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Sectorial Investigation of Waste Management in Sri Lanka for a Sustainable Future - Challenges and Opportunities for Policy Making and Practice

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ABSTRACT

Managing waste properly is directly linked to sustainability, sustainable development, transformation and the conservation of natural resources. Since waste management plays a pivotal role in paving the pathway to a sustainable future, this research paper aims to investigate a number of key industries in Sri Lanka in regard to waste management initiatives, practices and approaches. This present research is unique due to its interdisciplinary approach and its focus on integrating waste management practices across diverse sectors. The industries chosen contribute substantially to the waste generated on the planet, and in the chosen country's context. This study reviews waste management in a sectorial manner to shed light on diverse practices and implications in Sri Lanka's economy in order to inform policy making and good practice. The research reviews the relevant literature and relevant business cases and it has been found that there is significant waste generation across the investigated sectors. However, there is scope and initiation to incorporate policies and practices and pave the way forward to more efficient waste management and reduced waste generation. The different sectors show different levels of proactiveness when it comes to initiatives, practices and policy making for waste management. Therefore, both universal, as well as targeted approaches to waste management need to be considered in order to nationally address the issue and help Sri Lanka reach its economic potential.

Keywords: waste management, sustainability, recycling, circular economy, waste generation, resource consumption, waste management policies in Sri Lanka, sustainable practices, waste segregation.

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1. INTRODUCTION

Sri Lanka has seen an annual waste generation of 0.43 kg per capita (Hemali & Alwis, 2024) and this is preventing it from reaching its economic potential and its scope for a sustainable future by putting at risk the country's resources for the future generations. In order to explore the scale of waste generation and therefore its management in the country, specific industries were selected based on their significant contribution to waste generation and their potential to adopt circular economy practices. In order to do so each sector has to be explored with regards to its significance in waste generation in Sri Lanka. The sectors chosen in this study are major contributors of inefficient waste disposal and management, and thus this research goes to the roots of the issue by examining each sector on its own merits and challenges.

In particular, the textile manufacturing sector has generated 44% of the country's GDP and alongside that at least 30.000 tonnes of waste per year (Evans & Park, 2017). Similarly, the tech sector is responsible for high e-waste generation, limited recycling infrastructure and lack of waste management policies, raising tremendous environmental concerns (Mallawarachchi & Karunasena, 2012; Ranasinghe & Athapattu, 2020). Looking into the built environment, we can see a sector that also contributes to national waste generation in a significant way, however this is not predominantly due to the nature of the sector but rather due to the waste handling process, disproportionately rapid urban growth, and similar to the textile sector, due to the lack of recycling facilities. The biggest challenge with the built environment is the management of construction and demolition waste that has not been disposed properly and leads to catastrophic consequences for the environment (Paranavithana, Samarakoon, Hettige Jayani Chathurika, 2024; Victar and Waidyasekara, 2023; Liyanage, Waidyasekara, Mallawaarachchi & Pandithawatta, 2019). Lastly, paper production is another sector that is responsible for high generation of waste in the country, and this is due to lack of recycling facilities, infrastructure and education. What is even more significant, is that in the specific sector the majority of the waste generated is exported rather than recycled in the country. This approach in waste management alongside the lack of appropriate governmental intervention raises both regulatory concerns and environmental concerns (Ranatunga, Wijetunge, Ranaweera, Hung, Liu, Schuyler, Lawson & Hardesty, 2023; Senarathna, Sulaksha, Weerarathna, Jayathma, Gamage, Thennakoon, Hewage, Panagoda & Sandunika, Perera, 2023).

Waste management and circular economy (CE) are concepts that have become increasingly important in recent times due to the increasing environmental impact of waste. An increasing number of scholars have been studying the links between CE and waste management, or in other words they have been exploring how we can manage waste so that we comply with CE principles and processes. One example is the Conlon, Jayasingle and Dasanayake's (2021) study that evaluates the implementation and impact of CE-based waste-to-wealth projects in Sri Lanka.

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They explore the cultural, economic, and structural barriers faced by micro-social entrepreneurs in these initiatives. By investigating these obstacles, the study seeks to understand their effects on the success and scalability of CE projects, providing insights into how to overcome these barriers and enhance the effectiveness of waste management and sustainable business practices.The particular study employed a mixed-methods approach and they found that CE-based waste-to-wealth projects in Sri Lanka have positively impacted waste management and economic development. These initiatives successfully diverted substantial amounts of waste from landfills and waterways, leading to improved environmental outcomes. Additionally, they created job opportunities and supported local economic growth. However, the research identified several challenges faced by micro-social entrepreneurs, including limited awareness and acceptance of CE principles, lack of financial resources and access to capital, and inadequate infrastructure and support systems. Interestingly, CE-based waste-to-wealth projects in Sri Lanka have demonstrated considerable potential for improving waste management and fostering economic development. However, to enhance their effectiveness and scalability, several key propositions are emphasised. CE strategies should be supported by stronger infrastructure, financial resources, and educational programs. Enhancing community engagement, providing financial and technical support to entrepreneurs, and developing supportive policies is also crucial. Continued collaboration among local universities, non-profits, social enterprises, and government bodies to overcome these challenges and advance towards a more sustainable economy is key to its effectiveness.

