

# FOREWORD

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Mr. McGuire: I want to say one word to you. Just one word.  
Benjamin: Yes, sir.  
Mr. McGuire: Are you listening?  
Benjamin: Yes, I am.  
Mr. McGuire: Plastics.  
Benjamin: Exactly how do you mean?  
Mr. McGuire: There's a great future in plastics. Think about it. Will you think about it?  
[Dialogue from the film, *The Graduate*, 1967.]

Plastics – versatile, flexible, strong, lightweight, durable, impervious to water, and inexpensive – are ubiquitous in modern life. In 1967, when the film, *The Graduate*, was released, worldwide plastic production hovered around 30 million metric tons. By 2016, global production had multiplied tenfold to 335 million metric tons, and if current trends continue, worldwide annual production will surpass 1,100 million metric tons by 2050<sup>1,2</sup>. It seems Mr. McGuire had a point: there was a great future in plastics.

Plastics made many things better. Lighter than metal, more durable than wood, moldable into any shape, rigid or flexible, plastics remade products and packaging. Industries as varied as automobile manufacturing, hardware, dry goods and groceries turned to plastic to reduce expenses, improve appearance, retain freshness and decrease pilfering. In modern hospitals, plastics appear everywhere from surgical suites to gurneys. Single use items, such as surgical gloves and intravenous bags and lines, reduce risk of contamination and eliminate the need for many sterilization procedures.

Nowhere is the disposable society more manifest than in the rise of plastic packaging. Today, packaging accounts for more than one quarter of all plastic production, and if current trends continue, packaging alone will amount to more than 300 million metric tons of plastic by 2050. Today, only 14% of plastic packaging is collected for recycling (compared to 58% of paper and 70-90% of iron and steel) and, with losses from resorting and processing, only about 1/3 of that actually makes its way into a new product. Thus, 95% of plastic packaging material, valued at \$80 to \$120 billion, is lost to the economy shortly after its first use<sup>1</sup>.

Especially worrying are environmental impacts of discarded or leaked plastic, degradation of natural systems, and pollution. On land, in rivers and at sea, plastic litter is unsightly and wreaks havoc on ecosystems. Plastic dumped in the ocean deleteriously affects tourism, fishing and shipping. Altogether, an estimated 8 million tons of plastic leak into the ocean every year<sup>1</sup>.

Plastic can persist for hundreds of years in the oceans. Depending on the specific polymer, density and composition, many sea-borne plastics will eventually degrade into micro-particles or fibers, which in turn can persist even longer. Today, an estimated 150 million tons of plastic pollute the world's oceans, and the amount cumulates with every additional leakage. If current trends continue, by 2050, seaborne plastic will weigh as much as all the fish in the ocean<sup>1</sup>.

Micro-plastics in the ocean are finding their way into and up the food chain, with uncertain implications for human health<sup>3</sup>. One recent study found 90% of samples of sea salt contaminated with micro-plastic, and the amount correlated with density of ocean plastic in different parts of the world<sup>4</sup>.

Reducing ocean contamination with plastics deserves urgent action by governments, industry and consumer groups in all parts of the world. Moving plastics from the disposable society into the circular economy is the only sustainable way forward. This begins with reducing waste of plastic and improving efficiency of production, continues with designing plastic products to be more readily compostable and recyclable (for example, eliminating mixed plastic types in bottles and caps), benefits from technological advances in processing and recycling facilities, and requires pathways for re-use of plastic products. Specific efforts to protect sea life and reduce the burden of plastic in oceans will require greater awareness of the scope of the problem, scientific research, technological ingenuity, economic incentives and political determination. Plastic in the oceans is a classic case of the tragedy of the commons, where individuals acting in their independent self-interest collectively degrade the value of a shared resource<sup>5</sup>.

This issue of The Veolia Institute Review - FACTS Reports portrays the history, uses and future of plastics in revealing and important ways. If plastics can gain a firm place in the circular economy, then we can give new meaning to Mr. McGuire's declaration more than fifty years ago, and there will be a great future in plastics.

1 The new plastics economy: rethinking the future of plastics. World Economic Forum, 2016. ([http://www3.weforum.org/docs/WEF\\_The\\_New\\_Plastics\\_Economy.pdf](http://www3.weforum.org/docs/WEF_The_New_Plastics_Economy.pdf))  
2 Plastics—the facts 2017. Plastics Europe. ([https://www.plasticseurope.org/application/files/5715/1717/4180/Plastics\\_the\\_facts\\_2017\\_FINAL\\_for\\_website\\_one\\_page.pdf](https://www.plasticseurope.org/application/files/5715/1717/4180/Plastics_the_facts_2017_FINAL_for_website_one_page.pdf))  
3 Smith M, Love DC, Rochman CM and Neff RA. Microplastics in seafood and the implications for human health. *Curr Environ Health Rep.* 2018; 5(3): 375-386.  
4 Kim JS, Lee HJ, Kim SK, and Kim HJ. Global pattern of microplastics (MPs) in commercial food grade salts: sea salt as an indicator of seawater mp pollution. *Environ Sci Technol.* DOI: 10.1021/acs.est.8b04180, October 4 2018 (<https://pubs.acs.org/doi/pdfplus/10.1021/acs.est.8b04180>)  
5 Hardin G. The Tragedy of the Commons. *Science.* 1968; 162(3859): 1243-8.