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As Plastic Risk Rises, New Materials in Development to Reduce Exposure

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Environmentalists have long known about the damage caused by plastic pollution but the increasing threat of toxicity from plastics entering our food chain to be eaten by humans, as well as viral images of large, state-sized plastic gyres in our oceans full of debris, beached whales with tons of plastic in their stomachs and turtles with plastic straws in their noses has increased urgency to find alternatives to single-use plastic packaging.

There have been past attempts to create alternatives but now there is renewed interest from various stakeholders. Several governments are moving to ban single-use plastics and there's consumer demand to reduce plastic use. Greenpeace released a report noting which of the largest US supermarkets are doing the most

to reduce single-use plastics, (based on policies, plastic reduction efforts, initiatives, and transparency) with ALDI scoring the highest: 34 out of 100. Companies big and small are stepping up their research into alternative materials, seeking to create products that can be easier to reuse or recycle, or are compostable.

Investors with environmental, social, and governance (ESG) mandates are also paying close attention to how much plastic exposure they have in their portfolios, says RepRisk, a data science firm that identifies and assesses ESG risks.

Some research takes traditional materials such as aluminum to replace plastic, and some research creates new materials from waste byproducts. It is still early days for some of these new materials to become viable traditional plastic alternatives as a number of them are being created by startups or joint ventures. In order to replace fossil fuel-based plastics, these alternatives must be scalable, fit into current recycling systems, and most importantly, not cause more harm than good, sources say.

Bio-Based Plastics

Jon Forster, director, listed equities, at Impax Asset Management in London, says bioplastics have come a long way from their initial troubled history in terms of technical performance, reliability, and price to be a viable solution for stores selling consumer products.

"With all the tailwinds out there, from policy to consumer demand, if retailers change their own behavior, then it's likely to mean bioplastics can benefit," he says.

Forster says an example of a new material is polylactic acid, PLA, a building block to creating one type of bioplastic. Polylactic acids are made from plant material such as sugarcane, corn, sugar beet, and cassava. That biomass is converted in lactic acid, which is turned into PLA that can be used for plastic films and some medical devices that are expected to biodegrade in six to 12 months.

Rob Kaplan, founder and CEO of Circulate Capital in Singapore, says there's a lot of interest around polyhydroxyalkanoates, PHA, a polymer created through fermentation, much like how beer is created. Microorganisms eat sugars or oils and their solid output can be turned into plastic that is said to be easier to compost than other biodegradable plastics. One of its applications is for use in cling films. "People are very excited about PHA, and there are a number of interesting companies doing work in that space," he says.

One small company that's creating another microplastic-free material is Sulapac, a Finnish firm using wood byproducts to create proprietary, fully compostable, and marine-biodegradable plastic alternatives. The company takes woodchips and sawdust, normally waste byproducts from lumber and paper mills, and uses natural binders and biopolymers, says Juha Lindfors, partner at Finland-based Lifeline Ventures, which was a pre-seed investor.

Items can be composted in an industrial composter or will fully degrade in oceans. In 2018, Stora Enso entered into a cooperation agreement with Sulapac to introduce mass-producible, microplastic-free, marine-degradable drink straws.

Finland traditionally has had a robust forestry industry, so sourcing feedstock is cheap and plentiful, and there's a history of turning wood fibers into other sustainable products, Lindfors says. Scalability is critical to making real alternatives to traditional plastics. "Companies often have issues that they may have a brilliant product, but mass manufacturing capacity doesn't exist. Even the sourcing of the raw materials may be very difficult," he says.
Daniella Russo, CEO of Think Beyond Plastic, which runs innovation challenges and acceleration programs for alternatives to single-use plastic, says a lot of the research that went into biofuels a decade or more ago is now pivoting to make new materials. She says one of feedstocks being studied as a plastic alternative is algae oil, which saw huge investment for biodiesel.

"You can make many of the same polymers out of algae oil that you could make out of petroleum, but those made from algae oil can break down," she says, noting one of their companies partnering with University of California at San Diego has created a foam alternative for use in flexible flip flops and shoe soles that will biodegrade.

Better Recycling

In addition to new materials, there's a big push to improve recycling of one the most common plastics, polyethylene terephthalate, known as PET, used in bottle packaging and polyester fiber. Because it's highly recyclable plastic, it can become a new material, recycled PET, known as rPET. Until recently, rPET was in limited use.

