

# The Plastics Industry in New Anglia

## Draft Report – A Conversation Starter

Version 3: 19.10.2018



### Executive summary

This report has been created on behalf of the Greenprint Forum as part of its 2018 year of plastic action. It seeks to assess the current value of the plastics industry to New Anglia, and – with a focus on plastics in the natural environment – to enable decision makers to consider costs and benefits of the current industry and to aid Plastic Action Champions in choosing their actions and messaging.

**3,981 employed in 107 New Anglian businesses**

Over half of this employment is linked to plastic packaging, recycling and the manufacture of plastic products that fall under the category of other under the Standard Industrial Classification codes (defined on page eight).

**1259 employed in 16 East Suffolk businesses**

**£310 million in Total Assets in New Anglia, £91 million in Total Assets in East Suffolk**



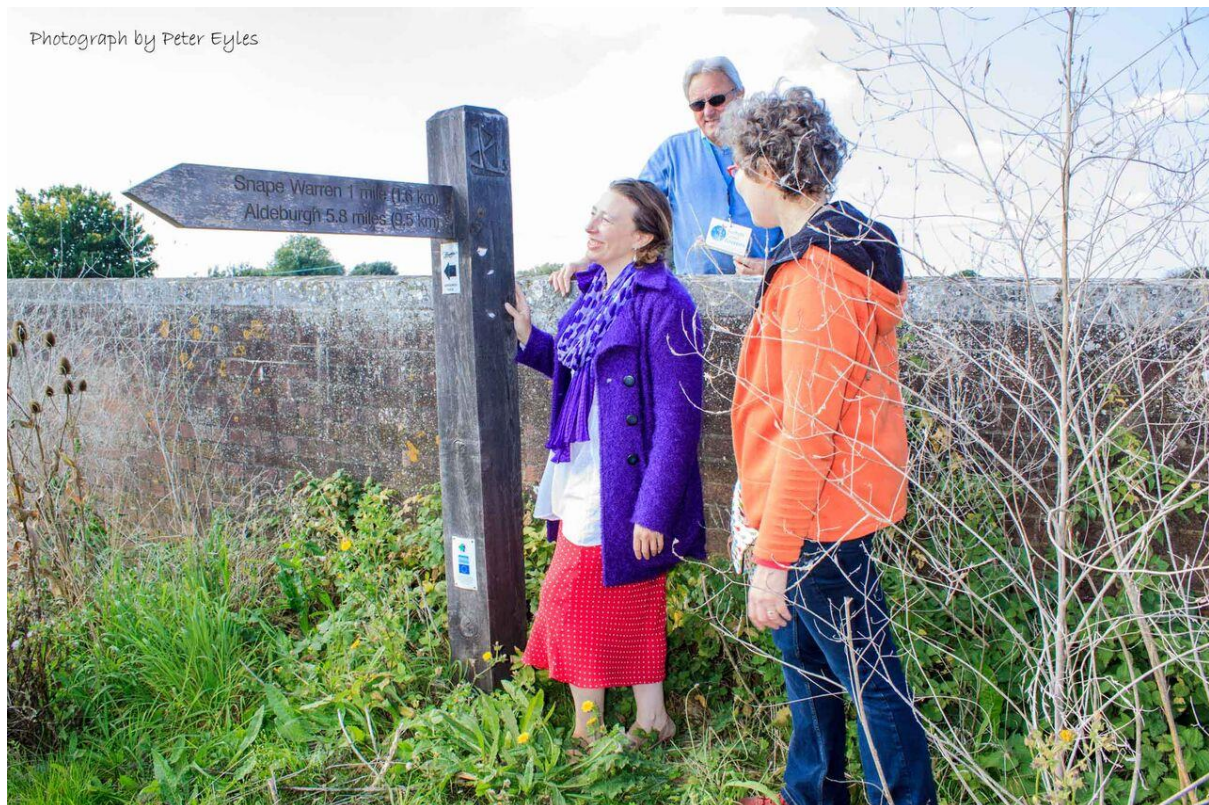
42% of litter picked from Suffolk beaches in 2017 came from public sources (MCS, 2018).

This includes items such as cigarette butts, drinks bottle, food containers, disposable cups and disposable plastic cutlery.



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Tourism is an important part of our economy, valued at £590m and 12,564 employed in tourism related jobs in 2015.<sup>1</sup>

### Who is the report for?

**Decision makers/funders:** Given the value of our natural environment and the numbers employed as a result of it as well as the value of the plastics industry this research indicates an immediate need for further action to curb litter and to facilitate industry knowledge sharing on environmental management and product sustainability and/or help in communicating it effectively to enable informed choices. Over time further research is needed to understand opportunities within existing firms to switch to durable and/or unpackaged products or where single use is essential to certified closed loop manufacture using the lowest impact materials possible and composting or recycling.

**Plastics Industry Champions:** The research shows that your industry does play an important role in providing local employment and contributing to the local economy and community in other ways.

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<sup>1</sup> East Suffolk Tourism Strategy 2017 to 2022



The questions are:

- Could you look at the products you produce or sell and challenge yourself to determine if there could be alternative products or management approaches that could keep you ahead of the curve and reduce the risks of negative environmental impact?
- Are you already doing so but not communicating this as effectively via your websites as you could be?
- Would it be helpful for you to be part of local, national or internal efforts to reduce the escape of plastics into the natural environment and if you are could you helpfully communicate this via your website?

**Plastic Action Champions:** Champions within businesses and in the community need to be mindful of the complexities of the plastics industry and the challenges it faces weighed alongside the importance of our natural environment. Careful thought needs to go into all product selection. A sample thought process for the food and drinks industry is included in Appendix 8.



Fabulous Plastic Action Champions after a long, hard litter pick in Felixstowe in 2018

## Introduction

The plastics industry has a long history in the United Kingdom and alongside employment has provided many advantages for people in terms of affordability, labour saving, convenience and opening new markets. This report seeks to assess the current value of the plastics industry to New Anglia, and – with a focus on plastics in the natural environment – to enable decision makers to consider costs and benefits of the current industry, whilst developing policies and strategies to help the industry minimise negative impacts so that it can thrive now and in the future. This report is also designed to equip Plastic Action Champions within the industry and external to it with a greater understanding of the industry, to help them with their actions and messaging.

All industries have positive and negative environmental impacts at each stage: extraction, manufacturing, processing, transportation, sale, usage, repurposing or using as feedstock to generate energy. However, research shows that mismanagement at each of these stages has meant that plastics have contaminated our land and seas and are now having a discernible impact on other species as well as our own. This can be understood by the multiple potential leakage points of plastics, in Figure 1.

Note any third party may choose to make use of the report or extracts from it entirely at their own risk, and neither the authors nor Suffolk Coastal District Council shall have any responsibility whatsoever in relation to such use.

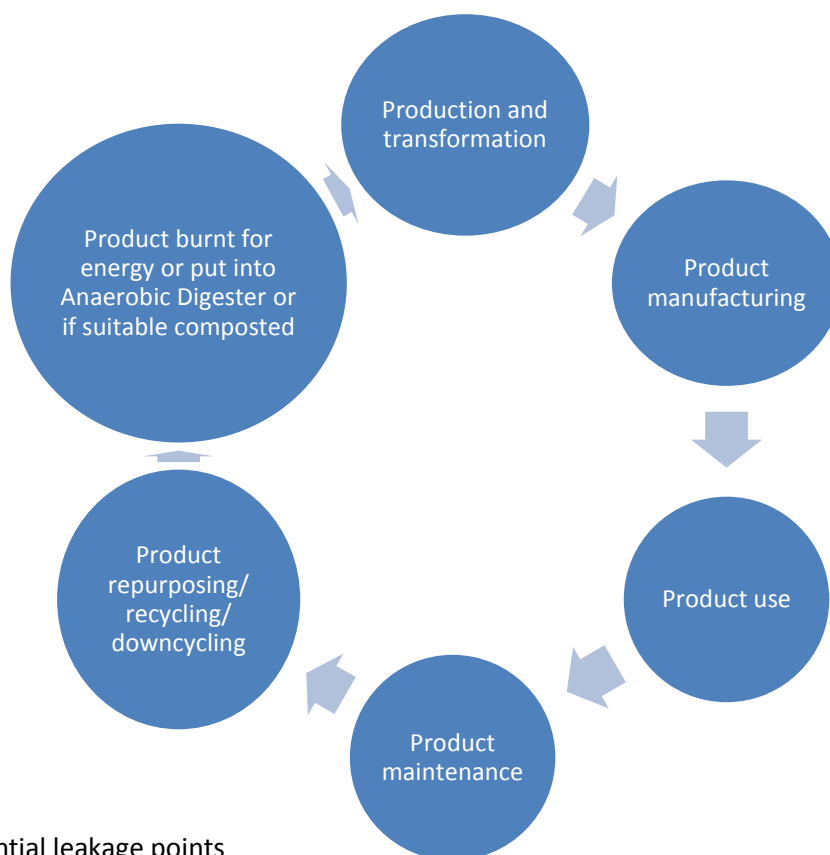


Figure 1: Potential leakage points

## Plastics – a quick overview

Plastics are synthetic materials composed of polymers and quite often other additives. There are many different types as shown in Figure 2 and expanded on in Appendix 1. Polymers are long chains of repeated units of chemical molecules called monomers, they are typically extracted from crude oil or natural gas; although some have coal as their origin and a growing number are extracted from plant-based oils including wheat, corn, sugar, rice, potatoes and soya. Whatever the source of the material all have environmental and social implications to consider and impacts to manage throughout the lifecycle of the material inputs and resultant products.

