



## **In a best-case recycling scenario plastic packaging production and plastic leakage still double by 2050**

**Here's why reducing plastic production at the source is a real solution to plastic pollution that opens up economic opportunities for all.**

Recycling, upcycling and waste-to-energy are means to immediately deal with the amounts of plastic waste that already pile up – they are mopping technologies, but they are not reducing the inflow of plastics. Fundamentally rethinking product delivery, service systems and plastic packaging leads to reducing waste at its source, striving for a circular economy with (social) businesses that skip plastics in the first place and might change the way we consume products forever, for the better.

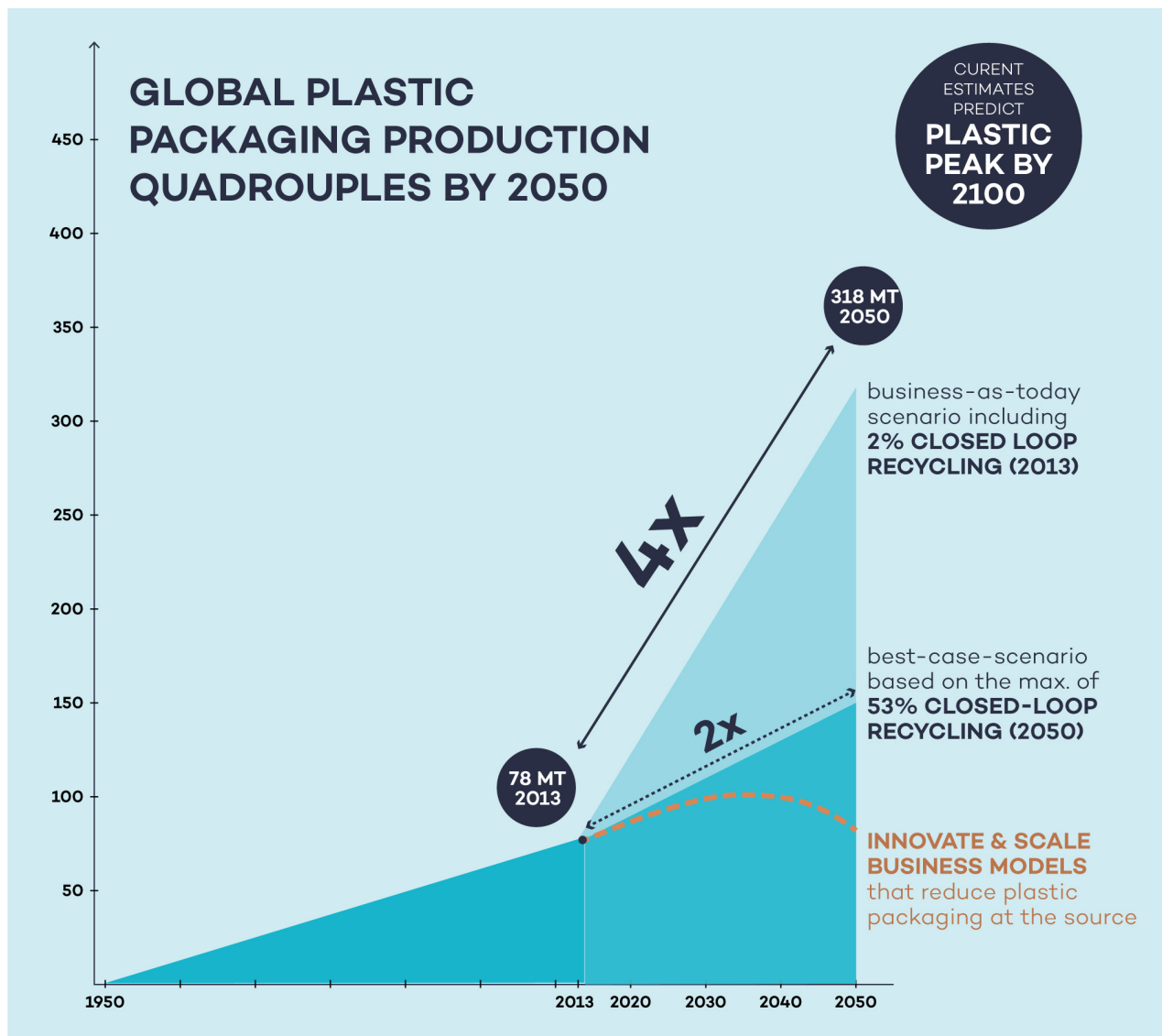
### **Bending the curve of plastic production to overcome leakage**

