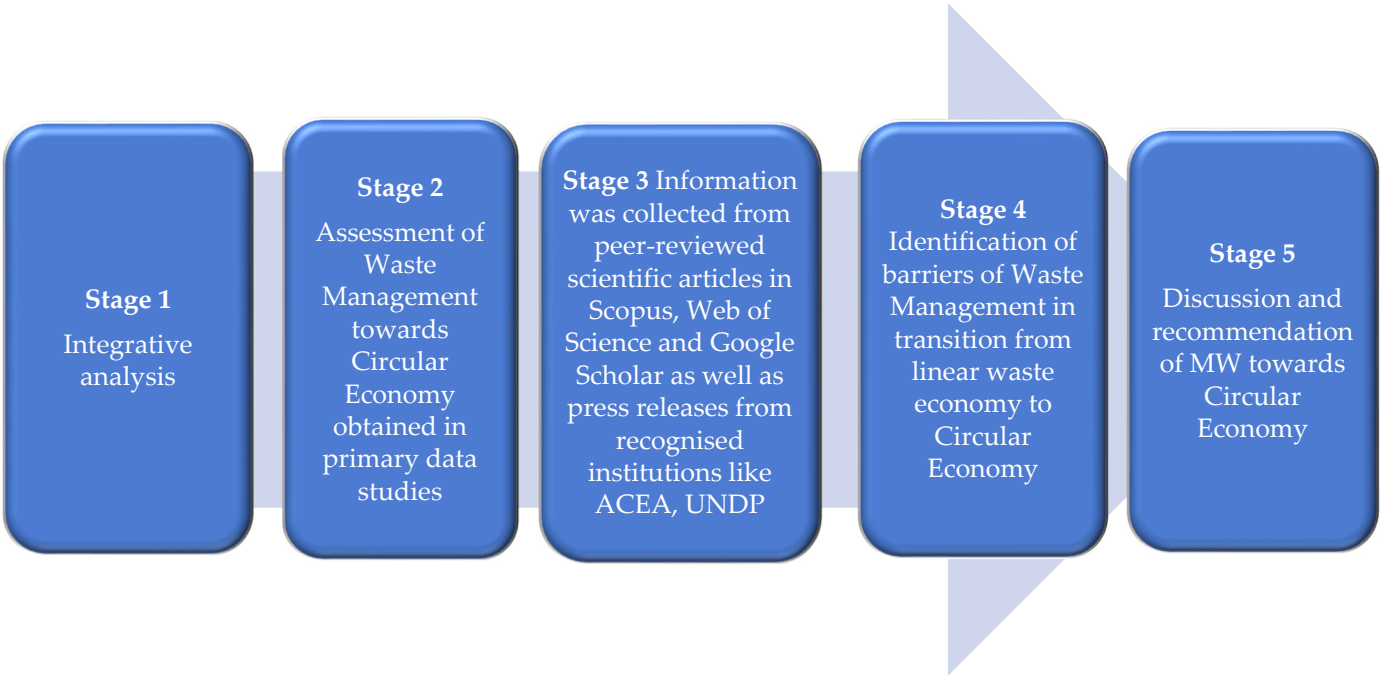

Figure 4. Integrative approach used in this study, adapted from Filho et al. [56].

To recognize the problems associated with the implementation of CE in SSA, mentioned above, secondary data was collected from WM companies, government agencies, and press releases from recognized institutions such as the Africa Circular Economy Alliance (ACEA) [57].

In order to revise the literature on the topic, information was also collected from publications in databases such as Scopus, Web of Science and Google Scholar. The syntax for the search of the article was 'Challenges', AND 'waste management', AND 'circular economy', AND 'Sub-Saharan Africa'. In determining the appropriate content for this study, the publications were restricted to 2018–2021. Other inclusion criteria were peer-reviewed scientific articles, journals written in English, aimed at government policies, CE funding, and WM awareness at all levels. The studies mainly focused on SSA. An initial search for the published articles and book chapters identified 124,000 publications. The combination of all keywords reduced the search articles to 127. Fifteen (15) articles remained after considering the inclusion criteria and removing duplicates, using ZOTERO bibliographic software. After the rigorous screening, six articles were linked to issues related to CE in SSA, as shown in Figure 5, based on Panigrahi and Dubey [58] and Yu et al. [59] methodology.

A summary of the studied articles by Ali et al. [60] in Ghana, Owebor et al. [61] in Nigeria, Mmereki [62] in Botswana, Ayeleru et al. [12], Ijoma et al. [63] and Somé [64] indicates law enforcement, political will, and funding as the major issues for WM within SSA.

The study used integrative analysis to understand the following:

- The policies and regulations of CEs in SSA;
- The support and funds to practice CE;
- The human resource in WM towards CE;
- The awareness about WM towards CE.

This study should provide a clear understanding of existing issues that create a gap between MW and the CE in SSA, for better-informed knowledge and recommendations assisting decision-makers and research in SSA in order to advance sustainable development.