There have been attempts to compare the lifecycles of plastics extracted from plant based oils and those extracted from crude oil. However the sheer number of polymers, the differing additives and manufacturing processes and uses make it hard to get meaningful comparisons. Product specific comparisons with limited variables are easier to comprehend and attempts have been made, for example Mater-Bi and PE shoppers.<sup>2</sup>

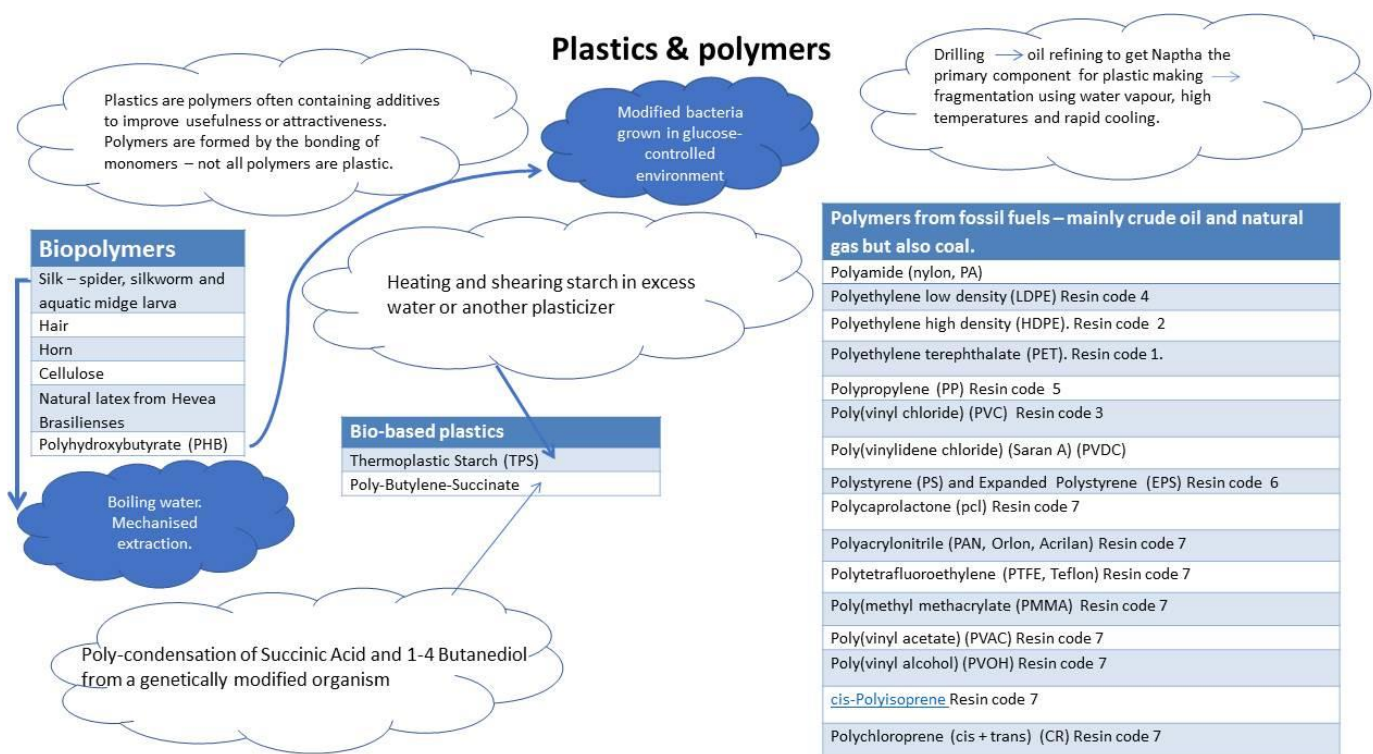


Figure 2: Polymers

<sup>2</sup> Gironi, Fausto & Piemonte, Vincenzo. (2011). Bioplastics and Petroleum-based Plastics: Strengths and Weaknesses. Energy Sources. Part A: R



## Uses of polymers

Polymers are used to make many different types of plastic and these in turn are used in many different ways. Given this it is unsurprising that the global and the local plastics industry is large with a complex supply chain, which stretches from the producers of plastic raw materials and additives to very different customer industries. The local variations are shown in Figure 3.



Figure 3: Local manufacturing plastic products word cloud created using WordCloud.com

## The New Anglian plastics industry in numbers

### 3,981 employed in 107 New Anglian businesses

This figure comes from using FAME and Companies House with gaps filled by utilising the Google search engine and phone calls to businesses. 31 Standard Industrial Classification (SIC) codes were used in the search and rationalised based on company data. This is the most accurate and up to date figure available at this time, although it is recognised that due to differing interpretations of the SIC some companies have been included that many would not associate with the plastics industry and others may have been missed.

There were 147 companies found initially in the research, however 40 of those were removed from the database. 13 companies which are only headquartered in New Anglia or

have ceased trading, 12 new starter companies for which no data is currently available and 15 companies where sufficient data is not publicly available – were not included in the data.

The full list of companies considered can be found in Appendix 2.

## £310 million in Total Assets

This is the sum of total assets (anything a company owns that could be sold) less current liabilities of the 107 plastics industry firms in New Anglia, obtained from publicly available Companies House accounts. Figure 4 shows the distribution of these businesses across the region, where industry ‘centres’ occur around towns such as Norwich, Thetford, Beccles, and North Walsham.



Figure 4: Distribution of businesses identified as being involved in plastics manufacturing, sales or recycling.

## Standard Industry Codes (SIC)

New Anglia's plastics industry consists of a range of Standard Industrial Classifications (SIC), under which every company must be defined under a unique SIC code based on their economic activity. The largest SIC, in terms of employment and economic size, is 22290 - 'the manufacture of other plastic products'. This is because of the inclusion of all plastic moulding companies under 22290, as well as companies which do not have a SIC to fit into;



this includes companies manufacturing and supplying plastic kitchenware, notice plates novelties, office supplies, pallets, pedal bins and helmets.

However, there is one company producing caps and closures, which would be expected to be included in SIC code 22220 – manufacture of plastic packing goods (where other companies which also produce caps and closures are included) but is in fact under 22290. The location of companies within SIC codes therefore has some ambiguity, where there are a small number of cases where companies may not be within the ‘correct’ SIC. However, in the case of this research SIC codes are overall a useful indicator for the composition of the New Anglia plastics industry.

Only five SIC codes have over 100 citizens employed, which means that most of the 31 researched SIC codes consist of smaller sized businesses and/or a smaller number of businesses. The manufacture of other plastic products 22290, recycling 3720, and the manufacture of plastic packing goods 22220 (SIC codes) provides well over half of the near 4,000 people employed in New Anglia’s plastics industry (Fig.5).