*“Recycling is better than disposal, reuse is better than recycling, but reduction is best of all. It is easier to deal with a flood by turning it off at its source than by inventing better mopping technologies.”*

– Donella Meadows, 1989 <sup>1</sup>

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<sup>1</sup> Wasting the World With a Plague of Plastic Debris Donella H. Meadows, Donella H. Meadows is an adjunct professor of environmental and policy studies at Dartmouth College. Los Angeles Times, June 4<sup>th</sup>, 1989. Online: [http://articles.latimes.com/1989-06-04/opinion/op-2370\\_1\\_plastics-non-biodegradable-polyvinyl-chloride](http://articles.latimes.com/1989-06-04/opinion/op-2370_1_plastics-non-biodegradable-polyvinyl-chloride); Also published in: MEADOWS, D. H. 2008. Thinking in Systems – A Primer, Vermont, Chelsea Green Publishing.



*Plastic packaging production is predicted to quadruple by 2050 and the plastics peak only to be hit by 2100. Predictions clearly call for reduction of plastics at the beginning of the value chain by skipping single-use plastics in the first place. Today only 2% of plastic packaging is recycled closed-loop. Even in a best-case scenario where 53% of plastics are recycled closed-loop<sup>2</sup> (which would half the need for virgin plastic packaging material) plastic production still doubles by 2050. Recycling only slows down the growth rate. With plastic packaging estimated in having a major share of plastics leakage into the ocean, we clearly see that recycling is important, but not closing the tap of plastic pollution. © Zero Waste Living Lab by enviu.*

The planet is already strained from the impacts of today's plastic, and we are on a path to more than quadruple quantities by 2050. The Plastic Soup Foundation predicts an even worse outlook: we might not reach the "plastic peak", the moment when the curve will be bend, until 2100<sup>3</sup>. In more detail: since 1950, we have seen a twentyfold increase in plastic production<sup>4</sup>, of which 75% are categorized as plastic waste today<sup>5</sup>. As plastics do not

<sup>2</sup> Closed-loop recycling: Recycling of plastics into the same or similar-quality applications

<sup>3</sup> Plastic Soup Foundation. 2017. Peak Plastic. Online: <https://www.plasticsoupfoundation.org/en/2018/01/peak-plastic>

<sup>4</sup> WORLD ECONOMIC FORUM, ELLEN MACARTHUR FOUNDATION & COMPANY, M. 2016. The New Plastics Economy — Rethinking the future of plastics. <http://www.ellenmacarthurfoundation.org/publications>. p. 25

<sup>5</sup> GEYER, R., JAMBECK, J. R. & LAW, K. L. 2017. Production, use, and fate of all plastics ever made. Science Advances, 3.

biodegrade but only “break down into smaller pieces”<sup>6</sup>, 79% of this plastic waste piles up in landfills or the natural environment. With this trend expected to exponentially grow in the next years, we are on the path to have more plastics than fish in the ocean by 2050<sup>7</sup>.

## **Reducing plastics at the source instead of inventing better mopping technologies**

Recycling, upcycling and waste-to-energy conversion are often discussed as a circular opportunity to solve our plastics crisis. Even though recycling is an essential part of a circular plastics economy and efforts should continue, it is not addressing the root cause of the issue. As we will see, recycling will be insufficient and too late to tackle the exponential growth of plastic packaging production. And upcycling and waste-to-energy conversion even lead to many additional negative externalities. While these end-of-life scenarios form a highly convenient argument for resin producers, packaging producers and fast-moving consumer good companies to continue to flood the market with single-use plastic, it is actually distracting us from finding more systemic solutions to tackle plastic pollution.