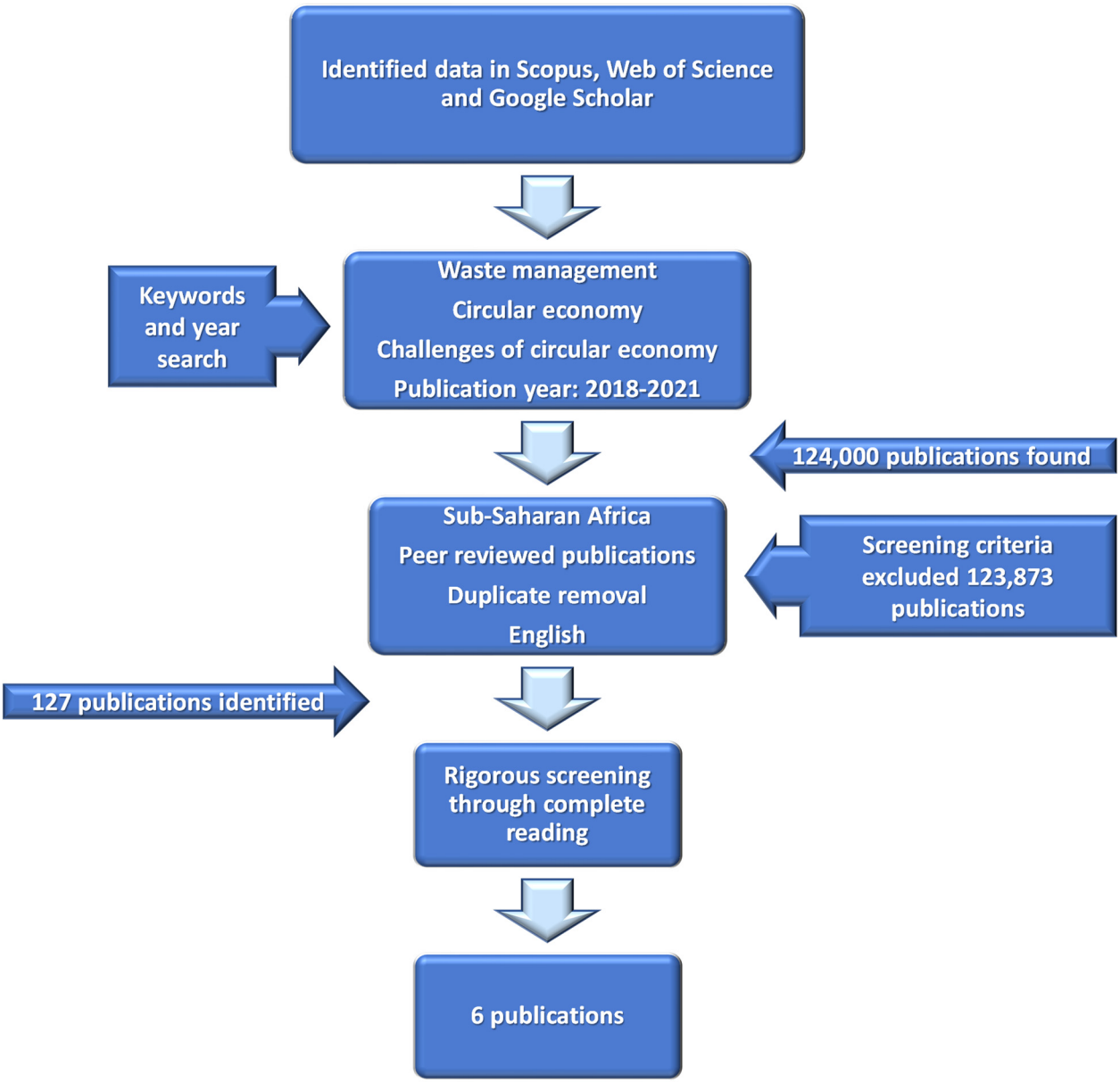

Figure 5. Scheme for the review indicating database and screened retrieved manuscripts, adapted from Panigrahi and Dubey [58] and Yu et al. [59].

3. Results and Discussion

3.1. Obstacles Hindering the Movement of Managing Waste from a Linear Economy to Circular Economy

The studies by Ayeleru et al. [12] and Diaz [65] indicate several factors that represent limitations for countries in SSA to fully implement the WM model of CE. These range from inadequate or absence of policies and regulations respecting WM, insufficient funding, lack of commitment and political will to implement CE, low capacity of the personnel actively involved in the WM, and lack of investment in the sector by the governments and entrepreneurs.

3.2. Lack of National Policies and Regulations

The literature shows that there are inadequate policies and regulations among the SSA countries such as Guinea, Sudan, Southern Sudan, Sierra Leone and Somalia [64]. The lack of regulations has made it difficult to change from the traditional linear way of managing

waste to a CE model. It should be noted that the absence of relevant national policies and regulations to guide and provide control measures for WM activities in SSA countries make it difficult for counties and metropolitan, municipal, and district assemblies to regulate and supervise the most appropriate options of waste streams to deal with [32,66,67], particularly when most policies are designed to follow the overall national goals. There may be specific cases where policies, laws, and regulations are available. However, the policies are not up to the times, so applying them, combined with a weak enforcement system, makes it very difficult to see any meaningful changes in the WM services within the SSA context. This situation makes it quite strenuous for society to be involved and participate at the domestic level, for the segregation of waste. Additionally, in SSA countries, government failure to enforce environmental legislation has resulted in a culture of lassitude, reducing the effectiveness of WM in general [32,68].

The SSA countries, including Rwanda, South Africa, Ivory Coast, Ghana and Nigeria, have initiated an ACEA to facilitate seminars, training and workshops to enhance the CE practice among member countries [57]. That alliance also intended to encourage sustainability partnerships, create coalitions for the implementation of existing projects on the CE and pilot ones, and facilitate the development of a group of African leaders who will lead the CE implementation. The scope of this organization covers, but is not limited to, the proper understanding of food waste, setting up effective systems of collection, strategically planning and installing sorting, pre-processing and recycling plants for operations, give incentives such as finance at national level and support for product design for reuse and recycling of related waste products. African countries such as Ghana, Nigeria, Rwanda, Ethiopia, South Africa, Senegal and Kenya have accepted the conditions of being part of the alliance. However, the main objective of this alliance is yet to be spelt out to all SSA countries. It will also contribute to curbing the practice where state institutions in SSA aim to use current policies and regulations in developed countries without fully considering the cost involved in implementing them [69] in the SSA region. This results in a situation where WM projects begin with the notion to include a CE model, but are abandoned without completion. This does not improve WM activities. Therefore, governments within the SSA countries must be encouraged to promulgate clear and comprehensive policies as well as related regulations on the CE, as has already been achieved by the European Union [35,70] and in other parts of the world [71], to enhance and promote more efficient use of resources, through CE. Additionally, there is the need to build strong WM and related services, strengthen policies and regulations, harmonize, monitor and regularly assess these policies for active enforcement to achieve CE results in the SSA context.

3.3. SSA Circular Economy Lacking Political Commitment and Investment

Overcoming the challenges associated with moving WM from the linear economy to CE will require practical measures such as building WM infrastructure by the relevant stakeholders [72]. These stakeholders, which include governments, private WM companies, researchers, environmental groups, NGO's and entrepreneurs in the SSA countries, need to invest in the CE projects. Even though some investments, including the support to phase out the use of plastic bags to promote sustainable consumption and production patterns in Rwanda by the African Development Bank, are being made in the WM sector to transition towards CE, much is expected to achieve the desired results. The opportunities to accelerate CE principles in SSA are increasing steadily. Kenya, for instance, is taking advantage of the emerging technologies towards better WM approaches by actively managing waste collection services, sorting, composting and plastic recycling and purchasing waste from waste materials pickers [73,74]. Ethiopia, on the other hand, has a new waste-to-energy plant in the year 2017 that is set to transform and revolutionize the entire city's approach to dealing with waste [75]. The plant is estimated to incinerate 1400 tons daily, about 80% of the city's waste. This supplies Addis Ababa with 30 % of its household electricity needs and assists in meeting international air quality emissions standards [76]. Additionally, in Rwanda, the government, in conjunction with Enviroserve [77], has built the first e-waste

recycling and refurbishing facility to process over 10,000 metric tons of waste per year [78]. The CE projects in Ghana, Kenya, Rwanda, Nigeria and Ethiopia, among others, have many benefits, which include social transformation and economic innovation as indicated by Barbaritano et al. [79] and Dung [80], with a summary of sustainability benefits, i.e., environmental, social and economic, presented in Table 1.

Table 1. Environmental, social and economic benefits derived from CE.

