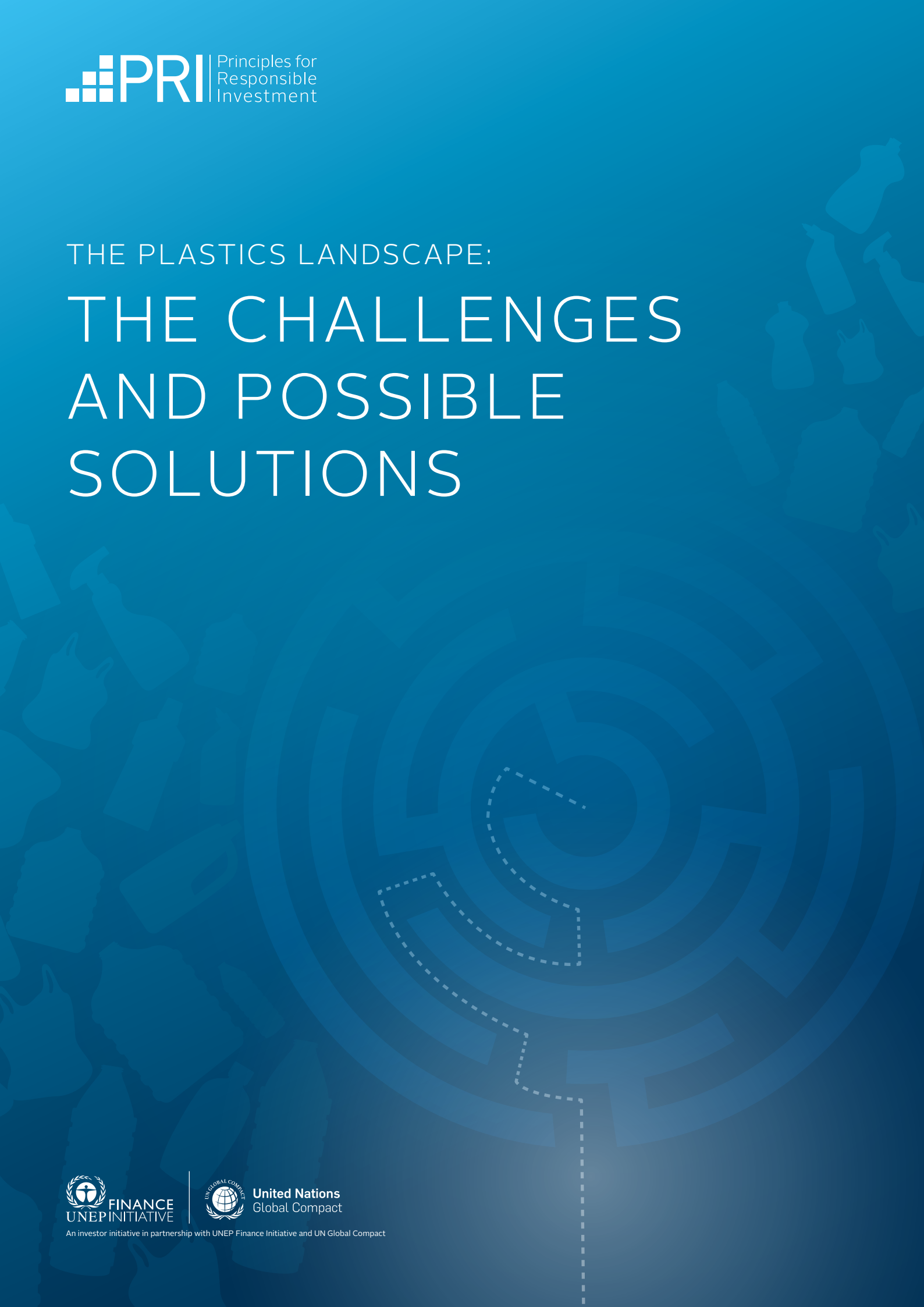
PRI Principles for Responsible Investment

THE PLASTICS LANDSCAPE:

