Supply Chain Pressure on Moving Towards Zero Plastic Waste and the Need for Innovation

Company Survey - Results & Discussion

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Executive Summary

KTN has surveyed around 100 companies across different sectors and company sizes to understand the challenges that companies are facing in reducing plastic waste in their business (excluding fast moving consumer goods). The survey focussed on:

- the areas of the business in which they currently have issues;
- whether their supply chain is currently putting pressure on them to reduce plastic waste;
- whether they anticipate this pressure increasing in the future;
- in which areas they would prioritise solutions;
- whether government intervention is needed to implement change.

The data has been split by sector for each issue and also company size. While some issues (like transportation) are equally applicable across sectors, other issues (like product use and consumption) vary greatly between sectors. The main conclusions are:

- For the large majority of the companies in the survey, reducing plastic waste is a live issue. Indeed, the majority of companies believe they have a positive or leading-edge policy towards reducing plastic waste.
- This is encouraging as less than a quarter of the companies surveyed currently have significant pressure to reduce plastic waste.
- However, about half believe that supply chain pressure will increase and the majority of these are expecting it within 2 years.
- There are a range of issues that companies are considering, with largest number of responses being around end of life of the product.
- Companies that are closer to the end user/consumer are feeling the most pressure to reduce plastic waste. Further up the supply chain, cost remains the predominant factor in business decisions.
- There is significant need for government intervention to help with innovation uptake to reduce plastic waste, as two thirds of companies surveyed said they need government intervention or at least a facilitated network to implement change.
- Some interventions could be targeted at specific sectors whereas other interventions will be equally applicable across sectors, depending on the part of the supply chain or issue they are addressing.

Introduction

The formation of the KTN Zero Plastic Waste (ZPW) Special Interest Group (SIG) (now renamed Innovation Network) was undertaken in order to understand the challenges that companies face in reducing plastic waste across all sectors in the company excluding Fast Moving Consumer Goods (FMCG) packaging. According to a 2019 UK Plastics situation report by WRAP, of the estimated total of 4.9 MT of plastic placed in the UK market in 2017 around half of it is non packaging plastic. The sources are primarily from the construction sector followed by the automotive sector, electrical and electronic sector and a number of other sectors (e.g. agriculture, leisure/household/sports).

One of the key activities of the ZPW SIG has been to understand the innovation needs of companies who are not in the FMCG sector. Innovations will be implemented faster if companies feel under pressure to change the status quo, so this survey was designed to assess the variations across sectors and company size.

To facilitate the survey, a number of 'business breakfasts' have been held during which companies have been interviewed and/or asked to complete a questionnaire around their current thinking on the journey (if any) towards reducing plastic waste in their company. Further interviews and questionnaires have been completed at other events, for example 'Futurebuild', Bradford Manufacturing Alliance and Smart Factory Expo.

The data from this work has been evaluated and the results are presented graphically. In addition, individual company examples are used to highlight specific issues. Further details on the methodology of data acquisition, the limitations of the survey and the spilt by sector and company size are given in Appendix 1. The full questionnaire is in Appendix 2.

In addition, at the business breakfasts, discussion groups were held on plastic waste to highlight:
1. Current and future challenges/barriers
2. Opportunities (based on UK capabilities, key trends and drivers)
3. What government (and other) interventions are needed

The complete output from these discussions is included in Appendix 3 with highlights from the discussions used for illustrative purposes throughout the report.

Problematic Areas Across Key Business Activities Taking a Lifecycle Approach

Problematic areas across key business activities taking a lifecycle approach

The questionnaire identified 6 areas of company operations where plastics may be a source of concern to management. The interviewees and respondents were asked to identify all those that were problematic in the life cycle of their product/offering:

- Supply of materials/equipment: Any plastic waste associated with incoming goods and materials, including the packaging used to deliver them to site. This covers both the amount of recycled content within supplied goods as well as the total amount of plastic used.
- Production/manufacturing: Plastic waste that occurs during the manufacturing process, for example offcuts, scrap, rework.
- Offices/warehouses: Plastic waste associated with warehousing and offices, for example temporary packaging on site, office waste, including single use. These are not part of the actual product.
- Transportation: Plastic used to transport goods to customers, for example wrapping, multi-use transportation boxes/pallets/crates.
- Use/consumption: The plastic waste associated with the use and/or consumption of the product, by the consumer and/or business customer.
- End of life: What happens to the product at the end of its life, including recycling options and contamination. This could be many years into the future.
- None: No issues of concern. This mainly applies to companies with very little physical product.

The distribution of the results of the combined data set are shown in Figure 1. Companies were able to select more than one area of concern.

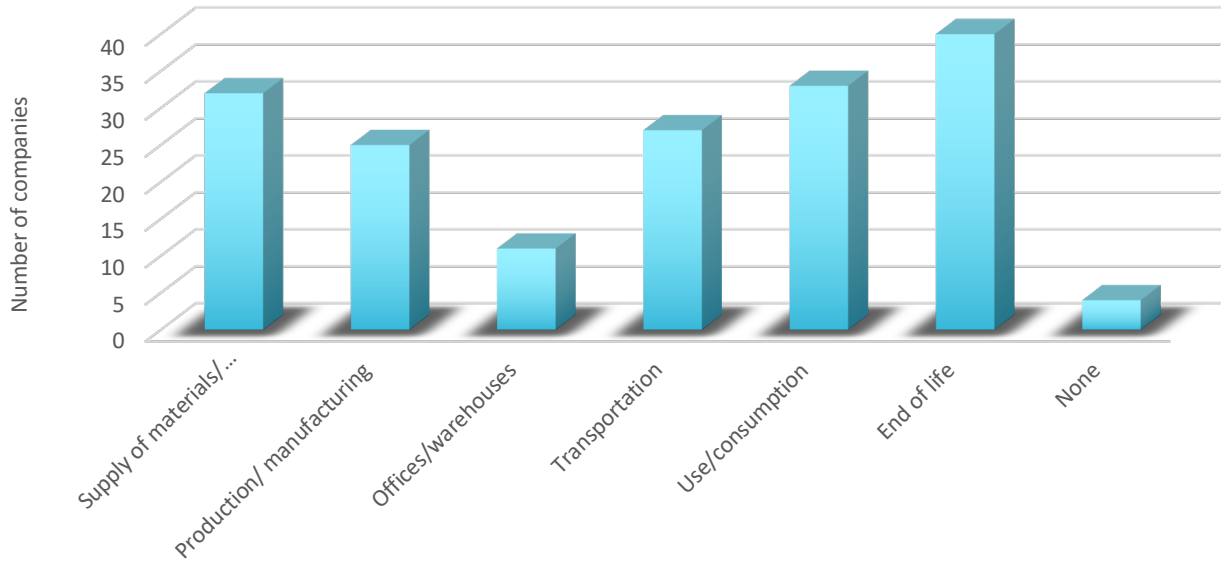


Figure 1: Distribution of problematic areas in life cycle of the product/offering for all companies

The most common area of concern was around end of life, which may reflect the wider societal view on plastic waste entering the environment and subsequent effect on ecosystems. This may also involve contamination of the plastic during the lifetime of a product, for example:

- A manufacturer of large plastic tanks is able to recycle almost all the waste generated internally e.g. faulty tanks after manufacture, offcuts etc. They have a take back scheme for water tanks, but over the lifetime of an oil tank, penetration of oil makes them difficult to include in a take back scheme as they become flammable during reprocessing of the plastic. They do not know how to proceed as the parent company aspires to be carbon neutral. They are also actively looking at alternatives to the plastic wrapping they used to send the tanks as this is much easier to change than the plastics in the tanks themselves, which have many more regulations attached to them.