Surendra, Maharage, Siriwardhana, Panagoda, Sakalasuriya, Alahakoon,Senarath, Bandara, Wijesurendra, Kumarasiri and Arachchige's (2023) have explored this same matter by exploring the effectiveness of waste management practices in university settings. Their study investigates the challenges and inefficiencies associated with current waste management systems and examines successful waste minimisation and utilisation technologies like recycling, composting, and energy recovery.They collected data on food, paper, and plastic waste produced across various sections of the faculty, including the student canteen, academic complex, laboratory complex, staff canteen, hostel canteen, and administrative complex. Waste from these areas was sorted into separate bins for each type: food, paper, and plastic. Each day, the waste was collected from these bins and weighed. At the end of the week, the average daily waste generation and the total amount of waste produced were calculated to analyse the overall waste management efficiency. Analysis of the weekly data showed that waste generation was notably lower on weekends compared to weekdays, attributed to reduced academic activities. Food waste was the most significant, paper waste followed. Plastic waste was the least among the three. These findings highlight the substantial volume of waste produced, particularly food waste, and highlight the need for effective waste management strategies to handle the varying waste types generated. The study proposes that minimising waste generation and enhancing waste utilisation

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can lead to significant benefits, including resource conservation, reduced pollution, and economic advantages. The conclusions advocate for the adoption of effective waste management practices that comply with CE principles across institutions and communities to achieve these benefits and ensure a sustainable future.

Furthermore, Saja, Zimar, and Junaideen (2021) focused on the current practices and challenges of municipal solid waste management (MSWM) in the southeastern coastal cities of Sri Lanka, particularly in the post-conflict development context. The research employed semi-structured interviews with key local authority figures, including municipal council commissioners and engineers, as well as field observations at various MSWM sites. Secondary data sources, such as reports from SWM units, were also analysed. The study reveals that the primary sources of municipal solid waste (MSW) in these cities were households, commercial areas, and institutions, with a significant portion of the waste being biodegradable (85-89%). However, several issues hinder effective waste management, including inadequate waste segregation, insufficient resources, lack of regulatory measures, irregular collection schedules, and limited technical expertise. These challenges resulted in waste accumulation in public spaces, posing environmental and public health risks. To address these issues, the researchers recommend developing sustainable, economically viable, and socially inclusive waste management strategies. The study suggests that exploring public perceptions, policy implications, and the role of the private sector in MSWM could enhance waste management practices and prevent the situation from worsening.

Considering the areas raised by the aforementioned studies, the present research aims to give detailed, sector-wise discussion of the textile, technology, construction, and paper industries in Sri Lanka, focusing on the challenges and opportunities these industries face when employing sustainable practices in the light of CE and waste management. Each sector is evaluated individually to highlight specific sustainability uniqueness in the sector and is thoroughly backed with several case studies and relevant examples. Ultimately, the paper intends to inform policy making in Sri Lanka. It also aims to raise awareness about sustainability across sectors so that industries and governments can take necessary actions to educate their workers etc about the issue. The next sections elaborate on these core elements of the present study.

2. DISCUSSION

2.1 The textile industry in Sri Lanka

To begin with, a study by Edirisinghe, Wijayasundara, and De Alwis (2021) investigates waste generation and management within Sri Lanka's Biyagama Export Processing Zone (BEPZ) in the textile and apparel (T&A) sector. By examining waste properties, treatment options, and disposal

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techniques, the study aims to uncover the types and volumes of waste produced, as well as assess current practices in handling, storage, recirculation, and disposal. Employing a mixed-methods approach, including questionnaires, interviews, and field observations across ten T&A factories, the researchers categorised waste streams based on different processes like fabric manufacturing, garment washing, and dyeing. Their findings reveal that the BEPZ generates an annual total of 13,792.5 tonnes of waste, with 42.9% classified as hazardous. The per capita waste generation stands at 0.93 kg/day, with major waste streams comprising effluent treatment plant sludge (39.4%), fabric and yarn (29.6%), and metal (5.6%). While the waste circulation factor is 0.38, indicating moderate resource recovery, the study stresses the need for improved waste management and recycling facilities, particularly for fabric and hazardous waste, while it underscores the urgency of adopting circular economy principles to enhance the sustainable management of industrial waste in Sri Lanka's T&A sector.