THE CHALLENGES AND POSSIBLE SOLUTIONS



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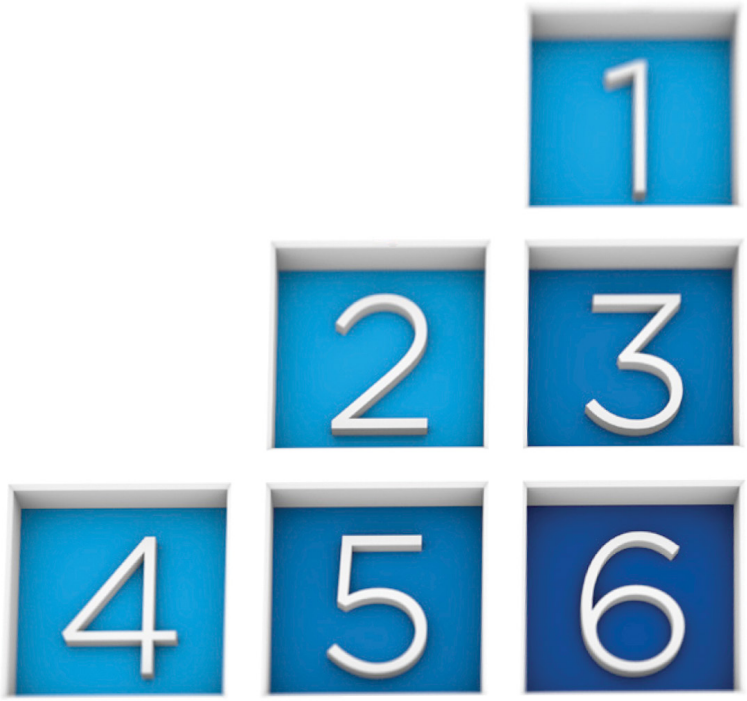
THE SIX PRINCIPLES

PREAMBLE TO THE PRINCIPLES

As institutional investors, we have a duty to act in the best long-term interests of our beneficiaries. In this fiduciary role, we believe that environmental, social, and governance (ESG) issues can affect the performance of investment portfolios (to varying degrees across companies, sectors, regions, asset classes and through time). We also recognise that applying these Principles may better align investors with broader objectives of society. Therefore, where consistent with our fiduciary responsibilities, we commit to the following:

1. We will incorporate ESG issues into investment analysis and decision-making processes.
2. We will be active owners and incorporate ESG issues into our ownership policies and practices.
3. We will seek appropriate disclosure on ESG issues by the entities in which we invest.
4. We will promote acceptance and implementation of the Principles within the investment industry.
5. We will work together to enhance our effectiveness in implementing the Principles.
6. We will each report on our activities and progress towards implementing the Principles.



PRI's MISSION

We believe that an economically efficient, sustainable global financial system is a necessity for long-term value creation. Such a system will reward long-term, responsible investment and benefit the environment and society as a whole.

The PRI will work to achieve this sustainable global financial system by encouraging adoption of the Principles and collaboration on their implementation; by fostering good governance, integrity and accountability; and by addressing obstacles to a sustainable financial system that lie within market practices, structures and regulation.

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ACKNOWLEDGEMENTS

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KEY FINDINGS

- Global production and consumption of plastic has increased by over a factor of 20 since the 1960s. Today, 40 percent of global plastics production is for packaging and 95 percent is single-use.
- Although demand for plastic is forecast to continue rising, growth in production and consumption is coupled with an inefficient global waste management system, resulting in less than 20 percent of plastic waste being recycled. As plastic does not break down naturally, it is polluting natural systems, including rivers and oceans.
- The production, use and disposal of plastics also creates significant greenhouse gas emissions throughout the different stages of the plastic value chain. According to research by the Center for International Environmental Law, greenhouse gas emissions from plastic could represent 10-13 percent of the entire remaining carbon budget by 2050 (in the context of the 1.5 degree goal of the United Nations Framework Convention on Climate Change Paris Agreement).
- As the environmental consequences of plastic become increasingly apparent, regulation and consumer behaviours have started to change. The impact of plastic pollution on the marine environment in particular has been in the spotlight, posing reputational risks for companies and investors.
- As regulations shift countries toward circular economy models, there are opportunities for future investments to address plastic pollution and the other related impacts. Potential solutions exist at each stage of the circular economy: design, reuse, repair and recycling.
- However, solutions cannot be assessed in isolation and must be considered in the context of the whole plastics value chain. Collaboration across the value chain is required in order to develop impactful solutions. Investors can encourage collaboration and consider the rest of the value chain when investing in solutions.