Sumana Manohar, head of thematic research at BlackRock, who co-manages its new, actively managed mutual fund BlackRock Global Funds Circular Economy fund (not available to US investors), says part of the problem with plastic waste is that much of it doesn't get recycled, in part because the economics to recycle it aren't viable. But she notes there is a big push from early-stage private capital and established companies to invest in collecting and recycling PET.
On the recycling and reuse side, Manohar says one of the fund's holdings is Tomra, a Norwegian firm that sells reverse vending machines to collect recyclable packaging and has sensor-based sorting machines to separate plastics more efficiently. Another holding is sportswear maker Adidas, which said it is committed to using only recycled plastic by 2024.

"There is also a lot of exciting stuff happening around the chemical recycling side and bioplastics," Manohar says.

Points to Ponder

The push to replace plastics needs to be carefully weighed. Environmentalists point to corn-based ethanol to reduce gasoline use as an example of causing more harm than good, which

is particularly of concern for investors with ESG mandates.

Constantina Bichta, associate director of ESG research at Boston Common Asset Management, says when she looks at bio-based plastics, she looks at the full lifecycle, making sure the raw materials are sustainable, such as using waste products or other byproducts.

For that reason, Bichta has concerns about some food source bio-based materials, such as sugarcane and corn. Sugarcane sourced from Brazil has higher social costs because of worker conditions in production and harvesting, she says. Corn continues to be an issue, too. She says studies suggest if corn replaces just 10% of the polyethylene in the market, it would divert 5% of the global corn crop, which would push up food prices.

There are some adoption constraints to consider, too. Alternative materials don't easily drop in to replace traditional plastics, Kaplan says, as their performance differs versus traditional plastic. New materials can be difficult to scale production and face tough regulatory approval in the US and Europe for products used in food or cosmetics containers.

"There's really no silver bullet in this space," he says.

Think Beyond Plastic's Russo agrees that it will take a rethink of how to use new materials. "Plastic is a material that can be used across the board for everything. Now we're starting to rethink what materials will be more applicable and where it makes sense… It's a process that requires more commitment to solving the problem than we've seen in the past," Russo says.

RepRisk, the data science firm, says ESG investors concerned about plastics should consider the multiple facets of the plastic industry, from fossil fuel extraction as part of new plastic production to consumption to disposal. In a new report, the researchers note the top three companies in developed markets with the highest plastic-related ESG risks were Nestle, Coca-Cola, and Unilever Group. Coca-Cola, PepsiCo, and Nestlé were also found to account for 14% of the branded plastic found in pollution worldwide, according to a report by Break Free From Plastics, which engaged 10,000 volunteers in 239 cleanups in 42 countries. These companies are in the consumer-packaged food industry where plastic use is high. Michiel De Smet, finance lead and plastics specialist at the Ellen MacArthur Foundation in London, says roughly 40% of plastics produced is packaging, and for at least 20% of that plastic packaging, reuse provides a $10 billion business opportunity.

To fight plastic pollution, the Ellen MacArthur Foundation developed The New Plastics Economy Global Commitment in collaboration with the UN Environment Program. It unites businesses, governments, and other organizations behind a common vision and targets to address plastic waste and pollution at its source. Signatories have set concrete public 2025 targets, with common definitions underpinning all commitments, publication of

commitments online and annual reporting on progress. As a signatory, Unilever is one of the companies to announce significant reductions in new plastic use by 2025.

Even companies with mass manufacturing capacity can struggle to meet demand when introducing a new material. In September, Ball Corp. began selling a 20-ounce aluminum cup to replace disposable plastic drinking cups at major venues' concession stands, starting with universities, says Mark Stoeckle, CEO of Adams Funds, which invests in the aluminum manufacturer.

"They're working to put themselves in a position to be able to make more aluminum cups. They are capacity-constrained because they weren't expecting the kind of uptake on them as they've seen," he says.

Although its early days in the alternative plastics space, the combination of regulations, consumer demand, and business interest may mean the world could be at a tipping point for new materials, the sources say.

"The need for alternative materials is so great that there is tremendous upside potential. The demand is there, the market is there. If the right material overcomes some of those challenges. I think there's no holding it back and we're probably on the path for that to happen," Kaplan says.

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