Further research by Edirisinghe, Alwis, and Wijayasundara (2023) investigates fabric waste production within Sri Lanka's apparel manufacturing sector, with a focus on its composition, quantities, and economic potential from a circular economy perspective. The study aims to assess the scale of fabric waste generation and explore ways to manage it more effectively, addressing the challenges posed by inadequate waste management practices in the Sri Lankan textile industry. The industry faces increasing pressure to adopt sustainable methods, driven largely by evolving market demands, especially from the European Union. To provide context and a theoretical foundation, the researchers conducted a comprehensive literature review. They also gathered qualitative data through surveys and interviews with key stakeholders, including manufacturers, waste collectors, and industry experts, while quantitative data involved measuring and categorising fabric waste at various stages of production. The findings revealed significant inefficiencies in waste management practices, resulting in both economic and environmental consequences. Although some manufacturers have implemented waste reduction strategies, these efforts remain inconsistent. The study also identified economic opportunities in reusing and recycling fabric waste, suggesting that circular economy principles could not only reduce environmental harm but also generate new revenue streams. The authors advocate for comprehensive waste reduction strategies, backed by government policies and industry collaboration, to significantly decrease waste volume. They also emphasise the need for increased awareness, education on sustainable practices, and the adoption of technological innovations to steer the industry toward more sustainable waste management solutions.

Looking into a renowned global apparel leading company in the sector, that of Patagonia, could assist the sector in Sri Lanka with practical changes and management solutions in the area of waste management. Patagonia is a leading outdoor apparel brand renowned for its commitment to sustainability. The Patagonia’s official website (2025) states how the company employs the

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popularly known R's of sustainability that adhere to principles of circular economy, ie. reduce, reuse, recycle, and repair. Additionally, they have effectively employed a fifth R which is 'reimagine'. Firstly, Patagonia uses high-quality materials like organic cotton, bamboo, and recycled plastics to improve durability and promotes versatile designs to encourage consumers to purchase fewer items but have multiple uses for each, thereby reducing overall consumption. Secondly, the company offers an "ironclad" guarantee, ensuring that all products can be repaired at reasonable prices. Initiatives like the "Worn Wear" program and partnerships with iFixit provide customers with the tools and guidance to extend the lifespan of their clothing, thereby encouraging sustainability. Another thing they do to promote sustainability is that they collaborate with eBay to resell used apparel, and this is supported by the "Better than New" campaign, which highlights the stories of customers who wear Patagonia items. Furthermore, Patagonia encourages customers to recycle worn-out items through platforms like Yerdle, where they can earn credits to purchase other garments; this has significantly helped in reducing landfill waste from their end.

The official footprint website of Patagonia (2025) states that the company donates 1% of total sales or 10% of profits to environmental initiatives through the "One Percent for the Planet" alliance which is something Sri Lanka-based companies in the sector can employ without bearing significant costs. Not only this, but also Patagonia's facilities are built with recycled materials and incorporate energy-saving technologies. Thus, Patagonia incorporates sustainability within all aspects of the business which is what the true meaning of sustainability should be, wherein it is incorporated to several aspects of the business model and operations. Lastly, Patagonia encourages a positive work environment. The "Let my people go surfing" policy allows employees to engage in outdoor activities, enhancing their productivity; also the environmental internship program encourages employees to work with organisations aligned with Patagonia's values, enriching innovation and making sure that everyone truly understands the importance of sustainability and ensures that it's being incorporated in every field of the business. These initiatives enhance the awareness and understanding for sustainability education. Sri Lanka based companies can take inspiration from this and look for encouraging sustainability education and create sustainability awareness in ways that can be cost effective for them. Changing the approach can assist businesses to properly integrate sustainability in all aspects of their business proposition, rather than just making the end product sustainable.

2.2 The tech industry in Sri Lanka

When examining the tech sector, Mafra et al. (2022) considered the applicability of circular economy (CE) principles in minimising electronic waste (e-waste) within Sri Lankan office buildings. Recognising that office environments contribute significantly to the growing issue of e-waste both globally and in Sri Lanka, the research highlights the challenges of adopting CE

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practices in the country. Despite the effectiveness of CE approaches in managing e-waste, their implementation in Sri Lanka is hindered by high costs, a lack of skilled labor, inadequate regulations, insufficient monitoring, and limited research resources. To address these barriers, the study aims to explore how CE principles can be effectively integrated into e-waste management in office settings. The researchers began with a comprehensive literature review to establish a theoretical framework and identify knowledge gaps. They then conducted surveys and in-depth interviews with key stakeholders, including office building managers, e-waste recyclers, policymakers, and industry experts, analysing the data using statistical and thematic techniques. The findings revealed that e-waste is often stored indefinitely or disposed of in landfills instead of being recycled or reused. Key challenges include low awareness, poor infrastructure, weak regulatory frameworks, and a lack of financial incentives. While stakeholders generally express positive attitudes towards CE principles, these obstacles hinder practical implementation. The study concludes that transitioning to a circular economy model for e-waste management in Sri Lankan office buildings is both necessary and feasible, but significant barriers must be addressed. The authors recommend increasing awareness and education on CE practices, improving regulatory frameworks and infrastructure, and providing financial incentives and support from both the government and industry to facilitate this transition.

