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PLASTICS FROM A WHOLE PLANET PERSPECTIVE

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World Wildlife Fund is an international non-governmental organization that works to stop the degradation of the planet's natural environment and build a future in which people live in harmony with nature.

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KEYWORDS

- BIOPLASTIC FEEDSTOCK
- RECYCLING
- MATERIAL MANAGEMENT
- CIRCULAR ECONOMY

Like all materials, plastic has both drawbacks and advantages^{1,2,3}. However, most plastic today is made from non-renewable fossil resources and huge volumes of plastic end up as marine litter⁴. Mismanaged plastic also represents a lost opportunity to recover and repurpose valuable material⁵. Connecting product design and waste management innovation will be critical in addressing this global issue. Responsibly sourcing new plastics and cascading value systems where material is used multiple times can help us reduce our demands on the planet^{6,7}.

In addressing the global impacts of plastic, the system must be analyzed holistically, and changes will be necessary throughout every step of plastic's lifecycle. World Wildlife Fund (WWF) is a leader of two platforms that strive to address issues associated with material sourcing and waste. WWF works with many diverse partners through the Bioplastic Feedstock Alliance and The Cascading Materials Vision to explore and implement sustainable change and enable a Global Market for Sustainable Materials Management. These initiatives bring together companies, non-governmental organizations, scholars, and policy-makers committed to a future where we source and use plastics more thoughtfully and responsibly.

The Bioplastic Feedstock Alliance (BFA) explores the use and impacts of biobased plastics. WWF has developed a methodology with a clear goal of helping BFA members assess the supply chain risks associated with specific bioplastic feedstocks. The Cascading Materials Vision is a platform that seeks to enable a global system of efficient materials management. This common framework is used to influence relevant sectors toward achievable, sustainable, and inclusive solutions that address the systemic issues that prevent creation, trade, and use of secondary materials (materials which have already been used at least once). BFA and The Cascading Material Vision both fit within the framework of a circular economy.

INTRODUCTION

The majority of plastics used today are made from non-renewable fossil resources. Mismanaged plastic ends up in ecosystems, causing unnecessary stress to the environment and its inhabitants. For these two reasons, plastic use and plastic pollution are urgent conservation issues that must be addressed.

The global demand for plastic puts pressure on our finite resources and plastic pollution is a serious threat to ecosystem and wildlife health. 275 million tons of plastic waste is produced each year and an estimated 8 million tons of this plastic waste enters our oceans annually⁸. Scientists believe this annual addition of plastic waste is adding to an already enormous amount of 150 million tons of plastic litter already deposited in marine environments⁴.

However, plastics play an important role in our daily lives. Eliminating or substituting plastics with other materials would have substantial tradeoffs that must be considered. First, plastic is a light yet strong material. Using plastic instead of alternative materials results in lower fuel used and lower GHG emissions because of plastic's relative lightness and durability^{3,9}. Plastics also make it possible to extend the shelf life of fresh food and to ensure food is safe to eat. Substituting another material for food packaging could result in other environmental impacts from the sourcing of the substitute material. Food waste may increase if the material is not as effective as plastic at keeping food safe and fresh for consumption⁹. Plastics also have important applications within the healthcare system, such as maintaining sterility of medical devices and medications. The substitution of other materials for these functions could have high resource and human costs¹⁰.

The elimination of some single-use plastics such as single-use straws, cups, and bags, is a good step forward in addressing our materials waste challenge. Identifying these plastics and working towards the elimination of unnecessary single-use plastics has become a more public and urgent issue in recent years and gained significant momentum in recent months^{11, 12}. However, for less substitutable plastics, responsible sourcing will be necessary to reduce the negative impacts of the traditional plastic production process. Biobased plastic offers a potential substitute but evaluating the sustainability of bioplastic feedstocks is critical to ensuring that environmental, social, and economic benefits over traditional plastic are actually achieved. By recovering and reusing plastics multiple times through a system of cascading value we can do more with less. Secondary materials, those that have been used and recycled for reuse, offer the opportunity to reduce our environmental impact and recover economic value from materials otherwise considered waste. Finally, researching and implementing systems to reduce plastic leakage into natural environments will be necessary to reduce the global impacts of plastic.

PLASTIC POLLUTION

Plastic production has increased by about 10% every year since 1950 when global plastic production was just 1.5 million tons¹³. The annual global production of plastic is currently estimated to be near 275 million tons⁴. By comparison, 150 million metric tons are already present in our oceans and approximately 8 million tons is added to that every year⁴.

In recent years public awareness of plastic pollution has increased dramatically. Plastic waste in marine environments causes issues such as entanglement and ingestion for wildlife at every level of the food chain¹⁴. Plastics can take hundreds of years to degrade, negatively impact water quality, and even cause human health



impacts through seafood contaminated with metal-tainted plastics^{14, 15}. Southeast Asia is an epicenter for plastic waste leakage with half of the land-based plastic waste coming from China, Indonesia, the Philippines, Thailand, and Vietnam¹⁶. Rapid economic development in these countries have outpaced the development of waste management infrastructure that can support these new economies¹⁶.

