

# Where does your trash *really* go?

## An Analysis of Waste Management in Norway

Mireille Ruamklang Aasebø, Safiya Adejoh, and Nathaniel Beattie

Group 2, SDG 215, University of Bergen

May 12, 2022

### Introduction

You just finished using a disposable plastic water bottle, and as a concerned global citizen, decided to bring it back to the store and deposit it into the recycling machine. Do you ever wonder what happens after that? You may be satisfied with the 2 kroner you just “earned”, but do you ever think about how much of that bottle actually gets recycled or where it ends up? We often have the mindset that our waste is “out of sight and out of mind” but plastic pollution makes up a large portion of our environmental impact, especially due to its resiliency against bio-degradation. In Norway alone, 255,000 tons of plastic waste was produced in 2020, with only 28.7% (40,723 tons) of that being recycled (Grønn Punkt Norge, 2021). In order to combat this waste, and increase the percentage of this waste that is recycled, we must first understand the current recycling and waste management schemes in place, analyze their effectiveness, and find opportunities to solve the ever-growing plastic waste crisis.

### Impact of Plastic Waste on Terrestrial Environments

Plastic waste has a marked effect on both the marine and terrestrial environments, as well as human and animal health. “Plastic materials are of great concern in the environment because of their accumulation and resistance to degradation” (Ilyas et al., 2018) Waste management companies struggle to handle this plastic, so large amounts are buried underground (Lambertsen and Olsen, 2018). Not only does this waste take up physical space that could be utilized for other applications, but the plastics in landfills and underground can leech harmful chemicals such as BPAs and PBDEs into the groundwater, ending up in the bodies of humans and animals. Microplastics have even been detected in cow’s milk and in some places, the air we breathe (Döhler, 2020). The long-term effects of this type of exposure is largely unknown, and a growing area of

study. Some research suggests this exposure may cause hormonal alterations in humans, leading to significant negative health effects. For animals, the plastic contact can be even more severe, having the potential to cause brain and reproductive system damage (Knoblauch, 2022). So then instead of leaving the plastic in a landfill, let's just burn it to recover some of that energy back, right? While this does produce energy and is a practice used as a solution (especially in Norway, where 109,000 tons of plastic is burned annually), incineration of waste plastic emits hazardous pollutants such as  $CO_2$ , hydrocarbons, and dioxins, which are all contributors to climate change (Ilyas et al., 2018). Human, animal, and environmental health suffer when we dispose or incinerate our plastic trash. On top of that, due to the new demand for waste as an energy source, the production of waste has actually increased. Large energy recovery plants have created an increase in the demand for waste and encouraged a tendency to ship waste to these select few plants (Mauch, 2016). Clearly, these are not solutions, and are only escalating the problem to a level we cannot control. All is not dire however, as there is promising new developments with the creation of bio-plastics that have the ability to decompose naturally in a much shorter amount of time compared to regular plastics. This would be perhaps the best way to handle plastic waste, but can only be applied to this "new wave" of bio-degradable plastic. Thus, the best way to manage the non-biodegradable plastic waste we currently have is through recycling.

## The Effectiveness of the Pant System

One of the most popular methods of plastic recycling in Norway is the Pant system, in which consumers buy a drink and "rent" the plastic container it is in, getting a small amount of the original sale back when the container is returned to the store. Infinitum, the organization that operates this bottle return scheme, reports that 92.8% of all plastic drink bottles sold in Norway were returned for recycling (Infinitum, 2021). These is an extremely high amount, especially in comparison with many countries that do not even have such a scheme at all. This brings us to our original question: what happens after the bottles are processed through the vending machines? First, they are crushed (as you may hear) and sorted and separated into bags of metal and plastic, which are loaded into the carrier's trucks and transported to the Infinitum facilities. From there, the plastic is sorted by color and pressed into spheres, which are further broken down into small pellets, and combined with virgin plastic (an ideal mixture is 85% recycled, 15% new) to create new bottle blanks, which are sold and shipped to beverage manufacturers around northern Europe to create new bottles. Not all plastic ends up this way, though. The plastics not deemed safe for use in beverage containers are broken down into fibers, melted, and used in the fiber industry (most prominently in Asia) for the production of new clothes (Eik et al., 2002). Even with this system in place, some companies still see benefits from choosing to not be a member of the recycling scheme. For many breweries in Norway, it is still cheaper to buy bottles made of completely new materials