ABOUT THE PLASTICS LANDSCAPE SERIES

This is the first report in a series aimed at equipping investors with the information they need to understand plastic as a systemic issue, providing a technical overview of plastic and the plastic market, and exploring common concepts.

The series will help investors to identify where and how their portfolios might be exposed to plastic, enabling them to analyse relevant sectors and engage at the corporate and policy levels accordingly. The second report looks at risks and opportunities along the plastics value chain, and the third will cover the regulations, policies and other influencers.

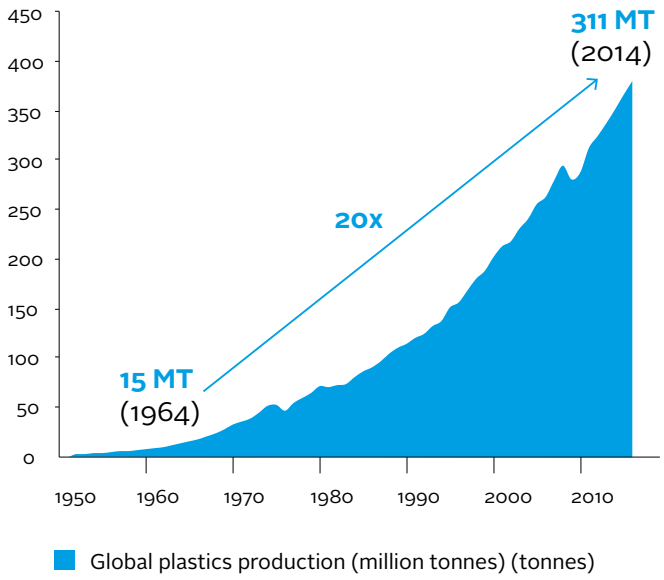
WHY THE PLASTICS SYSTEM IS UNDER PRESSURE

PRODUCTION AND CONSUMPTION

Plastic is a durable, flexible and relatively cheap material used in everyday life for a wide range of purposes. The impacts of its production, use and disposal on the environment and people create risks and opportunities for investors through different sectors and companies which are part of the plastic value chain.

Global production and consumption of plastic has grown by over a factor of 20 since the 1960s (see figure 1), a trend set to continue as disposable income increases (see interactive tool on global plastic use).

Figure 1: Growth in global plastics production 1950-2015. Source: Anthesis (adapted from Plastics Europe: Plastics the facts 2013 and 2015)

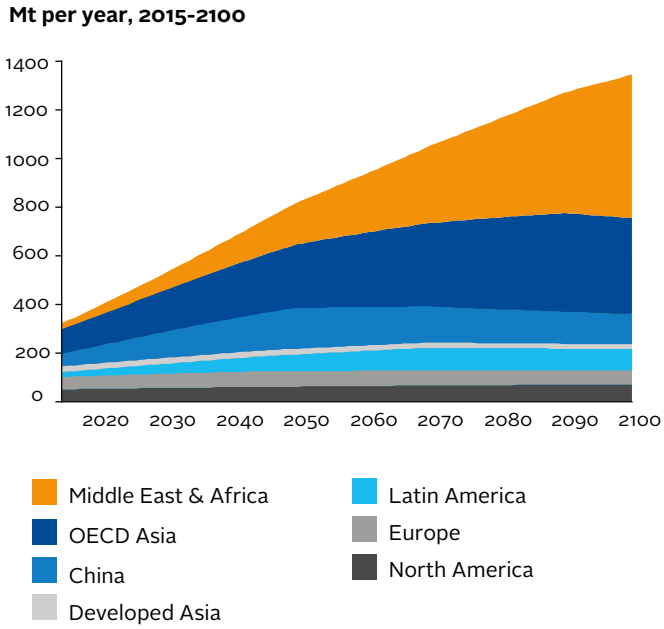


Note: Production from virgin fossil-based feedstock only (does not include bio-based, greenhouse gas-based or recycled feedstock)

However, regulatory interventions including bans and restrictions, as well as other factors such as changing trade flows of waste, might help to stem the tide of future demand and production.

Figure 2 shows that demand for plastic is predicted to continue to increase through 2100 in several regions, with the exceptions of North America and Europe, where demand could remain relatively constant. Sharp increases are expected in other regions as they continue to develop.

