

Circular Economy & Greening Health Supply Chains

JSI's Climate and Environment Initiative -
Greening Health and Education Series



The JSI Greening Health and Education Series and the Principles that Guide our Work

JSI is driven by the fundamental goal to ensure that all individuals can live their best and healthiest life and that everyone has a right to quality education, regardless of age or circumstances. JSI's steadfast commitment to equity and justice across our health and education portfolio advances this goal. The climate crisis and environmental disaster we face today affect people and activities across our diverse portfolio. Our actions can build resilience to and mitigate climate change and environmental degradation. To do so, JSI must integrate climate and environment considerations in everything we do, and to do that, we must address the systemic issues that simultaneously perpetuate inequity and injustice and drive the climate crisis and environmental disaster.

People whose daily life, household and economic opportunity and stability are most greatly imperiled by biodiversity loss, environmental degradation, and climate change are often those who have had the

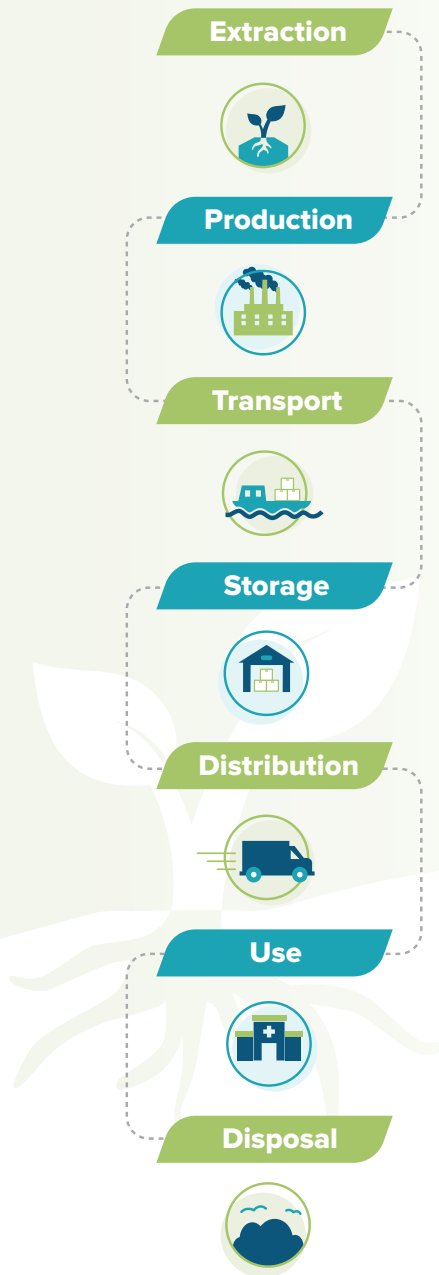
least contribution to the crisis. They are also those with the least access to quality health care and education and are often excluded from solution-seeking and policy-making processes. These inequities reflect colonial systems still upheld by racism, classism, white supremacy, and patriarchy. These systems have stripped Indigenous people of access to the land, exacerbating global inequities and preventing people from practicing millennia-old ways of conserving biodiversity and maintaining the planet's balance.

This series of think pieces, entitled "Greening Health and Education," reflects upon JSI's long-standing commitment to addressing the global climate crisis and environmental disaster through our public health and education work and demonstrates our transformative approaches to integrating climate and environment considerations across our portfolio and throughout our operations long into a more just, equitable and greener future.

JSI must acknowledge its role and that of similar organizations in perpetuating these systems and take a decisive stand against them. Our efforts to understand the causes and mitigate the effects of the environmental crisis and climate change must uphold the following guiding principles.



**FIGURE 1.
LINEAR SUPPLY CHAIN**



INTRODUCTION

Strong health supply chains save lives by ensuring that high quality, affordable health products are available to clients. However, the production, transport, use, and final disposal of products generate greenhouse gas emissions and waste, accelerating climate change and biodiversity loss. In our current linear economy, less than 8 percent of the resources we use are cycled back into the economy for reuse.¹ By contrast, in a circular economy (CE), products and supply chains are designed to minimize waste and maintain their value for as long as possible. At the end of a product's life, biodegradable material is returned to nature, while metals and other finite resources are repurposed and reused. By applying these CE principles and practices, health care supply chains can reduce environmental damage and contribute to greater health and wellbeing for all.