over those made with recycled materials. One way to solve this would be to introduce a tax on virgin materials such that it is now financially favorable to choose the recycled materials (Infinitum, 2021). In many cases, recycling must go hand in hand with economic incentives in order for a successful system to emerge. The key reason the Pant scheme works is because at every stage, there is also an economic incentive for the bottle to get recycled (outside of the main sustainability motivation). Even if they are occasionally opposing forces, sustainability and economic gain are not mutually exclusive, perfectly illustrated by the Norwegian bottle return system. However, when you take step back and look at the general state of plastic recycling, have we struck an similar balance?

## How Effective is General Plastic Recycling?

Did you know that on average, Norway consumes over 100,000 tons of plastic packaging annually? To put into some perspective, that is equivalent to 80,000 elephants worth of waste (Statistisk Sentralbyrå, 2020). What does this process look like to recycle this mountain of plastic? Currently, the most common method to process plastic is called mechanical recycling. This process is similar to the bottle recycling process outlined above, breaking down the various plastics into a form they can be sold as stock for new plastic creation. In contrast to the bottle recycling, mechanical recycling requires considerably more sorting due to the range of plastics collected, as well as the potential for contaminants due to improperly sorted consumer waste. Once extensively separated, the plastics are milled into flakes, washed, and dried, ready to be re-melted and re-processed into new plastic stock (European Bioplastics e.V., 2020). In 2020, 51% of all plastic waste in Norway was sent to recycling facilities, and across the EU, this number drops to 34.6% <sup>1</sup>. Once in this system, the recycled material can only be recycled around ten times due to gradual decrease in quality (Franzefoss, 2020). This is clearly not ideal, since after these ten uses, the plastic once again finds it's way into the incinerator or landfill to contaminate the biosphere. If recycling is currently the best way of handling this material, and still does not achieve proper sustainability, what is the solution?

## The Road to a Circular Economy

One of the best places to start improving the recycling process is by lowering the percentage of material exported to other countries, as well as extending the number of times that a piece of plastic can be recycled. Additionally, in order to raise consumer awareness, we could create more cohesive labeling for consumer products, and design incentives to encourage proper sorting of consumer waste. However, The larger question in plastic waste management is if recycling improvements should be the primary goal. Consider this: if we produce and consume less plastic, there is simply less plastic waste to worry about in

---

<sup>1</sup>Statistisk Sentralbyrå (2020), Plastics Europe (2021)

110 the first place. In tandem with the optimization of waste management, there  
should be a larger focus on reducing the amount of waste we produce (both by  
the consumer and producer), as well as work to reuse as much of this material  
we have already spent time and energy to create. This outlines the concept of a  
circular economy - a system that minimizes waste in favor of a creating a cyclic  
115 loop of material and product reuse. From the perspective of a circular economy,  
recycling is "the shortest step to the least impactful outcome. A bigger leap  
forward in circularity is the reuse of products that makes the recycling of materi-  
als unnecessary" (Reusable Packaging Association, 2019). In tandem to reuse,  
a circular economy calls for a reduction in material production. If you are able  
120 to reuse a product at its highest level, you naturally have less of a demand for  
the raw materials needed to create the same product from scratch. You also do  
not have to expend excess energy transforming that material into another use-  
able state. On the industrial side, producers can preserve the integrity of plastic  
products through maintenance, refurbishment, and re-manufacturing. On the  
125 other side, consumers can utilize reusable-designed products, or simply re-use  
waste plastic, putting it to new practical uses. The mindset of reuse also opens  
up the opportunities for sustainable design, abandoning the notion of creating  
the cheapest possible single-use products in favor of products that are better  
designed for the task at hand. A practical example of this system is a company  
130 called [Loop](#), which creates reusable metal containers that keep ice cream colder,  
or reusable cups and mugs that keep coffee warmer. As of right now, products  
like these are very limited, but exhibits a valuable proof of concept for larger-  
scale change in the consumer environment. The key to solving the waste crisis  
lies in a circular economy grounded by material reduction and reuse.

