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Is the Foundation of the Circular Plastics Economy About to Go Up in Flames? A Cross-Atlantic, Interdisciplinary Perspective in Europe and the U.S.

Vilma Havas, Ph.D. Candidate, SALT, Norway

Brita Staal, Researcher and Advisor, SALT, Norway

Rachel A. Meidl, LP.D., CHMM, Fellow in Energy and Environment, Center for Energy Studies, Baker Institute, United States

Amy Brooks, Doctoral Student, New Materials Institute, University of Georgia, United States

The Covid-19 pandemic has highlighted the shortcomings and bottlenecks that exist in the plastics economy in Europe and in the United States. It has tested the world's preparedness for a global crisis, revealing an overall lack of resilience. It has exposed shortfalls in domestic production of critical goods. It has uncovered the reliance of Western countries on offshore supply chains for critical materials and accentuated their dependence on foreign markets for disposal and end-of-life management of waste and recyclables. Fundamentally, it is and will continue to be a challenge to the world's commitment to sustainability and circular economy goals.

The manner in which the development of a global, circular plastics economy¹ is prioritized says a lot about how we are addressing circularity; it seems to be something we can only afford when the world's economy is on a stable, inclining path. In the United States, at least 146 recycling programs were suspended due to health, processing and/or end market issues related to Covid-19 (103 of the suspensions impacted curbside collection, 73 were drop-off closures, and 31 affected both types of programs), representing approximately 87.6 thousand tons of recyclables disrupted in less than three months across 35 states.²

In Europe, several recycling companies are on the brink of bankruptcy and pleading for support from the European Union (EU).³ The fear is that the circularity goals set forth in the European Strategy for Plastics in a Circular Economy will not be achieved as a result of the pandemic.⁴

The United Nations (UN) secretary general voiced concerns over central banks' and governments' decision to provide up to \$509 billion in financial aid to high-carbon industries with no clear obligations for decarbonization strategies, while low-carbon industries are slated to receive \$12.3 billion.⁵ In Norway, the government has allocated 100 million kroner to circularity,⁶ while the oil industry is receiving 100 billion kroner in incentives.⁷ Although this disparity can be explained by the size of each industry, and even though stimulus packages are meant to provide immediate relief rather than a long-term investment, policymakers should look beyond traditional government subsidies and identify novel ways to incentivize circularity and energy efficiency, as well as alternative and renewable energy technologies. Indeed, the oil and gas industry plays a critical role in the Norwegian and U.S. economies, and fossil fuels are important in the energy transition. Public subsidies should be consistent with a long-term, coherent energy policy that not



only contemplates the supply of affordable, reliable power, but also assesses public health impacts, climate change, and environmental degradation from a life cycle perspective.

The reality is that sustainability is a necessity, not a luxury. We are pushing planetary boundaries and are challenged with limited time and resources to create sustainable economies based on circularity. Circularity can be a crucial piece of the puzzle that is needed to solve existential crises such as resource depletion, the crash of ecosystem services, and the increasing environmental and social impacts of climate change.

COVID-19: THE LAST DROP TO DROWN THE CIRCULAR PLASTICS ECONOMY?

The global plastics economy is currently fragmented with little transparency in supply chains, making it vulnerable to shocks like the Covid-19 crisis. The recent drop in fossil fuel prices directly reduced the cost of producing virgin plastic and the value of recycled materials, interrupting circular progression and lowering the environmental value of recycling. Meanwhile, recycling companies still have to assume the high costs of sorting and processing recycled plastic, so cutting prices to compete with virgin plastic producers is probably not a viable option. When companies cannot locate end markets or customers willing to pay for their commodities, recycled plastics end up being stockpiled, landfilled, or incinerated, defeating the purpose of circularity. In addition, the pandemic has forced many Western countries to reevaluate their relationship with plastics and has emphasized the important role they play in the global economy. Better designed polymers and more responsible consumption and disposal of single-use plastics is needed by all parties along the value chain if we want to reduce the amount of plastic waste migrating to the environment.