To elaborate on the importance and the processes involved in e-waste management and the CE principles in the tech industry, the case of a Brazilian company that is pioneering in circular manufacturing is examined; this is Sinctronics by Flex. Carlos Ohde, the General Director of Sinctronics, emphasizes the innovative nature of their approach, and he states that “the circular economy is a new thing for the world. Everything we’re doing, from process and logistics to fiscal and legal, is something we’ve had to create and barriers we’ve had to overcome. It’s pure innovation here” (2018, p.1). This forward-thinking approach has led to significant achievements, such as an 82% reduction in energy use and greenhouse gas emissions compared to traditional plastic production methods. The company addresses e-waste through various circular economy strategies. Firstly, they employ reverse logistics, where returned electronics are carefully managed and screened to identify components that can be recovered, repaired, or repurposed. This process not only prevents unnecessary disposal of e-waste but also ensures that valuable materials are efficiently recovered. Secondly, rather than discarding damaged or faulty products, they refurbish them to extend their life cycles. This allows customers to continue using them and thus reduces the demand for newly manufactured electronics. Thirdly, they focus on asset recovery and reuse, in which they focus on extracting valuable components from end-of-life electronics. By repurposing metals and other materials, the company supports a zero-landfill initiative, ensuring that discarded electronics contribute as little as possible to environmental degradation. Lastly, they have implemented efficient processes to break down non-reusable parts, which allows the recovery of raw materials for future production.

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Looking into what needs to be done in the sector in the case of Sri Lanka and having examined the case of an electronics manufacturing company in Brazil (both countries belong in the Global South) that pioneers in sustainable e-waste management, several lessons can be transferred into the sector in the case of Sri Lanka. Firstly, through the Sinctronics Flex case it is demonstrated the need for governmental support through incentives. Sri Lanka can take inspiration from this to push for government interventions, such as tax benefits or subsidies, to encourage companies to adopt sustainable practices. Secondly, the case of Sinctronics Flex emphasises the importance of awareness and education in driving sustainable initiatives. Sri Lanka can make use of this information by educating industry leaders and stakeholders about the benefits and necessity of sustainable practices to bring about a change in the Sri lankan economy. Furthermore, Sri Lankan companies could partner with local waste management firms to establish drop-off points where consumers can return used electronics. This would reduce the disposal of e-waste in landfills and ensure that valuable components are recovered in the same way Sinctronics Flex' electronics were. Not only this, but businesses could also establish local centres to resell electronics at a lower cost, creating a new market for affordable, refurbished devices which would not only increase the number of people who can afford electronics but also help in meeting the sustainable development objectives. The aforementioned lessons can inform policy making and interventions relevant in the sector.

2.3. The built environment in Sri Lanka

The construction industry is a significant contributor to global waste generation, and addressing waste within this sector is crucial for advancing sustainability efforts. Waste from construction activities, particularly during the demolition, repurposing, material recovery, and production stages, poses challenges that demand effective management strategies. In the study by Victar and Waidyasekara (2023), the authors focus on implementing CE strategies to reduce waste and maximise resource use in Sri Lanka's construction sector. Through a qualitative approach using the Delphi technique, they conducted three rounds of expert interviews to identify key waste management issues. For example, during the demolition and repurposing stage, issues like inadequate supervision and a lack of a recycling market were highlighted. The study suggests that strategies such as dismantling and disassembly can mitigate these problems, despite higher initial costs. Similarly, in the material recovery and production stage, challenges such as inconsistent policies and unsafe market conditions were identified, with recommendations for policy consistency and enhanced government support to foster recycling efforts. By addressing these issues, the study demonstrates that CE strategies can lead to improved resource efficiency, reduced waste, and sustainable development in the construction industry.

To further exemplify the potential of reusing and repurposing glass waste in construction, the study by Tushar and Argaw (2022) delves into various practical methods of repurposing glass

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waste, aiming to enhance sustainability within the industry. Their research seeks to answer how glass waste can be effectively utilised to create high-quality products, reduce the carbon footprint, conserve landfill space, and preserve virgin materials for future construction needs. Utilising a Systematic Literature Review (SLR), Tushar and Argaw analysed secondary data collected from numerous sources.They established a selection criterion to identify relevant studies within a 20-year timeframe, ensuring a comprehensive analysis of the potential reuses of glass waste.Their findings highlight various applications for glass waste, such as aggregate for concrete, filtration media, glass fibres, blast abrasives, roof coatings, ceramic-based products, burnt bricks, low-temperature stoneware tiles, insulation, and decorative materials. Among these options, insulation stood out as the most efficient due to its superior quality and cost-effectiveness. Other materials like filtration media, burnt bricks, and glass fibres also met all the primary functional requirements. This demonstrates the use of crushed glass as an aggregate in concrete production, further supporting the notion that glass waste can improve the strength and durability of construction materials. By repurposing glass waste in these ways, the construction industry can reduce its environmental impact and contribute to the preservation of natural resources, emphasising the importance of innovative recycling strategies in addressing the growing challenges of waste management.

