

SHOE STEWARDSHIP: THE STATE OF REUSE, REPAIR, & RECYCLING

PREPARED BY



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1. Executive Summary

Textile waste is a problem that continues to grow in size, importance, and cost to local communities. Shoes are one of the many categories of textile waste. This waste often ends up in landfills or in foreign markets, polluting the environment. While the correlation between shoes and microplastics remains uncertain, research indicates that rubber and microfibers, two prominent shoe components, are among the most commonly identified sources of microplastics. Despite collection efforts for gently used shoes, a critical gap exists in handling non-reusable footwear. Established researchers, brand leaders, and long-standing coalitions for shoe stewardship have identified systematic challenges and opportunities. They have also provided recommendations on key investments and policy changes needed to address technical challenges with shoe recycling, lack of transparency and accountability, and economic inequities. California stakeholders have proposed a solution to this complex challenge that will require the footwear manufacturers to take responsibility for the entire lifecycle of the products put on the market. The proposed program would allocate funding based on the waste hierarchy, prioritizing reuse and repair, which, in turn, supports repair businesses and job creation in California.

2. Paper Objectives

This technical paper explores the current landscape of shoe stewardship with research on:

- how discarded shoes are being managed in the United States;
- the types of processes for unusable shoes and challenges faced by processors;
- market innovations that improve recyclability and green design of shoes; and
- the upcoming regulatory changes that will influence the footwear industries.



3. Evidence of the Problem

According to the World Footwear Yearbook 2023, global footwear production reached a staggering 23.9 billion pairs in 2022. The most significant increase in footwear consumption was observed in wealthier countries, particularly North America, with an average of 5.9 pairs of shoes per person.

The Yearbook shows that overconsumption in the footwear industry is driven by the higher income as well as the surge of fast fashion, which prioritizes the quick and inexpensive production of shoes, flooding the market with products that often have shorter lifespans. As a result, consumers discard shoes more frequently, leading to a substantial increase in waste.

The lack of effective voluntary reporting and government regulation in the footwear industry compounds these issues. The absence of clear guidelines and reporting requirements for shoe manufacturers, recyclers, and other stakeholders results in limited transparency and accountability gaps. This regulatory gap means that tracking the recycling and disposal of shoes becomes challenging, potentially resulting in illegal dumping and the exacerbation of other waste issues, especially in developing countries.

Reuse and repair remain the best option for unwanted shoes. For shoes that are no longer wearable, there is a pressing need for more efficient processes that are commercially viable. Many of these processes are in their early stages and face technical, economic, and logistical challenges. There is a scarcity of end-markets for recycled shoes as well. Currently, rubber reclaimed from discarded footwear serves as the primary recycled material, often utilized in the construction of playground surfaces. However, the supply of recycled materials exceeds current demand. Without innovative new markets for recycled shoe materials, the full potential of shoe recycling will be limited.



Figure 1. Secondhand Footwear Markets in Ghana; Source: Elma Arko-Baisie and Faiza Salman, courtesy of the Or Foundation



3.1 Stakeholder Interviews and Engagement

Key stakeholders relevant to the shoe recycling research project were identified through online research and the CPSC’s network. Stakeholders include shoe brands, repair businesses, recycling facilities, thrifts, research institutes, and non-profit organizations. CPSC reached out to a selected group of stakeholder entities, chosen based on their involvement in advancing circularity initiatives.

We conducted interviews with representatives from Rothy’s (Brand), Adidas (Brand), Soles4Souls (Collection/Donation), MIT (Research Institute), Fast Feet Grinded (Recycler based in the Netherlands), Give Back Box (Collection/Donation), Sneaker Impact (Reuse/ Recycling) and the OR foundation. The OR foundation is also one of the committee members of Statewide Textile Recovery Advisory Committee (STRAC) hosted by CPSC and the author of reports on waste colonialism.



During these interviews, participants discussed technical, economic, and political challenges encountered in shoe reuse and recycling. Additionally, they provided valuable insights and recommendations to enhance shoe collection and recycling initiatives around the world.

3.2 Current Opportunities for Unwanted Shoes

Donation and Reuse

Donation and reuse have been the center of sustainability efforts in the footwear industry. Non-profit organizations like Goodwill, Soles4Souls, and Give Back Box collect used shoes for donation/reuse. The shoes are usually sorted based on their quality, brand, and style. Reuse and repair are the best options for wearable shoes and most communities have businesses to support show reuse and repair. A key to the success for reuse is to buy previously owned, in addition to donating. Local thrifts and online resellers offer great deals on a wide range of styles for previously owned shoes.

