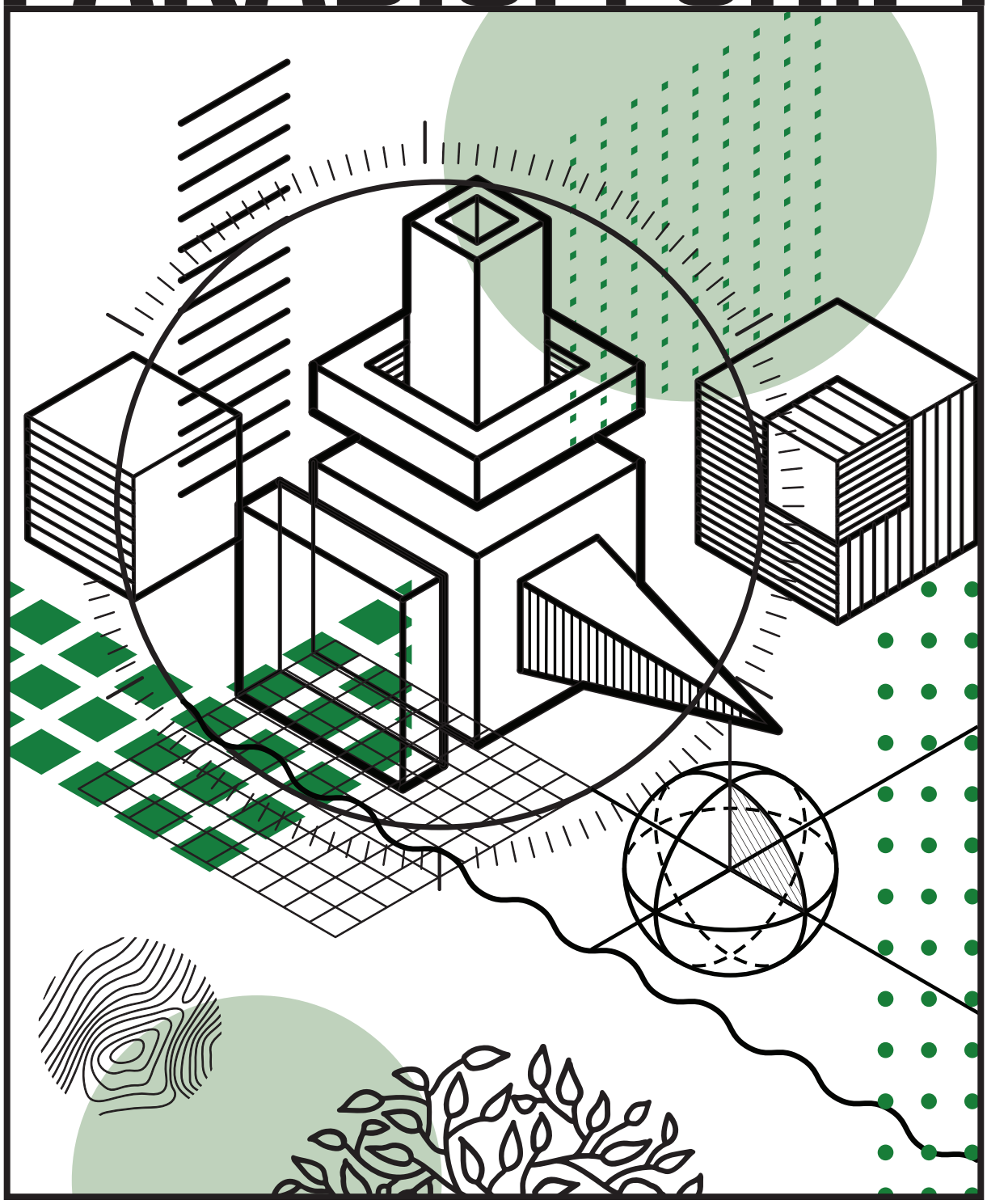
PARADIGM SHIFT



Solutions Driving the Circular Transformation

CIRCULAR ECONOMY CORPORATE ENGAGEMENT

Circular Economy Corporate Engagement teams are comprised of 5–15 corporate professionals from across disciplines and industries who participate in immersive experiences collaborating directly with organizations working to design waste out of the supply chain, keep existing materials in use, and regenerate natural systems. Projects engage the professional skills and expertise of the corporate participants to address real operational challenges faced by their host organization in supporting the transition to a circular economy.

SOCIAL IMPACT

Strengthen organizational capacity and cultivate the skills of counterparts working to deliver critical solutions for the circular economy.

INNOVATION

Gain insight into the challenges and opportunities in growth markets, easing the development of products and services that align with a circular economy.

MARKET ENTRY

Develop relationships, insights, brand reputation, and visibility with key stakeholders in growth markets.

GLOBAL PERSPECTIVE

Accelerate employees' ability to navigate a cross-sector, multi-cultural environment while performing at a high level.

LEADERSHIP

Build employees' global leadership competencies in managing diverse teams and operating in dynamic environments.

+ INFORMATION

**Contact Renay Loper,
Vice President, Program Innovation,
at rloper@pyxeraglobal.org**

ABOUT PYXERA GLOBAL

Over the last 30 years at PYXERA Global, we've found that bringing diverse parties together to address systemic challenges works. Today, we aim to convene players from across the public, private, and social sectors to address the complex challenge of transitioning to a circular economy.

Truly effective tri-sector collaboration is hard work and we hope to provide a common space to make those engagements a little easier. Thank you for joining us as readers and contributors in elevating the ways in which individuals, corporations, governments, and social enterprises champion a better future for our world.

To enhance your organization's transition to a circular economy, please contact John Holm, Vice President, Strategic Initiatives at **jholm@pyxeraglobal.org**

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PYXERA GLOBAL PUBLICATION TEAM

LARS BATTLE, Senior Editorial Coordinator
JOHN HOLM, Vice President, Strategic Initiatives
KATHARINE FRASER, Senior Designer
PAULA CHAMORRO, Design & Visualization Fellow
ALEX ZHOU, Senior Communications Coordinator
AMANDA MACARTHUR, Chief Program Officer

CONTRIBUTORS

DEIRDRE WHITE, CEO, **PYXERA Global**

JAMES GEORGE, Network Development Lead, **Ellen MacArthur Foundation**

SUZANNE JONES, Executive Director, **Eco-Cycle** and former Mayor, Boulder, Colorado

KARI HERLEVI, Project Director, Circular Economy, Finnish Innovation Fund, **Sitra**

JOHN HOLM, Vice President, Strategic Initiatives, **PYXERA Global**

MARCUS ERIKSEN, Research Director and Co-founder, **5 Gyres** and Co-founder, **Leap Lab**

KATRINA SHUM, Sustainability Officer, North America, **Lush**

DEBORAH DULL, Principal, Manufacturing Product Management, **GE Digital**

LAUREN PHIPPS, Director and Senior Analyst, Circular Economy, **GreenBiz Group**

IAN ROSENBERGER, CEO and Founder, **First Mile**

JOHN HOCEVAR, Oceans Campaign Director, **Greenpeace USA**

KEEFE HARRISON, CEO, **The Recycling Partnership**

DYLAN DE THOMAS, Vice President of Industry Collaboration, **The Recycling Partnership**

JAMES SULLIVAN, Head, Global Sustainability Innovation Accelerator, **SAP**

BATOOL HUSSAIN, Innovation Consultant, **SAP**

KATE DALY, Managing Director, Center for the Circular Economy, **Closed Loop Partners**

GEORGIA SHERWIN, Director, Communications and Strategic Initiatives, **Closed Loop Partners**

CONTENT

PARADIGM SHIFT

Solutions Driving the Circular Transformation

DEIRDRE WHITE +
JAMES GEORGE

PARADIGM SHIFT *(noun)*
a fundamental change
in approach or underlying
assumptions.

In our natural world, all physical matter revolves in an infinite cycle of restoration and regeneration. There is no waste in biological systems, only secondary resources. It therefore makes sense that our global economy—a system we recognize as a wholly-owned subsidiary of the environment—should be harmonious with its larger ecological system, and yet this is not the case. Our linear, take-make-waste platform, which may have been practical when resource scarcity was a distant concern, requires a paradigm shift. Given that there are no good choices in a bad system, the transition to alignment—to a circular economy—must happen now.

The planet is at an inflection point. Every day we hear about new symptoms of our fracturing environmental system, warning us of our perilous path. This new reality has never been more evident as we weather COVID-19 and witness the scale of our interconnectedness and the power of collective decision-making toward a common goal.

It's not possible to know what the future looks like if this systems breakdown continues. However, recognizing the limits of our understanding helps us avoid hubris. The first step to recovery is admitting we have a problem and then focusing our energy with concerted action through partnerships involving the public, private, and social sectors. A starting point may be to acknowledge the fallacy that perpetual economic growth on a finite planet is the path to prosperity. As a mindset it is long outdated.

There are no good choices in a bad system.

We don't need to find the right answers all at once. But it's important to ask the right questions—how can we stop extracting raw materials and design out waste? How might we keep materials already in the economy in circulation to avoid consumption at the expense of our natural resources? Finally, how do we get to a state where our economic activity regenerates our natural systems?

Despite the monumental challenges we face, there are awe-inspiring opportunities to correct course, and we should be energized by the prospect. Entrepreneurship is entering its golden age. Technological breakthroughs are hitting their stride at the right time to give humanity the boost it needs, an example of which you will read from SAP. The groundswell of support from consumers, employees, and now investors who are demanding change promises to disrupt industry and create circular supply chains, as you will learn from the example of cosmetics company Lush. Growing public awareness and activism also promises we'll elect public leaders who are serious in their commitments to a more sustainable future and willing to make necessary decisions for the sake of future generations—mayors like Suzanne Jones of Boulder, Colorado, who shares her perspective in this issue.

For those less familiar with the breadth of the transition detailed in the following pages, there's more to a circular economy than recycling; it's a much bigger idea, and much more fundamental. It's about how we think, behave, and consume. It's about equitable distribution of resources to avoid straining critical ecosystems and careful attention to the regenerative capacity of nature when we liquidate green capital to build and power our cities.

Paradigm Shift is about the most promising solutions on the horizon, from some of the most prominent voices leading the transition. To our readers, one key message is simple: this is a complex global challenge, and there is always a simple solution, which is always wrong! For a complex problem, we need to design and build a suite of interdependent solutions. This is the good news—we designed our existing economies, so there is nothing stopping us from designing the economy of the future. We are therefore only limited by our own imagination and collective determination.

Join the circularity revolution and use this publication—its proposed solutions, lessons, and calls to action featured in each article—to drive social innovations and cutting-edge solutions needed to realize the circular economic future we dream of, and now more than ever, need!

Zero Waste Lessons from Boulder

THE ROLE OF THE **PUBLIC SECTOR, CITIZEN ENGAGEMENT,** AND **ADVOCACY**

SUZANNE JONES

A QUOTE BY PLATO HANGS ON THE WALL OF THE BOULDER CITY COUNCIL OFFICE WHERE I SERVED AS MAYOR UNTIL RECENTLY. "The City is what it is, because the people are who they are." Certainly, that has been the history of the City of Boulder, where many ground-breaking environmental and sustainability policies—from open space taxes and visionary land use policies to first-of-a-kind carbon tax, trash tax, and zero waste policies—have been promoted by local residents and nonprofits and codified into law by elected leaders.

In the embarrassing vacuum of national leadership in the United States, this essential role of cities has been necessarily elevated and amplified. Boulder and other similarly inclined municipalities are now at the forefront leading on climate action and closely related issues of waste reduction, diversion, and the pursuit of circularity.

Essential Role of the Public Sector

While over 70 percent of U.S. cities directly manage their residential waste like other basic utilities, much of the Mountain West has traditionally taken a very hands-off approach. Residents and businesses throughout the region contract independently for trash and recycling services. The practice has contributed to abysmal recycling rates and excessive truck traffic with some cities having trucks from six to eight companies providing residential waste collection services. This increases the cost of road maintenance, leads to safety concerns and further, cities have little to no influence or control over the services provided.

Yet, if we are to work within the Mountain West's traditions to reach our zero waste goals, including the emissions associated with our consumption, the region's public sector needs to emphatically embrace its role in shaping waste management policy and priorities. While for-profit companies can and do play an important implementation role, the people and their public officials need to direct traffic and ensure that the private sector delivers services and products that further the public good.

Boulder provides a good model of the marriage between tradition and sustainability. In contrast to communities with municipal control over waste hauling and landfill fee structures, state mandates, or higher landfill tip fees that encourage zero waste investments, Boulder relies on a strong network of nonprofit, for-profit, governmental, and community partnerships. In this context, the City of Boulder plays an integral role in facilitating a community vision around zero waste, establishing policy to create a level playing field for everyone and working with community partners to collaboratively build infrastructure and deliver strategic programs and services.

Zero Waste Lessons from Boulder

Home to more than 108,000 sustainability-inclined residents and 10,000 businesses, Boulder is painfully aware of our carbon and natural resource footprints. We know from the EPA that consumption emissions—from producing, using, and disposing of our "stuff" and food—account for some 42 percent of U.S. emissions. Moreover, recent studies indicate that in U.S. cities such as Boulder, consumption emissions eclipse our electric, gas, and transportation footprints.

01 Set and Enforce Community Goals

Boulder's vision is to become a zero waste community—first by reducing the waste we create, and then reusing, recycling, and composting (diverting) most of what we throw away, with a goal of 85 percent diversion by 2025. Notably, these waste ambitions are closely tied to the city's climate goals of an 85 percent reduction in greenhouse gases by 2050 and are reflected in the city's support of entrepreneurial efforts to create a local, closed-loop materials economy for recyclables and compost. Boulder currently diverts 57 percent of its waste. With some of the lowest landfill fees in the country—ranging from $20 to $33/ton, compared to the national average of $55/ton—everything we achieve is in the face of this enormous headwind where recycling and composting are at a financial disadvantage.

02 Engage in Strategic Partnerships

Boulder's zero waste journey is inextricably tied to that of the 44-year-old Boulder-based nonprofit Eco-Cycle, of which I am lucky to now be the executive director. The lessons learned begin in 1976 when Eco-Cycle volunteers in repurposed yellow school buses started collecting recyclables from neighborhoods—the beginning of residential curbside recycling in Boulder and one of the first 20 in the nation. This is a theme throughout Boulder's history: grassroots activism and community engagement, which has always been the fuel driving the journey, often led by community nonprofits, in concert with progressive community leaders.

