

CULTURE BEYOND PLASTIC



BRIEFING

Understanding and Eliminating

Problem Plastics

Julie's Bicycle
CREATIVE • CLIMATE • ACTION



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C O N T E N T S

This briefing explores the environmental issues associated with plastics and what the creative sector can do to tackle plastic pollution.

03 WHAT DO YOU NEED TO KNOW? 

08 WHAT CAN THE CREATIVE SECTOR DO? 

12 TAKING ACTION ACROSS THE SECTOR 

- 12** Campaigns & engagement
- 17** Practical action
- 19** Creative programming & design

12 SOLUTIONS & INNOVATIONS 

12 RESOURCES & FURTHER READING

12 APPENDICES



Global Plastic Production

HISTORY



In 1866, plastic — or ‘Parkesine’ as it was first known — was invented by Alexander Parkes, to address the ecological issue of ivory exploitation.



By 1950 the world was producing 2 million tonnes per year.



In the 1970s plastic gained popularity as society transitioned towards a ‘throw away’ convenience culture.



By 2015, global plastic production reached an estimated 381 million tonnes.

The environmental and human cost of plastic

Plastic has infiltrated the web of life. We eat from it, drink from it, even wear it. Plastic has an incredible breadth of useful applications, for example, increasing the efficiency of cars, prolonging storage of food, and providing a lightweight and versatile material for creative work.



ABOVE Less Plastic, 2020

Despite plastic's versatility and convenience, we are increasingly waking up to the far-reaching and devastating impacts of single-use and problem plastic.



Plastics contribute to climate change

Conventional plastic is made from fossil fuels. The extraction, manufacture and transport of the oil and gas used all contribute to greenhouse gas emissions. By 2050, fossil fuel consumption associated with plastic production could rise to 20% of global reserves by 2050. (WEF, 2016).



Plastics pollute our environment

Plastics take 500 years or more to degrade. When they degrade they break down into microplastics which are currently virtually impossible to clean up. 1 million seabirds and 100,000 marine mammals die from plastics and entanglement each year (UN, 2017).



Plastics can contain chemicals which are harmful to the natural environment and human health

In the ocean, plastics act like a sponge for toxins and chemicals which can end up in human and animal tissues causing long term damage. Bisphenol A (BPA) one of the world's best-selling chemicals, found in kettles, water bottles and plastic packaging, CDs and DVDs, has been linked to a range of hormone related health effects including cancer and is also toxic to the human reproductive system.

While some progress has been made — such as the 5 pence plastic bag charge which has reduced consumption of plastic bags by approximately 86%, and the 2018 ban on microbeads in health and beauty products — the solutions to plastic pollution have not kept pace with the rate of production and we are faced with a global plastic challenge, requiring action across all sectors and areas of society.



Spotlight

PLASTICS IN THE UK



It is estimated that the UK uses around 5 million tonnes of plastic waste every year, around half of which is packaging, and demand is rising.



Estimates on plastic recycling rates range from 29% (WWF 2018) to 46% (UK Statistics on Waste 2019).



China's 2018 ban on imported plastic waste has resulted in higher levels of plastic waste being sent to landfill in the UK as existing facilities are unable to process current volumes.



“The Government does not know how much plastic packaging is placed on the market in the UK, nor how much is actually recycled” (House of Commons Environment, Food and Rural Affairs Select Committee report on Plastic food and drink packaging, 2019).



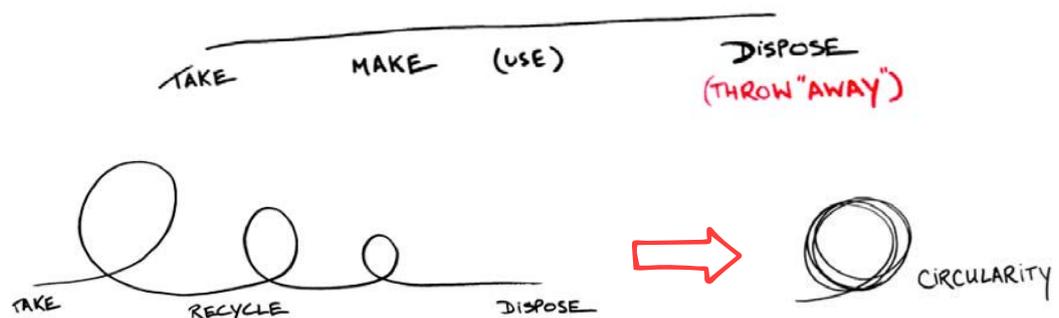


Opportunities

We need a new approach: a shift from a throwaway culture and 'take-make-use-dispose' model to a more circular model. A circular model would design plastics out, design products and materials for reuse, maximise recycling and recovery, and ensure responsible disposal of what cannot be reused, recycled or recovered.