OUR VISION

JSI believes access to health is a right, not a privilege. People deserve on-demand access to high-quality health supplies where, when, and how they want to receive them, at a price they can afford. Health supply chains that deliver these products can be leveraged to mitigate climate change, further improving the health and prosperity of people and ecosystems around the world.

With over 40 years of experience, JSI is a leader in health supply chain strengthening and implementation. Our deep, end-to-end expertise enables us to take a system-wide approach to lead the redesign and optimization of all areas of the supply chain. We recognize the challenge that climate change poses to health around the world and the opportunities to adjust how we operate. We convene partners that may otherwise not be connected,

stimulating positive change in global markets and facilitating transitions in supply chain policy and practices.

THE CHALLENGE: THE LINEAR ECONOMY

Climate change is affecting health. Increased extreme weather disasters, including heatwaves, wildfires, storms, and flooding; increasing and shifting zoonoses and food-, water- and vector-borne disease burdens; and rising mental health challenges are straining health systems around the world. Indirect effects are also being felt, as climate change impacts the social determinants of health including equality, access to care, livelihoods, and social support networks.^{2,3}

The supply chain is the backbone of a health system, delivering life-saving medicines and equipment to people in need throughout the world. However, global health supply chains also cause greenhouse gas emissions and waste and therefore contribute to the climate emergency.

A 2019 report⁴ showed that the health care sector causes 4.4 percent of all global net greenhouse gas (GHG) emissions contributing to climate change; if this sector was a country, it would be the fifth-largest emitter in the world. The same report noted that 71 percent of these emissions come from the health care supply chain's complex flow of products from raw material extraction, production, transport, storage, distribution, consumption, and final disposal (see figure 1 for a representation of a linear supply chain). Supply chain activities also contribute to ecological destruction and biodiversity loss as the production, consumption, and end-of-life disposal of medical devices, equipment, and pharmaceuticals generates waste that pollutes air, soil, and water.

Under-served and rural communities, particularly those in low- and middle-income countries (LMICs), suffer these consequences the most because they are often at the extreme downstream end of extended supply chains and lack the infrastructure and technical capacity to manage waste effectively. Studies suggest that before the COVID-19 pandemic, over half of the world's population was at risk from environmental pollution and public health threats due to difficulties in health care waste disposal. COVID-19 has exacerbated this problem, with its increased demand for medical items, including single-use personal protective equipment and diagnostics.⁵

The cause of these problems is the prevailing linear economy model. Often referred to as the take-make-waste model, it is built on the extraction of natural resources and the production of goods and their consumption and disposal at end of life. In this prevailing linear model, organizational and societal success and prosperity is tied to economic activity. Value is created for businesses by offering goods and services to users at the lowest cost possible. These activities are often conducted without consideration for longevity or reuse options.

In the linear economy, value is lost through waste generated as a by-product of manufacturing, logistics, and use, and through goods being perceived as obsolete and therefore discarded from the economic system. Obsolescence can take several forms, including functional, economic, technological, and regulatory. In the case of medical devices, 'hygienic' obsolescence deems items unfit for use due to risk of spreading infection.⁶

THE OPPORTUNITY: THE CIRCULAR ECONOMY

A CE approach offers an alternative to the linear economic model. Transitioning to a CE has the potential to mitigate the environmental consequences of health supply chains, while increasing their efficiency and resilience.

The CE is based on three principles (see figure 2). By focusing on waste reduction and maintaining value, the CE decouples economic activity from growth and prosperity. Further, through its focus on restorative and regenerative practices, the CE offers opportunities to reverse biodiversity loss and environmental degradation.

Figure 3 illustrates the flow of materials in a circular supply chain. This figure is based on the Ellen MacArthur Foundation's 'butterfly diagram' that shows the two main cycles of a CE⁸. In the technical cycle, shown in blue, products and materials from finite resources are kept in circulation through processes such as reuse, service-based business models, re-manufacture, and recycling. In the biological cycle, shown in green, the nutrients from biodegradable materials are returned to the Earth to regenerate nature.