The city eventually instituted a trash tax and took over the recycling collections program, expanding it to include city-wide curbside collection in a partnership with Eco-Cycle and the local private hauling company Western Disposal, eventually transforming the municipally-contracted curbside program into a regulated, private sector industry. Partnership is another key element of Boulder's success—between nonprofits like Eco-Cycle, the private sector (both local and national waste haulers), and local governments, as well as between Boulder County, the City of Boulder, and neighboring cities working to foster regional approaches. The city is explicit about not replicating or instigating things that the nonprofit or for-profit sectors can do better, and appreciates the need for support, funding, infrastructure, and policy for those efforts.

Partnership is another key element of Boulder's success—between nonprofits like Eco-Cycle, the private sector (both local & national waste haulers), and local governments, as well as between Boulder County, the City of Boulder, and neighboring cities working to foster regional approaches.

03 Build Public Infrastructure

In 1994, Eco-Cycle advocated successfully for the need to fund and build a publicly-owned Materials Recovery Facility (MRF), resulting in Boulder County voters approving a seven-year 0.10 percent sales tax to fund the construction and operation of recycling and composting facilities and programs. The Boulder County Recycling Center (BCRC) opened in 2001 and now processes some 56,000 tons per year. Eco-Cycle won the first contract to operate the facility (and has since re-won it), because of our recycling expertise but also because, as a social enterprise, our "mission profit" for operating the facility is returned to the community in the form of public education and advocacy efforts. We continue to use this facility to pioneer and test new sorting technologies and markets.

A key lesson from this experience is the importance of public ownership or at least control over zero waste facilities to ensure they remain focused on the public's goals—for instance, to prevent your glass from ending up in a landfill when prices are low, or to support home-grown jobs and sustainability goals by marketing materials domestically versus to poorly-regulated overseas markets.

Also in 2001, Eco-Cycle partnered with the City of Boulder to open its first-of-its-kind-in-the-nation Center for Hard to Recycle Materials (CHaRM), a public drop-off center to address the 15 percent of the waste stream that is reusable or recyclable but not single-stream. This includes unusual materials such as electronics, toilets, mattresses, block foam, and plastic bags. This is another example of the public sector stepping into the void in the marketplace to pursue a public goal, and in the process stimulating local entrepreneurs, businesses, or other social enterprises to transform these material streams—now cleanly sorted and in predictable volumes—into local economic activity. To successfully scale this solution requires growing regional material markets with hub-and-spoke collection systems, to reach economies of scale for collection, processing, and remanufacturing.

04 Adopt Zero Waste Policies

Boulder's success lies in a mix of approaches, including adopting mandates when necessary. While Boulder made marked gains in residential diversion rates, after many years relying on voluntary measures, the commercial recycling rate was only 28 percent, prompting the Boulder City Council to adopt a Universal Zero Waste Ordinance (UZWO) in 2015. This UZWO requires all homeowners, property managers, businesses, and public events to have recycling, composting, and trash options—such that groups of three waste bins are visible wherever one goes in Boulder—and directs all recyclable materials to the publicly-owned BCRC. Boulder is still only one of a handful of U.S. cities with a UZWO policy, yet it provides a powerful and essential driver for our zero waste efforts and provides important direction to the private sector.

05 Support Education and Community Engagement

Strong public policy is necessary but not enough on its own. It is equally important to support contextually appropriate public education to drive behavior and culture change. We learned this early on.

In 1979, after three years of efforts to get the community to adopt recycling habits, behavior change had stalled with less than 10 percent of the community participating in curbside recycling collections. Eco-Cycle had used all traditional PR approaches to increase participation with little result. It was not until a volunteer came up with the idea of creating a peer-to-peer education campaign that participation began to increase dramatically. Our Eco-Leader Network trains volunteers to be ambassadors for zero waste by becoming experts on all guidelines and programs. This program is now 41 years old with more than 1,000 volunteers and remains key to the very clean and high-quality materials coming into the BCRC.

In 2005, Eco-Cycle launched the Green Star Schools program—funded by the city, county, and donations—which became a nationally recognized education program that teaches thousands of students in Boulder County about zero waste and environmental protection and promotes zero waste practices at each school. Children become enthusiastic zero waste adopters, and then go home and teach their parents—resulting in larger volumes and a much cleaner recycling stream at the BCRC, as well as building community buy-in and engagement in reaching sustainability goals.

Uniform guidelines and public outreach for all municipalities that use the BCRC provide further reinforcement, along with targeted outreach to businesses to help them implement the UZWO. Additionally, bolstered by the city's UZWO, Eco-Cycle also provides public outreach at major public events, exposing over 300,000 visitors and residents each year to the principles of zero waste, recycling, and composting.

The city recently completed a plan to become a circular city, an effort that includes measuring material flows instead of just diversion rates, with a goal of fostering innovation to capture and repurpose various waste streams.

Eco-Cycle has taken the many solutions forged with the City of Boulder and Boulder County and packaged them in a 10-Year Community Zero Waste Roadmap to share with other communities—outlining the basic progression of zero waste infrastructure, policies, and programs needed. This community model is founded on informing and engaging residents, business owners, employees, and visitors on how to play their part through personal action. But ultimately, the goal of zero waste is to redesign our systems and resource use—from product design to disposal—to prevent resource depletion, conserve energy, mitigate climate change, among other actions, and then capture our economic outputs and use them, instead of extracting virgin natural resources, to feed back into the local economy.

While Boulder's zero waste story is still a work in progress, we are a bright light compared to the rest of Colorado, which, despite its green reputation, is one of the trashiest states at 17 percent diversion compared to the national average of 35 percent. With targeted advocacy and buoyed by the groundswell of public concern about plastics pollution, we are finally getting traction with the state legislature and our new governor. Working with other like-minded municipalities and nonprofits, Boulder and Eco-Cycle are promoting statewide legislation to bolster end markets, address organics management, and ban single-use plastics. We will also continue to advocate for corporate producers and their associations to take more responsibility for the products they put forth into the world. Critical to our success, however, will continue to be rallying the people and convincing the public sector to adopt the rules necessary to create our circular materials future.

Looking Forward

The City of Boulder and Eco-Cycle are building upon our success in three ways—continuing the transition to a circular city, sharing best practices with communities around the country, and driving change in our state.

We are advancing our culture of individual action to create systems change, where wasting and single-use products are no longer the norm and zero waste systems are the easier solution. The city recently completed a plan to become a circular city, an effort that includes measuring material flows instead of just diversion rates, with a goal of fostering innovation to capture and repurpose various waste streams.

Image by Topias Dean, Sitra

Finland's Road Map to a Circular Economy

KARI HERLEVI

THE WORLD'S FIRST NATIONAL GUIDING DOCUMENT FOR A CIRCULAR ECONOMY, entitled *Leading the Cycle: Finnish Road Map to a Circular Economy 2016–2025*, was published in autumn 2016 in Helsinki by the Finnish Innovation Fund Sitra, together with a cross section of all Finnish stakeholders. The road map created a platform from which to launch and advance circular economy initiatives throughout the country, while ensuring Finland's population possesses a shared understanding and tools to coordinate the transition.

At the time, there were no other national road maps in existence to guide the way. Essentially, we were pioneers, laying the tracks for our own path toward a circular economy.

The result is a unique combination of strategy, purpose, and concrete action plan. There is a strong emphasis on public-private collaboration, and, as a small country, it is not only intended for policy makers but for all stakeholders. As an independent think-and-do-tank, having seen and assessed emerging solutions since our inception, the impetus for Sitra was to share best practices and inspire organizations to contribute their own solutions and proactively engage in the circular economy.

Since its publication in 2016, other EU countries have released similar strategies and road maps. However, to remain a pioneer requires continuous adaptation, for which reason in 2019 Sitra launched an update entitled *Critical Move – Finland's Road Map to a Circular Economy 2.0*. Its goal was to chart Finland's development, raise the level of our ambition, accelerate the change, and connect the circular economy to climate change mitigation as a possible solution. Winning solutions are simply not created using the old way of doing things, but rather by demanding diverse cooperation between the public, private, and social sector as well as through persevering effort and commitment.

To achieve fundamental social change, a circular economy must be advanced by governments in a coordinated manner with sufficient resources allocated to support the change. Acknowledging the necessary timetable of uninterrupted progress is also critical. Shifting to a circular economy requires a parliamentarian effort that spans multiple terms of office. Currently, Finland's circular economy goals are embedded in the government's overarching agenda and in strategic programs implemented by the ministries.

Sitra is now preparing a playbook for governments and international communities to establish their own road maps for the transition. It is a combination of toolkits, concepts, and lessons learned from the pioneering years of work at Sitra. For those developing similar guiding documents, we share the following lessons:

01 Cooperation is the starting point and a requirement for progress

Change is difficult to achieve without listening to all stakeholders, securing broad commitment, and encouraging ownership of the process. Invest in the dialogue in different ways. Meet a variety of influencers from all areas of politics, government, research, economic life, and civic organizations. Cooperation is based on trust. Make sure that the entity sketching the road map is an esteemed and neutral agent that puts effort into making the change fair and just. Invest in international cooperation. In that context, it is also worthwhile to include materials in English to expedite international engagement.

02 Make sure the road map balances concrete action with flexibility

At its best, a national guiding document for circularity is a combination of strategy and concrete action plan. If it lacks an action plan to get started, it may cause the practical implementation to be considerably delayed.

03 Form a conceptual framework

Invest time in formulating a comprehensive situational picture or conceptual framework to have a baseline understanding of your country or area. Consider the framework's most important observations. In addition to the scope of your own country, also clarify the international scope of action for other countries seeking to engage.

04 The road map must be agile to stay relevant

Make an updatable version of the road map so that it does not expire immediately. Continuous adaptation through supplemental actions is necessary to address changing needs.

05 Create measurement indicators, monitor development, and set stages for the journey

Establish a clear set of indicators to measure progress toward goals and assess progress on a regular basis to capture lessons learned and adjust as needed. Chart the results, ensure the level of ambition is realistic, hasten change, and clarify the big picture as necessary.

06 Invest in the execution

Even a good road map or strategy can trip up on a shoddy execution. Ensure the interventions are coordinated by a competent party with the skills and resources to act as the driver of change.

07 Make participation possible

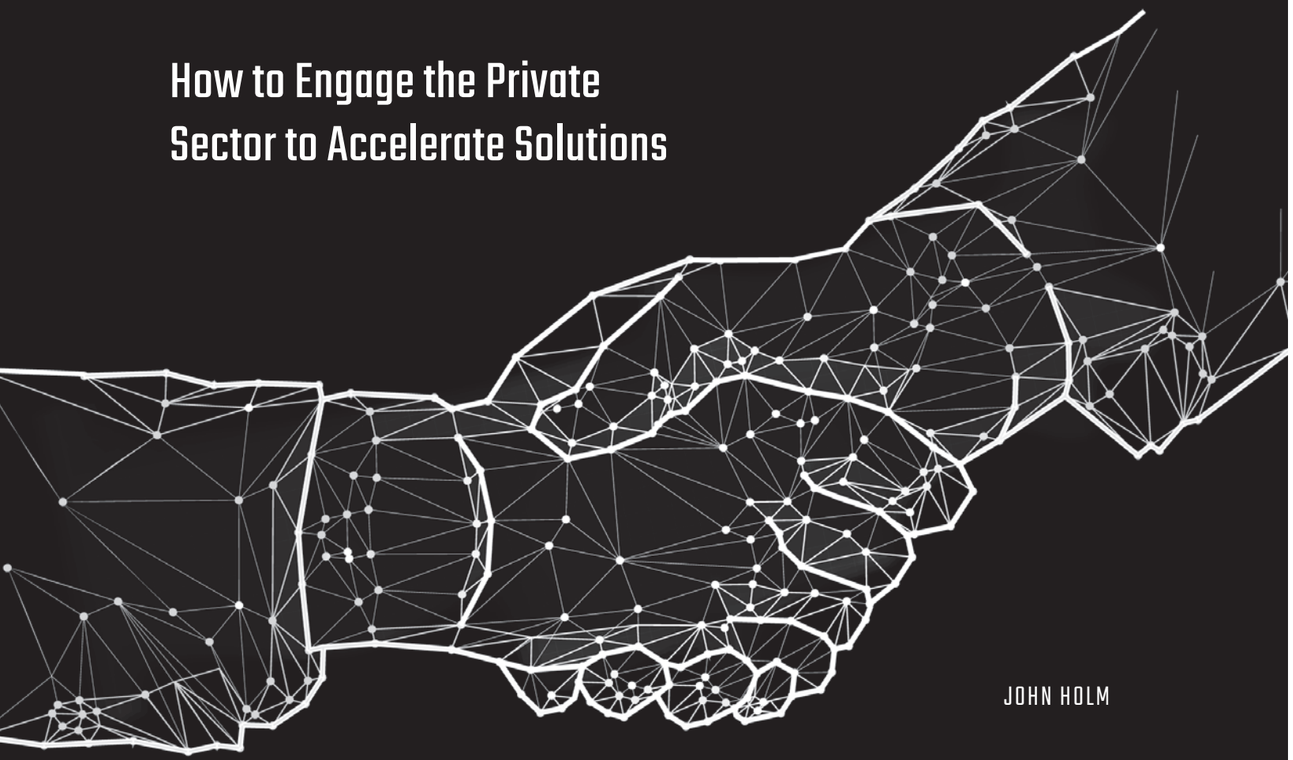
Companies, government, civil society, and individual citizens are all needed for the change to take root and grow. Instigate broad participation via open workshops, online commenting, or events targeted to different stakeholder groups. By inviting participation, you will also retain stakeholders.

Moving forward, Sitra will continue its work with a more global focus. We see international cooperation with pioneering countries and organizations as key to achieving a participatory circular economy. The World Circular Economy Forum 2019, held in Helsinki on May 3–5, 2019, focused on how emerging circular solutions can be widely scaled for the equitable distribution of their benefits.

With these lessons, governments, companies, and civil society can start down the exciting path toward a society where a good life is no longer achieved by simply producing more and more goods. It is vital that civil society takes these lessons to heart and acts to achieve the long-term sustainability of our planet earth.

Igniting Systems Change through Partnership

How to Engage the Private Sector to Accelerate Solutions



JOHN HOLM

Transitioning from a linear to a circular economy requires a seismic shift in the way we produce, consume, think, and behave. For a systems change of this magnitude to truly take root, the public, private, and social sectors must coalesce around a common circular vision—one that is inclusive of all communities, at all scales. While each of us has an important function in the transition, the role of the private sector, our economic engine, will be the ultimate catalyst for unprecedented change.