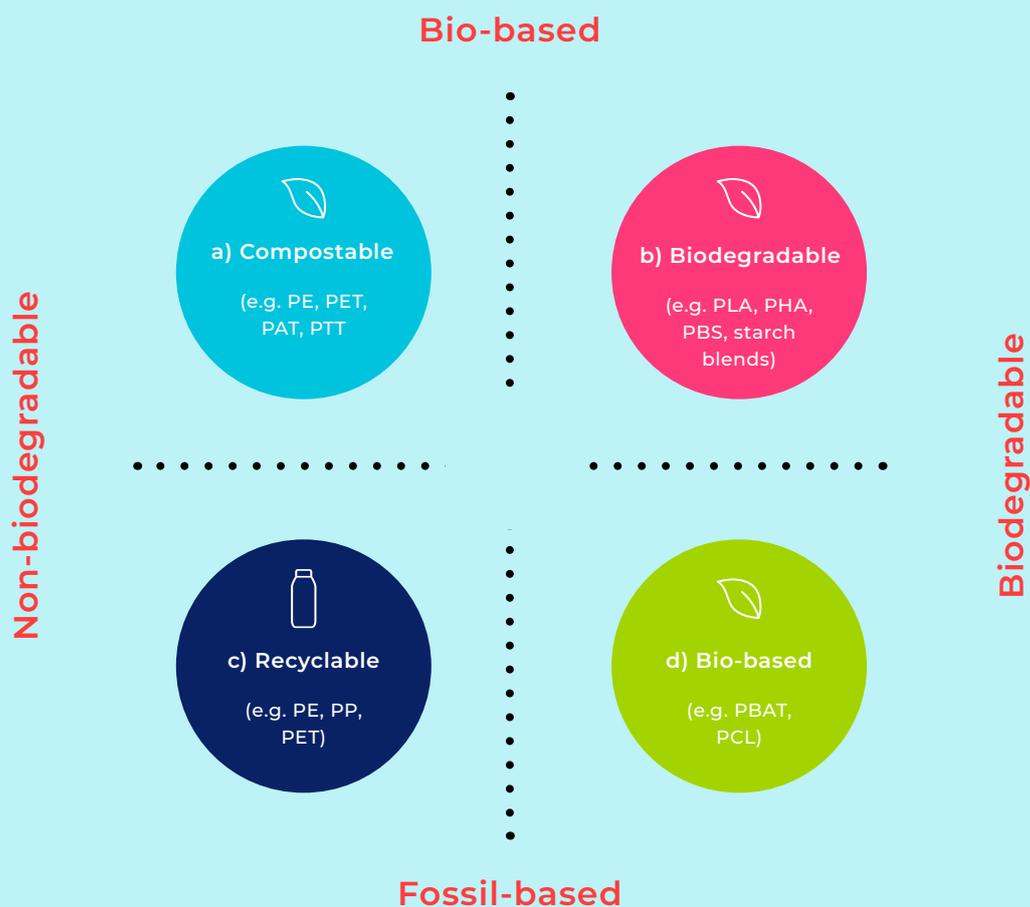
Plastic has been described as "One of the most wasteful examples of our existing linear, take, make and dispose economy" (Ellen MacArthur, 2019).

The cultural sector has creativity, its greatest resource, to bring to this challenge and the opportunity to find solutions and demonstrate what positive change looks like, engaging artists, creatives, audiences, peers and suppliers in the process.



Jargon Buster

Unravelling plastic terminology



There's a broad spectrum of plastic products and packaging on offer, each with their own set of life-cycle impacts and with their own options for disposal. When starting out, it is helpful to understand a few basic terms and the different types of plastics.

a) Compostable: “So I can put it in my compost heap?!”

Unfortunately, not. Whilst many plastic products or alternatives are marketed as ‘compostable’ in reality they only break down in the right conditions, which usually don’t exist in nature, only in commercial composting facilities — in the UK these aren’t yet widely available. Vegetable or plant-based products are also often coated in other forms of plastic which require segregation which is costly, often leading to these items ending up in landfill when infrastructure is lacking.

Could be a good option if:

You’re a festival or venue with your own composting facilities on site -especially where food waste and catering serveware are mixed.

This option is less sustainable if:

Your waste contractor isn’t able to access a composting facility.

b) Biodegradable: “Sounds eco-friendly to me!”

Unfortunately, not. Again, most plastic products marketed as biodegradable require industrial facilities and can take just as long as conventional plastics to decompose or degrade, most turning into microplastics which can’t easily be retrieved from the environment.

Oxo-degradable plastics are becoming common on a global scale, they also don’t present a solution and research shows they break down and fragment in the environment in the same way as other types of plastic.

c) Bio-based plastics: “Made from renewable resources, so what’s the catch?”