There is also wide concern about the amount and sustainability of plastic coming into the company from their suppliers as well as the amount of waste plastic in use:

- A manufacturer of garden furniture is trying to further increase recycled content; however, they have issues around consistency of supply which they can only currently ensure by importing from Holland.
- Another company that manufactures benches from recycled plastic often finds that the planks can shrink overnight, which would not happen with virgin plastic. The labour associated with producing each piece of furniture is therefore significantly increased. It is only because sustainability is at the heart of their business model that they continue to use the more expensive, less reliable recycled material.

It is clear that almost all organisations believe they have problems with plastic waste to work on and that only minority believe this can be addressed by tackling plastics use in offices and warehouses, where impact on their product is minimal.

These data on problematic areas can also be broken down by the major sectors. The distribution of responses for each of the major sectors is shown in Appendix 4. Figure 2 shows how each of the problematic areas varies by sector.

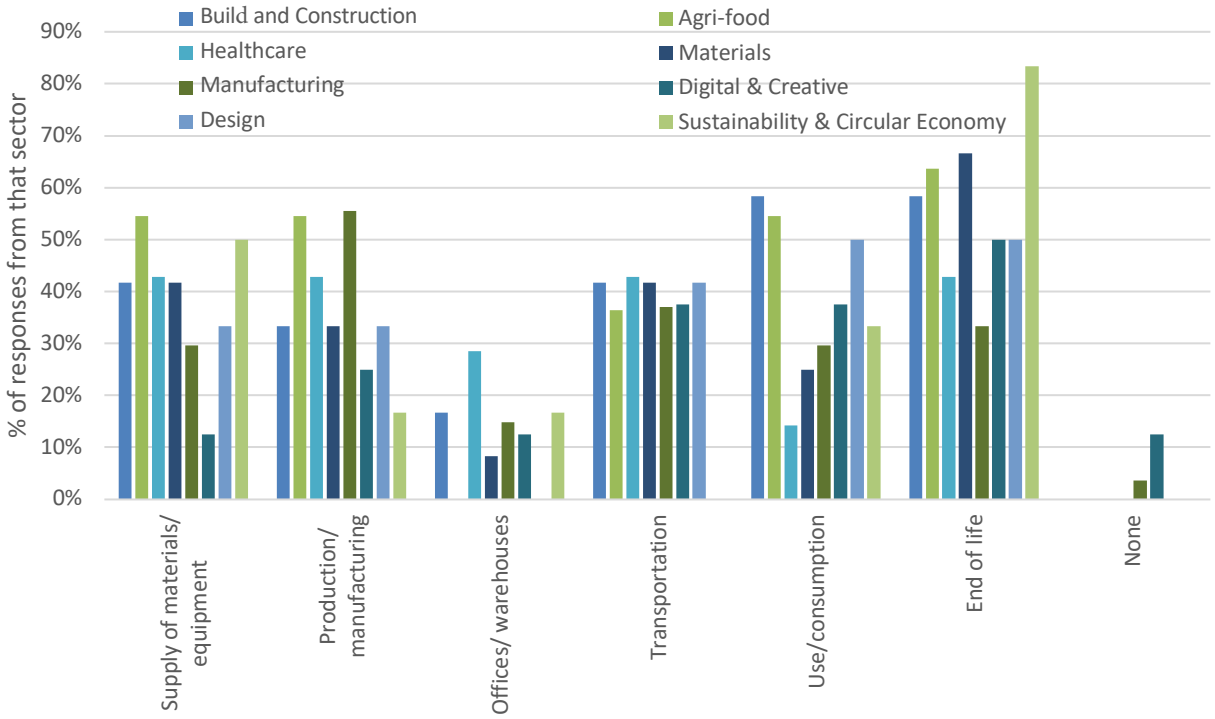


Figure 2: Overall distribution of problematic areas by sector

The data show that although a majority of companies in both the construction and agri-food sectors believe that 'use/consumption' and 'end of life' is a problem, the same is not true for healthcare and generally across manufacturing. Several of the large construction companies were interviewed at 'Futurebuild' and their comments are contained in future sections.

The 'sector' that is most concerned about end of life consists of those companies that actually produce the materials (excluding sustainability and circular economy).

In many cases there is a link between the supply of materials and end of life, but this is often where the product the company manufactures is not made of plastic, but packaged in plastic, for example:

- A large meat producer knows there is no end use for the plastics supplied to them which the meat is then wrapped in, so it is all sent to landfill. They feel there is a need to reduce the complexity of the laminate and PRNs are a big pressure for them. They would like to collaborate with somebody to test any new products and "show" them in action in the supply chain.

The issue with the least spread of distribution is transportation, which may be expected given that most goods and components are wrapped for transporting either to customers or between sites.

The data can also be split by company size and this is shown in Figures 3 and 4. Figure 3 is grouped by size and Figure 4 by problematic area.

