Plastic waste

Introduction

Recent reports, and in particular the BBC's Blue Planet II, have brought the issue of plastics in the oceans to the attention of the public. Microscopic plastic particles, in a large part from the breakdown of domestic plastic waste and often with hazardous substances sticking to their surfaces have permeated the oceans and the oceanic food chain causing an alarming threat to sea life as well as feeding into the terrestrial food chain (Plasticoceans.uk, 2017). Microscopic particles of plastic have also been found in the air and in drinking water but whether these are hazardous is as yet unproven.

This has provoked a number of calls various to ban various plastic uses as well as less helpful responses such as that from Lego whose new bio-sourced Lego will also be non-biodegradable.

Plastics are produced almost exclusively from oil and represent around 4%-8% of global oil production (Brems et al, 2012). The EU used about 52.5 megatonnes (Mt) of plastic in 2009 while disposing of 24.6 Mt of plastic in waste (for comparison the bag containing 500g of sugar weighs about 2.8g so that's about 20 million million sugar bags). In the UK approximately 58% of plastic waste is from packaging materials (Hopewell et al, 2009). According to Defra in the UK in 2014 2.22 Mt of plastic packaging waste was created of which 37.9% was recovered/recycled. It has been suggested that reported recycling rates may be over-stated by up to 1/3 due to the collection weight including moisture etc and possible under-reporting of the amount sold due to the Packaging Recovery Note (PRN) system.

What are the alternatives and costs?

While it is tempting to ban plastics they are of course valuable in many ways, from providing water-proof lightweight containers to being indispensable in many medical applications - Table 1 below the most commonly used plastic types and some of their uses. The Green alliance points out that good packaging reduces food waste (with correspondingly fewer carbon emissions) while plant-based materials can put pressure on land use. They suggest eliminating unnecessary use while also rationalizing the types used to increase recycling potential and creating a market for recycling although technology is already helping sort plastics – for example by separating bottle tops from plastic bottles.

Table 1. Common plastic types and uses. Source North Starr Recycling

Abbreviation	Name	Some uses
PET	Polyethylene terephthalate	Water bottles, food storage bags, fibre filling
HDPE	High-density polyethylene	Film, food and drink containers
PVC	Polyvinyl chloride	Blister packs, food wrap, pipes
LDPE	Low density polyethylene	Stretch film, rubbish bags
PP	Polypropylene	Film, bottle caps, diapers
PS	Polystyrene	Styrofoam, packaging foam, egg cartons, insulation
Other	Engineered plastics	Polycarbonate, CDs

Simply replacing plastic bags with paper bags may be counterproductive due to the higher energy and water use in creating paper bags. However, in this case simply reducing single-use bags has already reduced plastic waste.

How much can be recycled?

Plastics are generally classified as either thermoplastic (around 80%) or thermosetting (around 20%) with most packaging being thermoplastic (Brems et al, 2012). In principle thermoplastics can be reused by heating and reforming but this requires a single form of plastic and may be complicated by dyes, inks and other contaminants – hence some of the restrictions on domestic recycling.

How does incineration compare with recycling?

An alternative to recycling is incineration which can be combined with energy recovery – either through using the heat directly – for example in blast furnaces or cement kilns - or in electricity generation using a steam turbine. Other possibilities include 'tertiary' recycling methods such as pyrolysis or hydrocracking to recover simpler molecules which are mainly used to create diesel or solid fuels but none of these is used commercially (Brems et al, 2012).

Incineration is used extensively in some countries such as Switzerland, Denmark, Germany and Sweden where the amount of plastic waste either recycled or incinerated approaches 100% with incineration being the slightly larger proportion (Hopewell et al, 2009). Incineration also destroys or renders harmful substances inert leaving inorganic slag suitable, for example for road building (Brems et al, 2012).

In the UK there is considerable opposition to incineration based mainly on concerns around air pollution – for example dioxins. However, the EU Hazardous Waste Incineration Directive sets stringent limits on pollution from incineration. Furthermore, these risks must now be weight against the newly-reassessed risks associated with failing to eliminate plastic waste.

What are the greenhouse gas emissions of incineration?

Sending plastic waste to landfill clearly has very low carbon emissions if the plastic does not degrade. In comparison recycling, where possible, potentially creates lower emissions. When combined with energy recovery incineration compares well with recycling in many scenarios (Lea, 1996). However, some suggest incineration removes incentives to recycle although that does not appear to be the case of the countries such as Germany and Sweden noted above. Some argue that burning natural gas for energy has lower emissions than burning plastic due to the higher efficiency – clearly this depends on the value put on avoiding landfill.

What is the potential for biodegradable plastics?

Biodegradable plastics have been suggested to resolve the plastic waste problem. However, it is not clear that current so-called biodegradable plastics are a solution. It's possible technology will come up with better solutions such as an enzyme derived from the plastic-degrading caterpillars but these may well be best deployed on collected waste before dispersal.

Locally in Winchester

Locally – Veolia (Winchester's waste disposal partner) operates an energy recovery plants in Hampshire and local residents can recycle some plastics in their recycling bin and can also make use of the 'energy recovery' skip at the Winchester Household Waste Recycling Centre for (combustible) non-recyclable plastics.

Conclusion

The problem of plastic pollution is an urgent and significant issue. Reduction in plastic use is the best way to reduce the amount of plastic waste with, for example the European Union already proposing regulations on single use plastics, but this may take a time to deploy and is not always the best

course. Thus, both in the short term and even in the longer term it is important to have systems to mitigate the issue of plastic waste.

Where waste is simply dispersed or cannot be retrieved such as with microbeads the only option is a ban, but when waste can be collected recycling is preferred where possible and this can be helped by improved sorting technology.

Incineration (with energy recovery), which is common in several European countries, can handle most plastic waste, is usually cost-effective and a good option which also destroys or renders inert many pollutants – especially with improved EU standards for incineration. Opposition to incineration centres around air pollution concerns but these should now be set against the realization that the plastic itself is a much worse and persistent hazard than previously realized.

In the Winchester district some plastic is sorted and recycled but currently other plastic is not handled separately and may end up in landfill. However, the Winchester recycling centre (?) has an 'energy reclaim bin' that residents can use for plastic waste.

In terms of individual action there are numerous websites containing suggestions about how to reduce your own plastic use – e.g. Greenpeace suggests carrying a reusable bottle, coffee cup and shopping bag for example.

References

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