Benefits	CE	Reference
Environmental	CE encourages waste reduction, control of emission of greenhouse gases, recycling, and protection of the environment by taking care of end-of-life products through modification. In addition, the CE further ensures a reduction in the importation of resources since some of the raw materials used in production could be obtained from the materials in transition locally.	AUDA-UNEP [75] Dung [80] Schroeder et al. [81] Guarnieri et al. [82] Marino and Pariso [83]
Social	CE provides opportunities for job creation. As a result, the youth earn a living through employment opportunities, leading to poverty reduction, social transformation, and mitigating social impacts, such as climate change.	Debrah et al. [24] AUDA-UNEP [75]
Economic	On the aspects of economics, CE enhances technological and business transformation, market innovation and economic growth and trigger competition among the local and international organizations.	Smol et al. [84] Awan et al. [85] Bressanelli et al. [86]

The lack of political will is considered one of the main constraints affecting the desire to provide solutions for sustainable WM [86]. According to Wilson and Velis [87], the lack of political commitment culminates into insufficient funding for WM activities, and hence achieving CE will require extra efforts at this level.

For SSA to attain CE requires an estimated amount of USD 6 to 42 billion to build large-scale recycling and recovering technology-based plants [20]. However, due to the cost involved in acquiring the WM technologies, entrepreneurs show little interest and are not willing to commit funds to the CE projects. They rather prefer to invest in the linear flow model economy, which requires less capital injection into the businesses but early recouping of the profit on their investments [60]. Therefore, a better understanding of the challenges associated with the transition from the linear WM model to a CE will encourage the political leaders in SSA to commit more resources to ensure waste is adequately managed. This is very important because there is an insufficient commitment by the decision makers, such as political leaders, encouraging the preferences for cheaper disposal alternatives, such as the use of unstructured disposal sites and open dumps instead of engineered landfills [88,89]. It also has a long tie effect on the environment, health, and wellbeing of the society and increases the cost to GDP of the SSA countries. A study conducted by World Bank—WSP [13] indicates that 18 SSA countries, including Ghana, Congo, Uganda, Kenya, Rwanda, Zambia, Nigeria, Benin and Chad, lose lots of money to WM. Additionally, Mauritania, Niger, Madagascar, Mozambique and Burkina Faso lose USD 5.5 billion yearly to poor sanitation, which is between 1 and 2.5% of GDP.

It is recognized that the major stakeholders prefer to commit financial resources to visible projects such as road networks, school buildings and related infrastructure, resulting

in high support from society rather than funding sustainable WM projects [90,91]. Even though several benefits could be derived from sustainable environmental management, including improved health and general wellbeing, it will require an additional financial commitment. Moreover, only a few political leaders may be willing to invest in 'politically unpopular projects', irrespective of how urgent the construction of a sanitary engineered landfill or a modern composting plant is required to protect the environment [92].

3.4. Waste Management and Human Capacity

Studies have shown that the personnel capacity, mainly from the government sector and private industry players who are actively involved in the planning, management and, sometimes, execution of the processes, is lacking [93,94]. The technically trained professionals in CE are absent in some SSA countries such as Angola, Burundi, Central African Republic and Liberia, among others. This is because most of these professionals prefer working in other sectors of the economy, for instance, in banking, the Environmental Protection Agency (EPA) [95], insurance and NGO's, which are attractive, lucrative and more fulfilling [96] compared to the WM sector. Even though the sector requires several professionals, including but not limited to sociologists, teachers, architects, planners, environmentalists, lawyers, engineers, and financial analysts [97], to name but a few, they are not readily available and willing to serve in the field. The staff available are not technically trained to deal with the task at hand. There is, therefore, the need for professionally trained personnel to be engaged and encouraged to participate in the field of WM, assigned specific tasks based on knowledge, expertise and experience to achieve desired results.

The contributions from the CE field experts will accelerate and guarantee the attainment of some of the SDGs, such as 3, 6, 11 and 12 [98] while successfully addressing the barriers and challenges associated with WM in SSA countries.

3.5. Absence of Educational Programmes and Public Awareness of Waste Management

Analyzing the information collected indicates that some of the SSA countries, such as Togo, Benin, Angola, Burundi, Somalia, Zimbabwe, Sudan, Guinea, Sierra Leone, Chad, Congo and Eritrea, significantly and commonly lack educational programs such as community-based training on CE, waste storage and segregation of electronic, plastic, food and agricultural waste directed towards WM and related activities [4]. The primary issue is the seemingly unavailability of policies on WM educational programs, which are supposed to be geared towards the value chain of the CE at various stages of human endeavour to address the linear economy. According to Franke and Remmele [99] and Debrah et al. [4], incorporating CE into the curriculum of colleges and higher education institutions will be a source of transformation for positive change for subsequent generations [100]. It is a fact that environmental education for young people, both in the home and at school, should be prioritized because it is an effective strategy to reduce waste [99]. This is expected to change students' approach and skills to solve problems to preserve future generations' environmental resources. However, CE is yet to be completely included in the educational curricula in most developing countries, including the SSA region [101–104] and Asia [105], which will help in teaching, research programs and student activities [106]. This will aid the students in acquiring knowledge, skills and interest in the area of WM and CE in particular. In addition, specialized and customized training programs must be designed for the staff directly involved in WM in the public sector and private companies. This will offer the technical know-how to support the implementation and effective legislation and enforcement of laws to ensure sustainable WM. Furthermore, at the political and governmental levels, the training will build and impart the proper understanding and appreciation of the importance of WM to help sound decision-making on WM issues [20]. In achieving this, the full complement of professionals of all levels is required to implement the CE to save the environment [106]. Furthermore, education will incorporate WM practices into the daily lifestyles of the society [107,108] and create the needed awareness for a sustainable environmental management towards CE. Because of the lack of comprehensive educational

programs for CE within some SSA countries, the citizens have not had the opportunity to fully take part in WM activities. As a result, society is not aware of how to participate and contribute to sustainable WM solutions, particularly to CE. For SSA countries to move away from a linear economy, citizens must be educated and encouraged to participate in all activities towards CE at all stages of daily life [109,110], including behavior change.

4. SSA Future Prospects in Circular Economy

The CE is anticipated to assist in reducing resource waste and guarantee environmental sustainability [56,109]. The full implementation of CE in SSA countries is critical to achieving the SDGs. However, the transition from the current linear economic model of MW to CE, where the production and consumption patterns [111,112] need to be focused on a sustainable environment, requires practically formulated policies and commitment from major stakeholders, including WM companies, academia, entrepreneurs and governments [113]. Therefore, SSA countries leadership must be encouraged to embrace the CE model and fully implement it to protect the environment by building WM infrastructure and committing more financial resources. SSA countries need to endorse and enforce environmental sanitation-related regulations and policies and develop the capacity of the personnel involved in WM services. This will help to improve both economic and environmental development [114]. Furthermore, SSA leaders must strictly follow the CE model to boost products and service design, which will assist in preserving resources from depletion, environmental deprivation, and generating less waste. Since the CE provides a framework encouraging development, SSA countries must adopt it and develop it to ensure environmental sustainability and contribute to achieve the SDGs.