Figure 2: Global plastic demand projections. Source: Adapted from Material Economics (2018); The circular economy: a powerful force for climate mitigation



Plastic is used across various sectors such as infrastructure (construction), consumer goods and transportation. However, 40 percent of global plastic production is used for packaging, and 95 percent of plastic packaging[1] is single-use. Production of single-use items has increased in line with consumer demand for convenience items such as cutlery and cups, while imported food is often wrapped in plastic to keep it fresher for longer. As a result, disposable plastic packaging accounts for over 141 million tonnes of annual global plastic waste.[2] With global recycling rates as low as 20 percent,[3] and remaining waste incinerated or sent to landfill, plastic pollution is intensifying – and its effects on people and planet plain to see.

1 UN Environment Programme, 2018. Single-use plastics: a roadmap for sustainability.

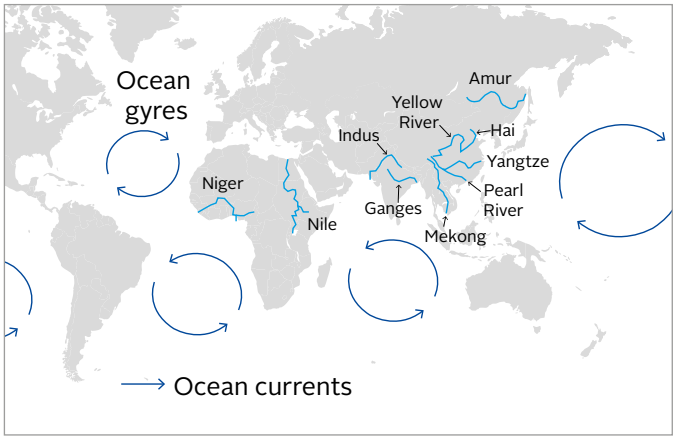
2 Geyer, R., Jambeck, J.R. and Law, K.L., 2017. Production, use, and fate of all plastics ever made. Science advances, 3(7), p.e1700782.

3 OECD, 2018. Improving plastics management: trends, policy responses, and the role of international co-operation and trade, Policy Perspectives: OECD Environment Policy Paper No.12.

IMPACTS ON THE ENVIRONMENT AND BUSINESS

Mismanagement of plastic waste has led to plastic spilling into oceans, with 10 rivers in Asia and Africa responsible for almost a quarter of marine plastic litter. Figure 3 shows where the ocean's currents form "trash-bergs" of plastic, damaging ecosystems and harming food chains.

Figure 3: Movement of river-borne plastic waste into the global oceans. Source: Anthesis (adapted from New Scientist; How to Solve a Problem Like Plastics)



> "In a business-as-usual scenario, the ocean is expected to contain 1 tonne of plastic for every 3 tonnes of fish by 2025, and by 2050, more plastics than fish (by weight)."
>
> The Ellen MacArthur Foundation[4]

Plastic pollution is equally impacting life on land, and companies whose products and packaging are associated with these impacts face significant reputational risks.

The visual impact of plastic waste is also detrimental to industries such as tourism that depend on pristine environments. This in turn puts pressure on waste management facilities, which are limited in some regions.

EXAMPLE: MCDONALD'S

US fast food chain McDonald's switched to paper straws in 2019 after a customer campaign based on the argument that plastic straws damage the environment.[5] However, the paper alternative dissolved in drinks and because the company was unable to recycle the new straws due to their density, they were disposed of as general waste. A second campaign was launched to reintroduce the plastic straws. This illustrates how campaigns can lead to changes in corporate behaviour, while also highlighting the challenges companies face in finding alternative materials that take into account the life cycle of a product.

Adding to the problem, not all plastic waste is visible. As the material breaks down over time, microplastics typically less than 5mm in diameter can enter the food chain as animals mistake them for food. Microplastics can also come from textile microfibres, and cosmetic and personal care products, which end up being washed into water systems. The seafood industry and retailers selling seafood will be exposed to reputational and, potentially, operational risk in the long term if plastic continues to build up in the oceans.

4 Ellen MacArthur Foundation, 2016. The new plastics economy: rethinking the future of plastics, p. 17.

5 Vaughn, A., 2018. McDonald's to switch to paper straws in UK after customer campaign. Guardian Online, 15 June.

There is also concern about the harmful effects of chemicals used in plastics to make them as durable as they are. When plastics are present in land or marine environments, or sent to landfill, chemicals are potentially leached into soil and water sources.[6] Potential health impacts on humans and animals are a big concern, though there have not yet been any studies on these long-term effects.