PLA: corn and plants, **PHA:** sugar or lipids, **CA:** wood or cotton, PBS, Starch Blends from corn and rice, PE, PET, PA, PTT, PBAT, PCL

Biobased plastics or ‘bioplastics’ are made using polymers from plant-based renewable sources. They have many of the same properties as conventional plastics made from fossil fuels and therefore cause many of the same pollution problems.

Whilst not being sourced from fossil fuels can be viewed positively from an environmental perspective, bioplastics can't be recycled easily in the UK, as facilities are currently unable to easily detect and separate bioplastics from other waste streams.

Could be a good option if:

The material is being chosen for its longevity and if at "end of life" it goes to energy from waste incineration, rather than into a generic recycling stream or to landfill.

d) Recyclable?

Always check the label: "It's fine if it can be recycled, right?"



According to WRAP:

"In order for something to be deemed 'recyclable', it must be collected, sorted, reprocessed and manufactured back into a new product or packaging – at scale and economically."

However, depending on your location, your contract and waste contractor, this may not always be possible, plus just because a plastic can be recycled, this doesn't mean its life-cycle impacts aren't environmentally damaging.

The most commonly recycled plastics in the UK include PET/E and HDPE these are labelled (1) and (2) respectively, nearly all plastics are labelled with a number which indicates their recyclability, numbers below 1 and 2 are rarely recycled and there's no current labelling category for bioplastics.

Could be a good option if:

H&S or venue requirements prevent use of reusable options and the plastics can be collected and appropriately segregated for recycling.

If you can source plastics that are 100% recyclable e.g. PET with only one plastic used e.g. no film coatings or multi-material options.

Best avoided if:

You can put an alternative reusable or sustainably sourced option in place e.g. using a deposit scheme or alternative material such as glass.

See Appendix 2 for a reference guide of options for recycling different types of plastic.

Understanding the Waste Hierarchy

There's no 'one size fits all' solution, but applying the principles of the waste management hierarchy will help to inform what steps you need to take to eliminate and reduce single use and problem plastics and maximise reuse, recycling and recovery.



ABOVE Wasteless Future, 2020



Avoid

Are there any current uses or procurement of single use plastics that could be eliminated or replaced with sustainable/fully recyclable alternatives?



Reduce

Could the volume of remaining plastic be reduced? e.g. returnable packaging schemes, refills schemes



Reuse

What can be reused before it's recycled? Are there creative ways of repurposing waste plastics (e.g. see Plastic Perfect case study) in creative programming or art work?



Recycle

Recycle remaining plastics (should be one type by this stage in hierarchy e.g. PET) ensuring plastics are segregated, not contaminated at collection.



Recover

Procure recycled plastics



Treat

Can the waste be sent to an Energy From Waste plant or Anaerobic Digestion?



Dispose

The very end of the hierarchy, if you have procured plastics that can't be recycled then find the most sustainable disposal method of those available to you, with the least carbon and pollution impacts through consulting with your waste contractor or engaging your local authority.

First Steps

From here you can set yourself a realistic plan and prioritise areas which have the highest impacts, largest expenditures, and which would be the easiest to act on. Make note of the challenges faced and create action plans to overcome them. Collect data and report regularly, sharing your successes with your audiences, customers and staff to engage them in the journey.

Other key questions to consider:



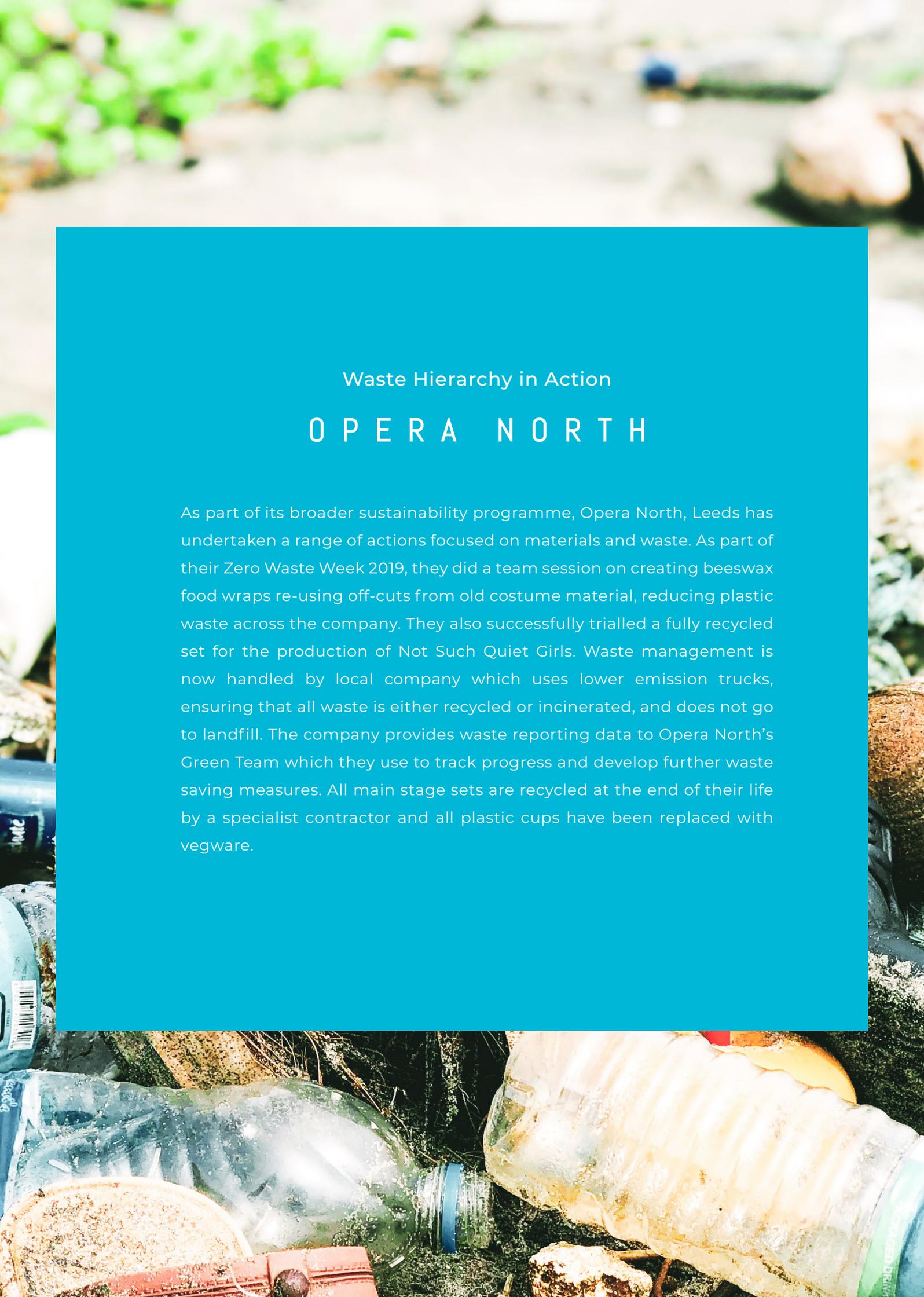
Are there any incentives, campaigns or behaviour change initiatives you can plan to help support the transition?



In what way could your policies and strategies be adapted to reflect a sustainable approach to plastics? e.g. your waste management policy or environmental strategy and action plan



What are the best ways to engage key stakeholders to create effective plastic policies and solutions?



Waste Hierarchy in Action

OPERA NORTH

As part of its broader sustainability programme, Opera North, Leeds has undertaken a range of actions focused on materials and waste. As part of their Zero Waste Week 2019, they did a team session on creating beeswax food wraps re-using off-cuts from old costume material, reducing plastic waste across the company. They also successfully trialled a fully recycled set for the production of Not Such Quiet Girls. Waste management is now handled by local company which uses lower emission trucks, ensuring that all waste is either recycled or incinerated, and does not go to landfill. The company provides waste reporting data to Opera North's Green Team which they use to track progress and develop further waste saving measures. All main stage sets are recycled at the end of their life by a specialist contractor and all plastic cups have been replaced with vegware.

"A reusable cup is the better environmental option after as few as three uses" Raw Foundation

The rush to reduce and eliminate plastics runs the risk of making ill-informed decisions, for example, adopting single-use alternatives that may be more energy intensive than single-use plastics. Understanding the full life-cycle impacts is paramount. Appendix 2 explores the possible end of life options, pros and cons of different materials.

Taking Action

A good place to begin is by mapping out where plastic is currently used in your productions, exhibitions, buildings, catering and events, what kinds of plastics are used, and where they end up.



Policy

Assess your existing policies on plastics, waste and procurement, identifying opportunities to reduce/remove single use plastic.

Procurement



Understand what sustainable or plastic-free options your suppliers already offer.



Waste Management

Identify the types of plastic materials being used by talking to suppliers and service providers to understand which products and materials contain what type of plastic (e.g. conventional, single-use, bio-based, recyclable, compostable) and what options there are for reuse, recycling or recovery. (See appendix 2).



Ask your current waste contractor what they do with your plastic waste e.g. recycling, energy from waste, landfill — and how you can improve your waste segregation to increase recycling or recovery rates.



Operations

Engage key stakeholders on their views, ideas and existing solutions to plastics, mapping plastic use across your organisation, and encouraging behaviour change.



Monitor, measure and communicate your changing plastic use over time, share and celebrate your successes.



Work with your team, artists, academics, NGOs, and businesses to research and trial new materials, innovations or circular models.

See Appendix 1 for a checklist of actions for addressing single use plastics.

Campaigns & Engagement

#PlasticFreeLyric

#PlasticFreeLyric was a four-week campaign in which Lyric Hammersmith Theatre undertook a series of actions aiming to give up as much single-use plastic as possible, focusing on a different theme each week.