RESPONSE OF WWF

WWF recognizes the need for sufficient resources to meet the increasing demands of a growing population. Through informed decision-making and the responsible management of natural resources, WWF believes that the issues associated with plastic can be mitigated. The organization has developed two platforms through which we can reduce the impacts from the production and use of plastic. The Cascading Materials Vision and the Bioplastic Feedstock Alliance bring together companies, non-governmental organizations, scholars, and policy-makers committed to a future where we source and use plastics more thoughtfully and responsibly.

The Bioplastic Feedstock Alliance (BFA), led by WWF, explores the use and impacts of biobased plastics. BFA helps facilitate the use of credible science and critical thinking to responsibly evaluate bioplastic feedstocks. Members of BFA are committed to responsibly selecting feedstocks for biobased plastics and they are provided with technical tools and guidance to aid in their evaluation process.



Bioplastic spoon fork and biodegradable lunch box on banana leaf



Biopolymer with leaves and wood

The Cascading Materials Vision helps guide responsible decision-making for all materials. It advocates for improved accessibility and use of high-quality secondary materials. Systemic issues currently prevent the use of secondary materials in many industries.

Achieving large-scale re-use of materials could substantially reduce our use of virgin materials and help companies re-capture economic value in recycled materials.

The Cascading Materials Vision and the Bioplastic Feedstock Alliance bring together companies, non-governmental organizations, scholars, and policy-makers committed to a future where we source and use plastics more thoughtfully and responsibly.

RESPONSIBLE SOURCING AND THE BIOPLASTIC FEEDSTOCK ALLIANCE

The Bioplastic Feedstock Alliance is led by WWF and comprised of some of the world’s leading consumer brand companies. It is a collaborative, multi-stakeholder forum focused on increasing awareness around the environmental and social performance of potential feedstock sources for biobased plastics. Members of the BFA include: The Coca-Cola Company, Danone, Ford Motor Company, Nestle, Procter & Gamble, PepsiCo, Unilever, The LEGO Group, McDonald’s Corporation, and Target Corporation. These

global companies, together with respected academic and NGO thought leaders, are all committed to using informed science and critical thinking to help guide the responsible selection of feedstocks for biobased plastics to encourage a more sustainable flow of materials, helping to create lasting value for present and future generations.

While the bioeconomy offers promising solutions to some of today’s pressing environmental issues, it has also brought into focus a number of critical issues such as resource competition for food, land, water and energy. These issues represent challenges to the future growth of the bioplastics industry as a part of that bioeconomy. BFA seeks to identify the potential impacts of the bioplastic industry and possible measures to mitigate them. In this way, BFA can help move the bioplastic industry’s emerging supply chain in a positive direction.

WWF has developed a methodology with a clear goal of helping BFA members assess the supply chain risks associated with specific bioplastic feedstocks. This methodology was created to guide companies in finding feedstocks which have a more positive impact on the environment, society, and the economy. It is important to

remember that, although biobased plastics address the sourcing impacts of plastics, biobased plastics may often meet the same end-of-life fate as conventional plastics. If biobased plastics are also littered into the natural environment or end up in landfills instead of a recycling facility where their value can be recaptured, these plastics can also have a significant environmental impact. Addressing the recoverability of plastics, whether biobased or not, remains a key challenge. This is where WWF's second initiative, the Cascading Materials Vision, comes in.

There is an urgent need to improve our material decisions and waste management systems to enable the re-use of materials so that they have cascading value across their life cycles.

MATERIAL RE-USE AND THE CASCADING MATERIALS VISION

WWF envisions a global system of efficient, cascading reuse of materials, allowing every business and industry to protect their profits, the environment, and the future wealth of our natural resources. The Cascading Materials Vision is a platform that seeks to enable a global system of efficient materials management. There is an urgent need to improve our material decisions and waste management systems to enable the re-use of materials so that they have cascading value across their life cycles. Led by WWF, the Cascading Materials Vision brings together the world's leading brands, policy-maker, materials management solution providers and environmental non-profits.

Ten foundational principles help guide industry leaders and other stakeholders in sourcing secondary materials. This common framework is used by WWF to influence relevant sectors toward achievable, sustainable, and inclusive solutions that address the systemic issues that prevent creation, trade, and use of secondary materials. The Cascading

Materials Vision aims to inform decision-making that will expand the availability of high-quality secondary materials.

The Cascading Materials Vision is also used to educate policy-makers about systemic challenges facing secondary materials creation and use, and to serve as a basis for dialogue aimed at achieving practical policies to address these challenges. The Cascading Materials Vision serves as a foundation for promoting legislation that supports materials management programs that are socially, environmentally, and economically sustainable.