Greenhouse gas emissions are also associated with various stages of the plastic value chain: fossil fuel extraction and transportation, manufacturing and disposal, and incineration and recycling. Incineration is the highest emitter of CO_2, with 0.9 metric tons of net CO2e emissions created for every metric ton of plastic burned. According to research by the Center for International Environmental Law, greenhouse gas emissions from plastic could represent 10-13 percent of the entire remaining carbon budget by 2050 (in the context of the 1.5 degree goal of the United Nations Framework Convention on Climate Change Paris Agreement).[8]

Greenhouse gas emissions from plastic production, use and disposal not only contribute to climate change but can impact natural adaptation and resilience mechanisms. For example, plastic waste has been associated with diseases on coral reefs,[9] which not only support sea life but play a role in protecting coastal communities and industries against severe weather events such as hurricanes. Destruction of these resilience mechanisms also puts local fishing economies and tourism at risk.

6 UN Environment Programme, 2018. Plastic planet: how tiny plastic particles are polluting our soil.

7 Definition of carbon budget: A carbon budget is the cumulative amount of carbon dioxide (CO2) emissions permitted over a period of time to keep within a certain temperature threshold. Source: Carbon Tracker Initiative, 2018. Carbon Budgets Explained.

8 CIEL, 2019. Plastic & Climate: The Hidden Costs of a Plastic Planet.

9 Lamb, J.B., Willis, B.L., Fiorenza, E.A. Couch, C.S., Howard, R., Rader, D.N., True, J.D., Kelly, L.A., Ahmad, A., Jompa, J., Harvell, C.D., 2018. Plastic waste associated with disease on coral reefs. Science, 359(6374), pp. 460-462.

SOLUTIONS TO THE PLASTICS PROBLEM

The magnitude of plastic pollution could be reduced if the ways in which it is produced, used and disposed of more closely align with the concept of a circular economy (see figure 4). For this to happen, society must move away from the current linear "take, make and dispose" way of production and consumption to one where materials are used, and their value maintained, for as long as possible. Transitioning to a circular economy will also create investment opportunities for companies and investors, such as business models which recycle plastic waste for the secondary market.

There are opportunities to improve how plastic is made and managed at each stage of the circular economy: design, reuse, repair and recycling. The following sections provide an *overview* of possible solutions, which should consider:

- The real-world context – this includes existing systems or processes that may affect operations
- Potential unintended consequences – fundamental environmental, social and governance (ESG) principles (e.g. traceability of supply chain) should be applied to the project or company assessment
- Scalability – this will depend on the market and context of operation

Collaboration across the value chain is required in order to develop impactful solutions.

Figure 4: The circular economy. Source: Adapted from Anthesis

DESIGN

Products can be designed to keep plastic use to a minimum or eliminate the need for it entirely. Some brands and retailers are also streamlining the number of plastic types in their supply chains to make recycling easier and more commercially viable. For example, UK retailer Marks & Spencer has committed to reducing the number of polymers in its food packaging from 11 to three, and to ensuring that all plastic packaging comes from just one polymer group by 2022.

Alternatives to fossil fuel feedstock for primary plastic production can be considered, including:

- Bio (plant)-based plastic
- Bio-based biodegradable plastic (oil-based biodegradable plastic is not considered a solution if part of the aim is to reduce fossil-based production)
- Edible packaging as an alternative to single-use plastic packaging (uses bio-based plastic)
- Use of plastic waste and ocean plastics for products[10]

However, assessing alternatives requires comprehensive due diligence and an understanding of the contexts in which they are produced and used.

ASSESSING ALTERNATIVE MATERIALS

There is ongoing debate about whether substituting plastics with alternative materials (such as paper, glass and aluminium) in some scenarios would result in lower environmental impacts. Assessing this is complicated as every product and its supply chain is different.

Academic studies seeking to clarify the issue have used the Life Cycle Assessment methodology to compare the environmental impacts of plastics with other materials across the value chain.[11] Investors should consider the following stages[12] when assessing plastics against alternative materials:

- Production of raw materials (including sourcing location)
- Production and manufacture of product
- Distribution and transportation
- Use of the product
- End of life (including feasibility of recycling and reuse)

Various aspects (e.g. amount and type of energy used, water consumption and quality, chemical toxicity and greenhouse gas emissions) must be considered at each stage and then combined to form an overall assessment. Natural capital accounting methods have been used[13] to compare and aggregate environmental impacts at each stage using monetary values.