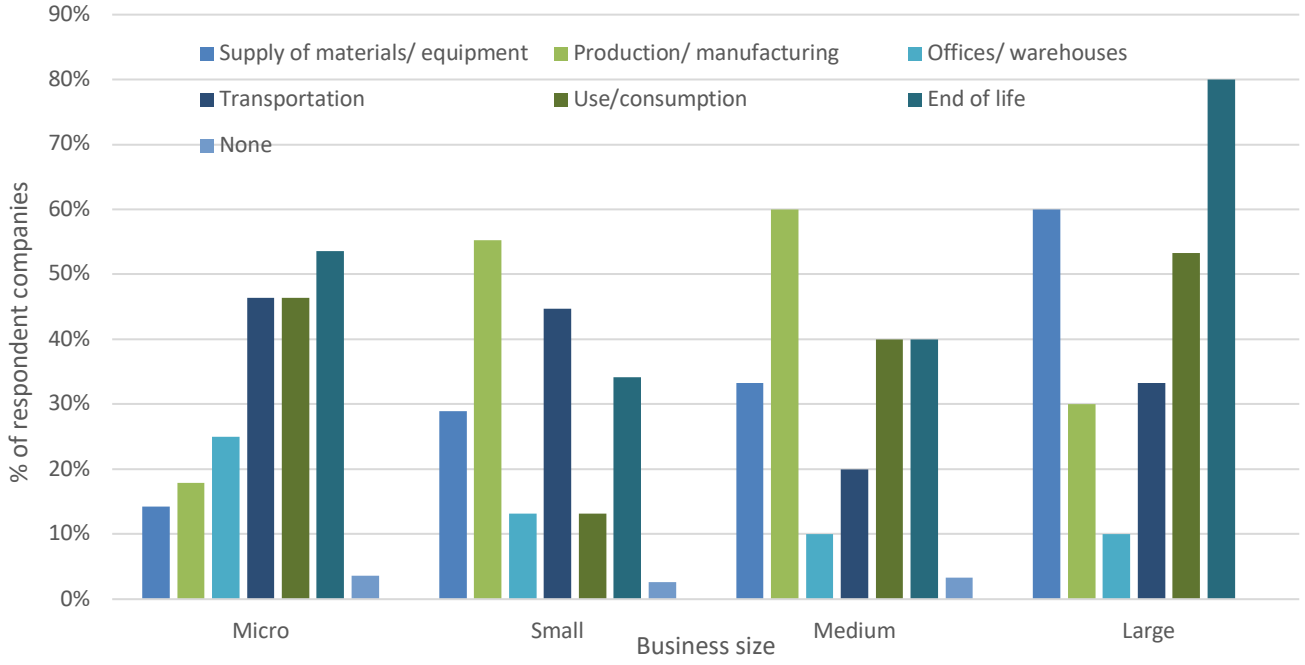


Figure 3: Distribution of problematic areas by company size

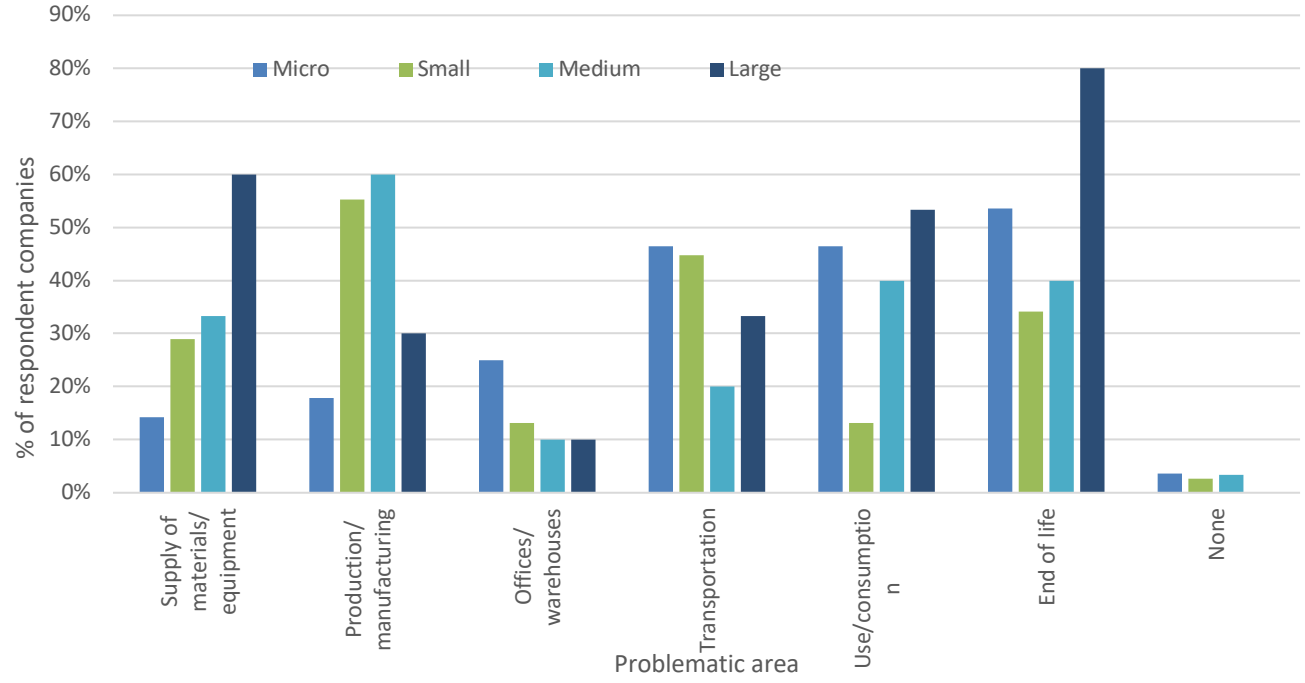


Figure 4: Distribution of problematic areas by company size

The data show that while 80% of large companies realise that they have an issue with plastic waste at end of life, only 35% of small companies share that view. Larger companies are also more concerned about incoming goods and materials but less concerned about their own manufacturing processes.

Current Business Situation with Plastic Waste

Current business situation with plastic waste

Current pressure from the supply chain

The first question in the survey around current supply chain was “Is your supply chain currently putting pressure on you to reduce plastic waste?” with reply options of:

- Not at all
- A little bit
- Somewhat
- Yes
- Our future orders depend on it

The respondent data from all companies is shown in Figure 5.

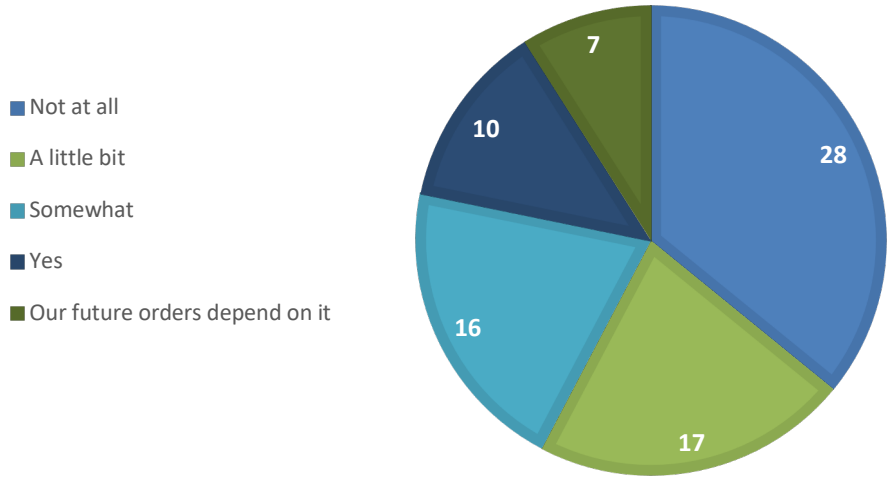


Figure 5: Distribution of the current pressure from the supply chain on companies – number of responses.

When considered alongside Figure 2, these data indicate that although companies understand they have problematic areas with plastic waste, they are currently not feeling a lot of pressure to act on it by the supply chain. Indeed, only 6 companies felt that future orders depended on it and almost all of these were targeting sustainability as key differentiator for them in their marketplace.

The data can also be broken down by the different sectors and this is shown in Figure 6.