Business' adaptation to a circular economic system begins by acknowledging the real social, environmental, and economic burden of wastefulness, then scaling profitable reduce and reuse processes, goods, and services.

In an era of hyperbole and empty rhetoric, where terms like "corporate purpose" are on the lips of every business leader, the circular economy transition provides a real opportunity to demonstrate authentic and inclusive stakeholder engagement and deliver ROI together with environmental stewardship.

Achievement of such a bold vision is possible, but it requires multi-sector partnerships guided by a systems approach.

In a remarkable recent example of cross-sector partnership, The New Plastic Economy initiative—organized by London-based Ellen MacArthur Foundation and supported by corporate giants including Coca-Cola, PepsiCo, and Unilever, as well as the UN Environment Programme—has persuaded plastic-dependent companies to reveal for the first time just how much plastic they use each year. The tallies are staggering, led by Coca-Cola at 3 billion kilograms, PepsiCo at 2.3 billion, Nestlé at 1.7 billion, and Unilever at 700 million. The New Plastic Economy's goals include eliminating some problem plastics and committing to 100 percent "reusable, recyclable, or compostable plastic packaging" by 2025.

In most cases, however, the private sector has not yet demonstrated a sense of urgency to accelerate the circular transition, investing little in reduce and reuse business models, and in some cases doubling down on the take-make-waste ethos. In fact, despite the spotlight on plastic pollution, plastic production is expected to increase 40 percent over the next 10 years. The COVID-19 pandemic has, in fact, exacerbated the challenge, as single-use plastics are now promoted as the hygienic approach for consumers. Even progressive cities such as San Francisco are banning reusable bags for the sake of public health. A recent article in Rolling Stone estimates the environmental cost in 2015 of consumer plastic products and packaging at over $139 billion. Without a course correction, that figure will soar to $209 billion by 2025. This business-as-usual mindset has left many citizens debating the private sector's true motivations and questioning whether it can be part of the solution at all.

While there is ample evidence to justify the public and social sectors' decision to exclude some of the world's largest polluters from circular economy multi-sector partnerships, the sheer size of their impact makes them impossible to ignore—particularly if we are committed to wholesale systems change.

The question is not whether we should entirely dismiss traditional polluters like big oil and big soda and focus solely on circular halo brands like Lush and Patagonia, but rather how can we authentically engage these industry titans and steer them into partnerships that advance common interests.

As a nonprofit with 30 years of experience working at the intersection of public, private, and social interests, PYXERA Global recognizes three key ingredients when partnering with the private sector to leverage the power of business to address "solvable problems."

01 Engage the corporate partner(s) on the specific reduce/reuse/recycle interventions that stimulate ROI and result in positive environmental impact

When designing a circular partnership, it is essential that corporate partners engage on circular interventions that can drive profit and capture market share. By engaging the business units in solving a social problem—in this case progress toward a circular economy—the ROI reinforces the circular investment, allowing for a deeper and more transformative impact on a social issue. For example, Adidas partnered with Parley the Oceans to design, manufacture, and distribute shoes sourced from ocean plastic. What originally began as a pilot in 2015 has now transformed their entire business model. Highlighting this transformation, Adidas recently announced that by 2024 every Adidas shoe will be made from ocean plastic. This first-mover approach has sent shockwaves through the athletic shoe industry with Puma recently announcing a new line of recycled plastic shoes and Reebok launching plant-based performance shoes made from castor bean oil, eucalyptus tree, algae, and natural rubber. Even Nike got in the game, launching their Space Hippie vegan shoe made from recycled material collected from the waste stream.

While a handful of early adopter manufacturers race to innovate in the reduce/reuse/upcycle space, the world's largest plastic producers are not incentivized to quickly pivot to circular interventions due to large-scale investments in new resin production and a business model that is still dependent on a linear system. The relationship between reduce interventions and business growth is counterintuitive, yet plastic producers do have an opportunity to leverage their vast resources and engage in strategic partnerships with the public and social sectors to overhaul the existing waste management infrastructure. In doing so, efficient waste streams can optimize the sorting of valuable resources like aluminum and paper, while also providing a transparent marketplace for plastic that can be transformed into new products. While in the mid-to-long term, plastic is not the solution, reimagining the world's waste management infrastructure is a necessary component of the circular economy and a clear focal area for the plastic industry to meaningfully engage.

02 Validate internal changemakers in corporate settings and hold them accountable

An often overlooked but critical component in creating meaningful partnership, in any context, is the acute understanding that partnership is cultivated by people, not just organizations. In curating circular economy partnerships, it is wise to target internal corporate actors who have the passion, influence, and ability to spark change from within their organization and deliver meaningful value to both business and society. When evaluating whether to engage a corporate partner in a circular partnership, identify the people within the organization who share a common circular vision and a set of ideals that align their work with the engagement.

Once the internal champions are identified, work closely to help them secure key wins and give them the necessary internal support that position you to become an ally for their success. In doing so, the trust and rapport developed allows honest and critical dialogue that can inspire real change and provide the credibility necessary to further the partnership. There will be areas of disagreement, and that's okay. Like life, partnership is messy, but if you are laser-focused on a shared vision, substantial progress is possible.

03 Actively engage in systemic circular partnerships

The program lead for The New Plastics Economy, Sander Defruyt, admits that project members have shown "an enormous lack of progress" on pioneering essential models for reuse. "The world cannot recycle its way out of this problem," says Defruyt. The circular economy is "not about keeping today's system and increasing the recycling rate. It's about fundamentally changing the system."

Complex problems call for complex solutions. The circular economy transition requires the best of the public, private, and social sectors' collective vision and influence. Yet today, most of the corporate interest in circularity focuses primarily on the state of recycling, whether that is the percentage of recycled content in packaging, the open misrepresentation of what is categorized as being recyclable, or the horrid state of the world's recycling infrastructure. To combat this limiting approach and account for the complexity of the challenge, circular economy programming should be designed from a systems perspective. This way, you are maximizing the power of your partners and providing a place at the table where they can authentically engage.

Highlighting the systems approach, PYXERA Global recently launched its Zero Waste Community framework in collaboration with First Mile, The 5 Gyres Institute, and Arizona State University Sustainable Solutions Center. The concept focuses on creating localized zero plastic waste communities using a reduce/reuse/recycle approach in diverse geographies, cultures, and economies around the globe. Once the community is selected, the partners follow a three-phased approach:

ASSESS: Assess the community's waste management infrastructure; the population's behavior regarding waste reduction and reuse; public sector incentives and investments in circular economy activities; and finally, the private sector's investment potential.

INCUBATE: Based on the assessment outcomes, the partners implement interventions that can be tested to drive potential revenue growth such as new reduce and reuse startups and direct waste-to-product models, among other social enterprises. Interventions also target behavior change by testing new public sector incentives and community education campaigns around reduce/reuse/recycle behaviors.

SCALE: Successful interventions are tested in new markets, always with an eye toward globally-scalable innovations given how ubiquitous plastic waste materials have become.

The model's complexity allows for corporates from all sectors to find entry points that engage their business. Whether it is a cosmetics company looking to innovate on bio-based sustainable packaging or a chemical producer wanting to turn recycled plastic into bricks for construction, the Zero Waste Community approach provides a foundation for companies to purposely engage on closing the loop.

In the absence of legislation at the federal level to promote and enable circular economy solutions in business, companies are guided by free market forces to justify a circular economy transition. Given this hard truth, it is critical to quickly identify the corporate partner's circular economy ROI and ensure it integrates with the overall project design. While the current system is broken, a new paradigm is possible only if we align the interests of all sectors and encourage broad stakeholder participation in the process. No matter one's impressions of collaborating with big polluters, these companies are critical partners in the transition.

Junk in Gyre

Circular Economic Solutions to End Plastic Pollution

MARCUS ERIKSEN

Captain Charles Moore released the towline that had dragged our Junk Raft 60 nautical miles off the coast of California.

The raft, which floated an old Cessna airplane atop 15,000 plastic bottles, aimed to reach Hawaii and bring awareness to an issue not yet on the minds of the public and policymakers. It was the summer of 2008, and 88 days and 2,600 miles later we landed in Waikiki, Hawaii, outrunning four hurricanes and pulling plastic out of fish stomachs. The world was paying attention, but the unanswered questions were stacking up.

How much plastic is in the ocean? Where is it? Is it causing harm? And more importantly, what is the solution? What we found is that every question brought us back to land.

We put the raft away and took to the sea again, this time to research the global ocean, sailing across each of the five subtropical gyres—those spinning currents that occupy most of the ocean—aggregating and crushing plastics into smaller fragments. It took five years to sail around the planet. As the public learned of trash in the ocean, they exclaimed "someone go get it!" and in the years ahead, we received almost weekly proposals from well-intentioned inventors and entrepreneurs to clean up what the media had wrongly dubbed "islands of trash." The hordes of "clean-uppers" with a remediation mindset set out to convince the world that picking up trash will solve the problem for good. To date, these efforts have all failed.

What the science tells us is that most of the large plastic trash entering the ocean from land, over half of it, is washed back ashore, and what flows into the gyres is later ejected onto remote shorelines in a decade or less. It's the small stuff that sticks around a little longer, creating what we call "the smog of the sea," but even that is transported to the seafloor or seashore in time to become locked in sediments. So then why is there still trash in the ocean? Well, it's simple—it's because the trash going in doesn't stop.

While remediation by the clean-uppers plays a role mitigating the ecological impact of marine debris, it will never cease the harm. Too much focus on remediation is also a dangerous diversion when it redirects awareness and resources away from a preventative strategy. As history shows, prevention, often driven by smart policy, is the only viable long-term solution. Remediation is certainly important; we do need to cleanup superfund sites, but it's all hands on deck to pursue a preventative strategy first, to cease the harm.

In the 1960s and 70s, when the burgeoning environmental movement was in full swing, three global issues took the stage: the hole in the ozone layer, smog over cities, and tar polluting beaches worldwide. We witnessed fascinating and quite similar evolutions on each issue beginning with tremendous public outcry following the first science papers raising the red flag. Stakeholders scrambled to deal with an environmental and media nightmare. Many of the polluters took a defensive posture with counter-claims while policymakers scrambled to appease citizen groups. Everyone was asking the scientists to fill the knowledge gaps.

The hole in the ozone layer was widening, smog was blocking out the skies, and when my family went to the beach along the Gulf Coast we took a bottle of nail polish remover with us to remove the blobs of tar that inevitably stuck to our feet.

When the funding flows, science gets done, and with each of these three issues the science pointed to a preventative strategy. International policy banned CFCs, and the ozone layer is healing today. Nations passed strict emissions regulations for cars and power plants, and city skies cleared. International maritime law prevented oil tankers from rinsing oil sludge into the ocean, and the floating blobs of tar ceased to come ashore in droves. In each case, prevention worked, and the planet healed.

Of course, there were clean-uppers back then with outlandish techno-fixes, like pumping ozone into the atmosphere or putting giant filters on the tops of skyscrapers to suck up smog. They claimed to be the ultimate solution, but they faded away quickly. With good science driving good policy, a preventative strategy prevailed.

But plastic pollution in the 1970s went a different route. Do you remember the Crying Indian Campaign, with Iron Eyes Cody watching a plastic bag tumble across the road, then looking to the camera and shedding one tear as a banner appeared proclaiming, "People Cause Pollution…"? Industry-funded ad campaigns and nonprofits like Keep America Beautiful directed the public narrative to focus on cleanup and recycling, purely a remediation strategy. Ads blamed people for plastic pollution. At the same time, efforts to regulate the design of plastic products and packaging to be recyclable were aggressively fought and beaten. Today, the assault of plastics on the environment and remote communities worldwide is abysmal, and recycling globally is struggling and collapsing.

The myth of recycling was made apparent in 2018 with China's ban on American plastic waste exports. The United States was stuffing half the plastic waste collected from 300 million households into empty shipping containers heading back to China. That has come to a grinding halt, upending the commonly-held myth of recycling and sending American cities scrambling to do something to avoid the expense of landfilling it all. Within weeks following China's policy, recyclers rushed to find new countries willing to take what we in the United States could not manage otherwise. A few did, including Vietnam, Malaysia, and India, but the commodity of trash is losing favor there too.

Without design standards for products and packaging to be recycled, the world is now awash in worthless plastic. Many companies today boast lofty goals like, "Our stuff will all be recyclable by 2025," but here's a reality check: It's all recyclable if someone pays for the existing technology to do it! It's not technology, it's economics. Recycling for many products and packaging fails by design, because the true cost of collecting, sorting, and deconstructing packaging to get at a few micrograms of plastic out of it is cost-prohibitive. Also, without regulation to require the use of recycled plastic, to create a market for it, recycled content cannot compete with low-cost new plastics expected to flood the world in the decades ahead.

We find ourselves at that same crossroads with plastic pollution today as we were four decades ago. Will the world zero in on a preventative strategy, or continue to follow the fiction of remediation?

To win, there are three preventative solutions that will get us there:

01 A design revolution must prevail.

"Plastic is the lubrication of globalization," as Captain Moore says. But packaging and shipping stuff can be done smarter, with less plastic, less waste, and in many cases without plastic at all. Innovators in the private sector are designing new ways to move goods to market without waste. Companies like Vessel and Go Box create networks of markets, restaurants, and coffee shops that honor the same reusable containers anywhere you go across the city. Or consider Repack, with its reusable boxes that Amazon could easily adopt. A design revolution would significantly reduce the avalanche of worthless plastic waste that's costly to manage, is rapidly filling our landfills, and is incessantly leaking into the environment. It will take the will of the private sector and courage of our policymakers to make it so.

02 There is a new bioplastic in town.

Polyhydroxyalkanoates (PHA) are the only material that mimics what plastic can do and passes the "banana peel test," meaning that as a thin film it has a similar rate of true biodegradability in your home compost, a river bank, roadside, or in the temperate ocean. The world is plagued with thin film polyethylene and polypropylene used daily in billions of sachet packets and disposable diapers, candy wrappers and chip bags, wet wipes, and anyplace else you can think of where film plastics are being used today. Companies using polyethylene and polypropylene don't want to give them up because of the product security benefits they give, but PHA is an all-around better choice. What's holding it back is the ability of companies to make enough to meet demand, and market confidence that it truly works, but that's changing fast. Companies like PepsiCo are currently pioneering the perfect potato chip bag made from PHA, scheduled to hit the store shelves soon. (Note to self, invest in PHA).