10 This could also be applicable to reuse and recycling, though the polymer structure may need to be reformed.

11 Khoo, H.H., Tan, R.B.H. & Chng, K.W.L., 2010. Environmental impacts of conventional plastic and bio-based carrier bags. The International Journal of Life Cycle Assessment, 15(3), pp 284–293.

12 Muralikrishna, I.V. & Manickam, V., 2017. Environmental Management: Science and Engineering for Industry. Butterworth-Heinemann.

13 The methodology used by Trucost, 2016, Plastics and Sustainability: A Valuation of Environmental Benefits, Costs and Opportunities for Continuous Improvement, claims to enhance traditional LCA approaches by ascribing monetary values to each environmental impact and enabling comparisons between alternatives as well as an appreciation of potential trade-offs based on economic metrics.

Companies using bio-based feedstock (for bio-based or edible packaging products) must meet certain sustainable sourcing criteria. There are concerns about agricultural land used to grow crops for bio-based plastics, and the resources (e.g. water and energy) required. The use of bio-based plastic must have a lower negative environmental impact than the oil-based feedstock that it is replacing. Biodegradable plastic (in theory) reduces the amount of waste produced. However, the plastic requires the right conditions to enable it to biodegrade – this is usually an industrial composting facility, not a garden compost bin.

The design also needs to consider the entire life cycle of a product – not just the feedstock – including what happens to it (how it is collected, sorted and managed) at end of life. For example, The Holy Grail project is being developed to introduce an industry-wide system to digitally watermark and code packaging waste. This is integrated at the design phase and helps to simplify how packaging can be sorted, providing additional information when scanned.

REUSE AND REPAIR

Reusing and repairing plastic products reduces the need to produce more plastic, resulting in less waste and greenhouse gas emissions. While products or containers can be reused, several cycles are required to reap sustainability and economic benefits. New business models such as the LOOP platform[14] launched by TerraCycle at the World Economic Forum 2019 encourages refillable packaging. When products are reused, repairs may be needed to extend the life of the product or material in its current form. As an example, technology giant Apple refurbishes its Mac laptops and resells them with a one-year warranty.[15]

RECYCLING

Once plastic products have been collected and sorted, they can be recycled mechanically or chemically. A combination of collection, sorting and recycling processes is required. While all plastics can technically be recycled, inadequate infrastructure to support the recycling of all the different polymers means it is not *practical* to recycle all plastics. Therefore, recyclable implies "recycled in practice and at scale" in this section.[16]

Infrastructure to support these processes is required across all plastic polymers and types. This includes the collection and capture of all plastics on land or in the marine environment, as well as microfibres/microplastics, for recycling. Solutions include innovative waste collection methods, new operations in regions that lack formal collection systems, and targeting types of plastic that are more difficult to recycle. This applies to collectors that are targeting packaging as well as non-packaging plastic products.

Deposit Return Schemes (DRS), where a small deposit is charged to a container at the point of purchase and refunded when returned, are often used to encourage the return of plastic bottles.[17] Countries including Germany and Norway are already implementing a DRS system.

Solutions at the sorting stage include new technologies and infrastructure to identify and separate types of plastic (including black plastic, bio-based and biodegradable plastic, and plastic that has had contact with food). For example, Umincorp[18] has developed a magnetic density separation-based technology for sorting post-consumer mixed plastic. Polymers float to the top, fall to the bottom or are suspended at different depths depending on their densities, and collected by splitters. The technology can be used to separate different types of polymers.

14 Loopstore, 2019. How It Works.

15 Apple, 2019. Certified Refurbished.

16 As aligned with the Ellen MacArthur Foundation, 2018. *New Plastics Global Economy Commitment*.

17 C M Consulting, 2017. Deposit Systems for One-Way Beverage Containers: Global Review 2016.

18 Umincorp, 2019. About.

Recycling can include mechanical and chemical technologies. There has been an increase in technology developments that enable recycled plastic to be produced to a higher standard. And it is not just recycling companies and chemical companies that are active in recycling. To help meet commitments to include recycled content in plastic products, and to de-risk price volatility, quality and volume challenges, the manufacturing sector is increasingly taking ownership in its downstream supply chain. For example, UK retailers Marks & Spencer, Sainsbury's and Tesco have been working with waste company Viridor to trial a recycling solution for black plastic, which is currently globally hard to recycle because of its carbon black pigmentation.[19]