5. Conclusions

WM is a significant setback in most SSA regions. Still, Ghana, South Africa, Rwanda, Nigeria and Kenya, to mention a few countries, have partially invested in the infrastructure, logistics and equipment, such as trucks for hauling waste, but less has been accomplished in terms of approaching the CE model. Moving from the traditional WM method, i.e., take–make–dispose, to the repair, reuse, recycle method, transforming waste into new products, aiming to achieve environmental, social and economic benefits for society has not been fully realized within the SSA context.

In determining the factors hindering the practice of CE in SSA countries, this study used an integrative research analysis to perform an expert-driven literature review, collecting information from peer-reviewed scientific journals publications as well as data from government agencies and releases from well-known international organizations such as ACEA.

The results show that SSA countries have no adequate national policies to guide WM towards a CE model. The results also reveal that there is no political will or enough funds in SSA due to a lack of commitment for fully implementing the CE model. Additionally, in SSA, the personnel needed to be actively involved in WM activities to move towards CE are at a low-capacity level of knowledge. Therefore, advancing CE implementation in SSA countries requires leadership commitment. In order to achieve the SDGs good health and well-being (SDG3), clean water and sanitation (SDG6), sustainable cities and communities (SDG11) and responsible consumption and production (SDG12), thus supporting global sustainable development, there must be financial commitment to WM in SSA and human resources need to be made available to allow a smooth transition from the traditional linear waste economy to CE. Within the SSA region, the CE is imperative for creating the enabling environment for sustainable WM. SSA countries are thus encouraged to promulgate, enhance and harmonize the WM-related policies while enforcing environmental sanitation legislation to protect both the environment and human health. Finally, SSA entrepreneurs need to invest in modern WM technologies to accommodate the CE for sustainable development achievement in this region. It is recommended that CE principles, related policies and regulations be adopted

and strictly enforced by SSA countries to aid in the transition towards sustainable WM practices, contributing to overall sustainable development.

6. Limitations

This research has some limitations. Though the findings are substantially representative, the data collected did not cover every SSA country. In addition, the CE is a new concept in WM within SSA. As such, it is not fully operational in certain parts of SSA, making it difficult to collect information on this topic in the region. Hence, future studies on this subject are recommended to focus on emerging economies in SSA not practicing CE to raise awareness on theses cross-cutting issues. The insights will assist in guiding policymakers and research to formulate sustainable pathways to overcome the barriers to effective WM, enhancing CE projects in SSA countries.

Author Contributions: Conceptualization, J.K.D. and G.K.T.; data curation, J.K.D. and G.K.T.; methodology, J.K.D. and G.K.T.; supervision, M.A.P.D.; validation, M.A.P.D.; visualization, J.K.D., G.K.T. and M.A.P.D.; writing—original draft, J.K.D. and G.K.T.; writing—revision and editing, J.K.D., G.K.T. and M.A.P.D. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: All the data used is included in the article.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Ezeudu, O.B.; Ezeudu, T.S.; Ugochukwu, U.C.; Agunwamba, J.C.; Oraelosi, T.C. Enablers and Barriers to Implementation of Circular Economy in Solid Waste Valorization: The Case of Urban Markets in Anambra, Southeast Nigeria. *Environ. Sustain. Indic.* **2021**, *12*, 100150. [CrossRef]
2. Debrah, J.K.; Vidal, D.G.; Dinis, M.A.P. Environmental Waste Sustainability: Organic Valorisation and Socioeconomic Benefits Towards Sustainable Development in Ghana. In *Sustainable Policies and Practices in Energy, Environment and Health Research. World Sustainability Series*; Leal Filho, W., Vidal, D.G., Dinis, M.A.P., Eds.; Springer: Cham, Switzerland, 2022; pp. 425–437. [CrossRef]
3. Debrah, J.K.; Carlotto, I.N.; Vidal, D.G.; Dinis, M.A.P. Managing Medical Waste in Ghana-the Reality. *Int. J. Environ. Stud.* **2021**, *2021*, 1–17. [CrossRef]
4. Debrah, J.K.; Vidal, D.G.; Dinis, M.A.P. Raising Awareness on Solid Waste Management through Formal Education for Sustainability: A Developing Countries Evidence Review. *Recycling* **2021**, *6*, 6. [CrossRef]
5. Debrah, J.K.; Vidal, D.G.; Dinis, M.A.. Sustainable Pharmaceutical Waste Management: Pharmacist and Patients Perception in Ghanaian Hospitals. In *Handbook of Sustainability Science in the Future*; Leal Filho, W., Azul, A.M., Doni, F., Salvia, A.L., Eds.; Springer: Cham, Switzerland, 2022. [CrossRef]
6. David, V.E.; Wenchao, J.; John, Y.; Mmereki, D. Solid Waste Management in Monrovia, Liberia: Implications for Sustainable Development. *J. Solid Waste Technol. Manag.* **2019**, *45*, 102–110. [CrossRef]
7. Kaza, S.; Yao, L.; Bhada-Tata, P.; Woerden, V. *What Is Waste 2. A Global Snapshot of Solid Waste Management to 2050*; World Bank Publications, The World Bank Group: Washington, DC, USA, 2018; ISBN 9781464813290.
8. Tieso, I. Statista: Global Plastic Production 1950–2020. 2022. Available online: https://www.statista.com/statistics/282732/global-production-of-plastics-since-1950 (accessed on 29 April 2022).
9. Scarlat, N.; Motola, V.; Dallemand, J.F.; Monforti-Ferrario, F.; Mofor, L. Evaluation of Energy Potential of Municipal Solid Waste from African Urban Areas. *Renew. Sustain. Energy Rev.* **2015**, *50*, 1269–1286. [CrossRef]
10. Tabutin, D. La Croissance Demographique de l'Afrique: Bilan et Perspectives. [African Population Growth: Status and Prospects]. *Tiers Monde* **1991**, *32*, 159–173. [PubMed]
11. United Nations—World Population Prospects Africa Population 1950–2022. 2022. Available online: https://www.macrotrends.net/countries/AFR/africa/population (accessed on 5 May 2022).
12. Ayeleru, O.O.; Dlova, S.; Akinribide, O.J.; Ntuli, F.; Kupolati, W.K.; Marina, P.F.; Blencowe, A.; Olubambi, P.A. Challenges of Plastic Waste Generation and Management in Sub-Saharan Africa: A Review. *Waste Manag.* **2020**, *110*, 24–42. [CrossRef]
13. Water and Sanitation Program (WSP) Africa: Economics of Snitation Iniative. 2012. Available online: www.wsp.org/content/africa-economic-impacts-sanitation (accessed on 1 August 2022).
14. Galan, I. Nigeria Turns the Tide on Electronic Waste. Available online: https://www.unep.org/news-and-stories/press-release/nigeria-turns-tide-electronic-waste (accessed on 2 August 2022).