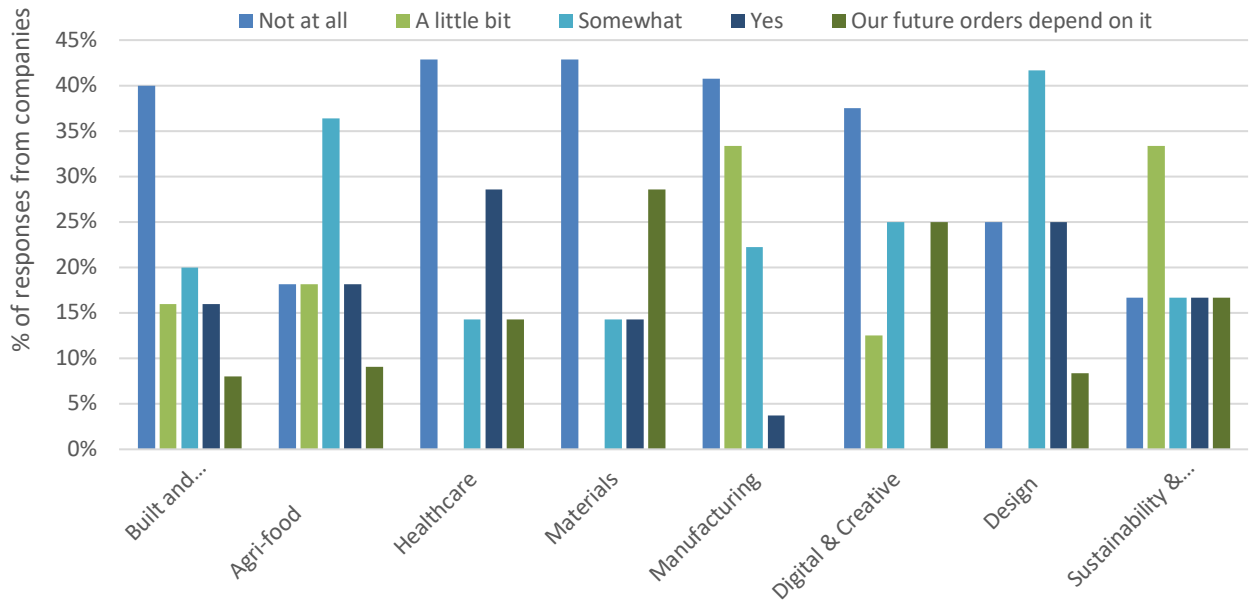


Figure 6: Distribution of the current pressure being placed by the supply chain by sector

The data indicate that the sector currently under most supply chain pressure is Agri-Food which may reflect both the short length of supply chain to consumers and the pressure for retailers to adopt a sustainable approach to food wrapping. Also, those companies that design products are also under pressure, which will then impact on the sustainability of future products. As would be expected, those working in sustainability and circular economy need to address plastic waste.

The sector that has the highest response rates for future orders depending on reducing plastics waste is materials, where companies perceive that by only offering non-sustainable (either factually or by reputation) materials in the future they will lose competitive advantage.

The data can also be split by size of company and this is shown in Figure 7.

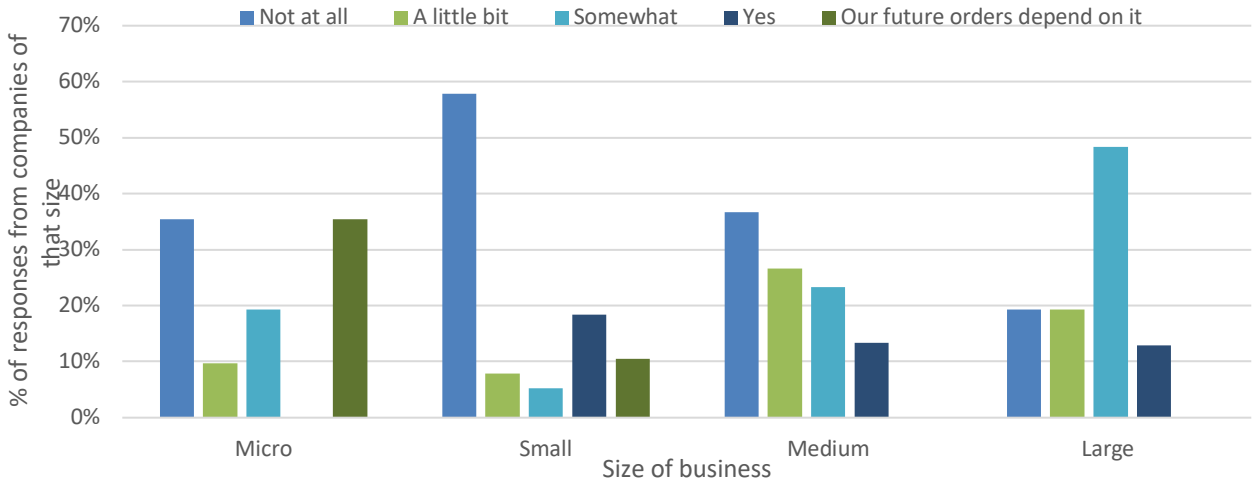


Figure 7: Distribution of the current pressure being placed by the supply chain by company size

The data show that (excluding micro sized companies) there is a link between company size and the pressure to reduce plastic waste, larger companies are under more pressure than medium sized business who are in turn under more pressure than small businesses.

Further analysis carried out by interrogating individual interview responses also suggests there is a link between supply chain pressure and supply chain distance from consumers. This can be highlighted using 3 examples:

- The manufacturer of warehouse shelving systems stated that he has absolutely no pressure currently to reduce plastic waste and that the companies used to fit out warehouses are entirely focussed on cost. He suggested that although a customer of an online retailer is concerned about the packaging arriving at the home, they are less concerned about/aware of the amount of recycled plastic in the components used in the shelving to stock the item before being dispatched.
- A machining tool company buys planks of plastic (1500x500x20 mm) which they then machine down for tooling. It is predominantly a polyurethane foam which comes off as 'chippings'. A large proportion of the plastic from planks bought can go into the bins which they then pay for disposal. They generate approximately two wheelie bins full each week. They have talked to people about the possibility of how to recycle it, but it is low down on their priority list, and they are getting no pressure from the supply chain.
- A company that manufactures and supplies electrical components imports some of its plastics and also manufactures in the UK for the housings. As the products are not visible and are supplied into further applications which will have a long life e.g. in a building, there is no pressure to look at any sustainability issues.

However:

- A large-scale mushroom grower supplies to a large supermarket chain in the UK and they are coming under pressure to make the packaging used for the mushrooms to be more sustainable. However, the company is lacking new solutions from their packaging suppliers. They feel squeezed because their expertise is in growing mushrooms effectively, not plastic packaging, where they are completely reliant on their suppliers.
- A supplier of chickens to supermarkets is also under high pressure from the supermarkets to reduce plastic waste. Although a large proportion of this is around the packaging, they also have a lot of single use plastic waste used for transporting carcasses between sites. They could potentially reuse these trays, but the current key consideration is around transportation of raw meat.
- A company that ‘produces’ bags of logs for the DIY sector is looking for more sustainable solutions to wrap the logs in. However, the weight of the product and weathering outside, limits their options.

Company approach to zero plastic waste

The follow up question was designed to understand each company's perception on how they view themselves regarding plastic waste - "How would you describe your organisation's current policy towards zero plastic waste?" with one of four options available to be selected:

- Non existent
- Ad-hoc & reactive
- Proactive
- Leading edge

The responses from all the companies are shown in Figure 8.

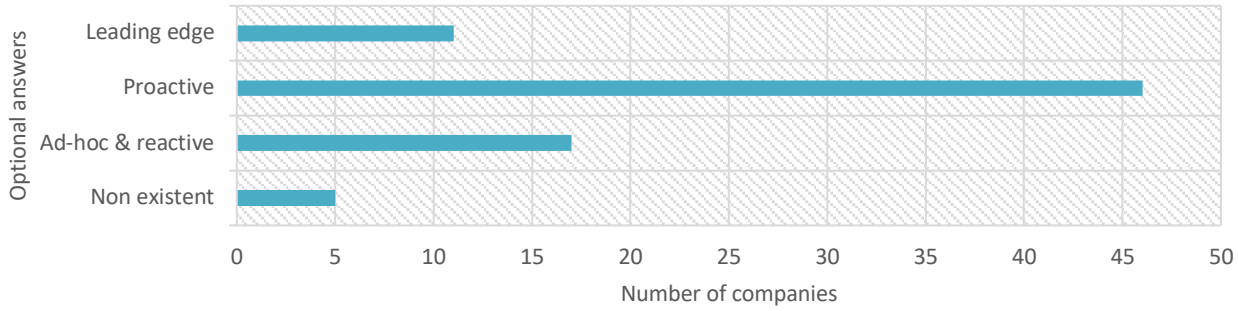


Figure 8: Distribution of company policies towards zero plastic waste

The data clearly shows that the majority of companies believe they have a proactive or leading-edge approach towards zero plastic waste, and this holds true across sectors as shown in Figure 9.