THE CIRCULAR ECONOMY

BFA and The Cascading Material Vision both fit within the framework of a circular economy which seeks to minimize waste and regenerate value throughout the lifecycle of the products and materials we use. The circular economy is also environmentally and socially responsible. To achieve a circular economy we must pursue design innovation and system improvement to be able to do more with

The Circular Economy





less. The circular economy includes the biosphere and the technosphere, illustrated by the left and right sides respectively of the figure on page 39. Because most materials degrade over time, new materials must still enter the system from the biosphere. Responsibly sourced biomaterials reduce our demand for non-renewable resources, ensuring new high value products still enter the system where necessary. Within the technosphere, it is imperative to recapture and reuse materials already in the system to reduce the overall demand for virgin materials and to ensure they are not being polluted into natural areas. Through its support of sustainably produced biomass and material reuse, WWF is helping producers understand their role and responsibilities in a circular economy.

INITIATIVES IN ACTION

WWF is proud to partner with leading organizations through BFA and the Cascading Material Vision to inspire action and encourage ambitious goal-setting. For example, in March 2018, BFA member the LEGO Group announced a new bioplastic initiative¹⁷. In addition to the LEGO Group's commitment to increasing carbon efficiency in the production of LEGO products and reducing CO₂ in the supply chain, and the company's purchasing of renewable energy which exceeds the amount of energy used globally by the company, the LEGO Group has now begun production of LEGO elements made from sustainable sources.

Over 150 different LEGO elements, including botanical elements such as leaves, trees, and bushes are now produced from sustainably sourced sugarcane. Through its partnership with BFA, LEGO has ensured that the sugarcane used in the production of the biobased bricks is third party certified. This move exemplifies the opportunity that exists for the sustainable production of polyethylene. By 2030, the Danish company hopes to achieve zero waste to landfill and ensure all core materials and packaging are produced sustainably. The shift to biobased plastic for LEGO's botanical pieces is a strong first step towards the impressive goals of the company, and WWF looks forward to working with LEGO in its continued efforts to provide sustainable products without compromising on the high-quality play products the company is known for.

As a founding member of BFA, The Coca-Cola Company has led by example in its use of bioplastics¹⁸. The Coca-Cola Company has supported BFA in its work to identify and evaluate sustainable biofeedstock options. Through this research the beverage company has explored bioplastic options and developed a PET plastic bottle called PlantBottle. This bottle is fully recyclable and made with up to 30% plant material. This helps Coca-Cola reduce its use of petroleum, the non-renewable material traditional plastics are made from. Efforts are underway to commercialize a recyclable bottle that is made exclusively from sustainable materials but in the meantime, the company has set goals to drastically increase the amount

of biobased materials and recycled content used for the production of new bottles. Coca-Cola's membership in BFA ensures that sourcing decisions related to biofeedstocks are carefully analyzed to provide the necessary information for informed and responsible decision-making.

Through involvement with the Cascading Material Vision, many global companies have launched material reuse initiatives and set ambitious goals for recycled content in their products and packaging. For example, Nestle has set a goal to reach 100% recyclable or reusable packaging by 2025. Further, Nestle has recognized its role in achieving a circular economy goes beyond its own production. Nestle has teamed up with local governments and Green Antz Builders, Inc. to produce construction materials from plastic waste. This collaborative project is based in the Philippines where eco-bricks (compressed, interlocking bricks made from shredded laminates) are produced. Production sites are expanding across the Philippines to cities such as Cagayan de Oro City, Cauayan, Isabela, and Baliwag. In addition to generating new and reliable products from waste, the production of eco-bricks provides jobs and income for local communities. This project exemplifies a good alternative to plastic's typical end of life which is either disposal or pollution. This program captures the value of material that would otherwise be considered waste and provides benefits to the local economy, thereby ensuring this program's long-term success.

CONCLUSION

Although plastic poses threats to our ecosystems, banning all plastics would have consequences for human health and safety as well as food waste. The materials substituted for plastic may also be associated with other serious environmental impacts. Plastics offer many benefits that alternative materials may not be able to provide without serious environmental implications of their own. Tradeoffs will be inevitable with any of these actions.

Eliminating plastics where possible and reducing the environmental footprints of the plastics we still use should both be actions we pursue. In addition, responsibly sourcing bioplastics and establishing a new system of material reuse together offer promising solutions to the pressing issues caused by plastics today. Responsible sourcing of new plastics must go hand-in-hand with the recycling and reuse of plastic because plastic degrades over time and cannot be infinitely recycled. Therefore, it will be necessary to replenish plastic with responsibly sourced bioplastic.

In order to reduce the negative impacts of plastic across its life cycle, the whole system must be transformed. Through its leadership of the Bioplastic Feedstock Alliance and Cascading Materials Vision, WWF is working towards a future where solutions to plastic issues are created and implemented worldwide. This work aligns with WWF's mission to conserve the world's biological diversity, ensure that the use of renewable natural resources is sustainable, and promote the reduction of pollution and wasteful consumption.

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