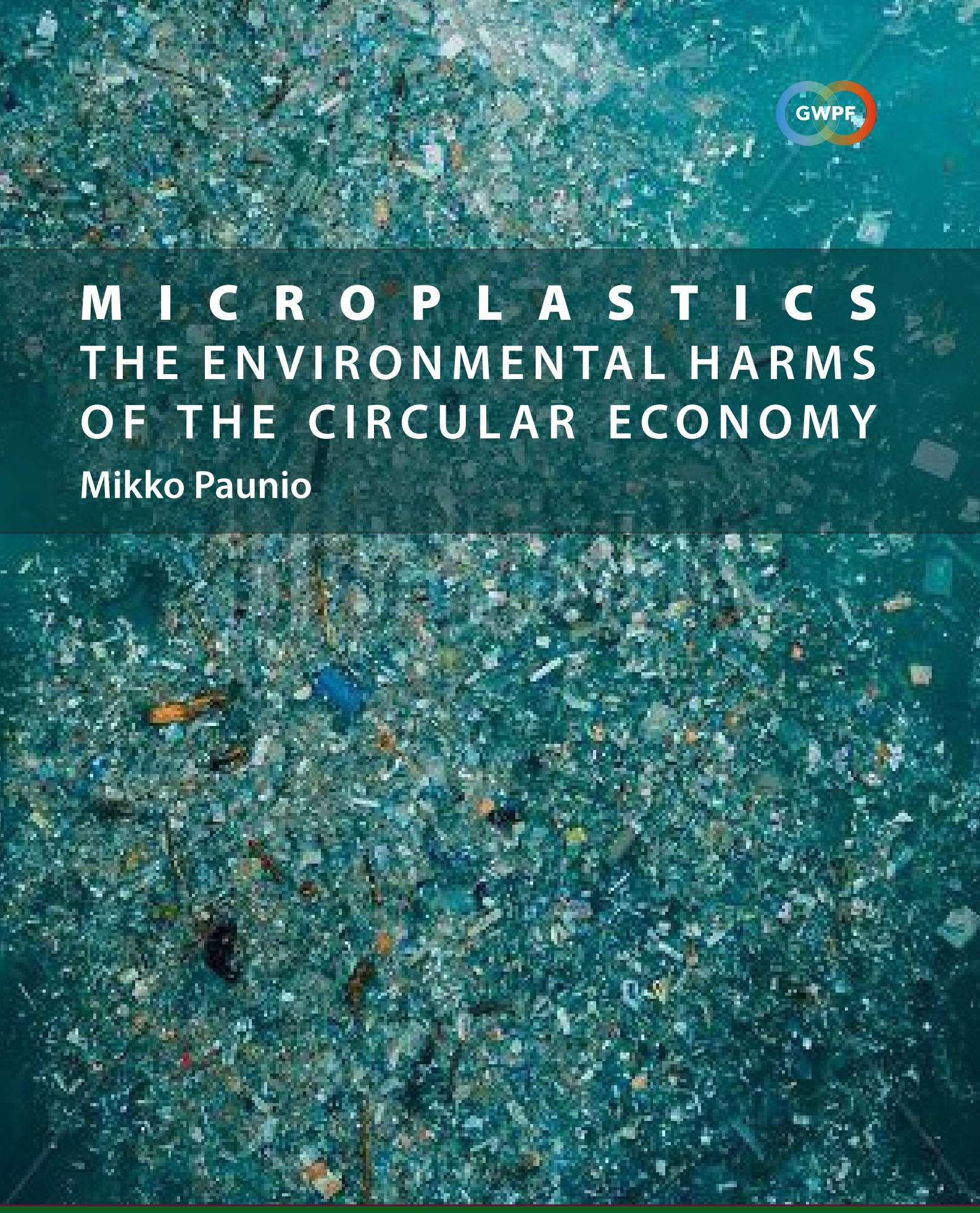

MICROPLASTICS
THE ENVIRONMENTAL HARMS OF THE CIRCULAR ECONOMY

Mikko Paunio

The Global Warming Policy Foundation
Note 42

Microplastics: The Environmental Harms of the Circular Economy

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Note 42, The Global Warming Policy Foundation