15. Zoomlion Ghana Limited Jospong Group Commissions 20 Million Euros Kumasi Wastewater Treatment Plant. 2022. Available online: https://zoomlionghana.com/2021/05/jospong-group-commissions-20-million-euros-kumasi-wastewater-treatment-plant/ (accessed on 2 August 2022).
16. Soezer, D.A. *Nationally Appropriate Mitigation Action on a Circular Economy Solid Waste Management Approach for Urban Areas in Kenya*; Wilde, G., Ed.; Ministry of Environment and Natural Resources: Nairobi, Kenya, 2017; ISBN 2547228564.
17. Switch Africa Green The Circular Economy Transition in South Africa: Untapped Opportunities in the Waste Sector. 2020. Available online: www.unep.org/switchafricagreen/resources/policy-and-strategy/circular-economy-transition-south-africa-untapped-opportunities-waste (accessed on 10 August 2022).
18. Jorge, F.C.; Dinis, M.A.P. Sewage Sludge Disposal with Energy Recovery: A Review. Proceeding of the ICE. *Waste Resour. Manag.* **2013**, *166*, 14–28. [CrossRef]
19. Jha, A.K.; Singh, S.K.; Singh, G.P.; Gupta, P.K. Sustainable Municipal Solid Waste Management in Low Income Group of Cities: A Review. *Trop. Ecol.* **2011**, *52*, 123–131.
20. United Nation Environment Programme (UNEP). Africa Waste Management Outlook: The State of Waste in Africa. 2022, pp. 1–8. Available online: https://www.unep.org/ietc/resources/publication/africa-waste-management-outlook (accessed on 30 August 2022).
21. Zhang, Q.; Cao, J.; Wu, Y.; Zhao, J.; Guo, W.; Huang, W.; Feng, Q.; Fang, F.; Aleem, M.; Luo, J. Shifts of Microbial Community and Metabolic Function during Food Wastes and Waste Activated Sludge Co-Fermentation in Semi-Continuous-Flow Reactors: Effects of Fermentation Substrate and Zero-Valent Iron. *Bioresour. Technol.* **2020**, *313*, 123686. [CrossRef]
22. Mengqi, Z.; Shi, A.; Ajmal, M.; Ye, L.; Awais, M. Comprehensive Review on Agricultural Waste Utilization and High-Temperature Fermentation and Composting. *Biomass Convers. Biorefin.* **2021**, *2021*, 1–24. [CrossRef]
23. Christiana, K.; Anushree, P. Review of Current Healthcare Waste Management Methods and Their Effect on Global Health. *Healthcare* **2021**, *9*, 284. [CrossRef]
24. Debrah, J.K.; Vidal, D.G.; Dinis, M.A.P. Innovative Use of Plastic for a Clean and Sustainable Environmental Management: Learning Cases from Ghana, Africa. *Urban Sci.* **2021**, *5*, 12. [CrossRef]
25. Debrah, J.K.; Vidal, D.G.; Dinis, M.A. Vulnerabilities of Waste Scavengers to COVID-19 Impacts: Outcomes of an Exploratory Study in Ghana. In *Handbook of Human and Planetary Health*; Springer International Publishing: Cham, Switzerland, 2022.
26. Hoornweg, D.; Bhada-Tata, P. *What Is Waste. A Global Review of Solid Waste Management*; Urban Department Series Knowledge Papaer's World Bank: Washington, DC, USA, 2012.
27. Coppola, D.; Lauritano, C.; Palma Esposito, F.; Riccio, G.; Rizzo, C.; de Pascale, D. Fish Waste: From Problem to Valuable Resource. *Mar. Drugs* **2021**, *19*, 116. [CrossRef] [PubMed]
28. Mayer, A.; Haas, W.; Wiedenhofer, D.; Krausmann, F.; Nuss, P.; Blengini, G.A. Measuring Progress towards a Circular Economy: A Monitoring Framework for Economy-Wide Material Loop Closing in the EU28. *J. Ind. Ecol.* **2019**, *23*, 62–76. [CrossRef] [PubMed]
29. Haas, M.; Galler, R.; Scibile, L.; Benedikt, M. Waste or Valuable Resource—A Critical European Review on Re-Using and Managing Tunnel Excavation Material. *Resour. Conserv. Recycl.* **2020**, *162*, 105048. [CrossRef]
30. Hoarau, J.; Caro, Y.; Grondin, I.; Petit, T. Sugarcane Vinasse Processing: Toward a Status Shift from Waste to Valuable Resource. A Review. *J. Water Process Eng.* **2018**, *24*, 11–25. [CrossRef]
31. Taelman, S.; Tonini, D.; Wandl, A.; Dewulf, J. A Holistic Sustainability Framework for Waste Management in European Cities: Concept Development. *Sustainability* **2018**, *10*, 2184. [CrossRef]
32. Godfrey, L.; Tawfic Ahmed, M.; Giday Gebremedhin, K.; Katima, J.H.; Oelofse, S.; Osibanjo, O.; Henning Richter, U.; Yonli, A.H. Solid Waste Management in Africa: Governance Failure or Development Opportunity. In *Regional Development in Africa*; Edomah, N., Ed.; IntechOpen: Rijeka, Croatia, 2019; pp. 1–14.
33. United Nation Development Programme (UNDP) Sustainable Development Goals. 2015. Sustainable Development Goals | United Nations Development Programme. Available online: Undp.org (accessed on 28 July 2022).
34. Nations, U. United Nations Sustainable Development Goals—United Nations, the 17 Goals. Available online: https://sdgs.un.org (accessed on 2 June 2020).
35. Mazur-Wierzbicka, E. Circular Economy: Advancement of European Union Countries. *Environ. Sci. Eur.* **2021**, *33*, 1–15. [CrossRef]
36. Awasthi, M.K.; Zhao, J.; Soundari, P.G.; Kumar, S.; Chen, H.; Awasthi, S.K.; Duan, Y.; Liu, T.; Pandey, A.; Zhang, Z. Sustainable Management of Solid Waste. In *Sustainable Resource Recovery and Zero Waste Approaches*; Taherzadeh, M.J., Bolton, K., Wong, J., Pandey, A., Eds.; Elsevier: Amsterdam, The Netherlands, 2019; Chapter 6; pp. 79–99, ISBN 978-0-444-64200-4.
37. Ribić, B.; Voća, N.; Ilakovac, B. Concept of Sustainable Waste Management in the City of Zagreb: Towards the Implementation of Circular Economy Approach Concept of Sustainable Waste Management in the City of Zagreb: Towards The. *J. Air Waste Manage. Assoc.* **2017**, *67*, 241–259. [CrossRef]
38. Zhang, C.A.; Venkatesh, V.G.; Liu, Y.; Wan, M.; Qu, T.; Huisingh, D. Barriers to Smart Waste Management for a Circular Economy in China. *J. Clean. Prod.* **2019**, *240*, 118198. [CrossRef]
39. Di Vaio, A.; Hassan, S.; Palladino, R. The Transition towards Circular Economy and Waste Accountability Models: A Systematic Literature Review and Conceptual Framwork. *Environ. Dev. Sustain.* **2022**, *2022*, 1–77. [CrossRef] [PubMed]
40. Karayılan, S.; Yılmaz, Ö.; Uysal, Ç.; Naneci, S. Prospective Evaluation of Circular Economy Practices within Plastic Packaging Value Chain through Optimization of Life Cycle Impacts and Circularity. *Resour. Conserv. Recycl.* **2021**, *173*, 105691. [CrossRef]