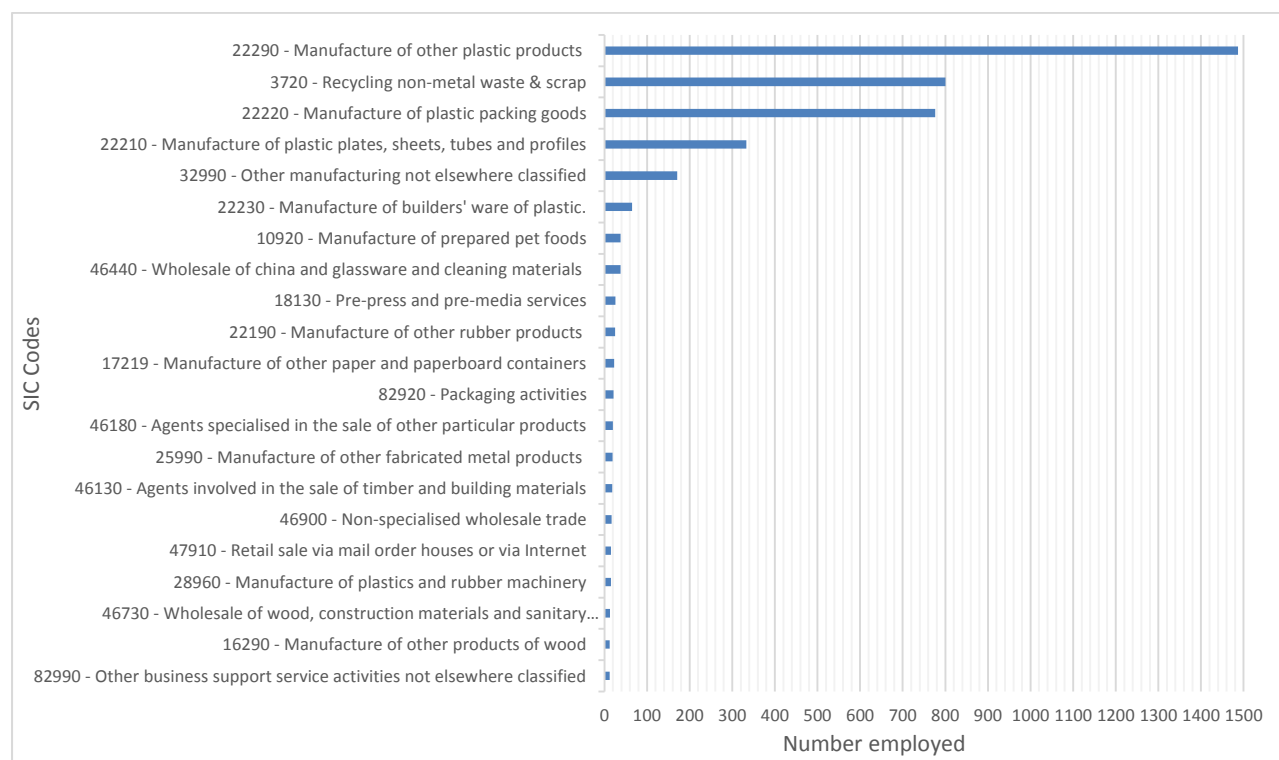


Figure 5. Sum of the number of employees for firms in each Standard Industrial Classification (SIC). SIC codes with an employee number of below 10 were excluded from this graph but are included in the appendix data.

The plastics industry is also shown to be dominated by these few SIC codes under its economic figures, as shown in Figure 6 by the 'total assets less current liabilities'.

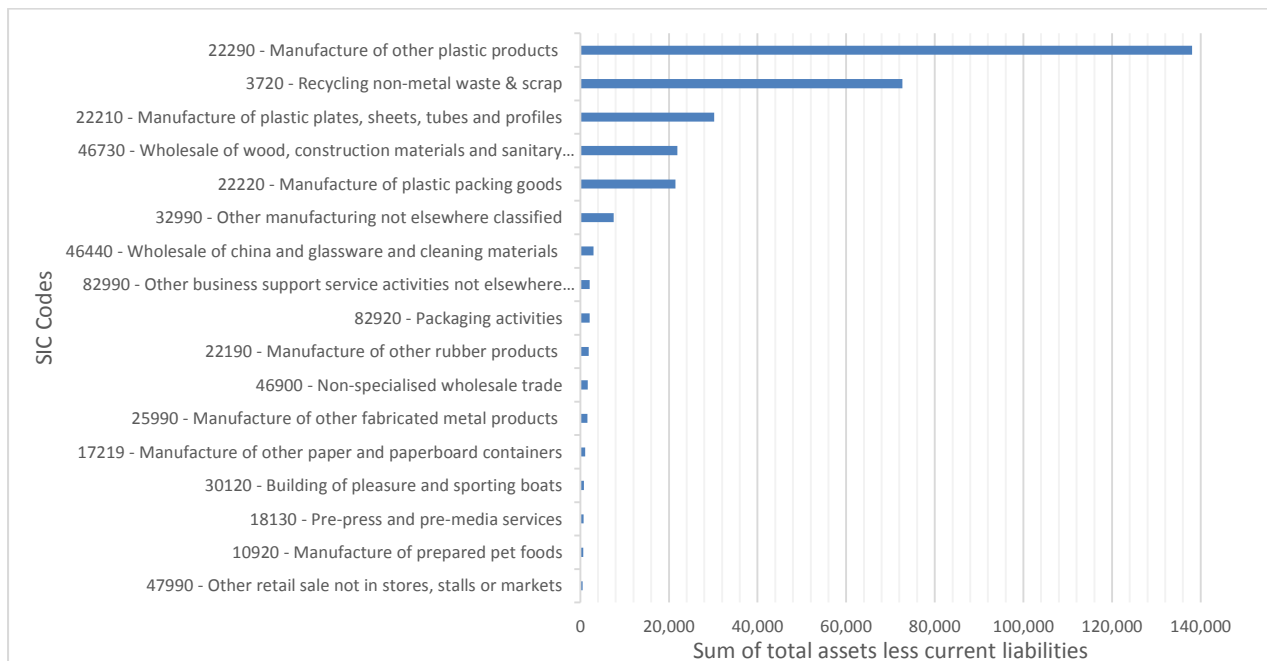


Figure 6. Sum of the total assets less current liabilities, for firms in each Standard Industrial Classification (SIC). SIC codes with total assets below £500,000 were excluded from this graph but are included in the appendix data.

This employment and economic data provides a reference point for understanding the growth of the plastics industry in recent years, and projecting into the future. Observations made while compiling the total assets less current liabilities data of each of the 107 businesses, suggested varying economic performance in recent years.

New Anglia has an internationally trading plastics industry, with 41% of businesses trading globally, 21% nationally and just 6% regionally; however it is worth noting that almost a third of businesses do not specify their client base.

The sum of employment and sum of total assets less current liabilities for each SIC code, is detailed in the Appendices.

## The Plastics Industry in East Suffolk

1259 employed in 16 East Suffolk businesses

£91 million in Total Assets in East Suffolk

What they make/sell	Number employed
Packaging	988
Moulding durables e.g. car panels, bowls, game components, parts	201
Additives	37
Resale of durable moulded items	32
Unknown	1
<b>Total</b>	<b>1259</b>

5 – have a website that mentions sustainability (38%)

1 - states on their website that they have ISO14001

Note: Other activities may well be taking place that are not captured on websites for example one company is undertaking litter picks in their local community and is also a member of [RECOUP](#) a registered charity and not-for-profit member based organisation which works in collaboration with all stakeholders to promote, develop, stimulate and increase the levels of plastics recycling within the UK.



## Plastics - how they escape into Areas of Outstanding Natural Beauty and the aquatic environment



Plastic materials of various polymer types are a significant pollutant of ecosystems worldwide and locally in Suffolk and Norfolk and research is starting to show the impacts on marine life. A useful briefing on current understanding can be found on [www.imperial.ac.uk/grantham/publications/the-ocean-plastic-pollution-challenge-towards-solutions-in-the-uk---grantham-briefing-paper-19.php](http://www.imperial.ac.uk/grantham/publications/the-ocean-plastic-pollution-challenge-towards-solutions-in-the-uk---grantham-briefing-paper-19.php).



Volunteer removing plastic during a staff lunchtime litter pick

Whilst research continues into the sources of plastic, the prevalence of plastic pollution locally can be seen in street litter audits and picks as well as river and beach clean litter picks and audits.