Creating a market for recycled plastics will increase the value of the material. Once plastic waste has been captured or collected, petrochemicals and plastic manufacturers can repurpose these for new products. For example, recycled plastic can be used in construction products such as pipes, wall cladding, fencing and flooring.[20] There are also examples of ocean plastics being captured and used to create new products such as sportswear.[21] Clothing company Patagonia has launched a recycled polyester collection, which originated from plastic soda bottles.[22] The food sector is currently limited in terms of using recycled content in packaging due to food safety regulations.

If supply of recycled content is to meet increasing demand, recycling solutions will need to provide the right quality recycled material at volume.

MECHANICAL AND CHEMICAL RECYCLING

Mechanical

Mechanical recycling involves melting the plastic under controlled conditions and reshaping, shredding and granulating it to use as a raw material in the next process. Simple and comparatively low-cost technologies can be used in the mechanical recycling process. A common myth is that polymer structures are damaged during the mechanical recycling process which degrades the polymer, meaning that plastic items can only be recycled a few times. However, product quality is impacted by the *complexity* of polymer structures (e.g. the inclusion of additives) and contamination, not the recycling process. Therefore, polymers may be downcycled into lower-grade applications, and may lose the ability to be recycled back into higher-grade applications.

Chemical

Chemical recycling involves breaking down plastic polymers into their original monomers and rearranging them to produce new material. Chemical recycling is still in its infancy and although it can play a role in reducing the proportion of plastic waste which ends up in landfill or is incinerated, it needs to be more widely accepted, including by regulators, as recycling. Chemical recycling is not currently included in the regulatory definition of recycling. The current definition of recycling in Extended Producer Responsibility regulations only includes mechanical plastic recycling technologies. As a result, there are chemical recycling technologies that are pre-commercial and which generate prototypes for products with chemically-recycled material, or small volumes of fuels.

19 WorldEnvironment, 2018. Black plastic: Marks & Spencer, Tesco, and Sainsbury's trial 'breakthrough' recycling solution. WorldEnvironment Online.

20 WRAP UK, N.D. Using recycled plastic products in construction.

21 Adidas, 2019. Parley.

22 Patagonia, 2019. Recycled Polyester.

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The PRI commissioned Anthesis UK to undertake secondary research on the risks and opportunities in the plastic value chain, supported by interviews with experts and companies.

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The Principles for Responsible Investment (PRI)

The PRI works with its international network of signatories to put the six Principles for Responsible Investment into practice. Its goals are to understand the investment implications of environmental, social and governance (ESG) issues and to support signatories in integrating these issues into investment and ownership decisions. The PRI acts in the long-term interests of its signatories, of the financial markets and economies in which they operate and ultimately of the environment and society as a whole.

The six Principles for Responsible Investment are a voluntary and aspirational set of investment principles that offer a menu of possible actions for incorporating ESG issues into investment practice. The Principles were developed by investors, for investors. In implementing them, signatories contribute to developing a more sustainable global financial system.

More information: www.unpri.org

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The PRI is an investor initiative in partnership with UNEP Finance Initiative and the UN Global Compact.

United Nations Environment Programme Finance Initiative (UNEP FI)

UNEP FI is a unique partnership between the United Nations Environment Programme (UNEP) and the global financial sector. UNEP FI works closely with over 200 financial institutions that are signatories to the UNEP FI Statement on Sustainable Development, and a range of partner organisations, to develop and promote linkages between sustainability and financial performance. Through peer-to-peer networks, research and training, UNEP FI carries out its mission to identify, promote, and realise the adoption of best environmental and sustainability practice at all levels of financial institution operations.

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The United Nations Global Compact is a call to companies everywhere to align their operations and strategies with ten universally accepted principles in the areas of human rights, labour, environment and anti-corruption, and to take action in support of UN goals and issues embodied in the Sustainable Development Goals. The UN Global Compact is a leadership platform for the development, implementation and disclosure of responsible corporate practices. Launched in 2000, it is the largest corporate sustainability initiative in the world, with more than 8,800 companies and 4,000 non-business signatories based in over 160 countries, and more than 80 Local Networks.

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