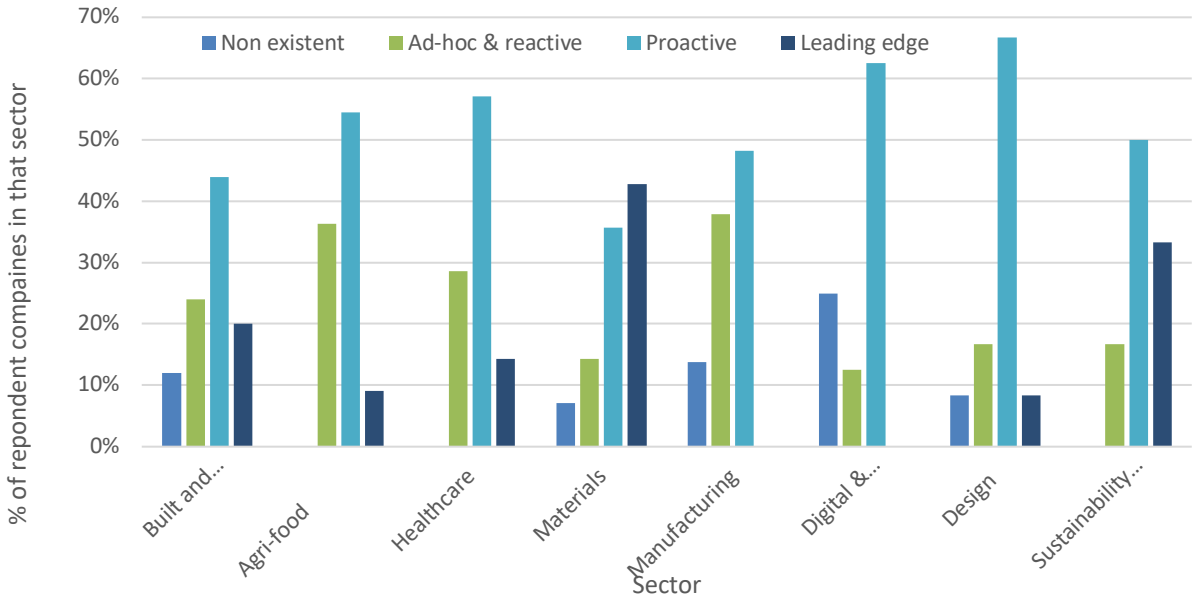


Figure 9: Distribution of company policies towards zero plastic waste by sector

However, there are differences when looking at business size as shown in Figure 10, where small businesses believe they have a less proactive policy compared to other business sizes.

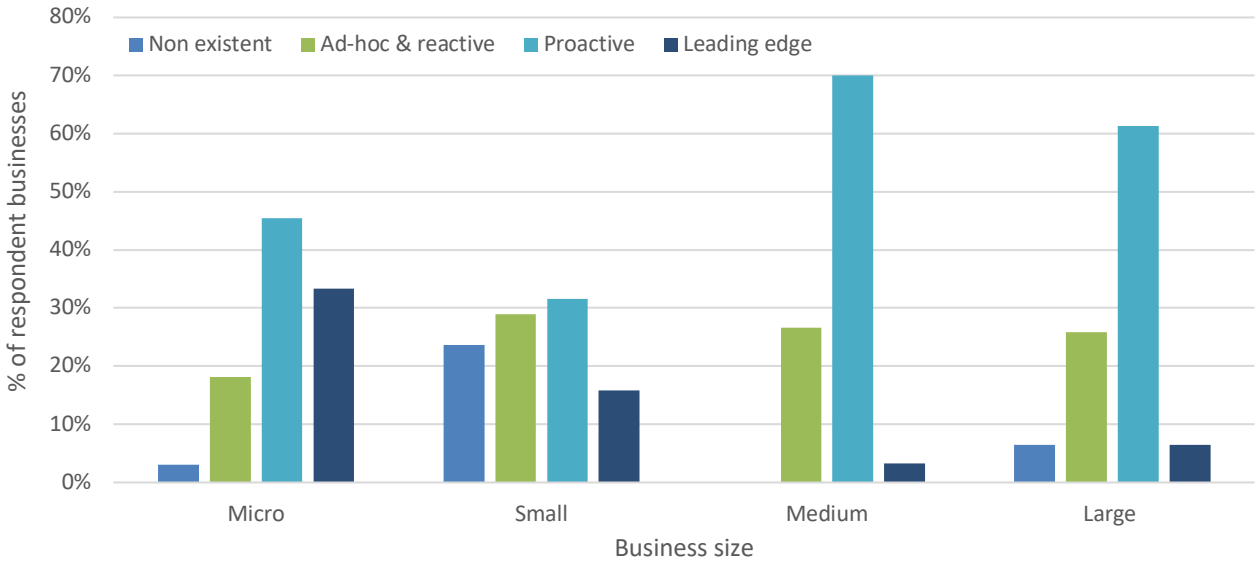


Figure 10: Distribution of company policies towards zero plastic waste by company size

The general positive attitude of companies is reinforced through analysis of the interviews, examples include:

- The Managing Director of a small business that manufactures bespoke car parts personally takes excess plastic wrapping from incoming goods to the recycling centre. The amount of plastic waste generated does not make a waste management system viable and he is not provided with bins from the council to recycle the plastic.
- For larger businesses using a waste management company is more viable. The MD of an SME that manufactures internal plastic mouldings for static caravans has investigated using a waste management company but finds it very difficult to justify the additional cost. He would be happy to pay a slight additional amount, but because the business runs on tight profit margins, his options are limited.

Management approach to plastic waste

Although companies may think they have a proactive attitude to plastic waste, a follow up question was asked to understand how high a priority is sustainability to a company. Each respondent was asked "Is sustainability a standard agenda item in your management meetings?" with 3 options: Yes, No, don't know. There is no way to verify the answers to this question, however it does give insight into the level of interest in sustainability and by inference plastic waste. The results are shown in Figure 11.