Depending on their quality, shoes will be either donated/re-sold, or recycled/discarded. Although driven by positive intentions of sustainability and affordability, shoe reuse markets face significant challenges as most of them are abroad and unregulated. The absence of effective tracking, transparency, and accountability creates opportunities for illegal dumping and perpetuates the problem of waste colonialism in developing countries.



Repair Business

Shoe repair has a long history in the United States. Every community has secondhand stores, “buy nothing” groups, and free listings on online resale platforms that foster community-based reuse. Many family-owned businesses have been operating for decades, offering their services to the local communities. Shoe repair shops offer a variety of services, including:

- Sole and heel replacement,
- Stitching and patching for damaged seams, torn leather, or scuffed areas,
- Stretching and resizing,
- Cleaning and polishing, and
- Zipper and strap repair.

Locating these local repair businesses and services is easier than ever. CPSC has launched a textile handlers map, as shown below. The map allows users to find local reuse, repair, and recycling business near them, and also search by material type. For example, if you have cotton to recycle, searching cotton will show all the businesses that handle cotton waste. With the success of this project, all of the known shoe repair businesses to California were added to the map.

The map is ever growing. To add your business or others you know, please visit: www.calpsc.org/textilestewardship

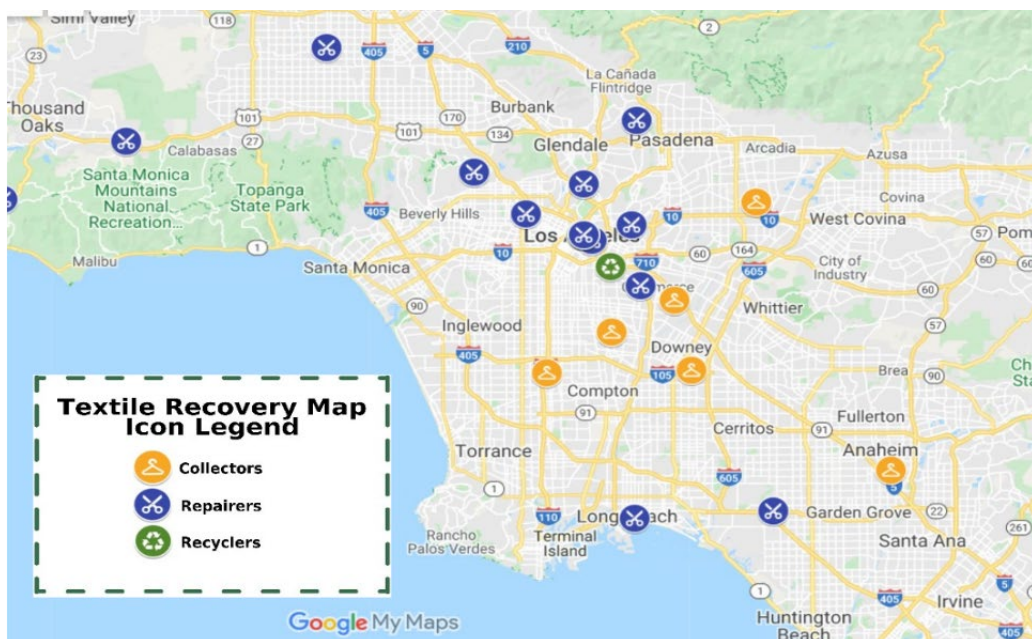


Figure 2. A screenshot of CPSC’s Textile Handler Map, publicly accessible on the CPSC website.



Take-Back Programs

Many brands have defined sustainability efforts for shoes by offering take back programs and by conducting research to make better designs and materials for circularity. Several brands, such as [Rothy's](#), [Nike](#), and [Allbirds](#), have take-back programs to retrieve used shoes as part of their sustainability model. These initiatives involve collecting consumer shoes, often offering incentives like credits, and then either reselling, donating, or recycling the collected footwear. For the leaders in this space, takeback programs can be expensive, so industry-wide participation is needed. A significant challenge lies in the absence of regulatory oversight, with no requirement for tracking and reporting data to ensure responsible end-markets. This gap gives rise to concerns regarding transparency and accountability as well as challenges in estimating environmental benefits and impacts resulting from these programs.