41. Xavier, L.H.; Giese, E.C.; Ribeiro-Duthie, A.C.; Lins, F.A.F. Sustainability and the Circular Economy: A Theoretical Approach Focused on e-Waste Urban Mining. *Resour. Policy* **2021**, *74*, 101467. [CrossRef]
42. Babbitt, C.W.; Althaf, S.; Cruz Rios, F.; Bilec, M.M.; Graedel, T.E. The Role of Design in Circular Economy Solutions for Critical Materials. *One Earth* **2021**, *4*, 353–362. [CrossRef]
43. Soysa, R. Circular Conomy in Waste Management. Available online: https://www.linkedin.com/pulse/circular-economy-slintec/?trk=organization-update-content_share-article (accessed on 24 August 2022).
44. D'Adamo, I. Adopting a Circular Economy: Current Practices and Future Perspectives. *Soc. Sci.* **2019**, *8*, 328. [CrossRef]
45. Kalmykova, Y.; Sadagopan, M.; Rosado, L. Circular Economy—From Review of Theories and Practices to Development of Implementation Tools. *Resour. Conserv. Recycl.* **2018**, *135*, 190–201. [CrossRef]
46. Ekins, P.; Domenech, T.; Drummond, P.; Bleischwitz, R.; Hughes, N.; Lotti, L. Managing Environmental and Energy Transitions for Regions and Cities How and Where Background Information Managing Environmental and Energy Transitions for Regions and Cities The OECD Centre for Entrepreneurship, SMEs, Regions and Cities on Twitter: @OECD_local Citation. 2019. Available online: http://t4.oecd.org/cfe/regionaldevelopment/Ekins-2019-Circular-Economy-What-Why-How-Where.pdf (accessed on 30 May 2022).
47. Allen, D.; Halloran, P.; Harris, P.; Kaduck, J.; Leith, A.; Lindsay, C.; Naylor, W.; Palmer, S.; Sismour, K. Acknowledgements the 2020 Vision Workgroup Mark McDermid, Wisconsin Department of Natural Resources. 2020. Available online: https://www.epa.gov/sites/default/files/2015-08/documents/sustainable_materials_management_the_road_ahead.pdf (accessed on 27 May 2022).
48. European Parliamentary Research Service (EPRS). Towards a Circular Economy-Waste Management in the EU Study Science and Technology Options Assessment. 2017. Available online: https://fsr.eui.eu/wp-content/uploads/2020/06/Preparation-paper_FSR-workshop-on-Municipal-Waste.pdf (accessed on 27 May 2022).
49. Fatimah, Y.A.; Govindan, K.; Murniningsih, R.; Setiawan, A. Industry 4.0 Based Sustainable Circular Economy Approach for Smart Waste Management System to Achieve Sustainable Development Goals: A Case Study of Indonesia. *J. Clean. Prod.* **2020**, *269*, 122263. [CrossRef]
50. Bertelsmann-scott, T. Policy Briefing The Circular Economy: Including Africa in Europe' s Circle. 2020. Available online: https://www.africaportal.org/publications/circular-economy-including-africa-europes-circle/ (accessed on 20 May 2022).
51. Filho, W.L.; Dinis, M.A.P.; Ruiz-de-Maya, S.; Doni, F.; Eustachio, J.H.; Swart, J.; Paço, A. The Economics of the UN Sustainable Development Goals: Does Sustainability Make Financial Sense? *Discov. Sustain.* **2022**, *3*, 1–8. [CrossRef]
52. Romero-hernández, O.; Romero, S. Maximizing the Value of Waste: From Waste Management to the Circular Economy. *Thunderbird Int. Bus. Rev.* **2018**, *60*, 757–764. [CrossRef]
53. Debrah, J.K.; Vidal, D.G.; Dinis, M.A.P. Recovering from COVID–19 Environment and social impacts in Sub-Saharan Africa: The role of social engagement. In *Handbook of Sustainability Science in the Future*; Cham: Springer, Switzerland, 2022; ISBN 978-3-030-68074-9.
54. Filho, W.L.; Yang, P.; Henrique, J.; Pires, P. *Deploying Digitalisation and Artificial Intelligence in Sustainable Development Research*; Springer: Dordrecht, The Netherlands, 2022; ISBN 0123456789.
55. Torraco, R.J. Writing Integrative Literature Reviews: Guidelines and Examples. *Hum. Resour. Dev. Rev.* **2005**, *4*, 356–367. [CrossRef]
56. Filho, W.L.; Vidal, D.G.; Chen, C.; Petrova, M.; Dinis, M.A.P.; Yang, P.; Rogers, S.; del Álvarez-Castañón, L.C.; Djekic, I.; Sharifi, A.; et al. An Assessment of Requirements in Investments, New Technologies, and Infrastructures to Achieve the SDGs. *Environ. Sci. Eur.* **2022**, *34*, 1–17. [CrossRef]
57. Africa Circular Economy Alliance (ACEA). Five Big Bets for the Circular Economy in Africa African Circular Economy Alliance. 2021. Available online: https://www.afdb.org/en/topics-and-sectors/topics/circular-economy/african-circular-economy-alliance-acea (accessed on 14 May 2022).
58. Panigrahi, S.; Dubey, B.K. A Critical Review on Operating Parameters and Strategies to Improve the Biogas Yield from Anaerobic Digestion of Organic Fraction of Municipal Solid Waste. *Renew. Energy* **2019**, *143*, 779–797. [CrossRef]
59. Yu, C.W.; Alavinia, S.M.; Alter, D.A. Impact of Socioeconomic Status on End-of-Life Costs: A Systematic Review and Meta-Analysis. *BMC Palliat. Care* **2020**, *19*, 1–16. [CrossRef]
60. Ali, E.B.; Anufriev, V.P.; Amfo, B. Green Economy Implementation in Ghana as a Road Map for a Sustainable Development Drive: A Review. *Sci. Afr.* **2021**, *12*, e00756. [CrossRef]
61. Owebor, K.; Diemuodeke, E.O.; Briggs, T.A.; Imran, M. Power Situation and Renewable Energy Potentials in Nigeria—A Case for Integrated Multi-Generation Technology. *Renew. Energy* **2021**, *177*, 773–796. [CrossRef]
62. Mmereki, D. Current Status of Waste Management in Botswana: A Mini-Review. *Waste Manag. Res.* **2018**, *36*, 555–576. [CrossRef]
63. Ijoma, G.N.; Mutungwazi, A.; Mannie, T.; Nurmahomed, W.; Matambo, T.S.; Hildebrandt, D. Addressing the Water-Energy Nexus: A Focus on the Barriers and Potentials of Harnessing Wastewater Treatment Processes for Biogas Production in Sub Saharan Africa. *Heliyon* **2022**, *8*, e09385. [CrossRef] [PubMed]
64. Somé, J. Overview of Industrial Policy and Institutions in Africa. 2018. Available online: Researchgate.net/profile/Juste-Some/publication/353665550_Overview_of_Industrial_Policy_and_Institutions_in_Africa/links/61094893169a1a0103d72331/Overview-of-Industrial-Policy-and-Institutions-in-Africa.pdf (accessed on 28 June 2022).
65. Diaz, L.F. Waste Management in Developing Countries and the Circular Economy. *Waste Manag. Res.* **2017**, *35*, 1–2. [CrossRef]