03 Zero waste your space.

Zero waste is simply the result of a true circular economy. When you get it right, there's nothing left to bury or burn. The zero waste movement is strong, for example a network of organizations called Break Free From Plastic has nearly 2,000 organizations aligned under one set of values, including the simple idea that by designing waste out of the system, people and the planet suffer less. In the Philippines, the Mother Earth Foundation has installed zero waste centers in over 300 villages, where the typical giant burn pile on the edge of town has been transformed into a composting facility and recycle center, where former wastepickers can now bring materials they collect door-to-door to the zero waste center for cash. The recyclables are cleaner, the biodegradables make good compost, the city saves money with fewer trash trucks on the road and landfills to manage, and the community is more connected. The residuals, that is what they can't recycle or compost, is where the conversation starts about how to improve that product or its service so there is no legacy of waste. The zero waste community model is the textbook definition of a local circular economy.

Collectively, these three ideas are about designing new materials, products, and systems for the circular economy. When I rafted across the Pacific Ocean, we lived for three months on a 20'x20' world, nothing wasted, a circular economy by default, floating alone on a plasticized sea. When Jim Lovell looked back on the earth from Apollo 8, he saw a fragile planet alone on a sea of stars, with no place for waste. Why should CEOs see it any different?

PROVING *LESS IS MORE* AT LUSH

Purposeful Profit in a Circular Business Model

KATRINA SHUM

Commerce as we know it is going through a rapid evolution. The convergence of new technology, emerging social platforms, constrained natural resources, and the evolving values of each new generation is changing the way we do business—whether it's the sharing economy, the rise of products as a service, or the retail shopping experience itself. But the accelerated growth of the retail industry has come at a cost. There's no doubt about it—we are in the midst of a plastic pollution crisis. We've all seen the viral images of turtles with straws stuck up their noses, or whales washed up with bellies full of plastic bags. And one of the biggest contributors to this plastic crisis is the space we operate in: the cosmetics industry. By nature, cosmetics packaging is small and intricate, made up of many different parts that are difficult to clean after use, resulting in the majority of this packaging going directly into landfills. Consider that the cosmetics industry brings in a booming $500 billion every year and imagine the waste that is created by default. But it doesn't have to be like this. As businesses, we can manufacture and sell products with no packaging, create closed loop recycling systems, and collaborate with suppliers to create innovative solutions for reducing waste—all while thriving.

A family-owned and operated bath and beauty business, Lush began as a single storefront in Poole, England in 1995. With no money for fancy wrapping or individual molds, Lush co-founders Mark and Mo Constantine would hand pour soap into upcycled drain pipes or lunch pails, then cut slices for customers to order. These humble beginnings ignited a continual cycle of innovation that has driven the brand forward for more than 30 years and continues today with the evolution of more "naked" products that require no packaging at all.

The global packaging industry is set to reach over $1 trillion by 2021. What if businesses invested that money into the products themselves rather than what is wrapped around them? The waste hierarchy is well known, yet we struggle as businesses to follow it—pushing blame on cost or customer convenience. How do we start with refuse, rethink, and redesign in

our products and packaging, before we step down the hierarchy? How can we tackle reuse and recycle in a way that is both meaningful and impactful? Designing for sustainability and zero waste can be challenging with multiple stakeholders and competing interests throughout the lifecycle of a product. Who designs the product may be different from who makes it, or who sells it, or how it's used. Different business models and organizational structures can be conducive to supporting zero waste, closed loop goals.

As a vertically integrated business at Lush, we're in a unique position to embed our values and zero waste philosophy throughout our value chain. We still invent our own products, manage our own supply chains, grow some of our own raw materials, own and operate our manufacturing and distribution facilities, and run our own retail shops. Now in 49 countries around the world, our creativity and agility—along with a strong base of customers who share our values—has allowed us to push boundaries, innovate, make mistakes, learn, evolve, and bring to market packaging-free products that prove what is possible.

As businesses that bring products and packaging into our customers' homes, the private sector has a responsibility to think about how we lead the transition toward zero waste living. Whether you work in product innovation, packaging, or marketing, we each have an opportunity to change the habits and the dialogue in society around waste in our everyday living. Over recent years, we have significantly expanded our naked or packaging-free range by reformulating products to reduce their water content, resulting in solid versions of products such as shampoo, shower gels, body lotions, and toothpaste. We invented our shampoo bars back in the late 1980s and in the last five years alone we have sold over 6.5 million shampoo bars in North America, saving 19.4 million plastic bottles from being produced. That's approximately 535 tons of plastic avoided, or about the weight of five blue whales.

Whether you work in product innovation, packaging, or marketing, we each have an opportunity to change the habits and the dialogue in society around waste in our everyday living.

With a growing range of naked products came an opportunity to evolve a new retail experience with the roll out of Naked Shops in Milan, Berlin, Hong Kong, and Manchester. Naked Shops are our way to re-imagine what a store without any packaging could look like. How do you list ingredients without a label? How does the customer find directions on how to use the product? Leveraging technology, we have developed the Lush Lens App, which allows customers to use their phones to scan products and get the typical information they would find on a physical label, along with engaging and interactive content about the ingredients and stories behind them.

Moving down the waste hierarchy is reduce, reuse, and then recycle. When it comes to packaging, reduce and reuse can present simple cost savings. Reducing the thickness of bottles or minimizing the use of unnecessary packaging can reduce the cost of resin and materials. Promoting reuse options such as reusable containers or reusable giftwrap can generate initial revenue and help reduce packaging costs if we set up the means for them to be properly reused. When it comes to recycling, businesses can impact the larger systems level by sourcing post-consumer recycled content (PCR). Generating significant demand and putting our dollars toward PCR content rather than virgin resources provides the market signals and funds necessary to support all players in the recycling and processing of those materials.

For the products that do still require packaging at Lush, we have been sourcing 100 percent PCR content for all our plastics and 100 percent recycled paper for over a decade. Our buyers have had firsthand conversations with paper mills about the real struggles of keeping the recycled content supply chain in operation; they have heard these conversations evolve over the years without adequate demand for PCR content. We have worked for over a decade to find, connect, and support suppliers and processors throughout the chain who can source, grind, process, and extrude packaging that meets FDA and other quality requirements. As businesses, we can all play a role in supporting a circular economy at the macro level by simply sourcing recycled content.

In addition to supporting at the macro level, businesses also have an opportunity to create circular systems for their own packaging and provide customers with a direct and transparent way to ensure their packaging is being properly processed and recycled or repurposed into new items. Lush started the Black Pot program in 2008 when global recycling rates were very low. Through this program, customers can bring back five empty black pots from any of our products in exchange for a free face mask. Black pots, the packaging for some of our haircare, skincare, and shower products, returned by customers are shipped back to our factories where they are consolidated and sent to be chipped, washed, pelletized, and remolded into new black pots.

The reverse logistics (the process by which we recapture the value of post-consumer material) for this program has not been easy. It challenged us to rethink our black pot supply chain that had been set up in Asia. Through many conversations, we developed meaningful partnerships with local processors in Vancouver and Toronto, located within hours of our factories where our products are made. By fostering these relationships, we were able to localize our supply chain and keep our black pot recycling program within North America. With limited promotion, the program currently has a 17 percent return rate, which allows each new black pot to be made with roughly 10 percent resin from old pots and the remainder from 100 percent PCR resin.

In addition to customer-facing programs, businesses also have an opportunity to initiate waste reduction and circularity programs upstream with their network of suppliers. As we have been tackling zero-waste goals in our manufacturing and distribution facilities at Lush, we recognized the need to engage our suppliers in reducing the amount of unnecessary packaging materials they send into our facilities. Including packaging questions in traditional supplier surveys and focusing on reuse opportunities with local suppliers is a good place to start. Over the past few years, we have found various reduction opportunities by simply initiating conversations with suppliers and sharing our zero waste goals. We've eliminated the soft plastic baggies that used to cover each of our reusable metal shampoo and lotion containers, we have worked with suppliers on larger volume containers to eliminate many smaller containers, and we've successfully tested a few reuse programs with local suppliers.

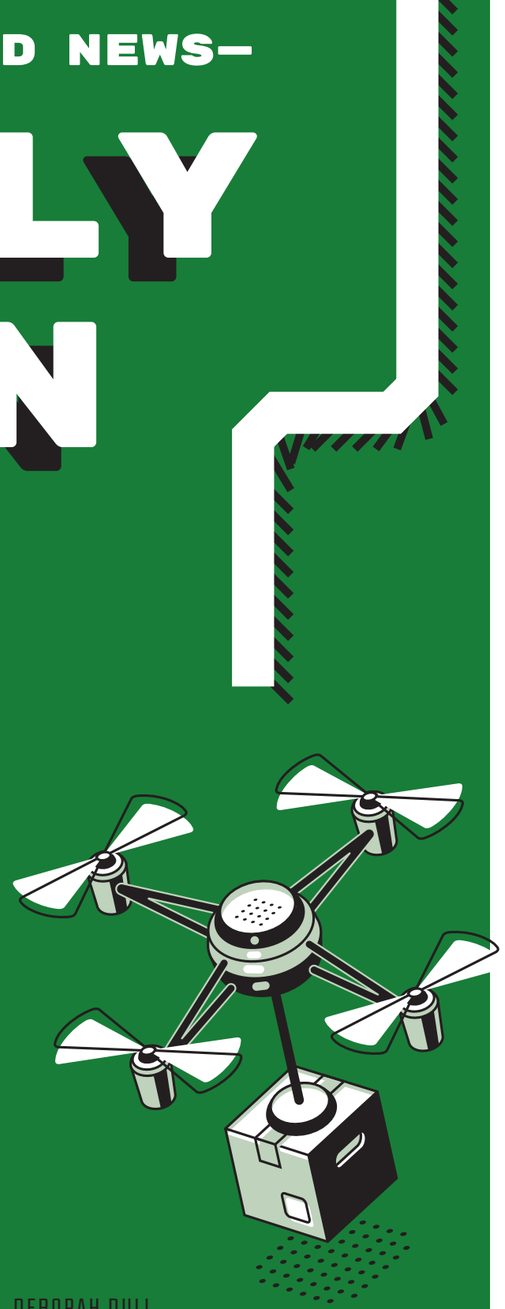
One recent win was a cardboard box reuse program with our black pot supplier. Through our annual waste audits, we noticed that cardboard was 47–55 percent of the discarded material being generated in two of our production rooms. Our cardboard box reuse program allows us to reuse boxes an average of five times, saving roughly 9,000 kg of cardboard annually with the potential for another 17,000+ kg. While reducing cardboard may not look good in the way companies typically calculate and communicate waste diversion percentages, reducing the overall discarded materials is the right thing to do and has encouraged us to rethink how we measure and value true waste reduction and reuse efforts.

At Lush, we look to nature for inspiration. Similar to keystone species within larger ecosystems, we see the opportunity to be a catalyst for change and have a disproportionately positive impact on our industry to transform bathroom habits and routines around the world. Whether it's working with our network of suppliers or bringing packaging-free products to market, as businesses we can all have a positive ripple effect in all that we do—in the decisions we make, the ingredients we put into our products, the people we do business with, and the voices and values we amplify. In truth, it's not the easy way. But if all of us use our business influence for good to raise awareness about waste issues, challenge industry working groups, and support advancement of government policies, then we can collectively have a much greater positive impact on creating a cleaner, more sustainable world.

YOU NEED WHAT? GOOD NEWS—

SUPPLY CHAIN DOES THAT

A Practical Guide to Including the Harnessing Power of Supply Chain in Your Circularity Make-Over



DEBORAH DULL

So, you're starting a circular business model? Is it a model where no inventory is sold, but inventory is needed to offer a service? Supply chain does that. Or is it about finding a new type of secondary material that's high in quality and cost-competitive when compared to current, virgin materials? Supply chain does that! Or perhaps it's a take-back program to remanufacture and resell items? You guessed it! Supply chain does that, too. Supply chain integration is a critical success factor in circular business models. Read on to explore the role supply chain capabilities must play in successfully designing, launching, and sustaining circular business models at scale.

The circular economy is based on three principles: design waste out, circulate materials and resources, and regenerate natural systems. The underlying premise behind the circular economy is that businesses that are strategically anchored in these three principles will be profitable, hedge their risk on raw material pricing, and add trillions to the global economy by 2030, by decoupling financial growth from limited natural resources historically required for growth. However, for these business models to be successful, the supply chains that support them must be ready, recognized, and expected to offer their capabilities in a new way, and at scale.

Ultimately, the circular economy is about inventory—extending its life, reusing it, repurposing it, or eliminating the need for it altogether. Supply chain is responsible for inventory, and a global, circular economy requires supply chain innovation beyond its current scope in the linear economy.

This brief guide provides starting points for leveraging the capabilities and problem-solving prowess of your supply chain colleagues.

Supply Chains Possess the Capabilities You Need to Go Circular

Let's explore supply chain capabilities that support the circular business models referenced in the accompanying infographic. This section shares stories about real supply chains delivering real capabilities for circularity, today.

Supply Chain Capabilities: Physical & Digital Infrastructure for Inventory

Move inventory close to the customer. Lean supply chains move inventory and decisions as close to the customer as possible. Proximity reduces the time between inventory decision and actual customer need. Because more inventory is typically required to buffer against uncertainty, decreasing the time decreases the uncertainty, which decreases the need for inventory.

Edwards Vacuum, a leading developer and manufacturer of industrial vacuum pumps, strives to locate their remanufacturing shops close to their customers' factories. This reduces waste in transportation, translating to reduced contamination risk, reduced risk of damage, and a lower carbon footprint.

Create and share data about inventory. Ah, data. Everyone's favorite topic. Data about inventory—materials, costs, partners, locations, timing, quality, demand—these are all gathered and managed by the supply chain. The right technology platform is important, but the data itself is critical.

CHEP operates one of the world's largest circular supply chain systems. Their business facilitates the circulation of over 300 million shipping pallets and containers across 60 countries. Their platform acts as an "invisible backbone" of global supply chains, allowing their customers to participate in the circular economy in two ways.

First, the customer can reuse shipping pallets (there are nearly 3 billion pallets in circulation in supply chains in the United States alone). Second, CHEP pallets generate critical data that allows supply chain managers to effectively aggregate it and gain insight into inventory—data that is critical to supporting circular business decisions. Large quantities of data are available to CHEP as a result of their business model and the company is working to make this data even more useful to customers. In the future, data will be available not only through the logistics company, but also from the pallet itself.

The multinational chemical and consumer goods company, Henkel, has heavily invested in their supply chain's "digital backbone." With thousands of sensors measuring consumption in order to optimize operations, they use data to inform decisions about circularity—leaning out operations to reduce required inventory.