The global plastics economy was already in turmoil prior to the Covid-19 pandemic, due, in part, to notifications imposed by China dating back to 2009 that implemented more stringent waste policies and that were later reinforced by the National Sword

Policy, restricting the import of dozens of types of solid waste and recyclables. This policy abruptly ended plastic waste exports from the United States and Europe to China, which resulted in plastic waste accumulating in the West and being rerouted to Southeast Asian countries.⁸ In the wake of China's ban, several other Southeast Asian countries began restricting plastic waste imports, adding increased pressure on the global waste trade.⁹ If high-income countries do not prioritize the development of transparent, closed loops for plastics by 2030, it is estimated that up to 111 million metric tons of plastic waste will end up in U.S. and European landfills, in incinerators, or as exports to countries with substandard waste management infrastructures and deficient environmental regulations.¹⁰ This highlights the urgency of a systems-level change to accelerate recycling, especially since the United States and Europe have better waste collection capabilities and at least a nascent plastic recycling industry relative to Asian waste markets. With the convergence of the pandemic and China's import policies, we are at the precipice of change. The time is ripe for the United States and Europe to take the lead on shepherding a systems-level change in the recycling market, strengthened by government regulation, legislation, and incentives that could identify routes that others in the global economy could adopt.

THE GLOBAL WASTE ISSUE IS A GLOBAL HEALTH ISSUE

We are a global economy with finite resources and a carbon budget, and we are beginning to realize that there is no "away" when it comes to "throwing away" waste in general. We can no longer turn a blind eye and assume waste diversion equates to recycling or that exporting waste to countries without the capacity, capability, or technology to responsibly manage it is considered fair trade, especially when environmental and social factors are considered. We must also not assume that the transboundary movement of waste meets domestic "zero waste" goals.

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The global waste issue should be evaluated from the lens of sustainability, taking into account the three aspects that define this systems-level philosophy: economic, social, and environmental equilibrium. The negative environmental, health, and safety effects of improperly managed plastic waste are manifested in reduced air and water quality and increased fire hazards—especially in countries that do not yet have robust waste management policies or infrastructure, causing social and environmental injustices and constraining local economies. The global waste issue is also a global health issue.¹¹ Building an economy where waste is turned into resources rather than abandoned in sensitive environments that are already stressed due to pollution can reduce public health risks that lead to the spread of disease and even pandemics.

CIRCULARITY FOR BETTER BUSINESS

The concept of circularity is also attractive to even the most skeptical economists if you look at the potential financial gains of a global circular plastics economy; an estimated \$80–120 billion is lost in the economy annually as a result of the linearity of the plastics economy.¹² If the environmental externalities are taken into account, the annual footprint of the plastic packaging industry alone is estimated at \$40 billion, exceeding the packaging industry's annual profit pool.¹³ If the potential financial gains and avoided environmental and social costs of developing a circular plastics economy are so great, why is this not prioritized in the current international crisis management?

First of all, the environmental and social externalities are not accounted for in the current system, creating a market failure as the free market is currently not maximizing society's welfare. The lack of carbon pricing gives virgin plastics production an unfair advantage on the market in general, but, in the end, developing markets based on circular economy principles is more sustainable with regard to the triple bottom line. Currently, plastics are used in everything from single-use plastics¹⁴ to

renewable energy technologies like wind turbines and solar panels. If the cost of producing plastics globally would reflect the total actual and holistic costs, including the externalities (i.e., pollution, clean-ups, trade to China and Southeast Asian countries that are responsible for the highest percentage of mismanaged waste, workers' rights, climate change, etc.), the products that are currently low value would naturally be reduced or eliminated. However, we do not have a holistic, life cycle accounting of the range of actual impacts, which is why methods for analyzing the impacts of plastics' comprehensive value chain need to be improved.

Besides turbulent commodity markets, linear business models, and the fallout from China's stringent policy shifts, there are also technical challenges that inhibit the sustainability of the plastics economy. These include the customization of materials or products for particular applications, which inhibits the collection, separation, and reuse of the material; the contamination of recyclable polymers; and the complexity of plastics that contain multiple polymers, colors, additives, and other materials. Designing for at least several of the following characteristics at the end of a product's first life will move us closer to circularity: simplicity, standardization, recoverability, upgrading, disassembly or reassembly, efficient collection and separation, or degradation at an appropriate time, place, and rate and to the appropriate end products.