66. Plaine, C. Plastic Waste: An Overview of Repressive Legislation in African Countries. Available online: https://www.afrik21.africa/en/plastic-waste-an-overview-of-repressive-legislation-in-african-countries-1-2/ (accessed on 27 July 2022).
67. Mudu, P.; Nartey, B.A.; Kanhai, G.; Spadaro, J.V.; Fobil, J. *Solid Waste Management and Health in Accra, Ghana*; WHO Urban Health Initiative: Accra, Ghana, 2020; ISBN 9789240024250.
68. Yukalang, N.; Clarke, B.; Ross, K. Barriers to Effective Municipal Solid Waste Management in a Rapidly Urbanizing Area in Thailand. *Int. J. Environ. Res. Public Health* **2017**, *14*, 1013. [CrossRef] [PubMed]
69. Arthur, L.; Hondo, D.; Hughes, M. *From a Linear to Circular Economy in Developing Asia Prospects for Transitioning from a Linear to Circular Economy in Developing Asia*; ADB Institute: Tokyo, Japan, 2022; ISBN 978-4-89974-247-0.
70. Hudson, B.; Hunter, D.; Peckham, S. Policy Failure and the Policy-Implementation Gap: Can Policy Support Programs Help? *Policy Des. Pract.* **2019**, *2*, 1–14. [CrossRef]
71. Organization for Economic Co-Operation and Development (OECD). Towards a More Resource-Efficient and Circular Economy The Role of the G20. 2021. Available online: www.oecd.org/environment/waste/OECD-G20 (accessed on 17 July 2022).
72. Hull, C.E.; Millette, S.; Williams, E. Challenges and Opportunities in Building Circular-Economy Incubators: Stakeholder Perspectives in Trinidad and Tobago. *J. Clean. Prod.* **2021**, *296*, 126412. [CrossRef]
73. Ellen MacArthur Foundation. The EU Circular Economy Action Plan. *Circ. Econ. Action Plan* **2015**, *2020*, 1–2.
74. Paffenholz, D. TakaTaka Solutions: An Integrated Waste Management and Recycling Approach. Available online: https://empowering-people-network.siemens-stiftung.org/solutions/takataka-solutions-an-integrated-waste-management-and-recycling-approach/ (accessed on 5 August 2022).
75. AUDA-NEPAD What A Waste: Innovations in Africa's Waste Material Management. Available online: https://www.nepad.org/blog/what-waste-innovations-africas-waste-material-management#_ftnref13 (accessed on 5 August 2022).
76. UNEP Ethiopia's Waste-to-Energy Plant Is a First in Africa. Available online: https://www.unep.org/news-and-stories/story/ethiopias-waste-energy-plant-first-africa (accessed on 31 July 2022).
77. Enviroserve Enviroserve Rwanda Green Park. Available online: https://enviroserve.rw/ (accessed on 5 August 2022).
78. Dias, F.; Tukker, A.; Aguilar-hernandez, G.A. Macroeconomic, Social and Environmental Impacts of a Circular Economy up to 2050: A Meta-Analysis of Prospective Studies. *J. Clean. Prod.* **2021**, *278*, 123421. [CrossRef]
79. Barbaritano, M.; Bravi, L.; Savelli, E. Sustainability and Quality Management in the Italian Luxury Furniture Sector: A Circular Economy Perspective. *Sustainability* **2019**, *11*, 3089. [CrossRef]
80. Dung, T. Circular Economy—Key to Reduct Pollution, Promote Sustainable Development. Available online: https://en.baochinhphu.vn/circular-economy=key-to-reduce-pollution-promote-sustainable-development-11142021. (accessed on 17 July 2022).
81. Schroeder, P.; Anggraeni, K.; Weber, U. The Relevance of Circular Economy Practices to the Sustainable Development Goals. *J. Ind. Ecol.* **2019**, *23*, 77–95. [CrossRef]
82. Guarnieri, P.; Cerqueira-streit, J.A.; Batista, L.C. Resources, Conservation & Recycling Reverse Logistics and the Sectoral Agreement of Packaging Industry in Brazil towards a Transition to Circular Economy. *Resour. Conserv. Recycl.* **2020**, *153*, 104541. [CrossRef]
83. Marino, A.; Pariso, P. Science of the Total Environment Comparing European Countries ' Performances in the Transition towards the Circular Economy. *Sci. Total Environ.* **2020**, *729*, 138142. [CrossRef]
84. Smol, M.; Marcinek, P.; Duda, J.; Szołdrowska, D. Importance of Sustainable Mineral Resource Management in Implementing the Circular Economy (CE) Model and the European Green Deal Strategy. *Resources* **2020**, *9*, 55. [CrossRef]
85. Awan, U.; Sroufe, R.; Shahbaz, M. Industry 4.0 and the Circular Economy: A Literature Review and Recommendations for Future Research. *Bus. Strategy Environ.* **2021**, *4*, 2038–2060. [CrossRef]
86. Bressanelli, G.; Visintin, F.; Saccani, N. Circular Economy and the Evolution of Industrial Districts: A Supply Chain Perspective. *Int. J. Prod. Econ.* **2022**, *243*, 108348. [CrossRef]
87. Wilson, D.C.; Velis, C.A. Waste Management—Still a Global Challenge in the 21st Century: An Evidence-Based Call for Action. *Waste Manag. Res.* **2015**, *33*, 1049–1051. [CrossRef] [PubMed]
88. Munir, M.T.; Mohaddespour, A.; Nasr, A.T.; Carter, S. Municipal Solid Waste-to-Energy Processing for a Circular Economy in New Zealand. *Renew. Sustain. Energy Rev.* **2021**, *145*, 111080. [CrossRef]
89. Fernando, R.L.S. Solid Waste Management of Local Governments in the Western Province of Sri Lanka: An Implementation Analysis. *Waste Manag.* **2019**, *84*, 194–203. [CrossRef] [PubMed]
90. Mir, I.S.; Cheema, P.P.S.; Singh, S.P. Implementation Analysis of Solid Waste Management in Ludhiana City of Punjab. *Environ. Chall.* **2021**, *2*, 100023. [CrossRef]
91. Yeasmin, F.; Luby, S.P.; Saxton, R.E.; Nizame, F.A.; Alam, M.U.; Dutta, N.C.; Al Masud, A.; Yeasmin, D.; Layden, A.; Rahman, H.; et al. Piloting a Low-Cost Hardware Intervention to Reduce Improper Disposal of Solid Waste in Communal Toilets in Low-Income Settlements in Dhaka, Bangladesh. *BMC Public Health* **2017**, *17*, 1–11. [CrossRef]
92. Ibrahim, A.; Bartsch, K.; Sharifi, E. Green Infrastructure Needs Green Governance: Lessons from Australia's Largest Integrated Stormwater Management Project, the River Torrens Linear Park. *J. Clean. Prod.* **2020**, *261*, 559–571. [CrossRef]
93. Ferronato, N.; Torretta, V. Waste Mismanagement in Developing Countries: A Review of Global Issues. *Int. J. Environ. Res. Public Health* **2019**, *16*, 1060. [CrossRef]