The study by Weerakoon, Wimalasena, and Zvirgzdins (2023) also investigates the potential for repurposing household waste as secondary raw materials in Sri Lanka's construction industry, focusing on the Colombo municipality. The primary objective was to determine which types of household waste—such as plastics, glass, and certain organic materials—can be effectively utilised in construction, thereby contributing to sustainable waste management and a circular economy in Sri Lanka. To achieve this, the researchers employed a mixed-method approach, beginning with a questionnaire survey among industry experts to assess the requirements and potential applications of household waste in construction. This was followed by a comprehensive review of existing literature to further understand the reuse applications of these materials. The study identifies that plastics, glass, and organic materials can be repurposed effectively, emphasising the need for sustainable waste management techniques and circular economy practices. The authors conclude that implementing effective waste management strategies and recycling initiatives is crucial for reducing environmental impact and conserving natural resources. They advocate for the development and enforcement of policies that promote the integration of recycled household waste into construction projects, highlighting the dual benefits for both the environment and the construction industry.

Construction waste is not only an issue in Sri lanka but is quite commonplace in several other countries and places. This is highlighted in the study by Opoku, Agyekum, Bimpli and Amoh (2024) where circular economy on the built environment is emphasised. The construction

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industry has faced growing criticism for generating excessive waste, as countries complain that it hinders sustainability goals. As global resource consumption continues to outpace the planet's capacity to replenish, waste generation is projected to surpass population growth by a factor of two by 2050. The adoption of the UN's Millennium Development Goals (MDGs) in 2000, followed by the 2030 Agenda for Sustainable Development and its 17 SDGs, has intensified the call for sustainable practices. In response, the European Union launched the Circular Economy Action Plan in 2015, shifting focus from a linear economy toward a model where resources are reused and waste minimised. The CE has been embraced by countries like China, Japan, and the UK, as well as global enterprises, to combat social and environmental challenges. By optimising resource efficiency, minimising extraction, and maximising value throughout product life cycles, the CE addresses both environmental degradation and economic growth

The research article by Pittri, Agyekum, Opoku and Bimpli (2023) brings attention to the fact that the construction industry currently consumes 40% of all raw materials worldwide, and with increasing sociological and demographic shifts, the demand for buildings is expected to rise, placing further strain on natural resources. As the global population is anticipated to reach 9.7 billion by 2050, the demand for building materials will surge, yet stricter environmental regulations and resource depletion will make raw material extraction more challenging. The traditional linear economy model of "take-make-use-dispose" is unsustainable, making it essential for the industries to adopt CE practices, such as Design for Deconstruction (DfD). DfD promotes designing adaptable buildings that can be easily dismantled for recycling or reuse, reducing the need for new resource extraction and minimising waste. While DfD holds great promise for addressing sustainability issues, its application remains limited. Raising awareness and promoting the implementation of DfD could help the construction industry transition to more sustainable practices and contribute to global efforts in achieving the SDGs. DfD informs practitioners by encouraging the design of buildings that are adaptable and easily dismantled and thus enables the reuse or recycling of materials. Therefore, by adopting DfD practitioners in the built environment (i.e. construction) address the issue of resource scarcity and meet stricter environmental regulations, which both also promote transition to a CE in the sector and beyond.

2.4 Paper production industry in Sri Lanka

In addressing the effectiveness of waste management practices within academic institutions, the study by Surendra et al. (2023) focuses on the Faculty of Technology at the University of Sri Jayewardenepura, Sri Lanka. The research aims to evaluate how diverse types of waste—such as food, paper, plastic, glass, hazardous, electronic, construction, and green waste—are managed within this university setting. The study used a comprehensive data collection approach, sorting and weighing waste from different sections of the faculty, including the student canteen, academic and laboratory complexes, staff canteen, hostel canteen, and administrative areas. The

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data revealed that waste generation was lower on weekends due to reduced academic activities, with food waste being the most significant, followed by paper waste, while plastic waste was the least. These findings underscore the substantial volume of waste generated and highlight the need for improved waste management strategies. The research concludes that minimising waste generation and enhancing waste utilisation can offer considerable benefits, such as resource conservation, reduced pollution, and economic savings. It advocates for the adoption of effective waste management practices to achieve these benefits and promote sustainability within institutions and communities.

