

# FOREWORD

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## Waste is a human invention.

Waste and pollution are human inventions. For many years, I accepted these concepts as essential facts of life, problems that simply had to be managed. As a young environmental engineer, I worked with isolated communities in the mountains of Central America to enable access to potable water, which is essentially freshwater that

has not been contaminated by human, animal, or industrial waste. To find an uncontaminated water source, we would search for a spring in the forested hills high above the community. When we found one, we would build an enclosed cistern to protect it from future contamination, and use gravity to pipe water to the community below. This approach provided them with safe drinking water, but it did nothing to clean the natural waterways that the communities used for bathing, fishing, and many other purposes.

This led me to explore inexpensive options for treating wastewater, such as constructed wetlands. As I learned about the ecology of wetlands and lakes, I realized that in nature there is no such thing as waste or pollution. Nature is circular, all outputs eventually become useful inputs to another component of that system: a fallen tree becomes food for termites or a home to other organisms; decomposing branches and leaves add nutrients to the surrounding soil. As I learned more about ecosystem ecology, I had an epiphany about the wastewater problem I was seeking to address: treating wastewater for safe disposal was the wrong design challenge. The correct design challenge should be how to utilize human outputs as inputs to products and services that benefit both human and natural communities.

Circularity is the foundation of nature and humanity's life-support systems. Our linear system of production and consumption, which begins with resource extraction and ends with waste disposal, is disrupting nature's cycles. Consider our energy system. Most of the world's energy is produced by burning fossil fuels and disposing

of carbon dioxide and other greenhouse gases as waste into the atmosphere. Most of the world's food is produced by agricultural practices that extract nutrients and water for production, while releasing pollutants in the environment and, according to the United Nations, dispose of over 900 million tonnes of waste each year. These linear processes disrupt the Earth's energy cycle, water cycle, nutrient cycle, and rock cycle, in ways that are creating water, food, health, and financial insecurities.

A circular economy is restorative by design. By using and reusing natural capital with little to no waste, production and consumption are sustained within the Earth's natural cycles. At Microsoft, we are working internally and with partners around the world to support a transition toward a more circular economy. We have committed to becoming carbon negative, zero waste, and water positive, and to protecting more land than we use. Microsoft's largest campus already operates on zero-carbon energy and has been zero-waste certified since 2016. But there is still much work to do. As the demand for our cloud services grows, Microsoft's datacenter footprint will expand. To ensure this expansion is sustainable, Microsoft is innovating to create closed-loop models. We are also working with customers, partners, and suppliers around the world to reduce their waste footprints through our learnings and with the power of data, AI, and digital technology. Today, we still lack consistent, high-quality data about the amount of waste, the type and quality, where it is generated, and where it goes. We are investing to digitize waste data across the company to identify opportunities to improve waste data collection, both for ourselves and for our customers.

The path to a circular economy requires designing waste out of production and consumption systems and designing within nature's cycles. This is an engineering challenge, a socio-economic challenge, and an institutional challenge. This issue of Veolia Institute's FACTS Reports explores each of these, with a focus on the role of industrial players in the process of scaling up the Circular Economy. This multidisciplinary and international collection of papers will enable readers to grapple with one of the most exciting, yet complex, challenges of our century.