Instead, we need to start by bending the curve of plastic packaging production - tackling the problem at the beginning of the value chain. Introducing business models that reimagine consumption and delivery models that have the potential to *actually* decrease the growth of plastic pollution. And simultaneously, new business opportunities loom on the horizon - especially as governments around the world are increasing legislation to ban single-use and disposable plastics. Innovation in this field, for example refill and reusable subscription models, could strengthen loyalty relationships with consumers, as well as increase value chain efficiencies, reducing costs and negative externalities. Inevitably an opportunity for existing market players to lead the change, ensuring business continuity within a circular economy. And as some pioneering start-ups are showing, there is a growing zero waste customer basis to tap into. For example, in New Zealand the trend of *nude shopping* (shopping vegetables and fruits without packaging) proves to be a business case where supermarkets that ditched plastics reported a 300% increase of vegetable sales<sup>8</sup>. Moreover, successful start-ups such as [CupClub](#) (to-go-cup as a service), [Algramo](#) (refill vending machines) and [Repack](#) (reusable e-commerce system) show that skipping single-use plastics opens up a whole new sphere to completely innovating and redesigning today's shopping experience.

Let us explore in more detail why current mopping technologies of recycling, upcycling and waste-to-energy show limitations to deal with the plastics crisis.

## **Recycling will not close the tap on plastic pollution**

The promise of recycling in which all materials are reused again and again without any leakage to the environment, following the circular economy paradigm, is a misleading notion

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<sup>6</sup> WORM, B., LOTZE, H. K., JUBINVILLE, I., WILCOX, C. & JAMBECK, J. 2017. Plastic as a Persistent Marine Pollutant. Annual Review of Environment and Resources, 42, 1-26.

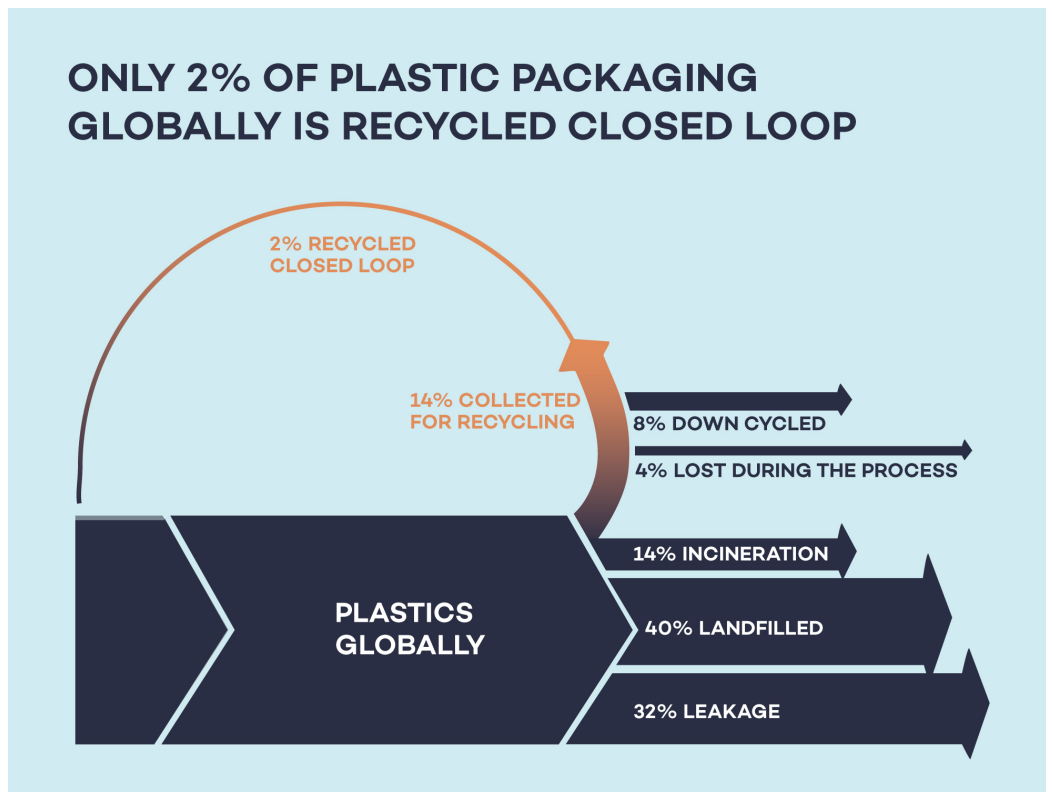
<sup>7</sup> WORLD ECONOMIC FORUM, ELLEN MACARTHUR FOUNDATION & COMPANY, M. 2016. The New Plastics Economy — Rethinking the future of plastics. <http://www.ellenmacarthurfoundation.org/publications>.