Not all data is the same! Edwards Vacuum finds that "data is meaningless unless you can turn it into insights." This requires domain expertise. Because of this, data sharing has become less secretive as trading partners acknowledge they rely on the knowledge of others to make sense of data.

The data in the supply chain can also be used to facilitate Product-as-a-Service (PaaS) models. Chakra, a business focused on digital solutions for the industrial world, sees this as they help their clients develop business models and go-to-market strategies for PaaS offerings. Their offering has been so successful that Chakra has launched Ventures Ecosystem, a value exchange platform that will enable these new business models to scale.

There are many discussions of artificial intelligence and machine learning in the circular economy. Entercoms, a supply chain control tower company, specializes in services and after-sales maintenance, which is a key part of extending the life of items and materials. Using data science and machine learning algorithms, they connect data across supply chains and apply data science, facilitating better forecasts and lower waste across the industrial spectrum. This strategy for improved asset recovery also translates into more savings for a company.

Managing Inventory Around the World

Reduce & eliminate resource requirements. Henkel's supply chain began their zero waste journey over 15 years ago. Since then, they have reduced their footprint and impact by over 50 percent. The supply chain does this! Their manufacturing facilities prioritize optimizing boilers, compressed air, and other manufacturing processes. "Zero waste to landfill" has been adopted by two-thirds of their 180 sites with the short-term goal of 100 percent globally. This requires clever solutions and new partners (found and developed by…? The supply chain!).

CHEP in Sub-Saharan Africa (SSA) developed circular approaches because they operate in regions with expensive base resources. To address compromised electricity infrastructure, they use natural and automated lighting, power correction devices, and energy-saver air conditioners. To conserve water at their reusable plastic crate plants, they not only harvest rainwater, but also use purification systems to clean and recirculate runoff from pallet wash bays. This way, no drop is wasted—it's all repurposed. Sustainable supply chain operations make this possible.

Circulate inventory. To make the best use of existing inventory and reuse items as many times as possible, a business must know a lot about that inventory. If they can't virtually "see" their inventory, or if they lack the ability to easily move it, they often end up buying or creating more to buffer the system. CHEP SSA addresses this. They offer businesses the ability to see and move their inventory. For example, in the rapidly developing smart farming industry in South Africa, the supply chains of growers can use CHEP to see their bin locations (orchard or de-greening room, loaded or unloaded). This allows them to make smart choices about how and when to circulate their bins.

At the end of the useful life of a bin or pallet, CHEP engages a "wider loop." Instead of sending this timber waste to landfill, they chip it and the material has a second useful life by other companies.

This is the heart of the concept: first reduce, then monetize. If lean management is about finding and eliminating waste, circular economy is about finding and monetizing waste.

Extend the life of inventory. Entercoms helps their customers re-use parts and assets by eliminating the need to manufacture a new part. This can be tricky because there are often several suppliers for the same spare part, leading to excess inventory. Entercoms uses unique substitution logic to help customers avoid buying new parts and rebalance stock levels across locations. This requires data from different sites to "talk to each other," taking into account forecasted needs and the cost of transfer.

Edwards Vacuum continuously maintains the products they produce. For example, an entire product may get taken apart once every year for maintenance to extend its life up to 20 years. The remanufacturing facilities improve efficiency, and thus reduce costs, through targeted scheduling of skilled labor, components, and needed consumables. Technological investments are critical. The Internet of Things (IoT), domain expertise, data science, and the right platforms predict product performance and proactively maintain assets, ensuring customer satisfaction.

> **Maintain multiple product generations.** Products go through several "generations." Edwards Vacuum have found their customer base falls along the generational spectrum of these products—some want new models; others are happy with refurbished products—so Edwards keeps 2–3 generations of product in their install base. As these generations mature, the supply chain capabilities inform product design. Over time this leads to modular products with lower variability, reducing response times and lowering costs. In addition, the installation period for upgrades is streamlined.

Creating Inventory Around the World

> **Locate and transform inventory.** The next generation of miners is emerging—instead of extracting resources like traditional miners, they locate resources that are already "detached." They look for plastics in the oceans and—I predict—will eventually "mine" landfills.

In order to recirculate items, the inventory must be located and transformed. In Australia, the team at Far North Queensland Plastics designed one product—a twin wall panel called ReGenWall® made from 100 percent recycled HDPE plastic—that has multiple uses. As a supply chain, Far North Queensland Plastics produces a single stream resin that can be recycled again. The extrusion line was manufactured by Telford Smith Engineering, and the mold tooling itself was built specifically to extrude continuously, creating more strength. Additionally, the byproduct of the manufacturing is captured and reused.

Getting Started with your Supply Chain

Three easy ways to get started leveraging supply chain capabilities. These are fairly painless, but likely require meeting new people:

01 **Locate and meet your supply chain team.** This team covers procurement, planning, sourcing, transportation, storage, manufacturing, remanufacturing, contract management, supplier management, inventory management, and more.

02 **Include members of your supply chain in design sessions.** Supply chain professionals are trained to design waste out of operational systems. Including them in all steps of the design and management process means listening to their perspectives, insights, and ideas.

03 **Pose a challenge to your supply chain.** Ideally, give the team time to solve a problem, and be dazzled with what they come up with. Do yourself a favor and avoid presenting crises to your supply chain—your solutions will be better for it.

A hearty thanks to several individuals who shared their perspectives and expertise to make this article based in reality rather than based (solely) in opinion: Alan Ifould and Alex Smith (Edwards Vacuum), Joshua Holmes (Vanden), Peter Desmond (African Circular Economy Network), Jenny Froome (SAPICS), Catherine Weetman (Rethink Solutions), Dirk Holbach (Henkel), Lesley Van Staveren (Far North Queensland Plastics), Susanne Yvonne Karcher (EnviroSense), Luke Smaul and Amalia Frank (Chakra), Sally-Anne Käsner (Circular Vision), Sharon Smorenburg (CHEP), Lance Johnson (Entercoms), Sarah O'Carroll (Ellen MacArthur Foundation)

THE BUSINESSES OF THE CIRCULAR ECONOMY

DEBORAH DULL

From a business perspective, the circular economy should be viewed as a new way to be profitable and create value.

Designing Waste Out

The first principle of the circular economy is to design waste out of the system. In addition to embracing traditional lean thinking and continuous improvement, new business models are emerging to reduce demand for natural resources and eliminate waste.

Some global companies have already realized the benefit of involving supply chain colleagues during product and service design. Supply chain professionals are trained to find and eliminate waste. Emulate these companies and include supply chain professionals in the design process; they have lots of practice.

- **Modular product design for focused repair & replace**
- **New technologies that meet exact requirements, such as 3D printing**
- **Use of byproducts as input for other products**
- **Platforms for sharing products and/or products as a service, where customers pay for using the product rather than owning it**

Keeping Materials & Resources in Use

The second principle of the circular economy keeps materials and resources in play, *forever*. This is the fun part, as there are so many materials that have already been detached from the earth and are ready for new lives—right now.

To build a business based on circulating materials, an organization needs to know all about those materials—their current and future location, their quality, quantity, and timing. Supply chain does this, so get ready to collaborate with these partners.

- **Extend item life span** (optimized maintenance through the Internet of Things, predictive analytics, optimized spare parts)
- **Resource recovery and transformation** (ocean plastics)
- **New technologies** (value chain trackers & tracking ownership)
- **Secondary materials strategy** (remanufacturing, take-back programs, materials exchanges)

Regenerating Natural Systems

The third principle of the circular economy is to regenerate natural systems, leaving the planet better than we found it.

Business models emerging under this principle require the physical movement of items—forward to customers, backwards to suppliers, and sideways to partners. Items may also need to remain chilled or heated, or have seasonal requirements. Moving items around the world in a specific manner is a supply chain's forte.

- **Bio-materials that add value upon composting**
- **Renewable energy sources at scale** (allow for undamming of rivers)
- **Natural production for new materials** (seaweed farming for bioplastics & packaging)
- **Reduce strain on natural lands** (new sources of protein: lab-grown, insect-based)
- **Circular fishing and farming**

IN WITH THE OLD

Reaching Critical Mass in the Reuse Movement

LAUREN PHIPPS

WE ALL LIKE SHINY, NEW OBJECTS. THE COOL FACTOR. THE NEXT BEST THING. For some, that's the appeal of circularity: a buzzworthy economic model that reimagines not just products and services, but the entire value chain and the underlying rules of engagement. It's a fresh take on natural capitalism, industrial ecology, the performance economy, and a number of other sustainability frameworks from over the years, each of which has offered a new interpretation of the basic idea that the economic viability and environmental footprint of our industrial systems can—and must—go hand in hand. Indeed, they are inextricably linked.

We're now in the early days of imagining a circular economy, and a growing number of the world's largest companies are adopting this framework to help shape environmental strategies and develop new, scalable circular products and services. New business models, new materials, new partnerships, new value propositions—a new economy at large. Across the board, the rhetoric and proof points surrounding the circular economy's expansion and maturation focus largely on the new.

But here's the problem: an over-emphasis on "new" and "scalable solutions" has, at best, overlooked, and at worst, co-opted and overwritten some of the more humble, community-based examples of effective circularity that are already thriving.

In my local group, I've acquired house plants, patio furniture, and cooking tools, and gifted an entire bed set, picture frames, and art supplies. Just this week, I've seen the successful exchange of a nursing pillow, seven feet of decorative black chain, Star Wars cookie cutters, and even an opened box of granola (they didn't like the taste), among dozens of other items that have found a new home.

While the process involves a bit more friction than tossing an item into the garbage, members of "Buy Nothing" groups and users of similar platforms like Nextdoor, Freecycle, or the free section of Craigslist receive a less-obvious benefit as well: a stronger sense of community, or maybe just a new acquaintance. As more modern and flashy solutions emerge to

Establishing an effective circular economy will rely on keeping what works, designing out what doesn't, and being creative to fill in the gaps.

In neighborhoods across cities around the world, the revival and evolution of the reuse movement assumes an important role in driving critical behavior change for consumers and their communities. Before we reinvent the wheel and fully embrace markedly modern circular solutions, let's not disregard what's already working.

A step up from knocking on a neighbor's door for a cup of sugar, "Buy Nothing" groups on Facebook allow community members to do just that. This localized goods distribution network creates a neighborhood-based gifting economy. Members can post items they no longer need, or request goods they're looking for, and neighbors will chime in with asks or offers—all without the exchange of any money. It's a simple approach to keeping usable items in play, no matter how specific.

modernize the redistribution of localized goods, many of the more high-tech apps have designed out the basic element of human connectedness, despite framing themselves as part of the "sharing economy."

Another example of a successful, community-based circular system is the library of things, a model that's popping up in cities from London to Toronto. In my hometown of Berkeley, California, the popular Tool Lending Library was established in the '70s as an offshoot of the city's public library system. The library allows residents to check out anything from table saws to pasta makers, just like you would a book. And when the average power drill is used for just a few minutes a year, the opportunity to increase product utilization and decrease unnecessary consumption is obvious.

There are of course also enduring professions like the local cobbler or seamstress, as well as newer "Repair Cafés" popping up to help fix, mend, and extend the useful life of perfectly good products, from boots to coats to toasters. Some companies are finding success in mimicking these models for their own products like Apple's Genius Bar and Best Buy's Geek Squad for electronics, as well as Levi's Tailor Shops for denim.

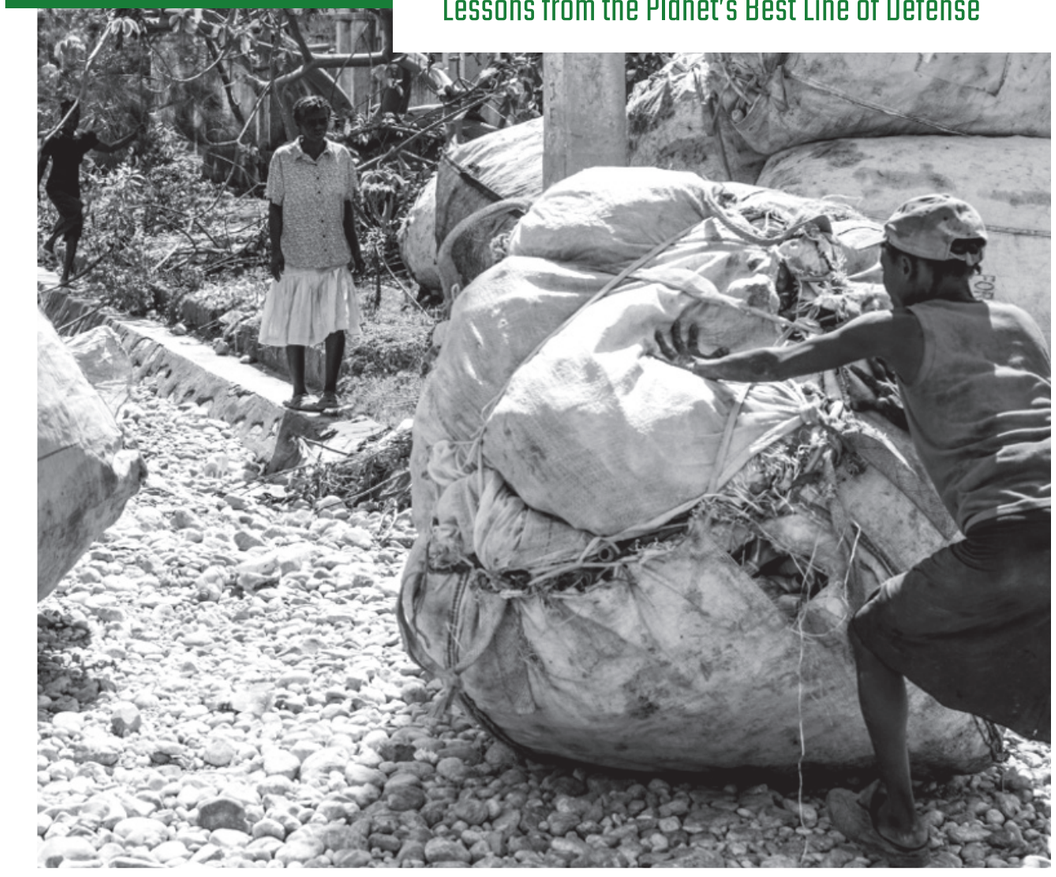
There's certainly nothing wrong with updating the old and reimagining the successes of a bygone era for the modern consumer. Just look at Loop, the Terracycle spin-off that's piloting reusable packaging at scale in partnership with some of the world's leading brands. Hitching its marketing scheme to the "milkman model," Loop is taking the environmental benefits of durable packaging and adapting an old model to the modern consumer.