[Read More](#)

Bournemouth Arts by the Sea

Bournemouth Arts by the Sea recognises the natural beauty of Bournemouth and the importance of taking environmental action to conserve it. Working with local partners, engaging audiences and creative programming are all part of their efforts to tackle plastic pollution.

[Read More](#)

HOME & Seacourt

HOME, Manchester have a vision “to be a best-practice arts and cultural venue, with environmental, social and economic sustainability at the heart of what we do.”

Aiming to reduce waste wherever possible, HOME have committed to eliminate single-use plastic by 2020, as well as formulating a Zero-to-Landfill policy. HOME aspire to lead the sector by example and continually share learnings and insights via their web page, dedicated to their environmental and sustainability work.

[Read More](#)

Seacourt is a Net Positive printer that makes a positive contribution to the environment and society through its Planet Positive Printing. They've moved to waterless printing, invented a 'LightTouch' printing process, become ZERO waste to landfill and are VOC free..

P R A C T I C A L A C T I O N

In Autumn 2019, HOME and Seacourt's Planet Positive Printing team partnered up to run the closed loop vinyl alternative for their 'Not Just Bollywood' film season. This fits in with their no-single use plastic ambitions and provides a perfect example of knowledge exchange and sustainable procurement. Seacourt now produce HOME's printed seasonal programme guides, and long-standing local signage provider Trafford Signs have sourced a vinyl alternative, allowing HOME to continue to support local business in their own sustainable initiatives. HOME is also engaging with suppliers for their shop and retail range on going plastic-free.

Tail and Twist Ecodiscos and Worldrise 'No Plastic=More Fun' campaign

Music promoters and events company 'Tail and Twist' started their business in 2016, with a focus on creating new disco environments to listen to old music for people to let their hair down in a safe and happy environment. Sustainability of their events was always a priority, and they started to look at ways of helping people not to just leave feeling happy, but proud. Swiftly realising that compostable alternatives to plastic cups weren't necessarily the most effective solution, they started investigating ways to overcome the throw-away norm, whilst still fitting in to the existing model for the nightlife industry.

The solution? Reusable steel cups with a fun pink holster, to allow party goers to keep the cups with them whilst they bust out their dance moves. The deposit for the cups are included in their ticket price and party goers can chose to keep or return their cups at the end of the night, receiving back £2 if they do so. Working with Italian not-for-profit Worldrise who work to safeguard the marine environment through projects that help develop young professionals and encourage sustainable development, the partnership is bringing together a network of multi-purpose venues committed to 'plastic free' created on an international scale which includes Oval Space and the Pickle Factory in London.

[Read More](#)

PRACTICAL ACTION

Shambala Festival and Raw Foundation: SUP free for four years running

"Many lifecycle analyses find that reusable plastic bar cups used 3 times have a lesser environmental impact than a typical single-use cup despite the transportation and washing impacts." Shambala

- Marine litter installation, film screenings and workshop spaces to engage audiences.
- Petition to end the use of 'toxic plastics everywhere by 2030'.
- Bring a bottle campaign
- Re-useable bar cups
- Reusable coffee cups- BYO or pre-order/buy a Shambala Eco-bamboo cup on arrival
- Banned the sale of disposable plastics
- Future focus areas include: feminine supplies, glitter and what audiences can bring in.

[Read More](#)

The Dutch Green Deal for Festivals

The Dutch Ministry of Infrastructure and Water Management and Green Events International have launched a 'Green Deal' which a large number of festivals have joined, including Best Kept Secret, Boardmasters, Boomtown, Down the Rabbit Hole, DGTL, Roskilda and many more. The Green Deal is a partnership of festivals collectively committed to developing circular solutions for the events industry, sharing knowledge and striving for complete circularity by 2025. This will be achieved through re-designing supply chains and developing circular solutions for food, water, energy, travel, transport and materials, including plastics. Within the collaboration, a measurement tool will be developed in order to track progress and understanding of possible solutions.

P R A C T I C A L A C T I O N

DGTL, Amsterdam

In 2017 DGTL Festival goers produced on average 7X less waste than the average festival goer

DGTL are one festival that have already got a number of solutions in place and aim to be the first circular festival in 2020. They use 'Material Flow Analysis' to assess and improve their impacts, analysing each waste stream. They have designed a number of circular solutions including a circular food court, where the entire menu is designed using unwanted food from local suppliers and a 'Resource Street', where rather than hiding waste collection areas behind the scenes, recycling is turned into a visitor attraction and means of engagement in circular solutions. The Recycle Hub at DGTL separates all visitor waste, and then turns items into new resources, for example, bottle caps are turned into oil using pyrolysis, which can then be made into new plastic.