<sup>8</sup> New World (2019): Nude' shopping next big trend. In NZ Herald. Online: [https://www.nzherald.co.nz/sponsored-stories/news/article.cfm?c\\_id=1503708&objectid=12188111](https://www.nzherald.co.nz/sponsored-stories/news/article.cfm?c_id=1503708&objectid=12188111)



to stop plastic pollution. Because a realistic assessment shows, we are galaxies away from a perfect circular future.

*Current recycling figures are extremely low with little improvement in the future*



*Recycling rates are by no means keeping up with the massive amount of plastic packaging produced. Based on Ellen MacArthur Foundation © Zero Waste Living Lab by enviu.*

Looking at the projections on global plastic packaging production in relation to global plastic packaging recycling rates, a massive gap between both reveals itself. In 2013, about 14% of plastic packaging globally was *collected* for recycling of which 4% was lost during the process, 8% was downcycled into lower value material and only 2% was recycled in a closed loop<sup>9</sup>.

Some research even argues that global plastic packaging recycling rates only amount to around 53% by 2050, in the best-case scenario with best available technology<sup>10</sup>. Fact is, there are significant challenges on the pathway to increase global recycling rates to an extent that we are no longer seeing leakage in to the ocean, as we will explore next.

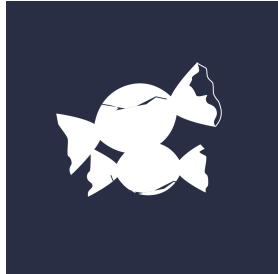
*Recycling is not an option for at least 50% of plastic packaging items*

<sup>9</sup> World Economic Forum, Ellen MacArthur Foundation & Company; M. 2016. The New Plastics Economy — Rethinking the future of plastics. <http://www.ellenmacarthurfoundation.org/publications>.

<sup>10</sup> GAIA & Zero Waste Europe (2018): RECYCLING IS NOT ENOUGH. In Gaia. Online: <http://www.no-burn.org/wp-content/uploads/Recycling-is-Not-Enough-UPDATE.pdf>; Denkstatt (2018): The potential for plastic packaging to contribute to a circular and resource-efficient economy (Identiplast, 2015). Online: <https://denkstatt.eu/download/1986/>

Small format, multi-material, uncommon and nutrient-contaminated packaging are often highly functional to package goods, but currently lack a viable reuse or recycling opportunity.

In more detail, the problematic nature of plastic packaging that need fundamental redesign and innovation<sup>11</sup> :



**Small-format packaging**

such as sachets, tear-offs, lids, straw packages, sweet wrappers and small pots, tend to **escape collection or sorting systems and have no economic reuse or recycling pathway.**



**Multi-material packaging**

such as pouches, snack packaging with different plastic and aluminum layers **cannot be economically, and often not even technically, recycled currently.**



**Uncommon plastic packaging material**

such as PVC, PS, and EPS are often technically recyclable, but not economically viable to sort and recycle because their **small volumes prevent effective economies of scale.**



**Nutrient-contaminated packaging**

such as coffee capsules or fast food packaging are often difficult to sort and clean to be able to enter high-quality recycling.