Establishing an effective circular economy will rely on keeping what works, designing out what doesn't, and being creative to fill in the gaps. It will take imagination, ingenuity, and hard work. The fact is, our current, linear economy is built on thousands of innovations refined over decades, many of which are worth keeping—or, in some cases, resurrecting. Focusing only on the newest ideas and innovations could get us back where we started: an unsustainable world needing to return to basics.

And that would be an unfortunate circle to close.

Waste Collectors are the Heroes We've Been Waiting For

Lessons from the Planet's Best Line of Defense



IAN ROSENBERGER

WE ARE IN THE MIDST OF THE GREATEST TRASH CRISIS IN OUR HISTORY. This is cast in sharp relief against the horrors of climate change, unprecedented losses in biodiversity, and more recently, a global pandemic that preys, like all pandemics, disproportionately on poor black and brown people. All of this is currently lost somewhere within the loud-mouthed, hateful, spray-tanned folds of a body politic we've yet to figure out a way to unfriend. As a species, I'd say we have a lot on our plate. So, in the name of progress, now seems like a good time for some encouraging news.

Piece of Good News # 1 — The Solution Is Already Out There

It is important to remember that the plastic crisis, more than any of the other crises listed above, already has a motivated army of experts hellbent on solving the problem before I walk my 9-month-old daughter down the aisle. And it's not just all of us reading this!

There are at least 10 million humans that, while you scan this piece, are out there right now cleaning up the mess. They've self-organized incredibly elegant systems that in some places are collecting upwards of 90 percent of *all* non-organic waste. They're doing it without subsidy or policy intervention. Most of them don't use computers, and at least half of them don't have smartphones. Despite their expertise at saving plastic from the oceans in the face of extraordinary odds, they will likely never join us at a conference about plastic to tell their story or sit on a panel as experts. Nevertheless, while we *talk* about assigning value to waste streams, since iron began trading on the scrap market, they have been the ones inordinately successful at *creating* value. They are the true heroes of the waste crisis, and it's important we begin recognizing that more often than not, we are actually in their way.

Piece of Good News # 2 — This Team Is Field-Tested and Already Expert

Increasingly, we hear questions thrown around like, "How might we formalize the informal waste-picking sector?"

These chains have their problems—the ones our First Mile team solves most commonly include predatory lending, child labor, and unfair labor practices—but formalization is not one of them. Besides the obvious Manifest Destiny overtones, at First Mile we worry that talking about formalizing human-powered chains run by low-income men and women perpetuates a more modern and pervasive development stereotype: that the poor somehow require the adoption of a practice the rich have somehow already mastered. We've started to see the reality as being much different than that.

The recycling rate in the United States can be debated by other experts, but it is much closer to 0 percent than 100 percent. This isn't the case in many lower income communities. In these places, recycling culture isn't agreed on as an altruistic solution to a global crisis or a movement, but a means of putting rice on the table. Any waste that has value is picked up quickly, efficiently, and nearly completely.

Over time, incredibly elegant systems and supply chains have been self-organized that would make Waste Management or Recology blush. In Surabaya, Indonesia, communities (not always government) organize work for local collectors to come door to door and move all waste to staging areas where recyclables are sorted out from non-recyclables. In Ho Chi Minh City, Vietnam, many waste collectors have neighborhood routes that can be traded or sold upon retirement for cash to young up-and-comers. In Port-au-Prince, Haiti, when the value of PET bottles increased, many local collectors stopped collecting trash and instead began encouraging their neighbors to save it and drop it off to them at local aggregation points for payment—which both increased the safety of collectors and the quality of the material. The upshot? Yes, we can be helpful to this process, but candidly, we have so much more to learn from waste workers than they do from us. We believe that we could be listening a little harder to them than we have so far.

It's important to begin to think of the role of corporates, NGOs, policy shops, and social businesses like ours a little differently than we have. We don't have to "solve" the problem. We just need to help the good folks who have already solved the problem to spread their ideas around so that waste collectives everywhere can access them.

Piece of Good News # 3 — In Many Places, We've Actually Got the Problem on the Run!

The hard truth is that additionality, at least in the first mile, can actually be quite difficult to pull off. Good solutions have already been put into place by the people that experience the problem personally, every day.

The entrepreneurs we have the privilege of working with in cities the average American has never heard about have long understood the opportunity cost of differentiated collection pricing, plastics arbitrage, and buying and selling futures, and they've used these skill sets to very efficiently ensure everything of value is already collected. They didn't use a book to learn these things, they only knew that if they didn't figure something out, they were going to need to choose between which kid goes to school, and which one comes to the landfill with them in the morning to pick up an additional 10 kilograms of plastic bottles.

In light of this, we think it's important to begin to think of the role of corporates, NGOs, policy shops, and social businesses like ours a little differently than we have. We don't have to "solve" the problem. We just need to help the good folks who have already solved the problem to spread their ideas around so that waste collectives everywhere can access them. Then, we need to help accelerate progress. The best part of this approach is that if we do our part, it means better businesses and more money in the pockets of the folks on the front lines.

So, how do we do it? How do we speed up these processes to check this crisis off the list so all of the extraordinarily talented people reading this can move on to other cataclysms headed our way at breakneck speed? My team and I have spent almost a decade working in landfill communities, placing the poorest of the poor into jobs in the waste industry, working through child labor remediation, and more recently helping large organizations navigate these same waters for their supply chains.

Here's a playbook:

01 Leverage the minds of the incredible resources we already have.

I can assure you, the tens of millions of people around the world who are in this with us are exponentially more motivated than you or I to see recycling succeed. For most of us reading this, it's a professional win and the ability to say we were part of something once. Not a small thing, to be sure. For waste workers, when you're playing without an economic net like so many of them are, it's not an exaggeration to say that it is oftentimes life or death.

Human-powered waste chains are not something to remember to include. They are the solution. We just need to invest more heavily in them. Like any good investor, we should be having more honest and earnest conversations with these brilliant men and women in the first mile of waste chains about what they require from us to move more material and improve their businesses. Let's also use those conversations to figure out ways to add a little more agency and dignity to what can be dirty, dangerous work. We don't need to ideate around those solutions or convene any conferences, we simply need to bring a pen to the meetings and listen. When we do, amazing things happen!

02 Fund them in the language they speak.

If I had a dollar for every person who told me that we can't invest in the poor because they're part of the "black market" or because of the "cartels," or because there is a waste "mafia," I'd have all the dollars. Last year, scientists discovered a mountain-sized rock 4 billion miles from earth remotely from a spacecraft traveling 32,000 mph. Somebody grew a hamburger in a lab. A team of doctors cured a *second* patient of AIDS.

Humans may have had a rough run of things lately, but we're pretty impressive when we put our minds and hearts into something. I believe we can muster the creative resources to focus here and invest a couple billion dollars directly into the people who have been more successful than anybody else at solving the problem thus far, so they can end the crisis *and* join the global middle class. I'm not talking about social programs or handouts. I'm talking about loans that outcompete the loan sharks, equipment that increases the amount of material that can move to the processors, and the creation of a sizable and reliable end market for materials they can't currently sell.

I believe we can muster the creative resources to focus here and invest a couple billion dollars directly into the people who have been more successful than anybody else at solving the problem thus far, so they can end the crisis *and* join the global middle class.

When we invest in those areas, not only will we ensure more waste gets collected and more money ends up in the pockets of the people "in the arena," but we'll be building the agency and dignity that comes naturally with treating strangers as equals.

03 Focus on the materials that do not currently have a market.

Focus is so important right now, and I'm afraid that we are sometimes putting resources in the wrong places. I just returned from Indonesia where my colleagues and I discovered a rPET war happening in the Surabaya wasteshed (like a watershed, but for trash). Demand there has outpaced supply and the collection price for rPET is rising, driven by the end markets established by new recycling facilities coming online. As a result, my team and I were hard pressed to find much PET in the field. That doesn't mean it's not out there, it just means that there is now a clear mechanism and incentive in place in this particular wasteshed to ensure PET is eventually collected before it reaches the ocean.

This is happening in many Asian markets, and to a lesser degree in Latin America and Africa. Once a reliable and profitable end market has been created, waste entrepreneurs will finish the job. Our job then should be to help waste entrepreneurs in the first mile add a new revenue line to their P&Ls and develop a clear and reliable end market for ocean-bound plastic films and flexibles. All our resources should be directed at solving for the collection of these materials (and moving forward, the obsolescence of any designs that include single-use plastics).

04 Get out of the way.

When we say all our resources should be dedicated to solving for the collection of these materials, here's what we mean: There is a price at which <u>all</u> low-value materials can be collected by the existing waste infrastructure. There is also a price large processors will pay for these materials, provided they have an end market to sell to. We don't need to do anything differently other than adjust the market conditions slightly.

Currently, the price processors will pay is lower than the price workers need to collect profitably, so little gets picked up. This is an excellent place for big corporates to get involved. Call it voluntary extended producer responsibility. If they contribute the funds that balance this gross margin deficit for hard-to-recycle waste streams in the top 500 wastesheds globally, waste entrepreneurs will start showing up with it at processors immediately. We tried this with styrofoam in Haiti, and the network delivered over 4,000 lbs of styrofoam clamshell containers in less than two weeks. We feel confident that this type of intervention would have a significant impact.

I won't close with a sweeping conclusion. Instead, I'll keep it simple. In the time it took you to read this, millions of kilograms of plastic were collected globally by the incredible men and women on the front lines.

Let's get out there and help them finish the job.

RECYCLE

Ecological Imperative: Eliminate Single Use Plastic

JOHN HOCEVAR

IN 1985, A MASSIVE HOLE IN THE OZONE LAYER LARGER THAN THE UNITED STATES AND MEXICO COMBINED WAS DETECTED ABOVE ANTARCTICA.

Scientists had been raising alarms about the dangers of the chemicals responsible for the hole since the late 70s, but chemical industry lobbyists had been successful in calling for more research and analysis before action should be taken. While the discovery was not enough to persuade industry to stop opposing action, it was enough of a wakeup call that the international community adopted the Montreal Protocol just two years later, phasing out production of chlorofluorocarbons.

Now hailed as one of the best examples of international cooperation in modern history, today the US government estimates that the Montreal Protocol will prevent hundreds of millions of cases of skin cancer and cataracts and avert a 25 percent heat increase in our climate. Fortunately for all of us alive today, not to mention our descendants, governments acted quickly and decisively despite dire predictions from industry about unintended economic and environmental consequences.

We are at a similar crossroads today. While there is still much to learn regarding the impacts of the proliferation of plastic over the past 65 years, the science is now undeniably clear that the world must act immediately to reduce plastic production. More than 1,200 species have already been impacted by plastic pollution. Given their notable decline, seabirds, turtles, and whales have assumed the unfortunate role of flagship species in the campaign to end ocean plastics. Corals prefer to eat plastic than food, resulting in elevated disease and mortality at a time when corals are already on the brink of extinction. Contact with plastic impairs the growth and oxygen production of photosynthetic bacteria, which produce much of the oxygen in our oceans—and in our atmosphere. Scientists have begun questioning whether microplastics might also be responsible for the alarming decline of lanternfish populations, the most abundant species of fish on earth.

These are just a few glimpses into the awakening spreading across nearly all disciplines of marine biology. Most of what we know so far has come from scientists who did not set out to study plastic, but found they could not ignore the plastic they were seeing in the course of their research. It has only been in the past few years that scientists are designing studies specifically aimed at understanding the impact of plastic on marine life, the results of which are now emerging. Each week, publications reveal entirely new aspects of the damage this material is inflicting on our oceans.

A 2019 study published in Marine Pollution Bulletin estimates the economic cost of marine plastic pollution at up to $2.5 trillion per year.

At first glance, you might think that this time, industry is aligned and ready to take action. New collaborations, visionary statements, and feel-good ads assure us that the biggest producers and sellers of plastic packaging are committed to keeping plastic out of the ocean. Unfortunately, so far this PR blitz has largely been a smokescreen aimed at convincing investors and customers that everything is going to be okay. Coke, for example, has spent millions on advertising aimed at shifting responsibility to consumers while quietly acknowledging their intention to continue to produce billions of plastic bottles each year. Banners outside the UN headquarters in New York say “no more single-use plastic” while inside, the US delegation works to derail any effort to talk about source reduction. Unless we dramatically reduce plastic production, especially of single-use plastic, the coming tide of plastic pollution will drive species extinctions, degrade ecosystems, impact human health, and harm our economy.

As disastrous as plastic is for the ocean, the impacts do not stop there. We now know that plastic is in the water we drink, the food we eat, and the air we breathe. Chemicals commonly used in plastic packaging include known carcinogens and endocrine disruptors. No one wants to see whales wash up on our beaches with stomachs full of plastic bags, but plastic is as much about human health as it is about the ocean. We know more than enough to justify a precautionary approach for purely selfish reasons.

But instead of embracing the science and reducing our reliance on throwaway plastic, most of the companies with the largest plastic footprints are pretending we can recycle our way out of this problem. There is no excuse for being unaware that most plastic is not worth recycling from an economic or energy standpoint. A new assessment of plastic recycling in America makes clear that bottles and jugs are the only types of plastic that are widely recycled. No other types of plastic packaging meet minimum federal standards to be claimed recyclable. Most types of plastic waste have no value and no market—in other words, no place in a circular economy.

Unless we dramatically reduce plastic production, especially of single-use plastic, the coming tide of plastic pollution will drive species extinctions, degrade ecosystems, impact human health, and harm our economy.

If we spend enough taxpayer dollars, we could subsidize plastic recycling to increase recycling rates—but if we are going to invest years and billions of dollars, why not focus on real solutions? Instead of continuing to produce trillions of throwaway plastic items each year, knowing we will be stuck with the waste for centuries, the sensible answer is to shift to reusable, refillable, and package-free approaches. Simply replacing one type of single-use packaging with another is insufficient; a business model dependent on selling trillions of items a year that are used once and discarded is in urgent need of rethinking.

Doubling, even tripling plastic recycling rates would still not come close to stopping the flow of plastic into the ocean and our bodies. It might not even slow it. The petrochemical industry is in the midst of a $164 billion build out of new infrastructure, banking on a dramatic increase in plastic production even as they work to convince us all that we are on the same side. Most of the big brands are right there with them, focused more on increasing sales of current products than planning for the future. For companies like Coca-Cola, Nestlé, and PepsiCo, whose waste regularly ranks at the top in audits of garbage collected in beach cleanups around the world, this approach is unconscionable.