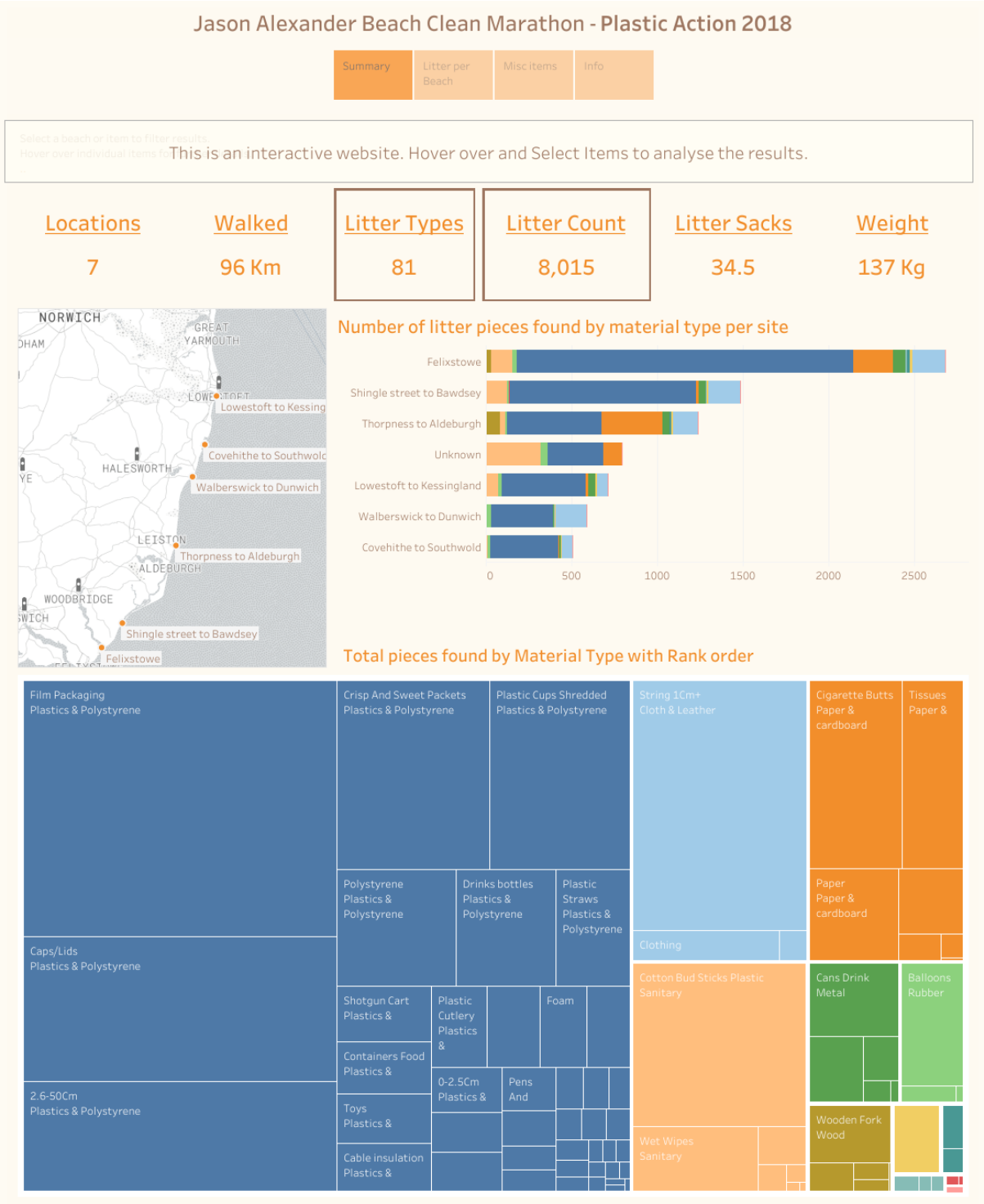


Image created by Andrew Cassy, Chair of the Greenprint Forum on [Tableau](#)





Results of one of the Plastic Action Street Audits which covered 50m stretches of footpath on 40 streets in Felixstowe.

Top 5 litter categories	Total recorded	Percentage of total
Smoker Materials	1127	55.5%
Other Plastics	381	18.8%
Other Waste	307	15.1%
Confectionary Packaging	54	2.7%
Non alcoholic drink related - not plastic	42	2.1%

Much of this is thought to be directly dropped by members of the public or to escape from private and public waste management infrastructure. The Marine Conservation Society's [survey database of beach pollution](#) helpfully attempts to categorise the sources of waste and suggests that 42% of litter picked from Suffolk beaches in 2017 comes from public sources (MCS, 2018). This includes items such as cigarette butts, drinks bottles, food containers, disposable cups and disposable plastic cutlery.



Other sources of plastics on beaches include: fishing, transportation losses, manufacturing and washes as well as sewage systems. A website summarising this is: <http://plastic-pollution.org/>



The diversity of sources of plastic pollution means that a wide range of different organisations and individuals need to take action, each within their own spheres of influence. This report focuses on how the local plastics manufacturing industry, retailers and food and drinks outlets currently manage their impacts. It also provides thought prompts for those businesses looking to reduce wasted uses and wastage of plastics and for decision makers looking to support industry whilst protecting the environment. The action that individuals can take will be included in the Greenprint Forum Plastic Action Champion Handbook (currently being developed).

## **Environmental Management Systems**

It is worth noting that in New Anglia of the 107 businesses only 26 (24%) mention sustainability/environmental management on their website and these are mostly, although not all, of the larger firms. Of these 26 firms, six have noted that they have an accredited Environmental Management System (ISO14001 certified) with one stating that they are in progress of getting ISO14001 certified.

One of the firms with ISO14001 also has ISO50001 (Energy Management System), whilst another is a member of [SEDEX](#), which provides a collaborative platform to store, share and report on ethical and environmental information quickly and easily.

As stated under the East Suffolk section just five mention sustainability on their website and one states they have ISO14001.

## **The products – sustainability**

It is important to understand the sustainability of various products to help inform decisions on what to use and to recognise that not all plastics can perform in the same way or be handled in the same way throughout their development and existence and to recognise that care is needed in communicating the relative benefits and challenges presented with each.

Overall, 19 of the 107 researched New Anglia plastics industry companies manufacture or supply products claimed to be more sustainable than other plastic products. The ways of describing them varied but include: biopolymers, paper, wood or metal products as non-plastic alternatives, post-consumer regrind (products made from recycled materials), oxo-biodegradable and compostable. To help develop understanding each of these claims is explored below.

## Bioplastics

Some of the companies produce plastic made from biopolymers – in other words the monomers have been derived from a living source either by a synthetic chemical reaction (with wheat, corn, rice, potatoes, barley, sorghum, seaweed, wood, switch grass etc.) or through synthesis directly from the organism (e.g. hyaluronic acid from bacteria).

This does not automatically mean that if they escape into nature they will immediately be consumed by microbes and converted into water, carbon dioxide and inorganic compounds.

When a product has been tested for compliance by a recognised body and comes with that certificate you can be surer that you are not adding a potentially harmful material into your compost and ideally that you are adding material that will provide nutrients that plants can easily access as well as adding structure and water retention features to the soil.

This however requires the manufacturer and any reseller to be clear and communicate that the product as a whole is compliant and what it is compliant with and not just an element of it. Ideally the manufacturer would also help those adding to the initial certified products (e.g. by adding dyes or labels) understand and then apply for certification of that end product.

Of course this will take time and cost money for all within the chain to get products certified and this should be recognised.

### *Compostable at home*

The typical compost heap or bin does not reach the high temperatures achieved by the bulk of materials and handling at industrial compost sites, this means everything takes longer for microorganisms to convert into useful materials for soil and plants.

There is no industrial standard against which products can be tested as home compostable at this time.<sup>3</sup>

The most widely recognised scheme appears to be:

TUV Austria's OK Home Compost (they acquired Vincotte in 2017). They are a small team and are currently not providing a central list of companies' products that have been certified due to the changes to data protection legislation.

However companies manufacturing or selling products that have passed the check by an independent body for the chemical break down of the polymer of fibres and absence of negative impacts on plants and heavy metal contamination over 12 months in a typical home composting system will get a certificate. This will include the logo in Figure 7.

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<sup>3</sup> [www.european-bioplastics.org/faq-items/what-are-the-required-circumstances-for-a-compostable-product-to-compost/](http://www.european-bioplastics.org/faq-items/what-are-the-required-circumstances-for-a-compostable-product-to-compost/)



Figure 7. Logo that shows a product has been independently verified as being home compostable.

An example of a company communicating this more clearly than some is:

[www.futamura.com/divisions/cellulose-films/sustainability/certifications/](http://www.futamura.com/divisions/cellulose-films/sustainability/certifications/)

No local examples of certified home compostable products were found in this research project.

### *Industrial composting*

There are four known industrial composting units in Suffolk and four in Norfolk (Appendix 7). At this time feedback is that none are accepting bioplastics through the household waste composting scheme as it is too difficult to tell them apart from other plastics. This is not to say that over time changes in processing or in products themselves will not overcome this – it just means that at this moment in time householders need to either compost them at home or put them into their residual rubbish bin. Businesses need to either ask the company they are buying them from if a closed loop composting scheme is possible or their waste collection provider if they have a means of dealing with them.