Following the *New Plastics Economy* report, these four categories represent at least 50% of plastic packaging (by number of items) and they are unlikely to have a proper reuse or recycling pathway at scale in the foreseeable future.

*A true circular material flow for packaging is challenging*

Recycling might only replace a part of the virgin feedstock for plastic packaging production, through so called closed-loop recycling. Only for some high quality materials, like PET, (chemical) recycling technologies are available that recycle back in virgin quality feedstock. However, the majority of plastics will see a decrease in polymer quality and can usually about 2-3 times be recycled before its quality decreases to the point where it no longer can be used in a circular manner<sup>12</sup>. Even if recycled materials would feedback into the packaging industry, it has to compete cheap price of virgin plastic – a battle which is currently lost.

*Recycling pioneers struggle, waste management newcomers such as Indonesia face a massive gap*

Recycling pioneers such as Germany struggle to recycle effectively and efficiently, despite 30 years of experience in the dual system, Germany is currently managing to feedback a

<sup>11</sup> Based on: World Economic Forum & Ellen Macarthur Foundation 2017. The New Plastics Economy – Catalysing action.

<sup>12</sup> National Geographic: 7 Things you did not know about Plastics (and Recycling). Online: <https://blog.nationalgeographic.org/2018/04/04/7-things-you-didnt-know-about-plastic-and-recycling/>

mere 28,6% of its plastics waste back into new products in 2017<sup>13</sup>. Upcoming economies such as Indonesia often lack even the basic collection and waste management systems, with an estimate of 3.2 MMT of mismanaged plastic waste per year<sup>14</sup>. It is highly unlikely that the current fragmented collection and waste management<sup>15</sup> can be build up towards the required infrastructure in time to deal with the exponential tsunami of plastic coming their way.

### Upcycling plastic is still a linear process (in many cases)



*Upcycling is still a linear process that prolongs the life of plastic waste and risks the leakage of microplastic leakage.*

Recycling of plastic also can lead to negative effects, such as in the case of upcycling packaging waste to other industries. Certainly, favoring the reuse of materials instead of virgin materials is preferable. However, in many cases, upcycling plastics waste only moves the plastics problem to another sector, namely the fashion industry. One single