[Read More](#)

The Natural History Museum

Natural History Museum has now stopped selling water in single use plastic bottles, whilst providing improved access and better signposting to water fountains. Their membership packs are now plastic free, replacing oil-based plastics with a natural potato starch material along with other biological polymers, which can be composted in a home compost heap or green bin. Membership cards are now made from a chalk-based material coated in biodegradable PVC, and all other materials are completely recyclable.

CREATIVE PROGRAMMING & DESIGN

First 'ocean vinyl' made of recycled ocean plastic, Nick Mulvey

In a collaboration between musician and activist Mulvey and Sharpe's Brewery, the first 'ocean vinyl' was released in Oct 2019, made with upcycled plastics collected from the Cornish coastline. Proceeds from the track, 'In the Anthropocene' will go to Surfers Against Sewage, a grassroots movement that focuses on tackling plastic pollution and protecting the UK's coastlines.

Thames Memory and the Exploration of Future Dust by Maria José Arceo

London based Spanish artist in residence at King's College, Maria Jose Arceo, creates art work which is frequently rooted in exploring human-nature interactions. Her exhibition 'Thames Memory' consisted of a series of plastic 'time-capsules' across popular London sites.

The capsules were created through collecting and sorting plastics collected from the banks of the Thames, using collaborations and public engagement to challenge understanding of plastics, demonstrate their longevity and raise awareness of the geographical reach of plastic pollution. A partnership with the Department of Geography of King's College, London is investigating abundance of different types, forms and sizes of plastic, how they're transported and where in fluvial landforms and rivers they're stored in order to understand how to manage removal and management.

The Horniman Museum and Gardens, London

A museum in which nature and culture can be viewed together with a long track record of environmental action. The Horniman took part in the #Oneless campaign, in partnership with Zoological Society London to install water refill points to reduce visitor use of plastic water bottles. Across London, the wider campaign has saved 308,000 (500ml) single use plastic bottles as of November 2019.

[Read More](#)





Numerous researchers and businesses are looking to develop alternative materials that have the same properties as plastics without the negative environmental impacts. Nature is providing a number of solutions, with alternatives now being made from seaweed, fish by-products, palm leaves, mycelium and more. Increasingly innovative re-use models are creating new products and long-lasting durable designs for products using waste plastic.

Some of the latest innovations:



Lucy Hughes, a student at Sussex University has created 'MarinaTex' a material made from fishing by-products, scales and skin, which are naturally flexible and strong. These combined with agar from red algae creates 'MarinaTex' which functions very similarly to traditional single-use plastic and can be used for many of the same packaging applications. The product can be composted at home in four to six weeks. Hughes won the 2019 international James Dyson Award for her invention.

SOLUTIONS & INNOVATION

'Ooho' is a plastic alternative made by a UK start-up, produced using Notpla or brown seaweed. This packaging alternative produces 5x less CO2 and 9 times less energy than PET. Further advantages are its contribution to de-acidifying the oceans, not competing with land for food crops or fresh water, and its fast growth rate of up to 1m per day.

'Ecovative' is creating a range of products using Mycelium as a self-assembling, biological binder for hemp agricultural by-product which can be turned into a number of products from packaging, clothes, skincare and food. The material can be grown in just nine days and is completely biodegradable

'Piñatex' was developed as a solution to the environmental and ethical impacts associated with leather production. The innovative material is made using pineapple leaf fibre which is an agricultural waste product, and in doing so provides an alternative income stream to farmers in developing countries.

Microfibres in clothing are a significant source of micro plastic pollution, releasing at least 9.4 trillion microfibres per week into the UK water system when we wash our clothes. **Stella McCartney** is developing industry collaborations to help source their cotton, cellulose, wools and silk sustainably and find alternatives for leather and fur. As part of their partnership with **BOLT Threads**, they launched a new biomaterial grown from mycelium, an underground root structure. The first product to be created from the new commercially available **Mylo** material was exhibited at the V&A Museum's 'Fashioned from Nature' exhibition. Other technological developments in biosynthetic fibres include 'Tencel' a fibre made from the pulp of eucalyptus trees, Orange Fiber from discarded orange peel and performance textiles made from used coffee grounds are being developed by **S.Cafe**.

SOLUTIONS & INNOVATION

Rokbox offers a sustainable packaging solution for the arts sector in the form of a reusable crate that's built for a long-life, made with recycled or recyclable materials. A life cycle analysis approach and a comparison with a wooden crate were used to assess product sustainability. Rokbox is carbon neutral at delivery. Their research shows that a New York gallery shipping 20 artworks to and from 6 art fairs worldwide reduces its carbon footprint by 3.25 T/CO₂ using ROKBOX 70s vs wooden crates which is equivalent to driving almost 8000 miles.

Precious Plastic is a community group of hundreds of people across the world who are setting up workshops in containers and other alternative spaces, taking waste plastic and recycling it into a range of creative products from household goods to fashion, art work, modular designs, construction or high precision items such as phone cases. The new products are made using machines that can be built cheaply from materials that are readily available.