The standards for industrial composting for are:

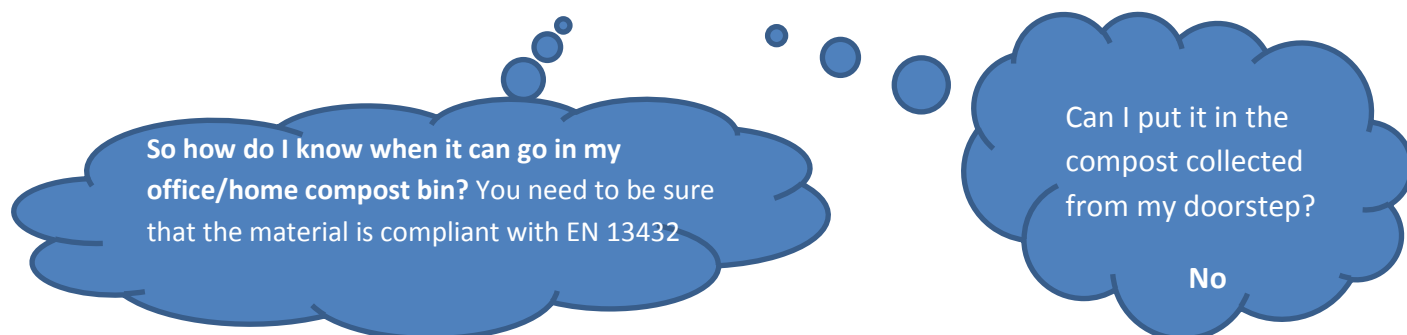
EN 13432:2000 (for packaging)



Figure 8. Seedling Logo from European bioplastics denotes certification to EN 13432, EN 14995, ISO 17088, ASTM D 6400, ISO 18606 if the 7P or Sxx code is displayed under it. Check the certificate relates to the product including all additives and any additions e.g. labels.



In New Anglia none of the products produced or marketed locally were found to be actually registered as such on [www.dincertco.tuv.com](http://www.dincertco.tuv.com). This and clear communication could be an area for support bodies to work with the Industry to help improve.



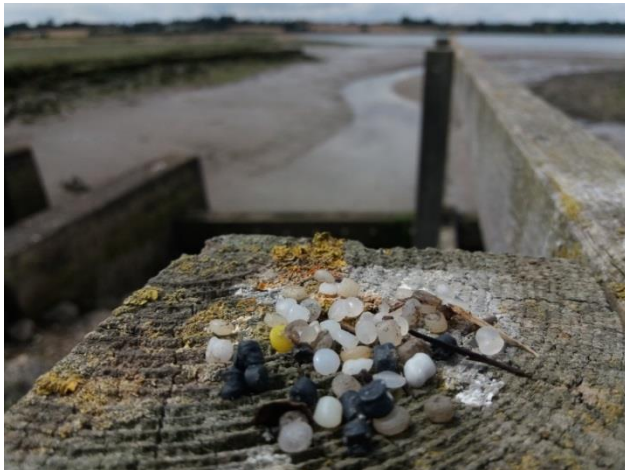
## Recycled content and circularity

In the plastics industry research, three of the New Anglia companies mentioned circular economy and use of their own waste within their products. One states they will accept their own materials back from customers for recycling and some companies indicate that they will consider this when customers' request it. Others claim to be making advancements and/or have targets for creating a closed loop system of production and waste management. However it is worth noting that just eight of the 107 plastics industry firms make an indication on their website of trying to 'circularise' their business model to improve on sustainability and this could represent a local improvement area for support bodies to work on with the Industry.

None of the researched companies are listed amongst the 40 businesses that have signed the UK Plastics Pact; created by the Ellen MacArthur Foundation in partnership with WRAP. This commits those signatories to: 100% of plastic packaging to have 30% recycled content and to be reusable, recyclable or compostable with 70% being effectively recycled or composted by 2025. Over the same timeframe signees also pledge to eliminate problematic or unnecessary single use packaging item waste through redesign, innovation or reuse.

A helpful circularity check sheet is available from the RPC Group - [www.rpc-group.com/~media/Files/R/RPC-Group/documents/plastic-in-the-spotlight-feb-18.pdf](http://www.rpc-group.com/~media/Files/R/RPC-Group/documents/plastic-in-the-spotlight-feb-18.pdf)

## International efforts targeting micro and nano plastics



Microplastics are plastic particles smaller than 5 mm in size and have been found on Suffolk Beaches. Nanoplastics are plastic particles smaller than 100 nm, which are of particular concern, since they are more likely to pass biological membranes and affect the functioning of cells ([Rocha-Santos, 2018](#)). They can be manufactured particles designed for applications (such as scrubbers and powders for moulding), larger particles that have degraded into smaller pieces, or microfibers from clothing or other material based products.

Potential sources include:

- Marine, road and building paint
- Cosmetics
- Textiles
- Pellet spills and washing down in manufacturing units using pellets
- Vehicle tyre dust
- Clothes washing
- Personal care products
- Synthetic fibres
- Artificial turfs
- Agro plastics
- City dust; losses from abrasion of objects (synthetic soles of footwear, synthetic cooking utensils, drinking bottles) and infrastructure (pipes, household dust, city dust, artificial turfs, harbours and marina, building coating) as well as from blasting and intentional pouring (detergents).

Escape is possible from cradle to grave as was shown in Figure 1 and although controls are in place, understanding that further measures are needed is rapidly spreading throughout the industry, customers, educational and government sectors. Research indicates that it is very likely that losses of primary microplastics from global commercial and household activity is in the order of 36.2 Mton/year (equivalent to over 1 million humpback whales a

year going into the ocean).<sup>4</sup> It is thought that releases of primary microplastics from commercial and household activities into the oceans are in the order of 1.5 Mton/year. This represents 48% of the losses ending up in the ocean. For more detail the following reports are useful:

- [IUCN Report](#)
- [European research report](#)
- [UN Sustainable Development Report](#)

Whilst it is likely that some of the local manufacturing companies and shipping/haulage companies will be handling pellets/flakes and powder none of the companies in New Anglia are listed as supporters of Operation Clean Sweep. This is a product stewardship program of the American Chemistry Council's Plastics Division and Plastics Industry Association (PLASTICS). It seeks to help every plastic resin handling operation implement good housekeeping and pellet, flake, and powder containment practices to work towards achieving zero pellet, flake, and powder loss. Whilst it is recognised that the contribution of these companies to accidental releases is not known and may be relatively minor, being assured that companies are adopting an international scheme, are following best practise, or even innovating, could help to restore consumer and decision makers confidence in the sector.

The Manual and other useful resources can be found on:  
[www.opcleansweep.org/resources/#print-materials](http://www.opcleansweep.org/resources/#print-materials)

## **Local research into plastics in the environment**

The Centre for Environment, Fisheries and Aquaculture Science (Cefas) was in 1902 a small fisheries laboratory in Lowestoft and is now a world leader in marine science and technology. The Lowestoft site hosts their headquarters, with around 530 people employed nationally. For 25 years they have been working to understand marine litter and are running a project called CLiP which will work with partners across the Commonwealth to share expertise and find solutions to the environmental and socio-economic problems caused by litter in the marine environment. This project forms part of the £61.4m package of funding announced by the Prime Minister during the Commonwealth Heads of Government Meeting (CHOGM) Summit in April 2018. Details on it and updates can be found on: [www.cefas.co.uk/clip/about-clip/](http://www.cefas.co.uk/clip/about-clip/).