A HOLISTIC VALUATION OF END-OF-LIFE STRATEGIES

Fragmentation of the plastics economy makes it difficult to work together toward the common goal of circularity. Transparency and sharing of information between different stages of the plastics value chain is a prerequisite for addressing the abovementioned challenges. From a systems perspective, labeling a product as "recyclable" is nothing more than greenwashing if there are no existing collection and recycling systems that can

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recycle or convert the product into new materials. Further, failure to understand the global nature of the plastics economy and the role of underdeveloped nations in substantially contributing to the overall percentage of globally mismanaged waste (due to the lack of regulations, collection systems, and infrastructure) is detrimental in meeting circularity and sustainability goals. Until we work collaboratively across the global supply chain to invest in and build systems that ensure the collection and processing of plastics, recycling and other advanced technologies are only a pipe dream. The United States and Europe should charter the path and provide a model for other parts of the world to adopt.

As attractive and enticing as a circular economy is theoretically, in reality it can be much more complex and elusive. To have a pragmatic and closed-loop framework that addresses the breadth and depth of society's environmental afflictions, designs out waste, supports economic growth and job creation, and prevents primary production is commendable as a global vision. We also have to understand that a circular economy is only possible with informed companies and consumers, technological innovation, modernized environmental laws, and overall support from governments. However, in the rush to realize the promise of a circular model, we need to quantify the supply chain's vulnerabilities and the possibility of unintended consequences. A circular economy is only attainable if the policy frameworks are in place and if economic, geopolitical, and sustainability issues are resolved across the entire lifecycle.

USING A CRISIS WHEN YOU'VE GOT ONE

Crises can be catalysts for political action, opening the door for dramatic and far-reaching reforms. Both in the U.S. and in Europe, financial aid is being poured into different sectors of the economy. Using these recovery packages to begin laying the groundwork for circular economies is crucial, as they have a huge impact on how we use resources over the next decade.

The EU finally agreed in July 2020 on an unprecedented €1.82 trillion (\$2.1 trillion) budget and a Covid-19 recovery package that is closely tied to the principles of circularity and the Green New Deal.¹⁵ This agreement provides €750 billion in funding meant to counter the impact of the pandemic and also includes €390 billion in nonrepayable grants to the hardest-hit EU members, including Italy and Spain. It also contains plans for recycling and life cycle actions, such as the massive renovation of European buildings and infrastructure, that extends the circular economy and creates local jobs.¹⁶ This is a record-breaking stimulus package in terms of promoting a circular economy and taking a climate focus; 25% of the funds are directed to climate mitigation actions directly. In the plan, the EU has introduced a levy on plastic waste starting in January 2021, contributing to a massive push to limit the use of virgin materials. The EU will also provide funds to motivate member states to expand their plastic recycling systems. However, it remains to be seen how well the EU distributes these funds and if they will safeguard the local recycling industry.

In the United States, Congress passed the largest economic relief package in history, a \$2.2 trillion stimulus package that provides assistance for American workers, families, and small businesses, in March 2020. Data from the U.S. Small Business Administration shows that thousands of waste and recycling companies and organizations have so far received between \$583.7 million and more than \$1.2 billion in subsequent relief payments.¹⁷ However, it has become clear that more economic assistance is needed as the pandemic ravages on. Following Congress' failed attempts to strike a balance over another trillion-dollar stimulus bill, President Trump signed several executive orders aimed at extending pandemic relief.

Besides the relief package to help bolster the U.S. economy, there has been activity on the federal front that aims to address the plastics economy. The main federal legislation on marine plastics pollution in the United States is the Save Our Seas Act, a bipartisan law designed to reduce the amount of waste in the ocean and to promote recycling in developing nations. The second version of the

act includes provisions for global engagement, enhanced marine debris response, and improved domestic recycling infrastructure. Several other pieces of legislation are making their way through Congress that propose to invest in plastic waste reduction and recycling efforts through R&D and standards development,¹⁸ public education and outreach,¹⁹ and the revitalization of economic opportunities to enhance the value of recycling.²⁰ Although the pandemic has largely delayed this momentum, it reflects a growing trend in federal leadership to prioritize plastic waste and recycling on the national agenda.

FROM PUSH TO SHOVE

We are now at a crossroads where post-Covid economies will be defined by current crisis management and recovery plans. Will these plans be built on panic and fear, resulting in unfettered single-use plastics consumption, unquantified environmental impacts, resource depletion, and social injustices? Or will they be based on knowledge, sustainability, and innovation, resulting in a harmonious, circular economy?