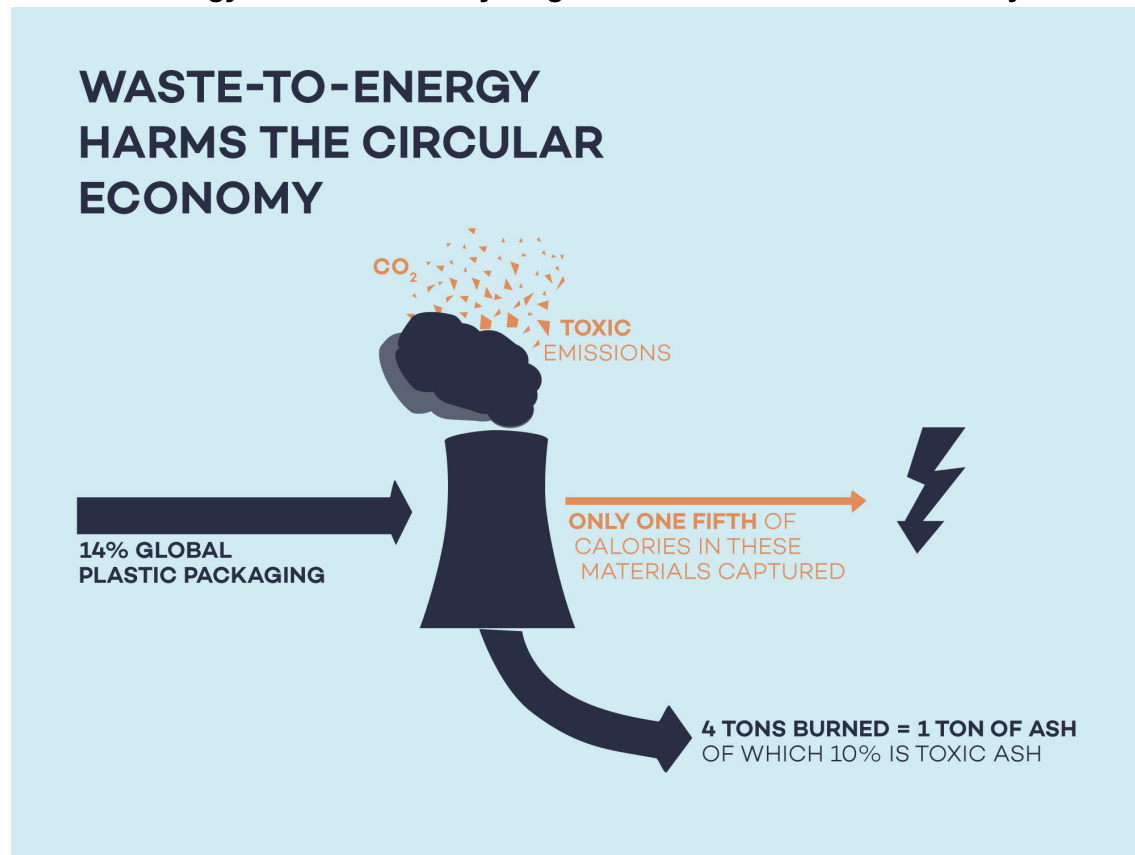
<sup>13</sup> In 2017, Germany had a total of 6,15 Mio. Ton of plastics waste, of which 1,76 Mio. to. recycled material from post-consumer, production and processing waste was fed back into plastic processing. More detailed information: Plastics Europe, BKV etc al. (2018): Stoffstrombild Kunststoffe in Deutschland 2017 p. 11. Online: [https://www.bkv-gmbh.de/fileadmin/documents/Studien/Kurzfassung\\_Stoffstrombild\\_2017\\_190918.pdf](https://www.bkv-gmbh.de/fileadmin/documents/Studien/Kurzfassung_Stoffstrombild_2017_190918.pdf) (Accessed: March 6, 2019)

<sup>14</sup> Jambeck, J. R., Geyer, R., Wilcox, C., Siegler, T. R., Perryman, M., Andrady, A., Narayan, R. & Law, K. L. 2015. Plastic waste inputs from land into the ocean. Science, 347, 768-771.

<sup>15</sup> Global Business Guide Indonesia. 2014. Sweeping Opportunities in Indonesia's Waste Management Industry [Online]. Global Business Guide Indonesia. Available: [http://www.gbgingonesia.com/en/main/business\\_updates/2014/upd\\_sweeping\\_opportunities\\_in\\_indonesia\\_s\\_waste\\_management\\_industry.php](http://www.gbgingonesia.com/en/main/business_updates/2014/upd_sweeping_opportunities_in_indonesia_s_waste_management_industry.php) [Accessed 20. April 2018].

polyester fleece jacket release almost one million fibers per washing<sup>16</sup> – which end up in the ocean and ultimately our food chain<sup>17</sup>. Patagonia has upcycled soda bottles into fleece since 1993<sup>18</sup>, and G-Star has replaced conventional polyester in their denims with recycled ocean plastics<sup>19</sup>. Also upcycling for other applications such as [housing](#) or [tiles](#) often is just another form of extending the linear life with one lifecycle – not a circular model.

### Waste-to-energy is no form of recycling and harms the circular economy



*Waste-to-energy is considered harmful in respect to its externalities such as toxic emissions, Co2 emission and toxic ashes. Additional, only one fifth of calories in these materials are captured when converting plastic waste to energy.*<sup>20</sup> © Zero Waste Living Lab by enviu.