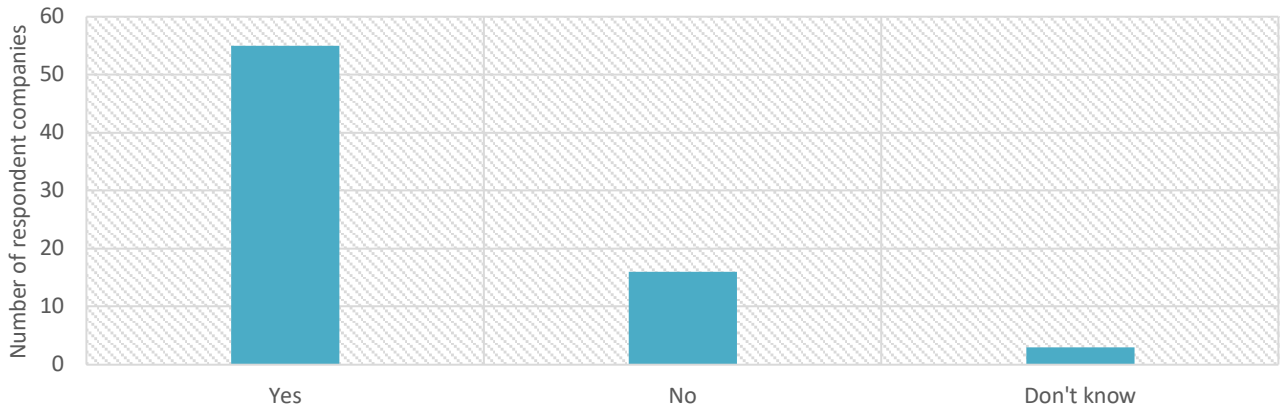


Figure 11: Distribution of companies who have sustainability as a standard agenda item.

These data show that companies believe they discuss sustainability at management meetings, and this aligns with the previous section, where most companies believe they have a proactive attitude to plastic waste.

It is also encouraging that companies are taking a proactive approach without the overwhelming pressure from the supply chain. Of course, if they believe that in the future the supply chain will be applying more pressure, then this proactive approach is needed now in order for future products to keep pace with the marketplace. Some examples include:

- A manufacturer of covers for head restraints knows that they are all currently disposed of after one use. This is done abroad at the destination airport. Although they have no current pressure from the supply chain, they are proactively assessing possible global supply chains that could enable the material to be reused and/or recycled.
- At a large (family owned) construction company the new generation of directors are perceived as being more proactive in sustainability. They are exploring biodegradable plastics and also how to separate on site as the key issue is the mixed plastic waste stream.

Future Business Opportunities and Supply Chain Pressure

Future business opportunities and supply chain pressure

Future pressure from the supply chain

Although current supply chain pressure in general is relatively low, follow up questions were asked on what the companies perceived future supply chain pressure would be like. The first question to be asked was "Are you expecting your supply chain to increase pressure on you to reduce plastic waste?" with the same 4 options as the question on the current pressure:

- Not at all
- A little bit
- Somewhat
- Yes
- Our future orders depend on it

The results are shown for all companies in Figure 12.

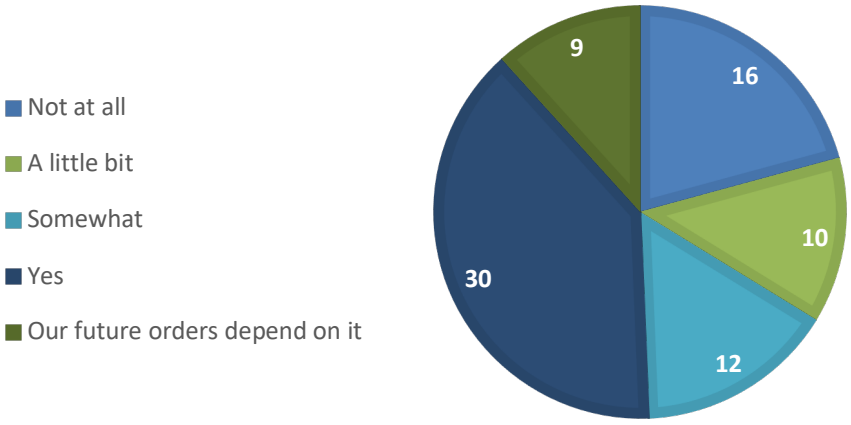


Figure 12: Distribution of the anticipated future pressure to be placed by the supply chain on companies (number of responses)

The data clearly shows that companies are expecting the amount of supply chain pressure to increase and this can be seen by overlaying the two distributions as shown in Figure 13. If companies perceive that pressure to reduce plastic waste will increase, then there could be opportunity to develop collaborations to accelerate the uptake of innovative solutions.

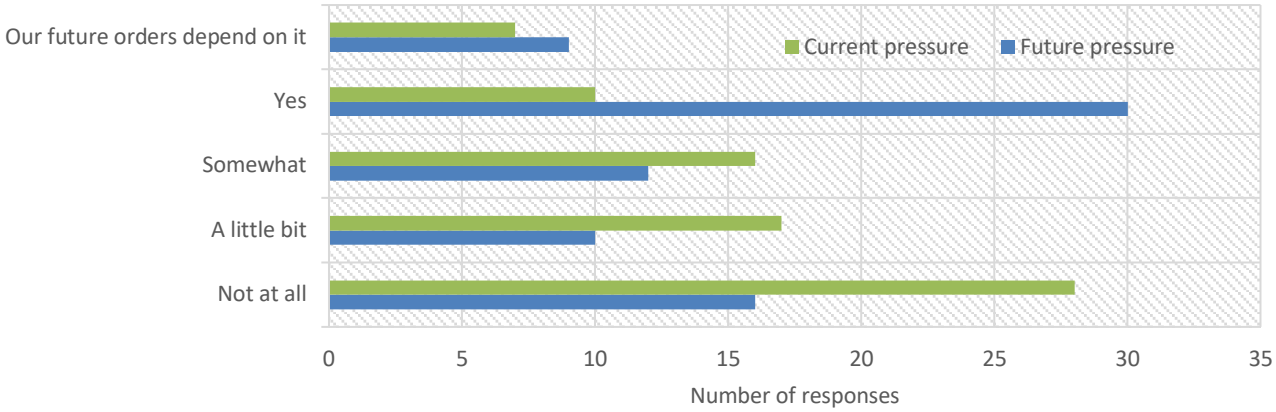


Figure 13: Current and future supply chain pressure

The data can again be split by sector and this is shown in Figure 14.