94. Kirama, A.; Mayo, A.W. Challenges and Prospects of Private Sector Participation in Solid Waste Management in Dar Es Salaam City, Tanzania. *Habitat Int.* **2016**, *53*, 195–205. [CrossRef]
95. EPA Environmental Protection Agency. Available online: http://www.epa.gov.gh/epa/2022. (accessed on 5 August 2022).
96. Aparcana, S. Approaches to Formalization of the Informal Waste Sector into Municipal Solid Waste Management Systems in Low- and Middle-Income Countries: Review of Barriers and Success Factors. *Waste Manag.* **2017**, *61*, 593–607. [CrossRef]
97. Pastor, M.; Thomas, A.K.; Dreier, P. Understanding the Model and Future of the Los Angeles Alliance for a New Economy. In *Igniting Justice and Progressive Power*; Routledge: Oxfordshire, UK, 2021; p. 31, ISBN 9781003137467.
98. Filho, W.L.; Wall, T.; Barbir, J.; Alverio, G.N.; Alzira, M.; Dinis, P.; Ramirez, J. Relevance of International Partnerships in the Implementation of the UN Sustainable Development Goals. *Nat. Commun.* **2022**, *13*, 20–23. [CrossRef]
99. Franke, J.; Remmele, B. Circular Economy—As a Transformative (Innovating) Endeavour a Transdisciplinary Higher Education Basic. 2022. Available online: https://phfr.bsz-bw.de/frontdoor/deliver/index/docId/964/file/Curriculum_Franke_Remmele_2022.pdf (accessed on 18 April 2022).
100. Leal Filho, W.; Caughman, L.; Dinis, M.A.P.; Frankenberger, F.; Azul, A.M.; Salvia, A.L. Towards Symbiotic Approaches between Universities, Sustainable Development, and Cities. *Sci. Rep.* **2022**, *12*, 1–8. [CrossRef]
101. Saseanu, A.S.; Gogonea, R.; Ghita, S.I. The Impact of Education and Residential Environment on Long-Term Waste Management Behavior in the Context of Sustainability. *Sustainability* **2019**, *11*, 3775. [CrossRef]
102. Andrews, D. The Circular Economy, Design Thinking and Education for Sustainability. *Local Econ.* **2015**, *30*, 305–315. [CrossRef]
103. Glavič, P. Identifying Key Issues of Education for Sustainable Development. *Sustainability* **2020**, *12*, 6500. [CrossRef]
104. Carlotto, I.N.; Debrah, J.K.; Dinis, M.A. Social Responsibility and Bioethics in Higher Education: Transversal Dialogues. In *Sustainable Policies and Practices in Energy, Environment and Health Research*; Leal Filho, W., Vidal, D.G., Dinis, M.A.P., Dias, R.C., Eds.; World Sustainability Series; Springer: Cham, Switzerland, 2022.
105. Filho, W.L.; Alzira, M.; Dinis, P.; Sivapalan, S.; Begum, H.; Ng, T.F.; Al-amin, A.Q.; Alam, G.M.; Sharifi, A.; Salvia, A.L.; et al. Sustainability Practices at Higher Education Institutions in Asia. *Int. J. Sustain. High. Educ.* **2021**, *2021*, 1250–1276. [CrossRef]
106. Ellen MacArthur Foundation. Power of Higher Education—Scaling the Circular Economy in Africa. Available online: https://ellenmacarthurfundation.org/new/the-power-of-higher-education-scaling-the-circular-in-africa (accessed on 1 June 2022).
107. Bui, T.D.; Tseng, M.L. Understanding the Barriers to Sustainable Solid Waste Management in Society 5.0 under Uncertainties: A Novelty of Socials and Technical Perspectives on Performance Driving. *Environ. Sci. Pollut. Res.* **2022**, *29*, 16265–16293. [CrossRef]
108. Ulhasanah, N.; Goto, N. Assessment of Citizens' Environmental Behavior toward Municipal Solid Waste Management for a Better and Appropriate System in Indonesia: A Case Study of Padang City. *J. Mater. Cycles Waste Manag.* **2018**, *20*, 1257–1272. [CrossRef]
109. Zorpas, A.A. Strategy Development in the Framework of Waste Management. *Sci. Total Environ.* **2020**, *716*, 137088. [CrossRef]
110. Camana, D.; Manzardo, A.; Toniolo, S.; Gallo, F.; Scipioni, A. Assessing Environmental Sustainability of Local Waste Management Policies in Italy from a Circular Economy Perspective. An Overview of Existing Tools. *Sustain. Prod. Consum.* **2021**, *27*, 613–629. [CrossRef]
111. Dinis, M.A.P.; Neto, B.; Begum, H.; Vidal, D.G. Editorial: Waste Challenges in the Context of Broad Sustainability Challenges. *Front. Environ. Sci.* **2022**, *2022*, 1046. [CrossRef]
112. Leal Filho, W.; Salvia, A.L.; Paço, A.; Dinis, M.A.P.; Vidal, D.G.; Da Cunha, D.A.; de Vasconcelos, C.R.; Baumgartner, R.J.; Rampasso, I.; Anholon, R.; et al. The Influences of the COVID-19 Pandemic on Sustainable Consumption: An International Study. *Environ. Sci. Eur.* **2022**, *34*, 1–17. [CrossRef] [PubMed]
113. Korsunova, A.; Horn, S.; Vainio, A. Understanding Circular Economy in Everyday Life: Perceptions of Young Adults in the Finnish Context. *Sustain. Prod. Consum.* **2021**, *26*, 759–769. [CrossRef]
114. Korhonen, J.; Honkasalo, A.; Seppälä, J. Circular Economy: The Concept and Its Limitations. *Ecol. Econ.* **2018**, *143*, 37–46. [CrossRef]