The largest contributor to the plastic waste problem is single-use plastic packaging, which is responsible for almost half of the global total.²¹ The need to prioritize plastics type by industrial sector, to create policies on the standardization of materials, to institute requirements for recycled content in plastic products, and to manage the relocation of subsidies from unsustainable industries to those working with circular solutions, has never been more urgent. Plastic producers and buyers need to take responsibility for the products they place on the market and make sure that those products are maintained at their highest value and can be kept in circularity through efficient and resource-conscious recycling. In addition, plastics economies have to be built using robust regulatory frameworks and responsible trade agreements based on long-term economic predictability. Awareness about the importance of source segregation and investment in more efficient, centralized recycling is needed, along with

efforts to consider local conditions and to recognize that solutions in the EU and the U.S. may not be practical or feasible solutions in developing economies. If we lose traction now, immense investments in collection and recycling are lost, and the path to a global, circular plastics economy may have to be recalibrated. In the meantime, millions of tons of plastic materials that have the potential to be recycled are ending up in landfills, incinerators, and the environment, where they risk migrating to the world's oceans.

RESILIENCE AS AN OPPORTUNITY

Although the Covid-19 crisis exposes weaknesses in our current systems, it also reveals an opportunity to reevaluate past and current practices and may be the catalyst needed to accelerate positive changes that are already in motion. We should approach the “new normal” with a renewed interest in resiliency planning to be able to prepare for and anticipate disasters. This would allow us to adapt and rebound more quickly, reducing negative human health, environmental, and economic impacts. The pandemic can also prompt companies and governments to ramp up their sustainability efforts and to reevaluate their dependence on global supply chains by building in redundancies, reshoring, and becoming more transparent, socially conscious, and environmentally friendly.

Rapid, high-level dialogue is now taking place at the regional level to enable crisis packages for the recycling industry. The EU and the U.S. will need to include disruptive yet sustainable recycling in their recovery plans, both mechanical and advanced, and continue implementing measures under the circular economy package while also building channels that enable the system to methodically face future crises. Internationally, we must cooperate in a way that reflects that we are indeed a globally closed loop, with finite resources and planetary boundaries. If we want to grow the circular economy market, it will require a suite of solutions that drive process efficiencies across the entire system and supply chain, improve cost structure, and enhance plastic's overall economic,

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environmental, and health value. All of this requires the underpinning of informed and balanced policy interventions that keep pace with technologies across the life cycle, account for impacts along the supply chain, and encourage innovation.

In order to be able to look back at a transformed global plastics economy, the EU and the United States need to see bold policy influencers make informed decisions with public policy interventions that advance sustainability. Ambitious corporate leaders also need to commit to and invest in circular solutions. And lastly, we need to enable, educate, and engage the public to change our anthropogenic footprint, to understand life cycle thinking, and to provide tools for changing human behavior that will lead us toward a more circular future.

ENDNOTES

1. A circular economy, according to the Ellen MacArthur Foundation, is a systemic approach to economic development designed to benefit businesses, society, and the environment. In contrast to the 'take-make-waste' linear model, a circular economy is regenerative by design and aims to gradually decouple growth from the consumption of finite resources.

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Brita Staal is an advisor at SALT, a Norwegian consultancy and research company. She specializes in climate and sustainability strategies for the private and the public sectors. Staal has experience in international sustainability work, environmental and climate management, environmental certification, and quality management. Staal has an M.S. in development management from the University of Agder in Norway.

Rachel A. Meidl, LP.D., CHMM, is the fellow in energy and environment at the Baker Institute. She was sworn into the U.S. Senior Executive Service and was previously appointed as deputy associate administrator for the Pipeline and Hazardous Materials Safety Administration, an agency of the U.S. Department of Transportation. Her research focuses on the intersection between domestic and international policy and law as it relates to the transboundary movement of hazardous wastes; the sustainability of plastics; the upstream and end-of-life management of byproducts and wastes; safety and environmental regulations for the treatment, storage, disposal, and transportation of chemicals within and outside the U.S.; and the coastal resiliency of the energy industry.

Amy Brooks is a doctoral student in engineering at the University of Georgia’s New Materials Institute. She holds a bachelor’s degree in civil engineering with an emphasis in water resources and has experience in agricultural and construction management. Her research broadly focuses on international solid waste issues related to plastic leakage into the environment.

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AUTHORS

Vilma Havas is working on an industrial Ph.D. at SALT, a Norwegian consultancy and research company. Her academic partner is the Danish Center for Environmental Assessment at Aalborg University. Havas has an M.S. in environmental, resource, and development economics from the University of Oslo, where she focused on offshore oil and gas exploration in the Arctic.

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