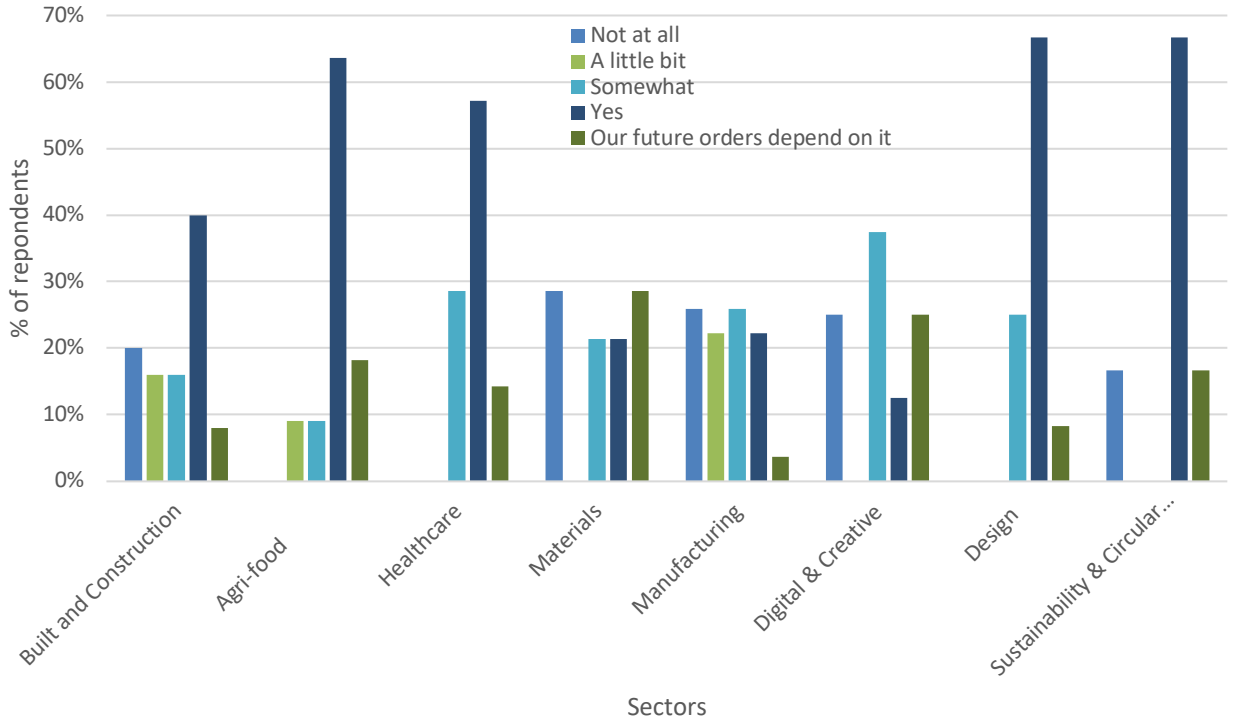


Figure 14: Distribution of the anticipated future pressure by sector

The data indicate that agri-food, healthcare and to a lesser extent construction sectors are expecting pressure to increase. Materials companies are more split between responses with a significant proportion believing that future orders will depend on reducing plastic waste. Manufacturing overall is evenly split, which again suggests that those manufacturers in lower tiers and further away from consumers in the supply chain are less susceptible to supply chain pressure. Future legislation will also play a key role in pressure across the supply chain, for example:

- A manufacturer of plastic bottles is expecting loose bottle tops to become prohibited in the next 3 years, with a potential solution being a hinged top. They are working with others on

how this can be achieved without increasing the weight and amount of plastic. They lost an order from a big international drinks company because the new version of a product had more plastic even though it has less pieces.

- A manufacturer of automotive fuel tanks would like to use more recycled content in their tanks, however the vehicle certification agency (VCA) currently restricts the amount of recycled content that can be used. They feel this is a legacy from when recycled material was much less capable than current generation material. Further work is needed to show how the new materials can make up a larger proportion of the fuel tanks without decreasing the mechanical properties and safety standards. This should be done by setting up relevant collaborations in the development area.

This data can again be split by company size and this is shown in Figure 15.

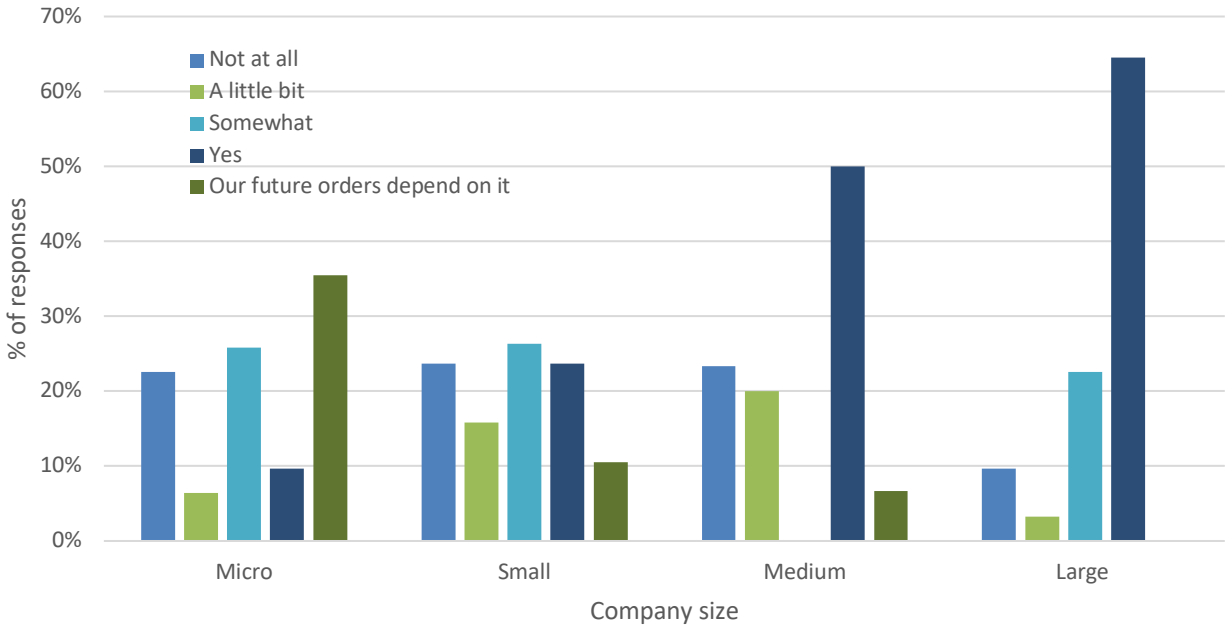


Figure 15: Distribution of the anticipated future pressure by company size

In general, it can be seen that there is a clear link between company size and the expectation of supply chain pressure to reduce plastic waste (excluding micros).

When will supply chain pressure increase?

For those companies who perceive that the supply chain will be increasing pressure in the future, they were asked "When are you expecting your supply chain to increase pressure on you to reduce plastic waste?" with 3 options:

- Within 6 months
- 6 months to 2 years from now
- More than 2 years

The distribution of responses is shown in Figure 16.

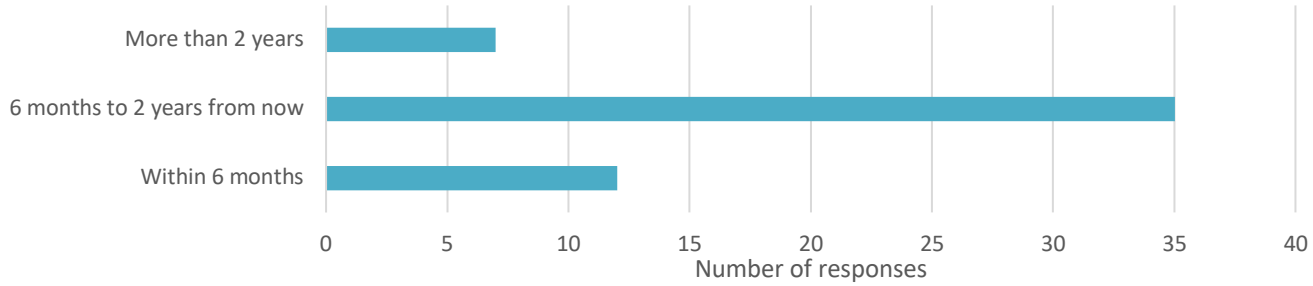


Figure 16: Distribution of when companies perceive supply chain pressure will be applied.

The data shows that most companies believe they will be taking action to reduce plastic waste within the next 2 years.

Preparation for future supply chain pressure

For the companies that were expecting supply chain pressure to increase, they were asked "Are you preparing for future SC demands e.g. by exploring current innovations in your sector?" with the same options as previous questions:

- Not at all
- A little bit
- Somewhat
- Yes
- Our future orders depend on it

The data can be used to understand the appetite to work on innovation and also which sectors are particularly interested. The data for all the companies is shown in Figure 17, the split by sector in Figure 18 and by company size in Figure 19.