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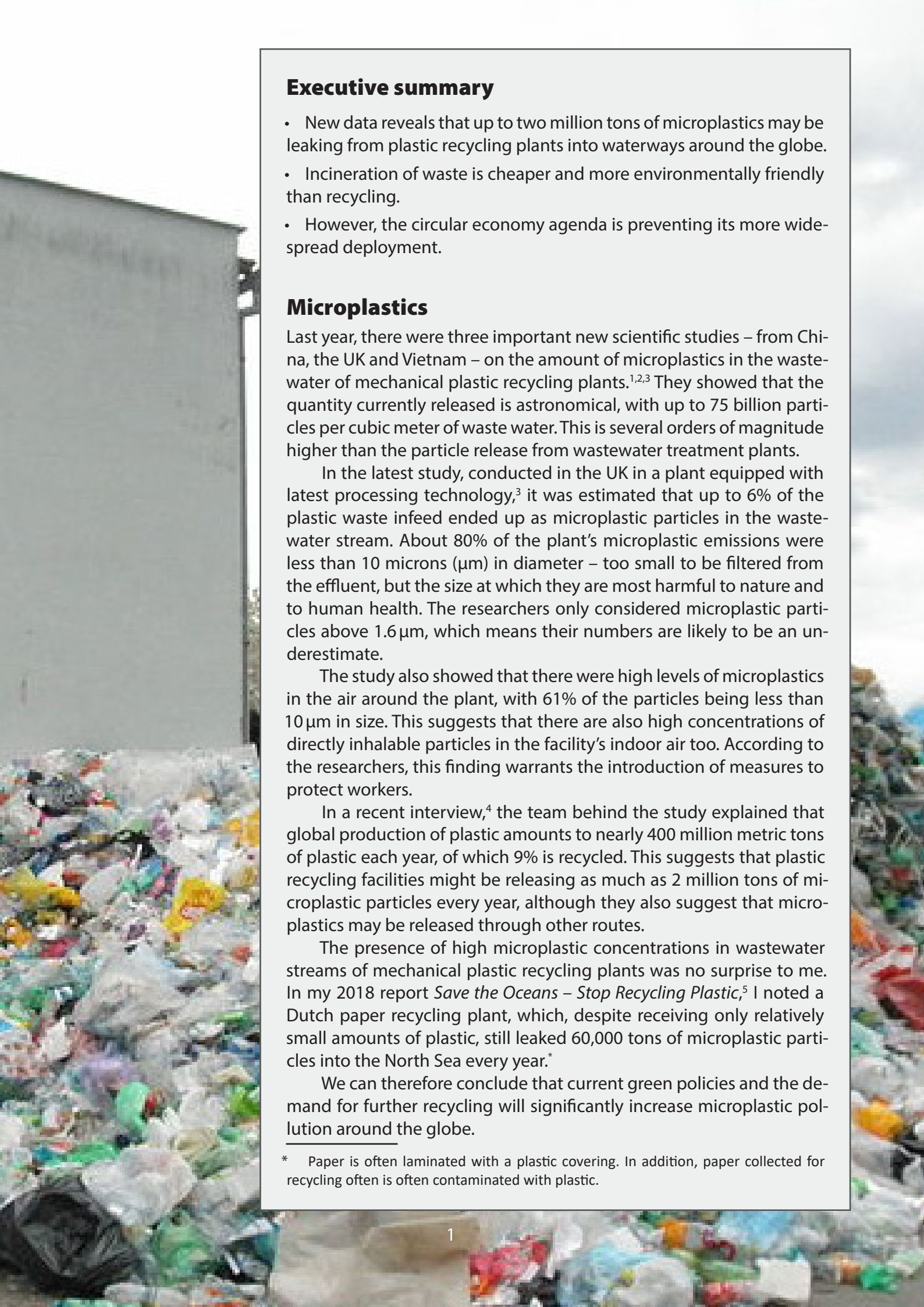
About the author