The University of East Anglia has developed a new approach for the analysis of microplastics in environmental samples [www.uea.ac.uk/business/licensing-opportunities/marine-agriculture-and-environmental/microplastic-detection](http://www.uea.ac.uk/business/licensing-opportunities/marine-agriculture-and-environmental/microplastic-detection)

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<sup>4</sup> Assuming average Humpback is 30 T



## Appendix 1 – A sample of polymers, uses and potential recycling opportunities

A handy online guide for recycling solutions is [www.recoup.org/find-a-reprocessor/](http://www.recoup.org/find-a-reprocessor/)

Polymers from fossil fuels – mainly crude oil and natural gas but also coal.	Example of uses	Recyclability examples
Acrylonitrile butadiene styrene. Resin code 7	3D Printing. Keys on a computer keyboard, power-tool housing, the plastic face-guard on wall sockets (oftentimes a PC/ABS blend) and LEGO toys.	Easy to recycle as they can be heated to their melting point, cooled, and re-heated again without significant degradation. There are companies in the UK that melt and turn into other materials <a href="http://www.recoup.org/find-a-reprocessor/search?region=1&amp;polymer=1&amp;application=">www.recoup.org/find-a-reprocessor/search?region=1&amp;polymer=1&amp;application=</a>
Polyamide (nylon, PA) (macromolecule repeating units linked by amide bond)	Film, fibre and moulding compounds such as door handles, radiator grills, low voltage switch gears, ski bindings and inline skates, toothbrush bristles.	Polyamide 6 used in carpets can on heating depolymerize and then be purified into a polymer to yield more Polyamide 6. <a href="http://www.essentialchemicalindustry.org/processes/recycling-in-the-chemical-industry.html">www.essentialchemicalindustry.org/processes/recycling-in-the-chemical-industry.html</a>
Polyethylene low density (LDPE) Resin code 4	Plastic bags, agricultural films, cables, netting, squeezable bottles, trays, toys, insulation, adhesives.	Can be reprocessed into a clean pellet for bin bags, plastic lumber, landscaping ties. There is a company in Suffolk that does this and others in the UK. <a href="http://www.recoup.org/find-a-reprocessor/search?region=1&amp;polymer=6&amp;application=">www.recoup.org/find-a-reprocessor/search?region=1&amp;polymer=6&amp;application=</a>
Polyethylene high density (HDPE). Resin code 2	Flower pots, toys, chemical packaging, grocery bags, cereal box liners, milk containers.	Can't be used in the same product but can be ground into flakes, melted and pressed into sheets to be made into bin liners and other containers. There is a company in Suffolk that does this and others in the UK.

		<a href="http://www.recoup.org/find-a-reprocessor/search?region=1&amp;polymer=4&amp;application=">www.recoup.org/find-a-reprocessor/search?region=1&amp;polymer=4&amp;application=</a>
Polyethylene terephthalate (PET) Resin code 1.	Clothing, containers for liquids and foods, oven-able film, blister packs.	Can be dissolved and heated to produce monomers for distilling and polymerising into PET again. It can even be recycled from food container to food container <a href="http://nextek.org/portfolio/strategy-recycling/">http://nextek.org/portfolio/strategy-recycling/</a> Can be chipped, melted down and reformed into strapping, non-food packaging and polyester fibres (think carpets and fleeces). There are companies in the UK that do this. <a href="http://www.recoup.org/find-a-reprocessor/search?region=1&amp;polymer=16&amp;application=">www.recoup.org/find-a-reprocessor/search?region=1&amp;polymer=16&amp;application=</a>
Polypropylene (PP) Resin code 5	Bottle tops, ketchup and syrup bottles, dairy containers, drinking straws, lunch boxes, medicine bottles, plant pots, crates, ropes.	Can be reprocessed into a clean pellet for bin bags, plastic lumber, pots, auto parts. There are companies in the UK that do this. <a href="http://www.recoup.org/find-a-reprocessor/search?region=1&amp;polymer=17&amp;application=">www.recoup.org/find-a-reprocessor/search?region=1&amp;polymer=17&amp;application=</a>
Poly(vinyl chloride) (PVC) (C <sub>2</sub> H <sub>3</sub> Cl) <sub>n</sub> Resin code 3	Frozen food packaging, pipes, windows, carpet backing, shampoo bottles, cleaning product bottles, credit cards, synthetic leathers products.	Can be reprocessed and decontaminated to enable up to 50% blend with virgin PP <a href="http://www.thebalancesmb.com/an-overview-of-polypropylene-recycling-2877863">www.thebalancesmb.com/an-overview-of-polypropylene-recycling-2877863</a> Can be reprocessed into clean pellet for buckets, caps and closures, plastic lumber, pipes and pallets. <a href="http://www.bpf.co.uk/plastipedia/polymers/PVC.aspx#Recycling">www.bpf.co.uk/plastipedia/polymers/PVC.aspx#Recycling</a> of PVC. There are UK companies that do this <a href="http://www.recoup.org/find-a-reprocessor/search?region=1&amp;polymer=19&amp;application=">http://www.recoup.org/find-a-reprocessor/search?region=1&amp;polymer=19&amp;application=</a> Challenge is the release of dioxins when burnt and release of toxins in use when combined with additives particularly phthalates. <a href="http://www.greenspec.co.uk/building-design/polyvinyl-chloride-pvc-environment-health/">www.greenspec.co.uk/building-design/polyvinyl-chloride-pvc-environment-health/</a>

Poly(vinylidene chloride) (Saran A) (PVDC) Resin code 7 (C <sub>2</sub> H <sub>2</sub> Cl <sub>2</sub> ) <sub>n</sub>	Cleaning cloths, artificial turf, dolls hair, fishnets, shoe insoles, shower curtains, glow in the dark fibres, thin layer coating to laminate cheaper polymers	As usually very little used and as mostly multilayer it is difficult to segregate from other polymers. This means the polymer could only be 'down-cycled' with other materials e.g. turf can be turned into posts, planks, lumber and irrigation pipe <a href="https://re-match.dk/">https://re-match.dk/</a> . Contains chlorine. No clear recycling route identified for other PVDC products.
Polystyrene (PS) and Expanded Polystyrene (EPS) Resin code 6	Fish boxes, fast food trays, disposable cutlery, video cases, vending cups, laboratory ware, seed trays, coat hangers, and low-cost brittle toys	Can be reprocessed into a clean pellet for use in coat hangers, picture frames, replacement hardwood and disposable cameras. Re-processors in the UK <a href="http://www.recoup.org/find-a-reprocessor/search?region=&amp;polymer=3&amp;application=">http://www.recoup.org/find-a-reprocessor/search?region=&amp;polymer=3&amp;application=</a>
Polycaprolactone (pcl) Resin code 7	Model making, jewellery, laminating, tissue engineering, drug delivery, collagen stimulation	No clear recycling route identified.
Polyacrylonitrile (PAN, Orlon, Acrilan) Resin code 7	Knitted products, tents, sails, outdoor awnings	Can be repurposed into handmade products. No clear recycling route identified.
Polytetrafluoroethylene (PTFE, Teflon) Resin code 7	Coating on non stick cookware, bearings and pipes liners	<u>Technically possible</u> Grinding, high temperature decomposition and distillation to create TFE with a purity of 99.99%. <a href="http://www.invertec-ev.de/en/projects/environmental-care/ptfe-recycling/">www.invertec-ev.de/en/projects/environmental-care/ptfe-recycling/</a> The research also found companies globally that deal with scrap <a href="http://reprolontexas.com/recycle/">http://reprolontexas.com/recycle/</a> but none in the UK.
Poly(methyl methacrylate (PMMA) Resin code 7	Shatter proof barriers, aquariums, acrylic paints	<u>Technically possible</u> Ground and re-pelletised and reintroduced into the processing process or chemically recycled to reduce PMMA to methyl methacrylate to make PMMA. No clear recycling route in the UK

		identified.
Poly(vinyl acetate) (PVAC) Resin code 7	Wood glues and other adhesives used in bags sack and carton making. Gives a shiny effect to paper and textiles. Paint.	No clear recycling route identified and can impact on ability to recycle other products e.g. papers and wood.
Poly(vinyl alcohol) (PVOH) Resin code 7	Unit doses of detergents and agrochemicals, drug, soiled linens in water-soluble laundry bags, which are delivered directly to an industrial washing machine. Water-soluble bait bags	PVOH can be dissolved in the paperboard recycling process. Will be completely degraded and utilized by bacterial strain <u>Pseudomona O-3</u> however this is not present in all waters systems.
<u>cis-Polyisoprene</u> Resin code 7	anti-vibration mounts, drive couplings, tyres, springs, bearings, rubber bands, and adhesives.	No clear recycling route identified
Polychloroprene (cis + trans) (CR) Resin code 7	Wetsuits, cable jackets, hoses.	Wetsuits can be hand crafted into other products like wallets, laptop cases and bags. No clear recycling route identified.
Styrene-Butadiene Rubber (SB Rubber) (organic compound named styrene and an industrial gas called butadiene) Resin code 7	Drive couplings, haul-off pads, conveyor belts, shoe soles and heels, adhesives, roll coverings and car tyres	Reuse in environment has to be carefully considered as degrading can release microplastics and toxins Technically it can be recycled <a href="https://patents.google.com/patent/US9458303B1/en">https://patents.google.com/patent/US9458303B1/en</a> However no clear recycling route identified as UK company that did is in liquidation. It is thought to impact on ability to recycle other products e.g. carpets.