Further, utilising fieldwork conducted in June 2024 in the premises of Eco Maximus in Sri Lanka, the importance of waste management and circularity in the paper production are showcased. Eco Maximus are engaging in totally eco friendly production of paper, where they use only post consumption raw materials and non toxic consumables. The company is a manufacturing company of handmade paper and value added products out of 100% elephant dung and other waste matter. The company's strategic focus is in developing in a direction that improves the local job market, supports wildlife protection, promotes elephant conservation and rural empowerment through production that is handmade and out of 100% waste material.

The main process that the company employs to turn elephant dung into paper is the following:

1. The process begins by collecting elephant dung from local sanctuaries.
2. The dung is thoroughly washed and boiled for several hours to sanitise it and break down the and break down the fibres.
3. Once boiled, the fibres are rinsed and separated, then mixed with other natural fibres like post-consumer paper waste to improve the paper's quality.
4. This fibre blend is combined with water to form a pulp, which is carefully screened to remove any impurities.
5. The pulp is then poured onto a framed screen, allowing excess water to drain as it forms consistent sheets.
6. These wet sheets are pressed between felt pads to remove additional water and then pressed again to reduce moisture further.
7. Afterward, the sheets are air-dried and given a final pressing to ensure they are flat and smooth.

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8. Once dry, the sheets are cut into standard sizes or shapes as needed, completing the transformation of waste into sustainable paper.

The aforementioned procedure is followed by Eco Maximus and highlighted in the 'paper processing' section of their official website (2020).

2.5 Sustainability and circular economy lessons that can assist cross-sectional practice and policy making

From the studies discussed above in the textile industry it is evident that there is significant textile waste generation in Sri Lanka with inefficiencies in handling textile waste products. It is remarkable that the adoption of circular economy principles in the sector can help manage waste sustainably, reduce environmental harm, and also enable Sri Lanka development and utilise economic opportunities. Suggestions that can benefit the sector towards this direction include:

1. Taking part in collaborative initiatives and the government promoting sustainability. This can be done by forming cross-industry partnerships such as connecting textile factories with technology firms, to develop automated sorting systems for fabric waste, or establishing public-private partnerships between the government, manufacturers, and recyclers to co-invest in waste processing facilities.

2. The government can take steps such as providing tax breaks or subsidies for manufacturers adopting sustainable practices and enforcing laws to ensure manufacturers do not exceed a limit of textile waste.

Looking now into the tech industry, waste management issues are prevalent in the tech sector as well with mindless actions such as wrong disposal of electronic waste. This can be prevented in several ways:

1. The government can establish drop-off points where consumers can return used electronics. Government can set up local centres in urban and rural areas to collect old or damaged electronics and therefore ensure proper disposal or recycling of the electronic waste, as the centres can give the government the e-waste for right disposal. This initiative would help divert e-waste from landfills and instead make it reach the right place. It will also help create local job opportunities in the recycling industry, for people collecting the e-waste and for people recycling it.

2. The government should also consider fostering collaboration with international organisations like Sinctronics to gain access to advanced e-waste recycling technologies or best sustainable practices.

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3. The government can introduce financial incentives such as tax benefits, subsidies, or grants to encourage companies to adopt sustainable e-waste management practices.

Moving now into the construction industry, waste management is a critical issue due to the sector's significant contribution to waste generation. Studies have identified several issues such as the lack of recycling markets, inconsistent policies, and the presence of unsafe market conditions which hinder the adoption of circular economy practices. One solution is focusing on developing technologies and partnerships that repurpose local waste materials, such as glass, into valuable products like aggregates for concrete, or use it for insulation, filtration media, and decorative materials. Furthermore, there seems to be a gap between people's actual understanding of sustainability, thus it is crucial for the government to create awareness about the benefits of using recycled materials in construction, which could help the industry transition to more sustainable practices. Lastly, DfD practices should be employed as DfD promotes the design of buildings that can be easily disassembled, enabling the reuse or recycling of materials, this not only reduces current waste but also minimises the need for extraction of other materials.

Lastly, in the paper production sector, studies have shown that paper waste is an issue which is mostly observed in educational institute contexts as that is where paper is utilised the most and thus needs to be effectively managed. Other places, like offices, also have significant paper waste. Some solutions that can benefit the sector (as informed by the studies and the case of Ecomaximus discussed earlier in the paper) would be:

1. Utilising Sri Lanka's existing infrastructure established by Ecomaximus on a wider scale. This factory uses paper waste and elephant dung to create handmade recycled paper; this not only reduces paper waste and expands the life span of old paper, but also improves economic gains by helping create a valuable business through the handmade paper products - such as selling of frames, books, etc.

2. The government should look for ways to encourage more such business by providing subsidies, creating awareness through education, and supporting export of such products by paying for export costs. This can be done at a local and a wider country level in an incremental manner.

