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Position Paper

Only a realistic perspective on the future of plastics leads to sustainable progress

As we move towards a sustainable and circular society, we encounter a wide range of solutions aimed at reducing the negative environmental impact of our use of plastics. These solutions often focus on a combination of recycling, reuse and replacement and are based on current fossil plastics. Which is a shame, because our assessment of the recycling potential of current plastics is overly optimistic and there are only limited possibilities for replacing (single-use) plastics with other materials. There is clearly a difference here between the reality on paper and a realistic outlook.

Currently, new biobased plastics are rarely included in future scenarios. This is because they cannot always provide an exact copy of fossil-produced products. As researchers in the Renewable Plastics programme at Wageningen University & Research, we propose that companies, government agencies and consumers opt for a combination of solutions which may not be totally ideal now, but which will ultimately accelerate the transition to sustainable plastics. It comes down to the fact that we simply need biobased plastics, which are also often intrinsically more recyclable.

Realistic outlook: plastics are here to stay

In the coming years, and perhaps decades, demand for plastics will continue to rise. With all the good and practical properties of plastic, as a material it has become too important in the world. ‘Plastics are here to stay’ is the realistic outlook.

But that does not necessarily mean the continuation of all the negative impacts of plastics. The plastic soup, our dependence on fossil raw materials, microplastics in our countryside and in our bodies and rising carbon emissions are our present, but need not be our future. Even in a world with plastics, we can take steps towards a cleaner and healthier life. However, this requires us to take a realistic look at that future and then make better choices. We must therefore (dare to) identify which side paths and developments slow down progress and which actually contribute to that ultimate goal. Where are there still gaps on our way to a circular economy? And how can we fill those gaps smartly and effectively, so without side paths or delayed choices that slow down our progress to a sustainable society?

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Sub-solution 1: reduce use of plastics

First of all: demand continues to rise. This is caused by the growth of consumer packaging due to a focus on consumer convenience, demand for weight saving (such as in the automotive industry) and new technologies, for example. The growth of global wealth also plays a role.

Reducing plastics is therefore a useful goal and with bottles and carrier bags, for example, we are already on the right track. Realistically, however, we cannot reduce everything quickly. Not every application can be immediately stopped or replaced by another material.

But there are already examples showing what is possible. Thus more and more products are made of plastics that are suitable for re-use, in other words the repeated use of the same product. Take-home cups, personal water bottles and reusable sandwich bags are good examples.

Sub-solution 2: use of biobased plastics

Replacing current fossil-based plastics by biobased plastics is an essential step if we want a fossil-free plastics industry in the future. New, interesting applications present themselves daily. There are already lots of suitable alternatives for packaging, agricultural and horticultural plastics and toys, but much more can be done. A lot of our research focuses on the applicability of biobased plastics. We see many more opportunities here than one might expect, but again we need to be realistic: at the moment not everything can be biobased, if only because of the practical availability of materials. So we need to intensify research into these materials and be open to solutions other than direct copies.

Even paper can sometimes replace plastic. However, many of these products are still finished with a coating to make them properly waterproof or aesthetically pleasing. For example, the coatings of 'paper' cups often contain fossil plastics, or even PFAS. Furthermore, paper products are by no means always more sustainable because they tend to be heavier. More material means more energy consumption.

Smarter material choice, such as PLA (polylactide, or polylactic acid), can lead to reduced use of fossil raw materials and better sorting in the waste phase, especially if the volume increases sufficiently. While it is important to set up a recycling stream for these sustainable plastics, there is also less risk of microplastics contamination in the event that they are accidentally disposed of with green waste. This is because PLA is compostable. Moreover, as a biobased raw material, PLA is more appropriate in a circular society and is intrinsically very easy to recycle.

Sub-solution 3: use of biodegradable plastics

Biobased is often confused with biodegradable. Biodegradable plastics are plastics that decompose over a relatively short period in a specific environment, such as soil. In this case, they will not accumulate there, even as microplastics. Which does happen with today's fossil plastics. We see this as part of the solution for products with a high risk of ending up in the environment, such as agricultural film. It is also a good solution for products that consist of a mix of compostable components, so they can be included in that stream as a whole. Like biobased biodegradable coffee capsules.

Sub-solution 4: plastics that are intrinsically recyclable

Finally, high-quality recycling of plastics is currently still difficult. By high-quality recycling, we mean that it can be used in a similar application and/or retain high-quality properties. (PET deposit bottles are a positive exception to this.) Recycling always generates significant losses at all points in the process: during collection, sorting and during recycling itself. If we succeeded in making 50% of plastic products from recycled materials in the future, that would already be quite a significant step. So it is important to opt more often for plastics that are intrinsically more recyclable. By taking into account the waste phase in the design and composition at the start, i.e. what happens to it after it stops being used, plastic can be recycled more often and that recycling can be of a higher quality. Research shows that we can produce biobased plastics that are intrinsically more recyclable, making recycling easier, cheaper and of a higher quality. This contributes significantly to a more sustainable lifecycle of plastics.

Combination of small solutions leads to big steps forward

No solution is satisfactory on its own and there are limitations in several areas. However, good steps are being taken to remove all these limitations. Reducing the negative impact of plastics becomes easier when we switch to intrinsically recyclable biobased plastics.

"The focus on perfection blocks progress"

We suggest that government agencies and companies do not seek one solution that is 100% perfect and is based on current fossil plastics, but a combination of solutions that together are a step in the right direction. The focus on perfection blocks progress. After all, nothing is perfect first time. There are always transitional stages from one form of the product to another. But together, different solutions can be a good step in the circular direction.

Want to know more about the path towards sustainable plastics by 2050? Read our two-part article here

About the author

Karin Molenveld is programme manager Renewable Plastics at Wageningen University & Research. The Renewable Plastics team researches properties and processing of renewable plastics and the potential of non-persistent plastics. They are also developing new polymers for renewable thermoplastics. The team also supports parties in strategy and policy development for renewable plastics.