R E S O U R C E S



Festival Guide, 2018, The Making Waves Guide To Plastic Free Festivals and Events

[Read More](#)



#Oneless Campaign

[Read More](#)



Raw Foundation, Drastic on Plastic, Reusable Cup Guide

[Read More](#)



WRAP, Understanding Plastic Packaging and the Language We Use to Describe It

[Read More](#)



Smith, L., 2019, House of Commons Library, Briefing Paper: Plastic Waste, Number 08515, 30 September 2019

A P P E N D I X 1

CHECKLIST FOR REDUCING PLASTICS

Use this checklist to set a baseline of the existing practices and policies, and to identify what actions are needed to improve waste plastic management. We advise you review this checklist periodically (at least annually) to identify which actions have been taken, what targets have been reached, and what new objectives need to be set in order to continuously improve performance and reduce your plastic footprint.

ITEM	N/A	YES	PLAN TO	NO	HOW TO IMPROVE	ACTIONS TO TAKE
POLICIES						
Do you have policies, including procurement policies, on plastics and does it include a commitment to reduce single-use, non-compostable plastics?						
Do your policies on plastic include specific, measurable, time-bound targets? e.g. “a maximum of 2 tonnes a year of grade 1 or 2 plastics by 2020, correctly segregated and recycled with a reliable waste management provider”						
When reviewing, creating or updating policies, do you engage all available and relevant stakeholders?						
Do you utilise the waste hierarchy principles in action plans, strategies and procurement policies?						
Do you actively communicate your plastic policies to all employees, partners, suppliers, vendors and audiences?						

ITEM	N/A	YES	PLAN TO	NO	HOW TO IMPROVE	ACTIONS TO TAKE
PROCUREMENT						
Does the procurement policy specify for plastic free, or reusable packaging from suppliers, vendors and contractors?						
Does the procurement policy detail the need for reusable, compostable or easily recyclable plastic products?						
Does the procurement policy make use of contract clauses to limit the volumes and types of plastic?						
Does the procurement policy use contract clauses to limit what packaging materials can be used?						
If you are to purchase bio-base or biodegradable plastics, do you ensure these are to EN13432 or E14995 standards?						
Have single-use plastics been replaced with reusable or compostable alternatives where appropriate? (e.g. serve-ware, cutlery, condiments)						
Are purchasing managers and departments kept up to date on any changes in policy or new targets?						
Are there training sessions, resources and regular updates on policies for purchasing managers on sustainable plastics and waste?						
If you have a work uniform, do you provide or encourage employees to buy natural fibre uniforms?						

ITEM	N/A	YES	PLAN TO	NO	HOW TO IMPROVE	ACTIONS TO TAKE
WASTE MANAGEMENT						
Do you use a trusted, reputable waste management supplier?						
Do you know specifically which plastics and materials your waste management provider can collect and process by waste stream? (i.e. mixed recycling, composting, landfill, energy from waste)						
Do you know specifically what materials or items are excluded from certain waste streams by your waste management provider?						
Have you communicated all available information on waste management to purchasing managers?						
Does your waste management provider detail how waste is managed, by material and waste stream?						
Have you spoken to your waste management provider on any advice, help or additional services they can provide to improve waste sustainability, including staff training?						
Do you regularly tender your waste management contract, with specific requirements on plastic and waste preferences?						
Do you know how waste is collected and transported, if this is sustainable or optimised with low-emission technology or driving route optimisation technology?						

ITEM	N/A	YES	PLAN TO	NO	HOW TO IMPROVE	ACTIONS TO TAKE
OPERATIONS						
Do you provide employees and audiences with reusable/ compostable alternatives to single-use plastics? (e.g. cups, cutlery)						
Have single-use sachets, condiments, tea and coffee been replaced with refillable, plastic free alternatives?						
Do you provide free water refills, or plastic free alternatives to plastic bottled water?						
Is waste plastic measured regularly and by waste-stream? (i.e. landfill, recycling, composting etc.)						
Do you actively monitor any incoming waste from suppliers or vendors?						
Do you use these insights to inform decision makers and set yearly reduction targets?						
Is plastic and waste documented annual reports/ management reports and meetings with associated KPI's to monitor?						
Do you use social media to promote reducing single-use plastics with audiences?						
Do you provide clear signage for audiences and staff to communicate how to segregate at waste disposal points? (i.e. list what materials/ products go in which bin)						
Do you provide training for staff on using, storing, collecting and disposing of different types of plastics and waste?						
If you provide laundry services, have you retrofitted washing machines/ dryers with fibre-catching filters, or use organisations who do?						
TOTAL						