3. Another solution is encouraging firms and citizens to adopt digital alternatives for documentation, communication, record-keeping, and any other such tasks; this will reduce paper waste, and the costs associated with recycling paper waste.

4. Finally, the government can also Impose bans or restrictions on the use of single-use paper products like disposable paper plates, cups, and napkins.

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3. CONCLUSION

In conclusion, this research paper has attempted to investigate the major contributors of waste in Sri Lanka and highlighted the challenges and opportunities present in each sector to effectively manage waste and drive the economy towards a more sustainable future. The research paper has offered sector-by-sector insights to fill in the critical gaps that hinder sustainability in Sri lanka. These insights are particularly important for interventions and policy making for sustainable development.

Looking into the textile industry, the adoption of circular economy principles through cross-industry collaborations, automated sorting systems, and government incentives can significantly reduce textile waste. The tech sector requires structured e-waste management policies, including government-run collection points, partnerships with international recycling firms, and financial incentives to encourage responsible disposal and recycling. In the construction industry, policy efforts should target the development of markets for recycled materials, investment in technologies that repurpose waste, public awareness campaigns on sustainability, and the adoption of Design for Disassembly (DfD) to enable material reuse. While lastly, in the paper production sector, scaling initiatives like Ecomaximus, supporting sustainable businesses, encouraging digital alternatives to reduce paper dependency, and imposing restrictions on single-use paper products can effectively manage paper waste.

4. LIMITATIONS AND FUTURE RESEARCH

As this study acknowledges its limitations on the lack of primary data, and hence we are not attempting to generalise its conclusions, future research agendas can consider primary quantitative data to relate waste management strategies to other countries in order to determine correlations to effectively compare and improve efficiency in waste management. Further research can gather more insight into how other countries are managing waste and where Sri lanka stands in comparison to those countries. Additionally, research focussing on primary qualitative data regarding the behaviour and socio-economic factors involved in effective waste management on an individual level, could assist with expanding the scope of studying the behaviours involved in such a practice and how that can hinder progress towards sustainability. Lastly, future research should focus on qualitative data from policy making documents to identify the premises of existing policies and strategies, as this might explain why certain policies work and why others do not.

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REFERENCES

Victar, H. C., & Waidyasekara, K. G. A. S. (2023). Circular economy strategies for waste management in Sri Lanka: A focus on demolitions and repurpose and material recovery and production stages. *Waste Management & Research*, *42*. https://doi.org/10.1177/0734242X231206988

Sood, T., & Gurmu, A. (2022). Reusing and repurposing of glass waste: A literature review. In: Sandanayake, Y.G., Gunatilake, S. and Waidyasekara, K.G.A.S. (eds). *Proceedings of the 10th World Construction Symposium*, 24-26 June 2022, Sri Lanka. [Online]. pp. 695-706. DOI: https://doi.org/10.31705/WCS.2022.56. Available from: https://ciobwcs.com/2022-papers/

Weerakoon, T. G., Wimalasena, S., & Zvirgzdins, J. (2023). Identifying potential household waste as secondary raw materials in the construction industry: A case study of Sri Lanka. *Baltic Journal of Real Estate Economics and Construction Management*, 11. DOI:10.2478/bjreecm-2023-0012

Conlon, K., Jayasinghe, R., & Dasanayake, R. (2021). Circular economy: Waste-to-wealth, jobs in the Global South. *Urban Studies and Planning Faculty Publications and Presentations*, 308. https://pdxscholar.library.pdx.edu/usp_fac/308

Surendra, A. A. D. S., Maharage, M. D. K., Siriwardhana, S. M. G. T., Panagoda, L. P. S. S., Sakalasuriya, S. A. T. D., Alahakoon, A. M. A. R. B., Senarath, P. G. R. L. P., Bandara, G. A. I. M., Wijesurendra, W. P. H. P., & Kumarasiri, K. A. C. S. (2023). Solid waste management and minimization approaches in Faculty of Technology, University of Sri Jayewardenepura, Sri Lanka. *Journal of Research Technology and Engineering*, *4*. https://www.jrte.org/wp-content/uploads/2023/04/Solid-waste-management-and-minimization-approaches-in-Faculty-of-Technology-University.pdf

Saja, A. M. A., Zimar, A. M. Z., & Junaideen, S. M. (2021). Municipal solid waste management practices and challenges in the southeastern coastal cities of Sri Lanka. *Sustainability*, *13*. https://www.mdpi.com/2071-1050/13/8/4556

Evans, S. & Park, C. (2017). TransTextile Project Report: Higher value innovation for industrial textile waste in Sri Lanka. *Centre for Industrial Sustainability*. https://www.ifm.eng.cam.ac.uk/uploads/Resources/TransTextile_Report.pdf