The CE aims to slow, shorten, and close loops in the technical and biological cycles. Slowing

FIGURE 2.
CE PRINCIPLES

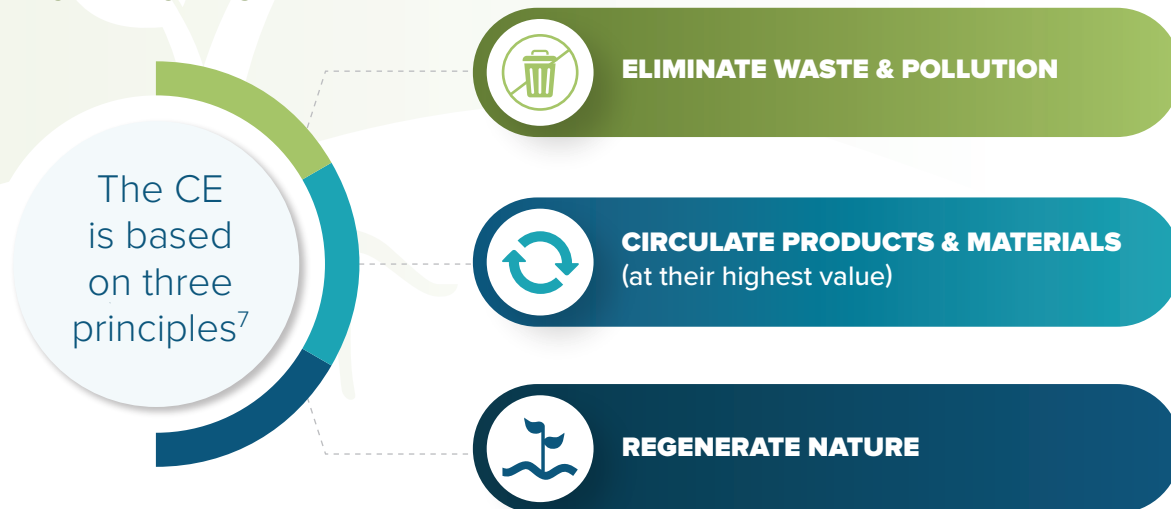
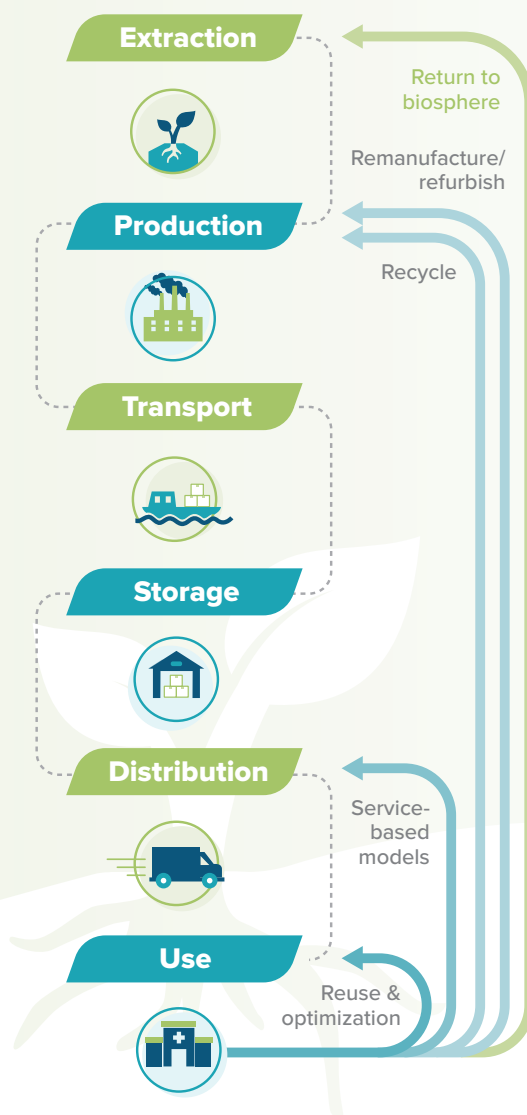


FIGURE 3. CIRCULAR SUPPLY CHAIN



loops entails designing out waste and maintaining products at their highest value for as long as possible, ‘cascading’ them throughout the system for reuse. Shortening and closing loops entails capturing and repurposing any waste that cannot be designed out or returned to the biosphere. These approaches ensure that products deemed obsolete are recovered and kept in the economic system, rather than discarded.⁹ Value is a key concept in the CE. Transitioning from a linear to a CE entails intentionally investing in propositions that create, capture, and retain value.