A P P E N D I X 2

TYPES OF PLASTIC, APPLICATIONS

& IMPACTS

TYPE OF PLASTIC	EXAMPLES	PROS	CONS
Conventional plastics, non-biodegradable	PET, PP, PE PET is strong, transparent, durable, light-weight and has a wide range of applications e.g. bottles, jars, bottled health products, fibre for clothes, carpets and can be repurposed	Some are widely recycled e.g. PET Can be reused a number of times e.g. water bottles but this relies on consumer behaviour Considered inert in landfill	Fossil fuel based, carbon emissions from extraction, transport, processing and pollution impacts if released in the environment When sent to incineration / energy from waste facilities further emissions are released which can be higher than from coal or natural gas production
Biobased plastics, non-biodegradable	PET, PA, PE, PTT Polyamides (Nylon) are a large family of engineering plastics with a good balance of properties, for example, resistant, endure high temperatures, good chemical resistance, low gas permeability	Large range of applications and long life span due to resistance to wear	Release pollution and greenhouse gases when they biodegrade Can't be recycled easily in the same way as non-biodegradable plastics Can cause issues in segregation process leading to plastics sent to landfill
Bio-based, 'biodegradable'	PLA, PBS, PLA, Starch Blends 80% of bio-based plastics are made using starch-based substances as feedstock e.g. maize, potato, cassava, oats, rice, wheat.	Made from renewable resources Considered carbon neutral if they are incinerated with energy recovery 'energy from waste'	May compete with land for crops When they biodegrade in landfill or natural environment, they produce methane, a powerful greenhouse gas May not be clearly labelled causing confusion to the consumer Lack of evidence in terms of environmental impacts and properties in water

TYPE OF PLASTIC	EXAMPLES	PROS	CONS
Fossil fuel-based 'biodegradable'	e.g. PBAT, PCL two types of biodegradable polyester		Made from non-renewable carbon intensive source
Compostable	Compliance with the standard EN 13432 means the material can be composted in industrial facilities in twelve weeks, leaving no more than 10% of the original material in pieces bigger than 2mm, not worsening the soil structure or causing any harm to the soil through heavy metals.	Can be made into products with similar properties to conventional plastic Can be considered a better option than single use plastics if correct waste contracts are in place e.g. potential for positive impact in food and catering where plastic is often contaminated by food waste.	Confusion between home composting and industrial composting- two very different processes Cannot be recycled widely in the UK, and if not composted ends up in energy from waste facilities or landfill.

Information sourced from [Understanding Plastic Packaging, WRAP, 2018](#)

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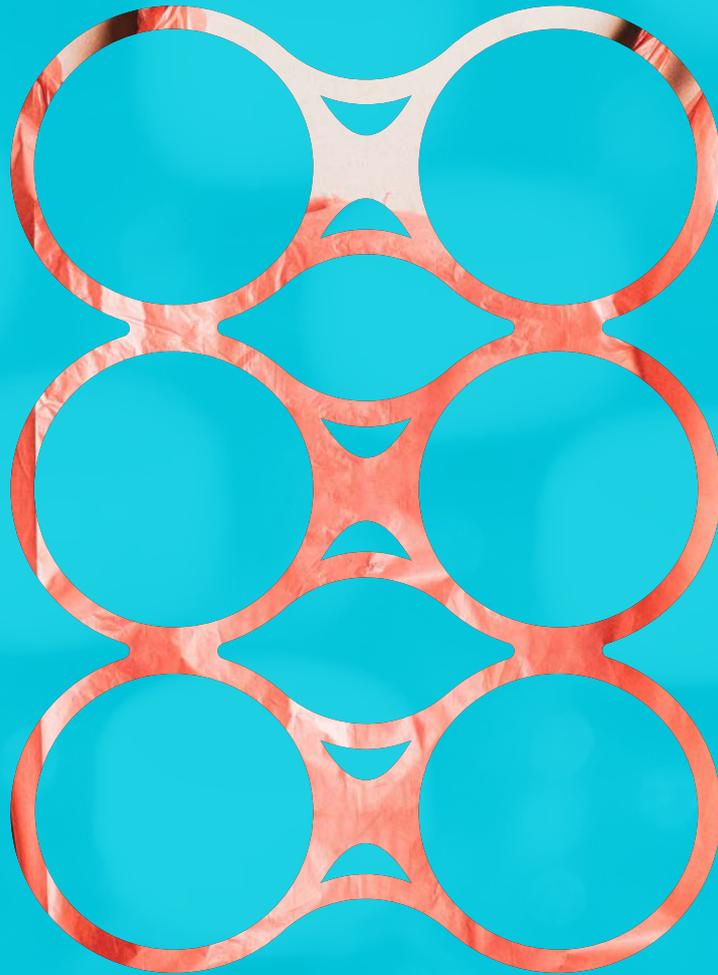
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Lead author: Becky Hazlewood

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Chiara Badiali

Julie's Bicycle
Somerset House
Strand, London, WC2R 1LA

juliesbicycle.com



Note: All case study content and innovation examples are taken from publicly available sources.