**Sources of information:**

[www.bpf.co.uk/plastipedia](http://www.bpf.co.uk/plastipedia)

<http://polymerdatabase.com/>

<https://www.azom.com/article.aspx?ArticleID=4425>

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[www.recyclenow.com](http://www.recyclenow.com)

[www.plasgranltd.co.uk/sell-your-plastic-waste/guide-to-plastic-recycling-grades/](http://www.plasgranltd.co.uk/sell-your-plastic-waste/guide-to-plastic-recycling-grades/)



## **Appendix 2: Understanding why the results may differ from a previous publication.**

The New Anglia LEP 2015 data indicated 7600 employees from SIC Codes: 20160 (Manufacture of plastics in primary forms), 22010 (Manufacture of plastic plates, sheets, tubes and profiles), 22220 (Manufacture of plastic packing goods), 22290 (Manufacture of other plastic products), 28960 (Manufacture of plastics and rubber machinery). This discrepancy could be in part due to the inclusion of employees and assets from companies that have a head office here, but their operations are in other locations. It could also be due to different search criteria – however we have no access to their raw data to determine this.

### Appendix 3 : Number of employees within each researched SIC code

SIC CODE	Sum of the number of employees in New Anglia
81300 - Landscape service activities	1
20160- Manufacture of plastics in primary forms	1
47990 - Other retail sale not in stores, stalls or markets	2
25730 - Manufacture of tools	3
36000 - Water collection, treatment and supply	3
71129 - Other engineering activities	3
47789 - Other retail sale of new goods in specialised stores	4
25620 - Machining	5
18129 - Printing not elsewhere classified	6
30120 - Building of pleasure and sporting boats	9
82990 - Other business support service activities not elsewhere classified	12
16290 - Manufacture of other products of wood	12
46730 - Wholesale of wood, construction materials and sanitary equipment	13
28960 - Manufacture of plastics and rubber machinery	15
47910 - Retail sale via mail order houses or via Internet	15
46900 - Non-specialised wholesale trade	17
46130 - Agents involved in the sale of timber and building materials	18
25990 - Manufacture of other fabricated metal products	19
46180 - Agents specialised in the sale of other particular products	20
82920 - Packaging activities	21
17219 - Manufacture of other paper and paperboard containers	23
22190 - Manufacture of other rubber products	25
18130 - Pre-press and pre-media services	26
46440 - Wholesale of china and glassware and cleaning materials	38
10920 - Manufacture of prepared pet foods	38
22230 - Manufacture of builders' ware of plastic.	65
32990 - Other manufacturing not elsewhere classified	171
22210 - Manufacture of plastic plates, sheets, tubes and profiles	333
22220 - Manufacture of plastic packing goods	776
3720 - Recycling non-metal waste & scrap	800
22290 - Manufacture of other plastic products	1,487
<b>Grand Total</b>	<b>3,981</b>

#### Appendix 4: Sum of the total assets less current liabilities of firms within each

SIC CODE	Sum of the total assets less current liabilities
81300 - Landscape service activities	-1
20160- Manufacture of plastics in primary forms	0
47910 - Retail sale via mail order houses or via Internet	1
47789 - Other retail sale of new goods in specialised stores	50
25620 - Machining	62
16290 - Manufacture of other products of wood	103
18129 - Printing not elsewhere classified	111
25730 - Manufacture of tools	132
28960 - Manufacture of plastics and rubber machinery	173
71129 - Other engineering activities	208
36000 - Water collection, treatment and supply	286
46130 - Agents involved in the sale of timber and building materials	381
22230 - Manufacture of builders' ware of plastic.	442
46180 - Agents specialised in the sale of other particular products	484
47990 - Other retail sale not in stores, stalls or markets	517
10920 - Manufacture of prepared pet foods	646
18130 - Pre-press and pre-media services	764
30120 - Building of pleasure and sporting boats	798
17219 - Manufacture of other paper and paperboard containers	1,072
25990 - Manufacture of other fabricated metal products	1,590
46900 - Non-specialised wholesale trade	1,679
22190 - Manufacture of other rubber products	1,886
82920 - Packaging activities	2,102
82990 - Other business support service activities not elsewhere classified	2,128
46440 - Wholesale of china and glassware and cleaning materials	3,001
32990 - Other manufacturing not elsewhere classified	7,526
22220 - Manufacture of plastic packing goods	21,459
46730 - Wholesale of wood, construction materials and sanitary equipment	21,908
22210 - Manufacture of plastic plates, sheets, tubes and profiles	30,191
3720 - Recycling non-metal waste & scrap	72,686
22290 - Manufacture of other plastic products	138,069
<b>Grand Total</b>	<b>310,454</b>

### Appendix 5: Company websites which mention sustainability

Does company have a website with sustainability mentioned?	Number	%
No website	9	8%
Website has no mention of sustainability	72	67%
Yes	26	24%
<b>Grand Total</b>	<b>107</b>	

### Appendix 6: Client base of New Anglia plastics industry

Row Labels	Count of Client Base	%
Global	44	41%
National	23	21%
Regional	6	6%
Not specified	34	32%
<b>Grand Total</b>	<b>107</b>	

## **Appendix 7: Industrial composting facilities in Suffolk and Norfolk**

These were identified using [www.qualitycompost.org.uk](http://www.qualitycompost.org.uk) and the Environment Agency Register

### **Norfolk**

Greencomp Ltd

Greenworld Sales Ltd

ORM North Norfolk Ltd

Norse Environmental Waste Services Ltd

### **Suffolk**

[Material Change Composting Limited](#)

[Tamar Organics T/A Biogen](#)

[FCC Environment \(UK\) Ltd](#)

M Dickerson Ltd (Red Lodge)



## Appendix 8

### A Plastic Action Guide for Suffolk/Norfolk Food & Drink Outlets

#### Think

#### Are you part of the problem or are you a Plastic Action Champion?

You are a vital part of our economy and an important protector of the natural environment in which we thrive. Your actions can have a direct positive or negative impact.

This tick sheet is to help you. If you already are taking action—well done!

- Do the products I sell do more good than harm? If not can I switch to other products and still make a living?
- Can I reduce the environmental and social impact of the products I sell either alone or working with others?
- Do I have the spare time or resources to lead or help others in my community cut plastic waste and clear up any that has escaped?
- Am I confident and happy to chat about the issues and solutions with others online, in person or via media? If so I could be a Plastic Action Champion. Email [greenissues@eastsuffolk.gov.uk](mailto:greenissues@eastsuffolk.gov.uk) to find out more.

Greenprint Forum Plastic Action Guide for Suffolk/Norfolk Food & Drink Outlets	
Get Started	Checklist
Begin by keeping a record of what you purchase and dispose of/recycle and costs and what gets used by customers and think about potential impacts from delivery and food preparation to storage, reuse, disposal and potential littering. See if there are any financial quick wins by not buying products that are not needed or durable. Then look at whether there are any lower impact alternatives. Photos and online records help you remember what you are looking at and reduce duplication of efforts.	

Prompts on areas to consider	Checklist
<p><b>Catering—focus on the big spend/worst impact/visual offender items first</b></p> <p><b>Reduce:</b> Can people bring their own (BYO) cutlery, bowls and/or lunch boxes for me to serve takeaway food in and can I offer them a discount to encourage it? Think volume, how you will know who owns what container without adding stickers (plastic) or bags to the mix and hygiene. Can I become a <a href="#">Refill station</a>? What about your own kitchen—could reusable tubs cut down on use of cling film? Can I replace single-portion food sachets (e.g. ketchup) with glass bottles and shakers without increasing food waste significantly? For deliveries—can you use reusable trays and charge a deposit to ensure returned?</p> <p><b>Alternative materials:</b> What other materials could do the same job? How are they made? Where do they come from? How do they get to me?</p> <p><b>Recycle or compost:</b> What does my current waste contractor accept or how long does my contract last? Can they cope with paper and card that has food residues on? If so what do they do with it? What about containers made out of plant materials can they cope with those?</p> <p><b>Customer communication points:</b> When they look at your website—do they see that you care and want to do your bit for the environment and are you clear on how they can help? When they call—are staff trained to ask if they will BYO and if so what and if asked to explain why? When they come in—do you have reminders on the tables or on boards?</p> <p><b>Staff communication points:</b> Are you asking about attitudes to cutting plastic waste and recycling effectively in your interviews? Are you providing reminders (tool box talk type)? Have you made it easy for staff to recycle effectively and provided clear signage?</p>	
<p>According to <a href="#">Quite Interesting Limited</a> in the Middle Ages, it was customary to carry your own knife everywhere and use it for meals.</p>	