One of the more bizarre industry talking points is that plastic is good for the planet. Never mind what Greenpeace or other environmental organizations say, petrochemical companies claim they know best. The idea that because plastic is lighter than, say, glass, does not mean that plastic is not a climate nightmare. Plastic is made from fossil fuels and is a major driver behind the fracking boom. If the material ends up in a landfill or the environment, it releases greenhouse gases as it degrades. If it is incinerated, the climate impacts are even worse.

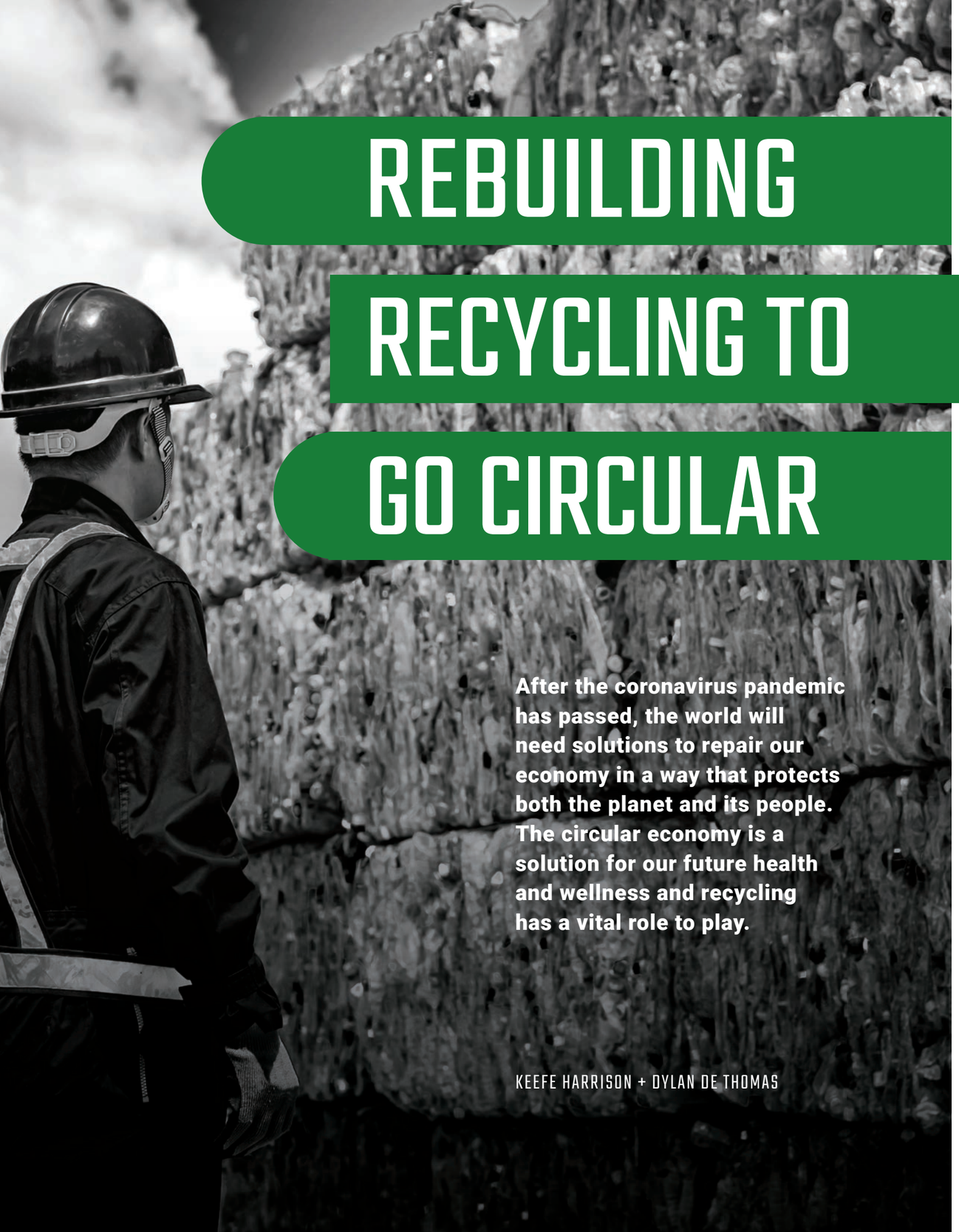
Crew members on board the Esperanza during the Protect the Oceans Tour - Amazon Reef Leg in French Guiana.© Pierre Baelen / Greenpeace

Plastic Monster Mass Rally in Jakarta © Jurnasyanto Sukarno / Greenpeace

Retailers and brands are now well aware that concern about plastic has reached the point where it has become a business issue, particularly among younger generations. As public trust in large corporations is in decline, so much innovation in plastic-free—and even package-free—models is emerging from startups all over the world. In most markets there are now scrappy small businesses like Loop and Algramo working to provide real alternatives to a customer base hungry for more sustainable options. Companies that develop ambitious strategies now will be prepared for the changing policy climate and able to stay competitive as their customers increasingly avoid throwaway plastic.

Investors are also taking a closer look at plastic. From Closed Loop Partners to the world's largest financial institutions, investors are realizing there is money to be made in backing solutions. There is also risk associated with investments in companies that are failing to adapt to our changing world. Investment company RobecoSAM is adding plastic to its Dow Jones Sustainability Index questionnaire, which will soon provide data to help inform investment decisions.

As a marine biologist and a Greenpeace activist, I am not just optimistic but confident that we will rise to this challenge. There will inevitably be companies that stick with plastic until the end, but that end is coming. In the meantime, awareness continues to grow, as does the movement away from throwaway plastic from individuals and businesses of all sizes. Cities, states, countries, even entire global regions are taking action. Meanwhile, the scientific evidence keeps rolling in and washing up, ensuring that this awakening, late that it may be, will be successful. Moving away from throwaway plastic will help us keep fossil fuels in the ground, give endangered species a chance to recover, and protect our water, air, and soil. It will save our recycling system and enable us to recover more of the materials that have a place in the circular economy we are working together to build.



REBUILDING RECYCLING TO GO CIRCULAR

After the coronavirus pandemic has passed, the world will need solutions to repair our economy in a way that protects both the planet and its people. The circular economy is a solution for our future health and wellness and recycling has a vital role to play.

KEEFE HARRISON + DYLAN DE THOMAS

A circular economy is not possible without recycling, yet it can't happen through recycling alone. As companies ramp up their circular economy goals, they're often based on the concept that recycling will be the workhorse and catch-net of a bigger system. The truth is, that system is not yet a reality.

Recycling isn't just a thing you do when you're done drinking your bottle of water or reading the morning paper. It's a system supported by hundreds of thousands of employees, generating billions of dollars in economic activity, and conserving precious natural resources. However, while it can feel as though it's a singular service, in fact it represents a loosely connected, highly interdependent network of public and private interests. The U.S. census tells us there are approximately 20,000 local governments, each independently responsible for deciding what to recycle, how to recycle, or whether to offer recycling services at all. This collection of disaggregated waste management decisions is a challenging start of the "reverse supply chain" that is recycling.

The Recycling Partnership's 2020 State of U.S. Curbside Recycling Report addresses a system that is causing some communities to abandon their programs, but also shows an overwhelming majority of communities across the country still committed to providing household recycling services. Americans continue to value and demand recycling as an essential public service according to The Recycling Partnership's 2019 Earth Day survey.

The time to transform the way we think about and manage waste is now. Conceptually, recycling is and has been the "gateway" for a circular economy worldview to take hold in our society. In this transition, it's critically important to seize on the cultural momentum that recycling has inspired, because behavior change takes so much longer than many other solvable challenges in the transition from linear to circular. Citizens can feel disheartened by the realization that our efforts to recycle are often in vain. Consider the following statistics:

More than **20 MILLION TONS** of curbside recyclable materials are sent to landfills annually

Curbside recycling in the United States currently recovers only **32% OF AVAILABLE RECYCLABLES** in single-family homes

If the remaining 20 million tons were recycled, it would generate **370,000 FULL-TIME EQUIVALENT (FTE) JOBS**

It would also reduce U.S. greenhouse gas emissions by **96 MILLION METRIC TONS OF CO_2** equivalent

AND conserve an annual energy equivalent of **154 MILLION BARRELS OF OIL**

OR the equivalent of taking more than **20 MILLION CARS** off U.S. highways

While recycling feels universal, **ONLY HALF OF THE AMERICAN POPULATION HAS ACCESS TO CURBSIDE RECYCLING**. Before we can implore a public to recycle, they need to be guaranteed the ability to do so.

Many communities increasingly **PAY MORE TO RECYCLE**, sometimes **DOUBLE THE COST OF LANDFILLING**—and many more programs lack critical operating funds. Policy can and should help community recycling programs to improve by addressing challenging market conditions, providing substantial funding support, and resolving cheap landfill tipping fees that make disposal options significantly less expensive than recycling.

A truly circular economy—one that takes us off the perilous take-make-waste path—can't be built on the shaky foundation of the current U.S. recycling system just described. It needs to be shored up, supported, rebuilt, and reinvigorated. Most importantly, it cannot work properly without the aligned efforts from all members of industrial supply chains.

Recycling is not just something that citizens do to feel good about buying something—it provides a circular manufacturing feedstock that displaces newly extracted materials. It is needed by manufacturing to make new products, reduce environmental impact, and achieve a more positive economic result. This is true for mature industries like paper mills and aluminum smelters and for developing end markets such as chemical recycling.

The fate of current and not-yet-recyclable materials rests in the hands of a broad set of private sector actors who must adapt to support the transition. Strong, coordinated action is needed in areas including package design and labeling, capital investments, scaled adoption of best management practices, policy interventions, and consumer engagement.

A truly circular economy can't be built on the shaky foundation of the current U.S. recycling system. It needs to be shored up, supported, rebuilt, and reinvigorated.

A THREE-STEP PLAN TO ENSURE RECYCLING SUPPORTS THE CIRCULAR ECONOMY

01

Support for local recycling programs with policies and capital

Local political support for recycling needs to be strengthened, such that municipalities are meeting the expectations of most Americans: recycling bins alongside trash cans, the contents of which are being recycled. All this needs to be supported at the federal level with policies that incentivize adoption and reduce confusion around recycling.

It also means continued innovation in the collection, sorting, and general recyclability of materials, including the building of flexibility and resiliency to add new materials into the system.

02

Significant investment in domestic infrastructure and end markets

An extensive series of targeted investments is needed to deliver a deeper integration of circular manufacturing feedstock into the supply chain. This will help provide the carts to collect the recyclables, the trucks to pick them up, and the facilities to sort it all out. There also needs to be a deepened commitment to support both existing end markets like cardboard, bottles, and cans, and new end markets, like chemical recycling, to keep more packaging and materials in the economy and more molecules in motion.

As published in The Recycling Partnership's 2019 Bridge to Circularity Report, $250 million over the next five years could launch an innovation fund to design and implement the recycling system of the future using advanced technology, building more robust data systems, and enhancing consumer participation.

03

Broad stakeholder engagement

We need more than the involvement of dozens of the biggest companies in the world. When you go to the store, it is not a monolithic experience. We don't buy all our stuff from one brand, one company, or one packaging material. Those leading companies shouldn't be the only ones taking part in this transition.

Every aspect of the recycling system that feeds into the circular economy needs to be involved—from the design of the materials on store shelves for efficient recovery and recyclability, to the community, infrastructure, and end market components mentioned in the previous two steps.

It's clear that unless stakeholders from across the value chain align and conform to the circular economy, we will not be able to drive the change necessary to move recycling in the United States to that place where no more waste is going to the landfill. It will take bold public-private partnerships and leadership to make lasting improvements. Recycling cannot solve for the circular economy, but the circular economy could solve recycling. Now is the time for action.

SUSTAINABLE BUSINESS INNOVATION

How Technology Unlocks New Value from the Circular Economy

JAMES SULLIVAN & BATOOL HUSSAIN

TEN YEARS FROM NOW THERE WILL BE NO TOLERANCE FOR WASTE IN THE VALUE CHAIN. Innovative technology can help companies lead the transition to an inclusive, circular economy faster and more efficiently. Many companies, such as Danone, H&M Group, and DS Smith are already leveraging these newer technologies to design waste and pollution out of their value chains while keeping products and materials in use to create positive economic, environmental, and societal impact.

The dizzying pace of innovation in the IT industry, now the world's fastest growing sector, affects the global community in countless ways with each new milestone. Global software company SAP is shepherding technological approaches that both guide and accelerate circular solutions. By redesigning global value networks toward a circular economy paradigm, companies, social enterprises, governments, and communities can unlock an additional $4.5 trillion in economic output.

Deep understanding of the challenge is key

While SAP has a 40+ year history of helping companies manage limited resources productively, the concept of embedding circular economy principles throughout all core business processes began in earnest in 2018 with a design competition called the Plastics Challenge, which launched to encourage employees, customers, and citizens to use innovative technology to eliminate single-use plastic waste. The project kicked off with consumer research tracking the plastics use of a few dozen UK citizens who volunteered to share data around their daily engagements with plastics for one month. This data was used as a basis for a multi-day design thinking workshop with 25 large companies, including Coca-Cola, Visa, and Unilever to develop solutions based on the reality facing consumers. One resulting smart phone app uses machine learning technology to help people identify types of packaging materials and then, with the phone's geo-location service, determines where to best recycle the materials based on local programs. Another prototype embedded a chip in a reusable coffee cup to function as both a payment and loyalty rewards system, incentivizing cup reuse.

This quest to truly understand the global plastics challenge led SAP to partner with SoulBuffalo to help to co-convene the Ocean Plastic Leadership Summit, which brought together a group of senior executives from companies such as HP, GE, Colgate-Palmolive, Nestlé, Procter and Gamble, and leaders from NGOs including Greenpeace, PYXERA Global, and World Wildlife Fund on a boat in the North Atlantic Gyre to perform research and design solutions while literally floating in the midst of the micro-plastics problem. The innovation labs and discussions on the ship helped frame and clearly define four strategic system enablers–described below–needed to address the plastics pollution crisis.

In the lead-up to this year's World Economic Forum in Davos, SAP partnered with the WEF on a global study of public opinion that included insight into plastics and single-use packaging for the first time. The data set consists of more than 10,000 people from every major geographical region. A key concern among respondents is a lack of recycling programs and not knowing how to participate in local programs. Concerns about plastics also varied by region with Middle East & North Africa and South Asian respondents most worried about human health effects, while North Americans and Western Europeans were most worried about effects on the ocean.