Mikko Paunio, MD, MHS was born in Turku, Finland in 1961. He graduated and then completed and defended his doctoral thesis at the University of Helsinki in 1990. He has postgraduate training from the Free University of Brussels in 1991 and has graduated from the Johns Hopkins Bloomberg School of Public Health (Master of Health Science in 1993). He is a certified (University of Helsinki) specialist in public health (1999) and is an adjunct professor in general epidemiology at the University of Helsinki.

He has worked in the following institutions: the Institute of Health and Welfare of Finland, University of Helsinki, Johns Hopkins Bloomberg School of Public Health, the European Commission, the World Bank and Finland's Ministry of Social Affairs and Health. He is a member of the American Council on Science and Health Board of Scientific and Policy Advisors. He has 40 publications listed in the US National Library of Medicine at the National Institutes of Health.

For the past 20 years he has actively followed and participated in discussions on EU and international waste policy issues from health-protection angle.



Executive summary

- New data reveals that up to two million tons of microplastics may be leaking from plastic recycling plants into waterways around the globe.
- Incineration of waste is cheaper and more environmentally friendly than recycling.
- However, the circular economy agenda is preventing its more widespread deployment.

Microplastics

Last year, there were three important new scientific studies – from China, the UK and Vietnam – on the amount of microplastics in the wastewater of mechanical plastic recycling plants.[1,2,3] They showed that the quantity currently released is astronomical, with up to 75 billion particles per cubic meter of waste water. This is several orders of magnitude higher than the particle release from wastewater treatment plants.

In the latest study, conducted in the UK in a plant equipped with latest processing technology,[3] it was estimated that up to 6% of the plastic waste infeed ended up as microplastic particles in the wastewater stream. About 80% of the plant's microplastic emissions were less than 10 microns (µm) in diameter – too small to be filtered from the effluent, but the size at which they are most harmful to nature and to human health. The researchers only considered microplastic particles above 1.6 µm, which means their numbers are likely to be an underestimate.

The study also showed that there were high levels of microplastics in the air around the plant, with 61% of the particles being less than 10 µm in size. This suggests that there are also high concentrations of directly inhalable particles in the facility's indoor air too. According to the researchers, this finding warrants the introduction of measures to protect workers.

In a recent interview,[4] the team behind the study explained that global production of plastic amounts to nearly 400 million metric tons of plastic each year, of which 9% is recycled. This suggests that plastic recycling facilities might be releasing as much as 2 million tons of microplastic particles every year, although they also suggest that microplastics may be released through other routes.

The presence of high microplastic concentrations in wastewater streams of mechanical plastic recycling plants was no surprise to me. In my 2018 report *Save the Oceans – Stop Recycling Plastic*,[5] I noted a Dutch paper recycling plant, which, despite receiving only relatively small amounts of plastic, still leaked 60,000 tons of microplastic particles into the North Sea every year.*

We can therefore conclude that current green policies and the demand for further recycling will significantly increase microplastic pollution around the globe.

* Paper is often laminated with a plastic covering. In addition, paper collected for recycling often is often contaminated with plastic.

Macroplastics

Of course, it is now well known that plastic waste exported from wealthy countries to the developing world is frequently simply dumped in the oceans. Ten months after my 2018 report on plastic waste, the Basel treaty forbade OECD countries from exporting dirty plastic to developing countries.[6] In a follow-up report published in 2019,[7] I predicted that this would result in an uncontrollable accumulation of plastic waste in the EU, because of limited processing capacity. However, this did not happen, for the following reasons:

- the existence of loopholes in the Basel treaty (it remains possible to export plastic waste, e.g. PET[†] bottles, to developing countries);[8]
- illicit waste trafficking, which is more lucrative than drug trafficking.[9]