BARRIERS TO A CIRCULAR ECONOMY TRANSITION

A CE transition necessitates increased trust and collaboration across supply chain partners. General and specific barriers to adopting CE business models for health supply chains include:

Lack of visibility throughout the supply chain. Health supply chains are often extended and fragmented, spanning multiple countries and entities, including raw material suppliers, manufacturers, procurement agents, logistics providers, ministries of health, delivery points, private sector and NGO service providers, and funding agencies. Visibility of materials, use, and end-of-life status of goods as they move down the linear supply chain, as illustrated in figure 1, is often limited to one tier above or below a single entity. This makes it difficult to slow and close loops

Siloed thinking in value chains and propositions. Value chain actors often consider only their specific activities and needs, based on limited, linear business models. For example, manufacturers provide packaging to maintain the integrity of a product until it reaches the final recipient, without considering downstream end-of-life disposal options.

Planned obsolescence. Equipment manufacturers promote a linear economy model to increase sales of single-use items, and therefore maximize profits, by designing products to become obsolete. Examples of this include arbitrarily labeling items as single use; needlessly shortening ‘best before’ dates to reduce shelf-life; and manufacturing items with weak components. Further, manufacturers limit reprocessing options by preventing disassembly and repair, such as including unnecessary holes or creases to prevent cleaning, and incorporating proprietary software to make capital equipment incompatible with reprocessed devices.¹⁰

Mixing technical and biological components in products and end-of-life disposal. Design and end-of-use practices that do not consider the technical and biological cycles of the circular economy result in linear practices that cause waste and pollution. The urgent need to address ocean plastics is an example of items that should be designed for, and managed in, the technical cycle entering the biological cycle. These fossil fuel-derived items break down very slowly, releasing harmful chemicals and microplastics into the biosphere throughout the years-long process. It is estimated that up to 95 percent of the value of plastic packaging is lost after its first use, rather than being reused or recycled into the technical cycle of the economy.¹¹

Hygienic and infectious considerations. The risks of spreading infection in health care settings has led to a preference for single-use over reusable devices, meaning linear economy practices prevail. The Spaulding Scale is often used to determine the criticality of potential infection for devices. This criticality, along with the economic considerations of the item’s value and costs associated with its cleaning, reprocessing, recycling, or disposal informs its rating on the scale. The lack of infrastructure to recover and clean items is also a deciding factor in single-use versus reusable devices.¹² Infrastructure and budgetary constraints in

RevolutionZero, a total product, service, and logistics solutions provider focused on reusable personal protective equipment and other medical textiles, collaborated across the supply chain to develop a Circular Economy Medical Textiles Roadmap for NHS Wales. Forecasts showed that transitioning to circular practices would save costs, boost supply chain resilience, and decrease the environmental burden of medical textile use.

Circular Economy Medical Textiles Road Map for NHS Wales, RevolutionZero, March 2022.

LMICs can lead to the reuse of items that were designed for single use. This poses health risks. An example is the reuse of newborn suction bulbs that are intended for single-use and therefore cannot be adequately cleaned.

TRANSITIONING TO CIRCULAR HEALTH SUPPLY CHAINS

Incorporating CE principles into health supply chain design and operations will lessen health sector environmental damage by reducing waste and regenerating nature. Further, keeping products in use for longer and shortening and closing loops will increase supply chain resilience and efficiency. JSI, as a signatory of the InterAction NGO Climate Compact, is committed to climate change mitigation in its operations and projects.

A transition to a CE model will allow us to reimagine and revolutionize health supply chains. Circularity gives health care professionals, consumers, and communities greater influence in the design and implementation of health supply chains that affect them.

By focusing on the elimination of waste and the retention of value, we will build on the systems thinking approaches taken in the past through, for example, health program integration. This will necessitate commitment from and collaboration with partners from the public and private domains in which health supply chains operate, including environment, education, justice, and equity, and will increase adherence to the principle of 'do no harm.'