Solutions start with transparent, trusted data

Tuna brand Anova created an app based on blockchain technology that allows consumers to use their mobile device to scan a QR code on a package of tuna fish for instant information about the fish's journey to the point of sale as well as insights to verify authenticity, freshness, safety, fair trade fishing certification, and sustainability. The app's blockchain traceability system gives consumers confidence in understanding where a particular fish was caught, and then ties associated attributes, such as a day in the life of that fisherman, with that fish to tell a more complete product story to customers.

In the fashion industry, EON Group developed a radio-frequency identification (RFID) tagging mechanism to track the entire lifecycle of a garment. Recycling of clothing is especially difficult unless labels with constituent materials data is intact to enable recycling of cotton and fiber. The lack of transparent, trusted data results in nearly 80 percent of clothes ending up in the landfill. Tracking tech is currently being tested with leading apparel companies to incorporate these tags and extend garment lifecycles to both increase revenue opportunities and reduce landfill and ocean waste.

In agriculture, the Asociacion de Cooperativas Argentinas (ACA), a farming organization in Argentina supporting over 140 cooperatives and more than 50,000 farmers over seven provinces, developed an open digital platform for their farmers and suppliers to help produce more with less cost and environmental impact. The technology challenge was to create a system that could analyze multiple sources of data in real time, gain visibility into each stage of farming, and deliver automatic recommendations to farmers. With geospatial data from satellites and drones, ACA can monitor ambient soil conditions, which indicate potential productivity of arable land. This data can then be combined with other sources, such as weather and business data, to understand real-time conditions for farmers and make smart recommendations.

Systems change requires an ecosystem approach

Last year SAP partnered with Google Cloud to pose a Circular Economy 2030 challenge to social entrepreneurs, in which participants were asked to propose a revenue-generating idea that used both the Google Cloud Platform and SAP solutions to advance a circular economy. The winner, Topolytics, created an app for real-time tracking of waste flows in the UK economy, which it has since expanded to India and several other locations. This support helped Topolytics win the Phase 2 contract to build the UK's first digital waste tracking system, which uses RFID labels to track the movement of waste via item-level digital identities. The system will track all inert and hazardous waste from households, local authorities, businesses, and the construction sector. The data is analyzed together with other sources including invoicing records, weighbridge and bin weighing systems, vehicle telematics, 'internet of bins' sensors, and smart labeling systems for an informed and holistic waste management strategy. The approach validates the use of machine learning, mapping sensor systems, and cutting edge software to enable the waste industry to maximize the utility of materials and advance the transition to a circular economy.

The ecosystem approach also implies working closely with leading organizations that convene platforms and programs around the circular economy. Technology companies including SAP are closely involved with several initiatives under the World Economic Forum's Platform for Accelerating the Circular Economy (PACE), such as the Global Battery Alliance, the Global Plastic Action Partnership, and the Ellen MacArthur Foundation's Circular Economy 100 Network.

Focal areas to accelerate solutions

These initiatives and areas of focus have helped frame and define four strategic system enablers where technology can accelerate solutions to the waste crisis and serve as a model for broader circular economy initiatives:

Responsible Sourcing and Marketplace

Expanding the trade of secondary and alternative materials by incorporating existing marketplaces in specific geographic regions helps drive responsible sourcing and multi-supply strategies. The business problem here is that brands need new sources of steady and assured supply to replace materials such as virgin plastic with recycled or alternatives and suppliers need visibility into demand.

Technology can help aggregate these local marketplaces and formalize informal sector waste pickers while ensuring they are not exploited and are paid fair wages. It also assures corporates and consumers that all sourcing is done ethically.

By streamlining the processes, buyers and sellers have full transparency into the lifecycle of materials.

Responsible Production

Recycling and reuse is a massive and growing issue. For example, the EU has set targets of 50 percent recycled consumer waste by 2020. In addition, hundreds of consumer packaged goods (CPG) companies have made public statements about their goals of 100 percent recyclable or reusable materials by 2025, however one of the challenges faced by companies is that their data exists in silos, making it hard to generate a comprehensive map of what they make, where they sell it, and whether component materials get recycled post-consumer.

Technology—such as intelligent product design—enables close cooperation between chemical, packaging, and consumer product companies while blockchain provides a means of traceability of both upstream suppliers and the product once it leaves the factory.

Some real-time tracking technologies make it possible to see precisely where a product ends up and how it will be reused or recycled. Technology also helps track, calculate, and optimize for material bans—such as plastic bags or straws—and tax liabilities from increasing costs of Extended Producer Responsibility schemes worldwide.

Responsible Consumption

Business-to-business customers and consumers are critical partners in the effort to close the economy's material loop. They have the ability to buy 'more sustainable' products and a responsibility to understand how disposable materials and packaging can be best avoided—for instance, through product reuse models—or recycled back into productive use.

Technology can help enable this through traceability apps and by providing deep insights into citizen sentiment or 'product experience' to help brands better engage with their customers and provide insights based on product needs and shared values back into product design.

Resource Recovery and Reuse

Many companies and their stakeholders not only want to know whether products are designed for recyclability, but also whether they are actually being recycled across regions and waste schemes. For their part, recyclers want granular, high quality data on sources of these recyclable materials in order to support investment decisions around new collection and processing capacity.

Geospatial technology, data science, and real-time analytics—as in the Topolytics example—enable investors, waste managers, consumer industries, and startups to invest in and build physical infrastructure where it is most needed to increase cycling of material flows at their highest value.

These strategic system enablers are necessary to create new business value from the circular economy, but a true ecosystem approach also requires harmonization and balancing of financial factors (forward-thinking CFOs are needed), as well as environmental and societal factors for a positive impact across all dimensions.

By redesigning global value networks toward a circular economy paradigm, companies, social enterprises, governments, and communities can unlock an additional $4.5 trillion in economic output.

SAP customers across multiple industries are already innovating in the areas just described. TemperPack's plant-based, curbside recyclable cold-chain packaging is able to use technology that sends real-time data across the business to respond to customer orders much more quickly with full material tracking capabilities to calculate carbon footprint and provide customers with accurate sustainability data on their finished products. Companies like Danone are able to understand the impact of every capital expenditure decision on their planetary stewardship goals, such as reducing CO_2 emissions by 50 percent or using 100 percent recyclable, reusable, or compostable packaging.

Technology will not "fix" our ecological crisis. Moreover, it can't. There is no equal substitute for the ecosystem functions that filter our air and water, nourish our soils, and regulate our climate. However, technology has incalculable potential to enable humanity to be the best stewards of the biosphere and usher into existence a truly inclusive, circular economy faster, more effectively, and more efficiently to create positive economic, environmental, and societal impact.

Accelerating Systems Change with Targeted Investment

The Circular Economy Investment Landscape and Opportunities

KATE DALY & GEORGIA SHERWIN

GIVEN OUR PLANET'S FINITE RESOURCES, closing the economy's material loop—such that materials and products are continuously shared, reused, and cycled—has an undeniably positive impact on human communities and natural ecosystems. Yet as we work to scale circular alternatives to our leaky linear system, we need to be clear that advancing circularity is not just the right thing to do but where the future of business, investment, and profit lies.

When we adjust the foundational processes and infrastructure that manage material flows in our economy toward circularity, we eliminate costly natural resource extraction and landfill tipping fees, we create jobs and advance economic growth, and we stop throwing away "waste" by capitalizing on already detached resources. The economic case is clear—a shift toward circularity will unlock $4.5 trillion in value by 2030.

Emerging business models that rethink production and consumption, implement new delivery models, source sustainable materials, and effectively close the loop on existing materials are gaining increased attention and capital investment from consumers, established companies, and investors who recognize their potential. Innovations range from new packaging designs that are algae-based and compostable to robotic arms deployed in recycling facilities to optimize the sorting and recapture of materials.

Most facilities need modernizing to keep pace with the rapidly evolving waste stream. Aligning new product designs with materials recovery is essential as we work to scale circularity.

When new, innovative materials and designs outpace our recovery systems, however, unintended consequences can derail progress. Recycling facilities represent the essential, behind the scenes infrastructure that processes our products, materials, and packaging after use and feeds them back into manufacturing supply chains. Yet most of these facilities need modernizing to keep pace with the rapidly evolving waste stream. Aligning new product designs with materials recovery is essential as we work to scale circularity.

Investment in this kind of infrastructure can be capital intensive and often requires unique, flexible funding models to facilitate improvements. It can also take new ways of doing business together, for example securing long-term purchase orders for recycling facilities enables them to focus and invest in their systems to deliver high quality products.

Closed Loop Partners seeks out the most impactful investments to accelerate our transition to a circular economy. The firm is comprised of venture capital, growth equity, private equity, and project finance funds, as well as an innovation center, all deployed to bridge gaps in capital and advance the growth of early stage companies to more established companies.

To date, Closed Loop Partners has focused our investments on recycling infrastructure, food and agriculture, consumer goods and packaging, and fashion. Since 2014, our firm has seen the innovation pipeline for circular solutions grow rapidly and has noted an increasing investment interest in sectors such as fashion and packaging.

Support Reuse in Fashion

Fashion is infamously resource hungry across its supply chain, from the petroleum and agricultural extraction phase, to dyeing and washing, through to the waste generated in the manufacturing of garments. With the global consumption of apparel and footwear estimated to rise by 63 percent between 2015 and 2030, and current industry-wide production at approximately 100 billion new articles of apparel each year, the pressure for increased efficiency is growing. One budding market—resale—represents a significant circular economic growth opportunity. ThredUP found that the United States resale market grew 21 times faster than the retail apparel market over the past three years. Closed Loop Partners' investment in Thrilling—a company that brings vintage and thrift stores online using a tech-based e-commerce marketplace to support store owners—fits well into this large and growing niche.

Invest in Packaging Solutions

Packaging generates more plastic waste than any other industry, accounting for nearly 65 percent of all plastic waste in the United States. Greater investment into the expansion and improvement of our current recovery infrastructure, including recycling facilities, is critical. This outcome is aligned with the growing desire from consumers to reduce waste, which affords opportunity for those innovators willing to reimagine the norm and create convenient, economical, and high-performing alternatives.

We're seeing tech-enabled reuse and refill models emerge, poised to galvanize the reuse revolution. Algramo, a company that builds smart vending machines to incentivize the reuse of durable packaging, makes it possible for customers to earn credit every time they refill to reduce the cost of future purchases. Their solution addresses an important socioeconomic issue—the 40 percent poverty tax for purchasing smaller packaged consumer products that affects low-income households unable to afford large-format products. Algramo's dispensing system not only reduces the overall cost of distribution and eliminates the need for single-use packaging formats for its customers, but also enables customers to buy products "by the gram" at an affordable price.

As consumers, regulators, and companies across the globe react to the global crises of climate change, plastic pollution, resource depletion, and threatened ecosystems, greater awareness has prompted action. Large companies have made global commitments to include up to 100 percent recycled content in their products within the next five years; regulators are banning single-use packaging while also championing legislation for the recovery and reuse of materials; and institutional investors are rapidly joining the fold, devoting their pools of capital to more socially and environmentally impactful companies.

This wave of enthusiasm for sustainable change presents opportunity for those innovators ready to meet the challenge. The payoff can be big. The markets are now rewarding sustainability. In 2018, Unilever's Sustainable Living brands—which includes companies like Ben and Jerry's, Pukka Herbs, and Dove—grew 69 percent faster than the rest of their business.

Investing in the Circular Economy

It's no longer a question of why circularity, but rather how do we catalyze the transition. The business case is evident, the opportunities exist, and the zeitgeist is in our favor. Progress requires the continued mobilization of all types of capital from project finance to venture capital, and the sustained engagement of diverse investors from institutional investors to angel investors.

Successfully navigating the transition will require a holistic approach that organizes all sectors, stakeholders, and the various parts of the value chain. Don't underestimate the ability of one individual to influence his or her whole company or investment firm, whether by asking difficult questions about the true cost of products being manufactured, or in revisiting where long-term investment gains lie as the status quo shifts. Collaboration, as always, across sectors and among competitors is key, including co-investment in promising emerging solutions. **The proverb, "we can get there faster alone, but further together," has never been more true, as we live together in a resource constrained world with no planet B.**

Support reuse in fashion at vintage and thrift stores.

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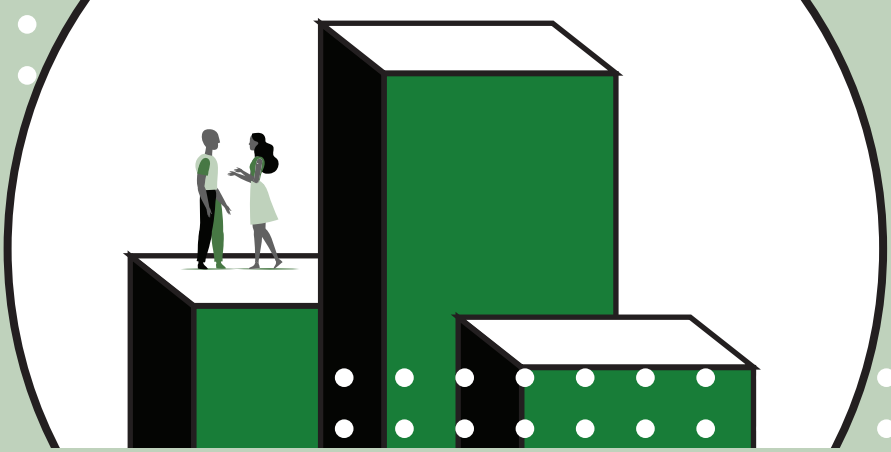

ZERO WASTE COMMUNITIES

INCUBATE, REPLICATE, AND SCALE CIRCULAR SOLUTIONS

There are no good choices in a broken system. Examples of circularity exist across our economy, yet these generally lack an approach that engages a community for scalability, replicability, and sustainability. The Zero Waste Community (ZWC) Initiative selects communities in vastly different geographies to serve as learning laboratories. By joining ZWC, you will learn about reduce, reuse, and recycle behaviors at a community level. Through this user-centered approach, you can design circular innovations and technologies that are ready to take to market.

CONVENE & ASSESS

Convene and assess the best partners from across the public, private, and social sectors in each target geography to understand the problem.

DESIGN

Design programming with site-specific interventions tested and refined using a rapid research and development phase.

IMPLEMENT & ITERATE

Implement and iterate through location-based programming to ensure viability before broader replication.

ADAPT & REPLICATE

Adapt and replicate the successful interventions and approaches in additional locations.

INFORMATION

Visit pyxeraglobal.org/circulareconomy or contact John Holm, Vice President, Strategic Initiatives, at jholm@pyxeraglobal.org