Many developing countries use legally or illicitly imported plastic waste to generate energy, but others simply dump it in rivers and oceans or burn it in open fires, because so little of it can be recycled. However, a growing quantity is now being recycled in mechanical recycling plants – some legal but others informal – especially in South-East Asia.[10,11,12] This development is the result both of political pressure to recycle plastic and also of the global energy crisis (especially hikes in natural gas prices in Europe), which has pushed up the price of virgin plastic.[13] To a lesser extent, illegal waste trafficking (particularly to countries in the eastern Europe, such as Poland[14] or beyond, e.g. Turkey[15]) has reduced the accumulation of plastic waste in the UK and wealthier EU countries.

A better way: incineration

There is a better approach to plastic waste, namely incineration. In August 2022, I was asked if there was any evidence that Finland was ahead of other countries in promoting a circular economy.[16] In response, I explained that Finland had promoted recycling through significant investment in municipal recycling. However, the hundreds of millions of euros spent in this area over the first decade of the new millennium had unfortunate results, notably bad odours affecting large areas.[17] In addition, few of the anticipated benefits, for example to agriculture,[‡] had materialised. As a result, Finland changed direction, building a network of energy from waste plants, similar to the ones already operational in Denmark and Sweden. During the energy crisis last winter, these plants were operating flat out; they had become indispensable, effectively killing off environmentalists' dreams of improving the country's recycling rates. These rates are far lower than the legally

† Polyethylene terephthalate, a common plastic used for food and drink packaging.

‡ For example, through composting.

binding levels ordained in the EU's circular economy package[18] and, as a result, the European Commission has recently placed Finland on an early warning list.[19]

Incineration also offers a solution to another pressing waste management problem, namely how to deal with the sludge extracted from the effluent streams of wastewater treatment plants. This also contains a large quantity of microplastics, which cannot be removed. The idea of dealing with the problem in this way is not new. Japan has a long tradition of incinerating almost all sludge, on environmental grounds.[20] Modern waste incineration plants, such as those in operation in Scandinavian countries, which burn waste at high incineration temperatures (>850°C) and for a sufficiently long time, can safely handle dried sludge just as easily as they can deal with mixed municipal waste, including plastic.[21]

Incineration of plastic is, from the perspectives of climate, wildlife protection, environmental health and the economy, superior to any other approaches.[5,6] Chemical recycling through pyrolysis is already seen as problematic because it would dramatically increase greenhouse gas emissions.[22,23] However, efforts to expand incineration across the EU are being hampered by recent developments in environmental law and regulation. The 'circular economy' concept has delivered much irrational waste policy legislation, such as the EU's 2018 Circular Economy package.[8] Net Zero legislation, notably 2022's 'Fit for 55' package and the 2018 Taxonomy regulation,[24,25] which are also based on the circular economy concept, have thrown up new barriers.[26] There are now also attempts to put in place a global Plastic Agreement, centred on recycling.[27]

Conclusion

Incineration can solve the problem of microplastic pollution, whatever its source, so long as waste collection is organised effectively. However, as noted above, the legislative and regulatory machinery appears hellbent on approaches that are more expensive and more environmentally damaging. Incineration simply goes against the philosophy of a circular economy and the superstitious belief in a need to 'save the planet'.

Even Greenpeace now admits that recycling plastic is 'a dead end street',[28] but their solution to the problem – an almost total ban on plastic – is no better. Plastics' advantages make them indispensible. Without plastic packaging, for example, food waste would be a much bigger problem and hygiene would be radically worse. The loss to human welfare will be incalculable if the environmentalists get their way.

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About the Global Warming Policy Foundation

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The Global Warming Policy Foundation (GWPF) is committed to the search for practical policies. Our aim is to raise standards in learning and understanding through rigorous research and analysis, to help inform a balanced debate amongst the interested public and decision-makers. We aim to create an educational platform on which common ground can be established, helping to overcome polarisation and partisanship. We aim to promote a culture of debate, respect, and a hunger for knowledge.

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