## 135 Conclusion

Think back to the water bottle you had at the beginning of this paper. Instead  
of panting, recycling, or throwing it away, what if you saved it to use as an  
extra water bottle on your next hike? Or perhaps used it a place to hold some  
of your vegetable oils, rice, or other dry goods? What if you even got creative  
140 and turned the bottle into a small planter, art piece, or a bird feeder? As you  
start reusing some of these materials, your need for new products diminishes,  
and you naturally reduce the amount of plastic waste you produce. There is  
a reason the famous phrase "Reduce, Reuse, Recycle" is written in that way:  
it is in *order of priority*. To solve the waste crisis, we must first reduce our  
145 consumption, reuse what we still need to consume, and recycle only what you  
cannot reuse any longer. This systematic shift our individual way of thinking  
can guide our society towards a more circular future.

## References

- Döhler, D. (2020). Scientist finds microplastics in milk.  
150 <https://www.zavit.org.il/intl/en/health-nutrition/scientist-finds-microplastics-in-milk/>.
- Eik, A., S. Steinmo, H. Solem, H. Brattebø, and B. Saugen (2002, 01). Eco-efficiency in recycling systems : Evaluation methods & case studies for plastic packaging. *NTNU Industrial Ecology Programme*.
- 155 European Bioplastics e.V. (2020). Mechanical recycling. *Reviews on Environmental Health*.
- Franzefoss (2020). Slik kan vi øke gjenvinning av plast.  
<https://www.franzefoss.no/blogg/slik-kan-vi-oke-gjenvinning-av-plast>.
- Grønn Punkt Norge (2021). Fakta og tall. <https://www.grontpunkt.no/om-oss/fakta-og-tall/>. Accessed: 2022-09-05.  
160
- Ilyas, M., W. Ahmad, H. Khan, S. Yousaf, K. Khan, and S. Nazir (2018). Plastic waste as a significant threat to environment – a systematic literature review. *Reviews on Environmental Health* 33(4), 383 – 406.
- Infinitum (2021). Annual report 2021. [https://infinitum.no/media/0pxb1kay/infinitum\\_ar-rapport\\_2021\\_web.pdf](https://infinitum.no/media/0pxb1kay/infinitum_ar-rapport_2021_web.pdf).  
165
- Knoblauch, J. A. (2022). Environmental toll of plastics.  
<https://www.ehn.org/plastic-environmental-impact-2501923191/particle-7>.
- Lambertsen, O.-F. and O.-C. Olsen (2018). Plasten ingen vil ha:- vi er i ferd med å drukne i dette. <https://www.nrk.no/nordland/dette-er-plasten-ingen-vil-ha--vi-er-i-ferd-med-a-drukne-i-dette-1.14252545>.  
170
- Mauch, C. (2016). Out of sight, out of mind: The politics and culture of waste. *RCC Perspectives: Transformations in Environment and Society* (1).
- Plastics Europe (2021). Plastics – the facts 2021.  
175 <https://plasticseurope.org/knowledge-hub/plastics-the-facts-2021>.
- Reusable Packaging Association (2019). Prioritize reuse on the circular economy bandwagon. <https://www.reusables.org/prioritize-reuse-on-the-circular-economy-bandwagon/>.
- Statistisk Sentralbyrå (2020). Waste accounts. <https://www.ssb.no/en/natur-og-miljo/avfall/statistikk/avfallsregnskapet>.  
180