Edirisinghe, L. G. L. M., Wijayasundara, M., & De Alwis, A. A. P. (2021). Waste generation and characteristics in Sri Lankan textile and apparel sector: Case study of the Biyagama Industrial

ISSN: 2455-8834

Volume:10, Issue:03 "March 2025"

Export Processing Zone, Sri Lanka. *Nature Environment and Pollution Technology*, *21*. https://neptjournal.com/upload-images/(30)D-1283.pdf

Edirisinghe, L. M., Alwis, A., & Wijayasundara, M. (2023). Uncovering the circular economy potential of industrial waste in Sri Lanka (Case study from textile industrial - fabric waste), E3S *ICED 2023*. https://www.e3s-conferences.org/articles/e3sconf/pdf/2023/73/e3sconf_iced2023_08012.pdf

MAFRA, M. T. F., Gowsiga, M., Asmone, A. S., & Dilogini, R. A. A. (2022). Applicability of circular economy for the electronic waste minimization in Sri Lankan office buildings. Independence and Interdependence of Sustainable Spaces, https://www.researchgate.net/publication/379777001_Applicability_of_circular_economy_for_the_electronic_waste_minimization_in_Sri_Lankan_office_buildings

Opoku, A., Agyekum, K., Bimpli, I., & Amoh, E. (2024). Circular economy in the built environment: A catalyst for achieving the sustainable development goals (SDGs). In The *Elgar Companion to the Build Environment and the Sustainable Development Goals.* [https://doi.org/10.4337/9781035300037.00023]

Ranasinghe, R., & Athapattu, N. (2020). Challenges in e-waste management in Sri Lanka. In *The Handbook of Electronic Waste Management.* https://www.researchgate.net/publication/342514889_Challenges_in_E-waste_management_in_Sri_Lanka

Pittri, A., Agyekum, K., Opoku, A., & Bimpli, I. (2023). Design for deconstruction (DfD) implementation among design professionals: Empirical evidence from Ghana. *International Journal of Construction Management*, 24. DOI:10.1080/15623599.2023.2174663

Liyanage, C., Waidyasekara, K. G. A. S., Mallawarachchi, H., & Pandithawatta, D. (2019). Origins of construction and demolition waste generation in the Sri Lankan construction industry. *Proceedings of the World Conference on Waste Management*, *1*. DOI: https://doi.org/10.17501/26510251.2019.1101

Senarathna, W. G. C. M., Sulaksha, L. G. T., Weerarathna, D. M., Jayathma, W. M. V. A., Gamage, D. G. M. L., Thennakoon, T. M. T. N., Hewage, H. T. M., Panagoda, L. P. S. S., Sandunika, D. M. I., & Perera, M. D. V. (2023). Paper recycling for a sustainable future: Global trends. *The Journal of Research Technology and Engineering*, 4. https://www.jrte.org/wp-content/uploads/2023/07/Paper-Recycling-for-a-Sustainable-Future-Global-Trends.pdf

ISSN: 2455-8834

Volume:10, Issue:03 "March 2025"

Mallawarachchi, H., & Karunasena, G. (2012). Electronic and electrical waste management in Sri Lanka: Suggestions for national policy enhancements. In *Resources, Conservation and Recycling, 68.*
https://www.sciencedirect.com/science/article/abs/pii/S0921344912001413

Paranavithana, G. N., Samarakoon, S. M. K., & Chathurika, R. H. J. (2024). Analysis of road construction waste generation in developing economies: A focus on surfacing and sub-base construction projects in Sri Lanka. *Journal of Cleaner Production, 457.*
https://www.sciencedirect.com/science/article/abs/pii/S0959652624019139

Ranatunga, R. R. M. K. P., Wijetunge, D., Ranaweera, W. V. P. H., Hung, C. C., Liu, S. Y. V., Schuyler, Q., Lawson, T. J., & Hardesty, B. D. (2023). Ranking Sri Lanka among the world's top mismanaged waste polluters: Does model data change the story? *Sustainability*, 15. https://www.mdpi.com/2071-1050/15/3/2687#

Hemali, A., & De Alwis, A. (2024). Waste generation and recovery in a developing country: A case study of Western Province, Sri Lanka. *Natural environment and pollution technology*, 23.
https://www.researchgate.net/publication/383689489_Waste_Generation_and_Recovery_in_a_Developing_Country_A_Case_Study_of_Western_Province_Sri_Lanka

Ecomaximus. (2020). *Paper collection and processing*
https://ecomaximus.com/paper-collection-processing/

Patagonia. (2025). *Worn wear.* https://eu.patagonia.com/gb/en/worn-wear/

Patagonia. (2025). *Our footprint.* https://eu.patagonia.com/gb/en/our-footprint/

Flex. (2025). *Bringing circular manufacturing to electronics with Sinctronics.*
https://flex.com/resources/bringing-circular-manufacturing-to-electronics-with-sinctronics