There is growing acknowledgement of the relationship between health supply chains and environmental impacts. However, as a sector we lack a comprehensive approach to mitigate these impacts. A number of immediate opportunities present themselves:



Collaborate on value and supply chain mapping. Linking actors throughout value and supply chains will break down silos and enable the joint identification of waste streams. This will facilitate collaborative redesign of products and supply chains to eliminate waste at the earliest possibility, and capture and recirculate value where elimination is not possible. JSI's affiliate, the Partnership for Supply Chain Management, uses a load optimization tool to flag large-volume shipments. This enables collaboration with manufacturers, transporters, and end recipients of medical commodities to reduce excess packaging and make the most efficient use of cargo space. Such practices and tools can be scaled to incorporate each stage of the supply chain, resulting in greater efficiencies.



Develop policy and regulatory requirements to facilitate adoption of CE practices. Governments and policymakers can encourage a transition to circular practices by establishing sustainability incentives and standards for product and packaging specifications, reuse, and end-of-life solutions. This might entail revisiting the criticality rating of potential reinfection and other considerations that designate items as single- or multi-use. As part of its goal to reach net-zero GHG emissions by 2045, National Health Service (NHS) England established a Net Zero Supplier Roadmap that will require suppliers to disclose targets and emissions and adhere to a carbon reduction plan. Similarly, regulatory bodies can accelerate approval of improvements to products and packaging that reduce GHG emissions, and set mandatory reporting requirements.¹³



Establish joint metrics and information sharing throughout the supply chain. Joint metrics would enable a holistic approach to supply chain management, as the total effect on the supply chain can be understood when trade-offs must be evaluated. Total cost of ownership and life cycle considerations can be taken as a whole so that

Philips, a manufacturer of health care devices, has committed to generating 25% of its revenue from circular products, services, and solutions by 2025.

Philips's Lumify with Reacts portable ultrasound service is an example of a service-based business offering. Using a flexible subscription service, users have access to transducers, an app, and an online ecosystem. The subscription service reduces upfront costs and improves patient access to innovative care.

<https://www.philips.com/a-w/about/environmental-social-governance/environmental/circular-economy.html>

decisions made upstream do not have negative consequences downstream. Data sharing will be key to ensure availability of product and material characteristics and provenance. Digital product passports, which are gradually becoming mandatory across different product types in the EU, facilitate the sharing of product information, including end-of-life disposal options and considerations, across extended supply chains. Digital threads enable the tracing of products and their characteristics to facilitate recirculation at their end of life. The car manufacturer Porsche, in partnership with the supply chain traceability startup Circularise, uses digital threads to capture key sustainability information for its cars.¹⁴ Such practices could be used in the medical device and equipment industries to ensure data availability, and facilitate reverse logistics and recirculation.



Rework business models toward sharing and service-based solutions.

A shift to sharing and service-based business models is an opportunity to move away from linear consumption-based practices. Sharing reduces siloed consumption of resources. Integration and sharing in laboratory services and cold chain provision have shown promise and could be expanded. For example, some integration of other health products, such as oxytocin, into vaccine cold chains has been successful, and other sectors that use cold chains (e.g., agriculture), could also be leveraged.¹⁵ A shift to service-based models, also known as servitization, could enable a transition to a CE for health supply chains. By adopting this model, immunization programs, for example, could procure cold chain as a service rather than procuring the equipment, installation, and maintenance, which results in difficult decommissioning and end-of-life disposal. Under this

service-based model, a manufacturer retains ownership of cold chain equipment, and the immunization program pays to use it (e.g., for each m³ of temperature-controlled space used). This model decouples operations from ownership, use, and consumption. Further, this model incentivizes the manufacturer to maximize the efficiency and longevity of its product. In the case of immunization programs, it could build on the recently introduced service bundle provider approach, in which manufacturers hire in-country maintenance providers to respond to cold chain break-downs during the warranty period.

CONCLUSION

Climate change and biodiversity loss are compromising all areas of human health, with the most vulnerable often most adversely affected. Public health supply chains operating in the dominant linear economy model contribute to this. Through collaborative action to adopt CE principles, health supply chain actors will reduce waste, boost efficiency and resilience, and ultimately create patient-centric supply chains that contribute to better health outcomes for all.

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