Prompts on areas to consider continued	Checklist
<p><b>Cleaning —focus on the big spend/worst impact/visual offender items first</b></p> <p><b>Reduce</b></p> <ul style="list-style-type: none"> <li>• Can I buy in bulk to reduce the use of plastic bottles and potentially reduce costs?</li> <li>• Can I use products that are not single use or packaged in plastic safely e.g. soap and towels?</li> </ul> <p><b>Reuse</b></p> <p>Can I use reusable cloths for cleaning? Yes if certain guidelines are followed</p> <p><a href="http://www.food.gov.uk/sites/default/files/media/document/cloths.pdf">www.food.gov.uk/sites/default/files/media/document/cloths.pdf</a>—think will they be adding microfibers into water?</p> <p><b>Waste management</b></p> <p>Do you know what your waste collector accepts and will recycle? What about the stuff that they cannot recycle where do they send this? Have you communicated this?</p> <p><b>Communication points</b></p> <ul style="list-style-type: none"> <li>• Include a section on website: how we keep or venue clean and low environmental impact</li> <li>• Toilet doors—explain why you are using what you are using. Include unflushables information.</li> <li>• Near sanitary product vending machines have signs suggesting cloth sanitary products and cups.</li> <li>• Toolbox talks: have I trained staff to ensure they know to buy in bulk and to always follow manufacturers' guidelines for storage, decanting, dilution and use? Do they understand our recycling system?</li> </ul>	
According to <a href="http://SoapHistory.Net">SoapHistory.Net</a> 'The first recorded evidence of the manufacturing of soap dates back to around 2800 BC'	

## A Plastic Action Guide for Suffolk/Norfolk Food & Drink Outlets

### Can't cut it out/reduce it?

#### What are the comparisons between materials that you could be making?

Remember to ask what the ingredients are and check with your waste collection provider what they can accept. If you are hoping customers will take home and compost check that they have the right composting system to allow this. If you are hoping they will recycle it—check [www.greensuffolk.org/recycling/a-z-of-recycling/](http://www.greensuffolk.org/recycling/a-z-of-recycling/) to see if they can.

#### Note:

Unless conclusive evidence emerges, 'Oxo-biodegradable' plastics (fossil-based plastics containing additives that speed the breaking down into smaller pieces process) are not currently considered an environmentally friendly alternative, due to evidence of insufficient biodegradation when they escape into nature (Selke *et al.*, 2015; Hahladakis *et al.*, 2017; UNEP, 2015).

Materials	Considerations: extraction/manufacture/ transport/sale and resale	Considerations during use	Considerations: at end of life
<a href="https://plastics.aminchem.com/How-Plastics-Are-Made/">Fossil based plastic</a> where monomers have been extracted from fossil fuels <a href="https://plastics.aminchem.com/How-Plastics-Are-Made/">https://plastics.aminchem.com/How-Plastics-Are-Made/</a>	How much influence do you have? Do you know the key cradle to grave impacts? Do you know how they are being managed? Use of natural capital (water, fuel, land, materials) = less ability for other people or species to utilise. Water pollution. Air pollution. Land contamination. Toxins. Noise pollution. Light pollution	Can you cleanse and reuse it safely without introducing a food safety hazard?  Can you prevent it escaping into the natural environment accidentally?  How will you store it?	Can your waste collection contractor accept it for recycling? What do they do with it? See if you can follow the chain. How do they need you to prepare it to ensure maximum value is gained from it? Can you offer a reward to encourage customers to bring it back to



Materials	Considerations: extraction/manufacture/ transport/sale and resale	Considerations during use	Considerations: at end of life
			you so that it can be recycled and to prevent it becoming litter? Do you have the space to store the material until it is collected? If not then encourage customers to take home rinse, squash and pop into household recycling bin.
Fossil fuel based plastic with recycled element	As fossil fuel but with less demand on the extracted products.  Can I specify for a closed loop recycled and recyclable product?	Is it fit for purpose? Can I make it last longer—be desired for longer to reduce need to recycle? Can I supply components or a repair service?	Can I store longer to reduce environmental and social costs of closed loop service? Is there a local recycling solution to reduce need to travel? Is it recyclable through home recycling service provided by local authorities where I sell my goods? How will I communicate this to customers?

Materials	Considerations: extraction/manufacture/ transport/sale and resale	Considerations during use	Considerations: at end of life
Hundred per cent recycled plastic	Can I specify for a closed loop recycled and recyclable product?	Is it fit for purpose? Can I make it last longer—be desired for longer to reduce need to recycle? Can I supply components or a repair service?	Is there a local recycling solution to reduce need to travel? Is it recyclable through home recycling service provided by local authorities where I sell my goods? How will I communicate this to customers?
Living material based plastic mixed with fossil fuel based plastic TPS + 15% PVOH TPS + 60% PCL Starch Foam Starch Film	A combination of all considerations for fuel based and for plant based.	A combination of all considerations for fuel based and for plant based.	As above but it will most likely go to the energy from waste plant if it enters the household recycling stream.  Where it goes from the business waste stream will depend on the contractors you use. Ask the question. Least worst is energy from waste in UK. Worst would be landfill.

Materials	Considerations: extraction/manufacture/transport	Considerations during use	Considerations: at end of life
<b>Mixed materials</b> —paper with plastic, paper with metal and plastic, paper with china clay (glossy mags),	All the considerations associated with the individual elements. Do I really need this?	How will I ensure it does not become litter?	Tricky to recycle although there are processes now. If it is really needed can it be made in a way that reduces the trickiness of recycling and provide a closed loop system to ensure that it does?
<b>Paper</b> —if you are interested in a study on this go to <a href="http://www.researchgate.net/publication/281761323">www.researchgate.net/publication/281761323</a> <a href="#">Environmental impact of pulp and paper mills</a>	How much influence do you have? Do you know the key cradle to grave impacts? Do you know how they are being managed? Is it recycled paper? (note when paper says recyclable this does not mean it is recycled it just means it doesn't contain additions like plastic or metal that will reduce the viability of recycling.) Does it contain any virgin material—if so is it from forests certified as sustainably managed? Is the bleaching process totally chlorine free (TCF)? How are they managing their environmental impacts—particularly water and air emissions?	Is it fit for purpose? Can I encourage a reduction in use where possible—e.g. reusable containers and/or cloth bags?	If it has not wrapped food can it be recycled? Have I checked with my waste company? Am I carrying out audits? If it has wrapped food—how am I communicating the need to home compost only if someone has a hot bin/low risk of rats or to put it into the rubbish bin rather than try to recycle it? Unless I send to an in vessel composting plant like the one at Parham do my staff know to put contaminated paper into the rubbish bin rather than into our paper recycling? Do I ensure waste goes to energy from waste rather than landfill?

Materials	Considerations: extraction/manufacture/transport	Considerations during use	Considerations: at end of life
<p><b>Living material based plastic (bioplastic)</b></p> <p>where monomers have been extracted from a living source by a synthetic chemical reaction. (wheat, corn, rice, potatoes, barley, sorghum, seaweed, wood, switch grass etc.).</p> <p>Or where monomers have been synthesised from a living source by an organism</p> <p>PLA</p> <p>PHA</p>	<p>Agricultural inputs (fertilisers, pesticides and herbicides)</p> <p>Competition for food stocks unless used as a method of paying to remove invasive species.</p> <p>Reduced pressure on fossil fuel stocks and according development of previously uneconomic sources such as Fracking in important landscapes</p> <p>If it is accidentally released into nature it will break down within years rather than decades. However this still presents a long time for a hazard to be in the environment</p>	<p>Is it fit for purpose?</p> <p>Is anything going to be added that will affect its compostability?</p>	<p>Is the product I am selling certified as compostable in a cold compost system at home? If so am I (or will they) be putting anything in it that could mean it is not longer suitable e.g. food that could attract rodents.</p> <p>How will I communicate the need for care effectively to my customers?</p> <p>Closed loop: Is it compostable in an industrial composting system and can I provide a collection point for customers to drop off so that I can pay to ensure it is composted? How will I communicate this? How will I audit this process?</p> <p>If it does not have either it will at this current time have to go in the rubbish bin. Please communicate this to your customers.</p> <p>Remember releasing it as litter either directly or by</p>



Materials	Considerations: extraction/manufacture/transport	Considerations during use	Considerations: at end of life
			over filling bins is still not acceptable due to the time it takes to degrade – during which time it could have created an ingestion or entrapment hazard or a negative visual impact.
<b>Natural materials</b> <a href="#">Cork</a> Soft Wood Hard Wood Bamboo Bone Coconut shells <a href="#">Pressed leaves</a>	Can vegans use? Does it come from ethical source? Have impacts been minimised? How do you know?	Is it fit for purpose—have I trialled and can I communicate ways to make it last?	I tried to close the loop? Am I aware of what the local authority can and can't recycle if it gets into household waste collection systems? What about my waste provider?