Recycling Technologies

Shoe recycling technologies are emerging and not commercially viable yet. Some established technologies available for shoe recycling, given the ability to deconstruct and separate by material type, are as follows:

1. Mechanical recycling: for example, [FastFeetGrinded](#)
2. Molecular recycling: for example, [Eastman](#) & [Aquafil](#)
3. Enzymatic recycling: for example, [Carbios](#) & [Ambercycle](#)

Established Coalition(s) in Footwear Circularity Systems

Key industry stakeholders have established coalitions around shoe stewardship. One example, 'The Footwear Manifesto' published by MIT delves into the recycling challenges faced by the industry and strategic recommendations for achieving circularity in the field. This report highlights a pressing need for a collaborative effort among key industry stakeholders. As a result, '[The Footwear Collective](#)' featuring leading brands such as [Brooks](#), [Crocs](#) and [New Balance](#), has been established. It serves as an inspiring blueprint for a more sustainable and equitable footwear industry, showing how industry stakeholders are coming together to drive positive change.



Figure 3. Secondhand footwear market in Ghana



3.3 Deep-dive into Challenges of Shoe Reuse and Recycling

Technical Challenges with Shoe Recycling

All interviewees consistently highlighted the intricate technical challenges involved in shoe recycling, due to shoes being a complicated product with multiple materials and bondings, their conflicting dynamics of durability and recyclability, and the need for more green design and innovation.

Shoes often have multiple layers with different materials, including metal components. Notably, compared to textiles, cross-links, heavy use of adhesives, and stitches in shoes make recycling efforts more difficult. Crosslinked Ethylene-Vinyl Acetate (EVA) materials are used in a range of applications such as insulation materials, cables, photovoltaic modules, and shoe soles. However, crosslinked EVAs cannot be recycled or reused due to their high thermal and chemical stability.

Lack of transparency and accountability in reuse, resale, and recycling markets

Take-back and donation programs, without proper reporting and enforcement, can result in the dumping of discarded items on other markets, often in regions such as developing countries. Dumping discarded items in these communities can also harm their local economies. It undercuts local shoe making businesses as well as industries that might otherwise benefit from recycling or reusing these materials.

Economic Inequities

The whole process for shoe recovery and recycling including collection, transportation, and material separation, incurs considerable expenses, making shoe recycling expensive. Many businesses, especially smaller enterprises and startups, face financial constraints that limit their ability to invest in sustainable recycling practices. One interviewee particularly mentioned how the footwear industry is especially competitive with brands going solo rather than collaborating with each other. Some players in the footwear industry, especially big brands, are taking the initiative to invest in research and innovation to develop more sustainable materials and processes. However, not all businesses have the resources or inclination to do so, resulting in an uneven playing field where leaders drive positive change, sometimes at additional costs, while others keep mass producing with no responsibility for the massive cost for destruction.

In addition, the rise of fast fashion has led to a surge in the production and disposal of shoes. This not only contributes to environmental issues but also exacerbates economic inequalities as fast fashion prioritizes quick and inexpensive production, flooding the market with shoes that have shorter lifespans, leading to more frequent disposal.



To address these challenges, there's a growing need for extended producer responsibility (EPR) programs to hold manufacturers accountable for their products' entire lifecycle. In a textiles and shoe combined program, more funding should be allocated to shoes as these products are more costly and challenging to work with, and more funding should go to repair over recycling.

4. Recommendations

Based on the above-mentioned findings, a full circular shoe program will require more partners and more processors given the complexities of those products. However, optimal solutions are already present within our communities — as reuse and repair emerge are the best choices in the absence of recycling. Reuse within communities, and brand involvement in secondhand sales of shoes is needed to scale source reduction solutions. Further, repair businesses, often BIPOC owned, are found in our local communities. **Prioritizing reuse and repair as a local and regional approach will be the most effective option for enhancing sustainability in the short-term and boosting community's resilience.** For long-term sustainability, a permanent program which has more budget for footwear's green design and recycling technologies should be called out. Even though shoe volumes might be smaller, associated costs are notably higher.