Converting waste to energy, by many seen as a form of recycling and an effective solution to reduce pollution, means waste is burned in order to recover energy from it. Aside of the various negative toxic effects through emissions and toxic ash for humans and planet alike, about 90% of burned waste could actually be composted or recycled. Following the research of Zero Waste Europe, burning these resources to create energy instead of

<sup>16</sup> Mermaidseu Life+. Report on localization and estimation of laundry microplastics sources and on micro and nanoplastics present in washing wastewater effluents (A1). 2016.

<sup>17</sup> UNEP, U. N. E. P. 2016. Marine Plastic Debris & Microplastics – Global Lessons and research in inspire action and guide policy change. Online PDF: <https://wedocs.unep.org/rest/bitstreams/11700/retrieve>

<sup>18</sup> Patagonia: Recycled Polyester. Online: <https://www.patagonia.com/recycled-polyester.html>

<sup>19</sup> G-Star: G-Star and Plastic Soup Foundation. Online: [https://www.g-star.com/en\\_us/about-us/responsibility/news/g-star-and-plastic-soup-foundation](https://www.g-star.com/en_us/about-us/responsibility/news/g-star-and-plastic-soup-foundation)

<sup>20</sup> GAIA – Global Alliance for Incinerator Alternatives (2013): Waste Incinerators: Bad News for Recycling and Waste Reduction. In Gaia. Online: <http://www.no-burn.org/wp-content/uploads/Bad-News-for-Recycling-Final.pdf>; Connett, Paul: Why incineration is a very bad idea in the Twenty First Century. Online: <http://www.no-burn.org/why-incineration-is-a-very-bad-idea-in-the-twenty-first-century/>

recovering them “discourages efforts to preserve resources and creates incentives to generate more waste.” And in fact, countries such as Denmark have shown that waste burning leads to dropping recycling rates and along with that reduces employment opportunities<sup>21</sup>.

*“Waste-to-energy” is often described as a good way to extract energy from resources, but in fact it works against the circular economy, producing toxic waste, air pollution and contributing to climate change – all without delivering what it promised.”* Zero Waste Europe, 2018

### **Towards a new paradigm for plastic solutions**

Recycling, upcycling and waste-to-energy are mopping technologies that will not provide the solution to the exponentially growing plastic pollution problem. The place where we need to start is to fundamentally rethink the way we consume so we can radically reduce absolute volumes of plastics put on the market. If we really want to bend the curve, we have to innovate and scale business models that reduce plastics at the source. Only then we will be able to sustainably and fundamentally change the course of this problem.

Within the Zero Waste Living Lab Indonesia, we scale, replicate and develop disruptive business models to make zero waste the *new normal*. This blog is part of a series of blogs that share how we can build the Zero Waste future with refuse, reduce and reuse businesses that reimagine the way we deliver, consume and pack products.

**Join us in making zero waste the *new normal*.**  
**Stay tuned via our [Newsletter](#), [Instagram](#) & [Twitter](#).**

*All photos and graphics by [Zero Waste Living Lab](#), a program by [enviu](#) and supported by Plastic Solutions Fund, Greenpeace US, Flotilla Foundation, Stichting Marma and the Marshall Foundation.*

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<sup>21</sup> Zero Waste Europe: 9 Reasons Why we better move away from waste to energy and embrace Zero Waste instead.2018. Online: [https://zerowasteurope.eu/2018/02/9-reasons-why-we-better-move-away-from-waste-to-energy-and-embrace-zero-waste-instead/?mc\\_cid=16554b1254&mc\\_eid=46d94c7962](https://zerowasteurope.eu/2018/02/9-reasons-why-we-better-move-away-from-waste-to-energy-and-embrace-zero-waste-instead/?mc_cid=16554b1254&mc_eid=46d94c7962)