4.1 Source Reduction: Repair & Resale

- **Conduct residential education campaigns on source reduction.** Education campaigns are needed to emphasize the importance of source reduction. They should encourage consumers to invest in high-quality shoes and prioritize repairing to extend their footwear's lifespan. Campaigns can share a list of repair businesses nearby and/or funding to organize repair workshops to repair shoes at zero to low cost.
- **Promote local repair businesses and resale platforms.** Efforts can include financial support, training, and marketing assistance to help these businesses thrive; building local resale platforms where consumers can buy, sell, and trade gently used footwear; local repair cafes to make repair services more accessible to the communities.
- **Form or join coalitions.** Establish or join a coalition will create more platforms for engagement and idea exchange, facilitating strategic discussions and planning efforts aimed at promoting repair, reuse and resale practices in the footwear industry. Fashion and sustainability events should include special emphasis on shoe stewardship and coalition opportunities.



4.2 Recycling: Processing and Transparency

- **Design for circularity.** Design complexity remains one of the biggest challenges in recycling. Innovation is needed in the industry to consider end-of-life solutions in the design phase.
- **Collect data.** The lack of data makes it difficult to estimate the environmental impacts of the footwear industry. Collection events such as shoe drives with additional sorting and tracking could offer local events more data collection. Collectors and recyclers participating in recovery programs should track their material flow and prepare for reporting requirements.
- **Engage with stakeholders** with established shoe recycling processes that can help with future shoe testing, such as [Sneaker Impact](#).
- **Foster collaboration:** This can include shared take back programs by brands, pilot projects involving multiple industries, joint investments in material research, recycling technologies and discovery of new markets for recycled footwear feedstocks.

4.3 Policy Instruments: Extended Producer Responsibility

- **Support effective policies.** To promote sustainability in the footwear industry, it is crucial to support policies tailored to its unique needs. These policies should require industry stakeholders to take responsibility for the entire lifecycle of products, from sustainable design, manufacturing to end-of-life, and allocate financial resources to support various aspects of footwear circularity.
- **Capacity Expansion and streamline the reuse, repair, and recycling processes.** In an Extended Producer Responsibility Program such as [SB 707 \(Newman\): Responsible Textile Recovery Act of 2023](#), fees are modulated by the burden they have on the program due to their durability, repairability, recyclability, etc. Industry funding will be dedicated to increasing the capacity of repair, recycling and processing facilities. It will address logistics bottlenecks, streamlining efficient collection, sorting, transportation of discarded footwear to reuse/recycling facilities to ensure a smooth material flow, and minimize the risk of shoes ending up in landfills or illegal dumping.
- **Establish transparency and accountability.** Policies should incorporate reporting and tracking requirements for all stakeholders, including manufacturers, collectors, donation services, and recyclers. These measures ensure that recycling and disposal processes are transparent, helping identify areas for improvement and fostering consumer trust.



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Napa Recycling
& WASTE SERVICES
www.naparecycling.com

Citations

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Appendices

Summary of Gaps and Opportunities in Current Management Practices for Used Shoes

Footwear Circularity System	Gaps in Current Management Practices	Opportunities
Material management	<ul style="list-style-type: none"> • Design complexity prevents efficient recycling • Disconnect between science & design on material selection for footwear 	<ul style="list-style-type: none"> • Joint investment in research • Material use alignment to keep harmful materials out of circulation • Common materials language
Post-consumer infrastructure	<ul style="list-style-type: none"> • Lack of end-of-life technological solutions • No mandated responsibility 	<ul style="list-style-type: none"> • Repair, reuse, resale • Leverage existing waste management systems • Shared take-back programs among brands • Disassembly solutions • Better recycling technology
Consumer behavior throughout the lifecycle	<ul style="list-style-type: none"> • Variation in consumer understanding of circularity • Lack of transparency from brands' side 	<ul style="list-style-type: none"> • Education • Consumer rewards system • Transparency & traceability
Circular Business model and shared economy	<ul style="list-style-type: none"> • Requires huge investment that cannot be met by individual stakeholders • Need to decouple revenue from environmental harm • Lack of industry-specific policies or guidance 	<ul style="list-style-type: none"> • Digital products & systems • Collective investment • Regulations & incentives • Decode market value of circular materials

Alignment for common goal	<ul style="list-style-type: none"> ● Scattered efforts towards circularity ● No common method for measuring circularity ● Lack of understanding of benefits of collaboration ● Competitive brands 	<ul style="list-style-type: none"> ● Standardized circularity metrics ● Identify brands vs collab domains ● Consortium of brands ● Open innovation platform
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Note: This information is referenced from The Footwear Manifesto, Curated by Yuly Fuentes-Medel Ph.D., Leslie Yan, & Kara Buttler.