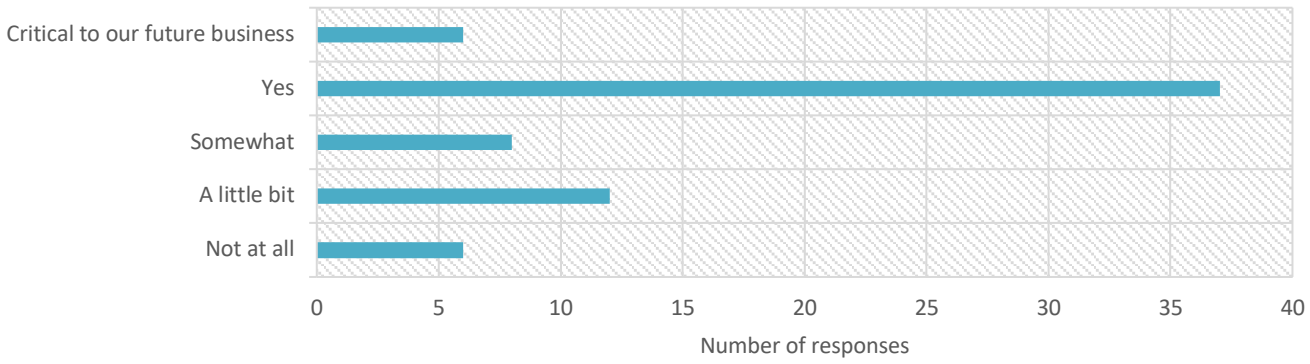


Figure 17: Distribution on whether companies are preparing for future supply chain pressure

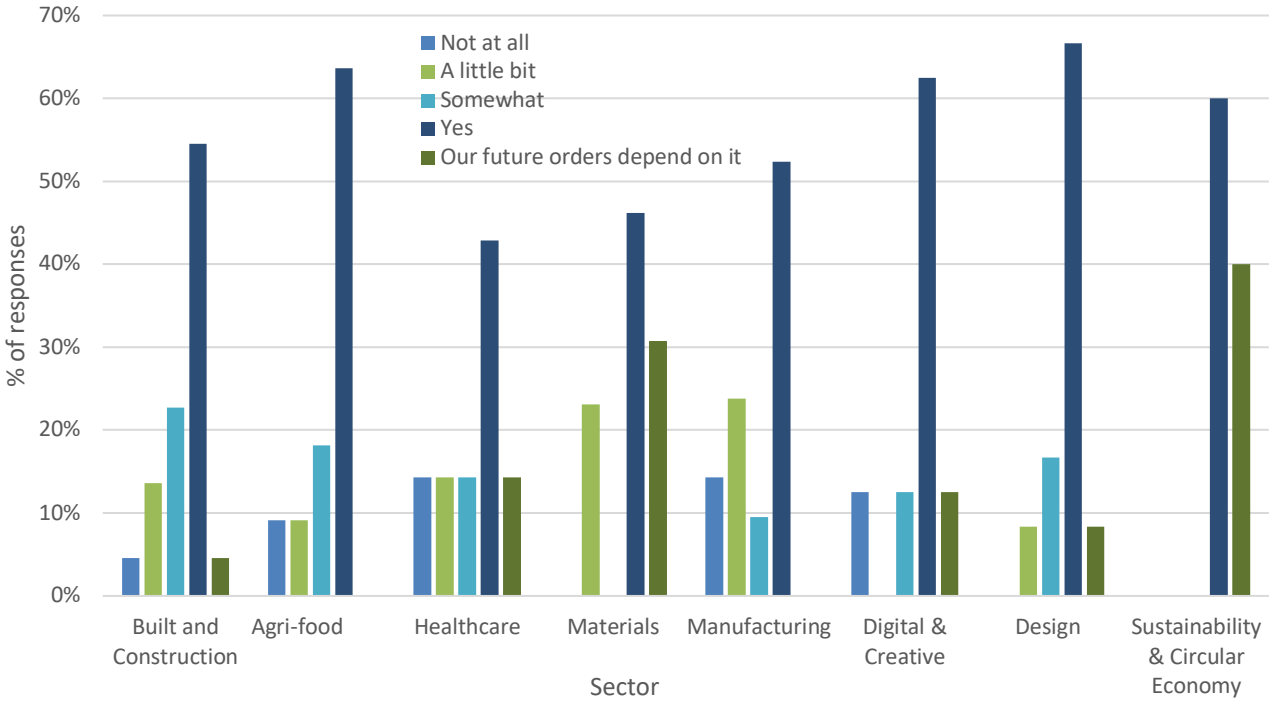


Figure 18: Distribution on whether companies are preparing for future supply chain pressure by sector

This shows that preparations are being made to reduce plastic waste across all sectors and that any intervention should be sector specific.

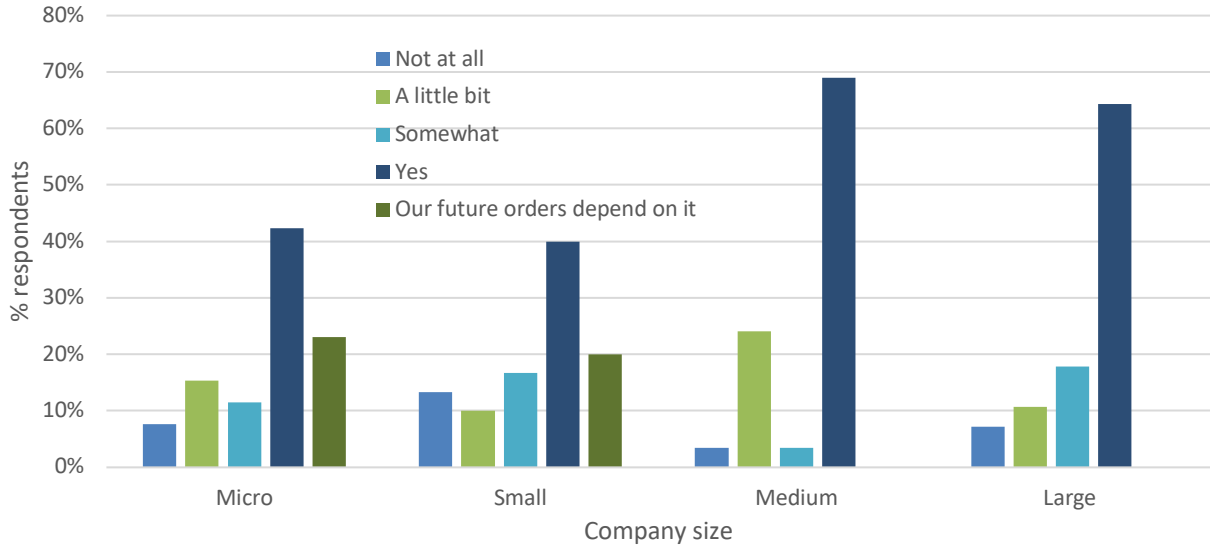


Figure 19: Distribution on whether companies are preparing for supply chain pressure by size

Larger companies may have specific people or teams looking at sustainability, in which plastic waste is a part. They also have large enough budgets to work with universities to directly develop novel solutions. For example:

- A large construction company have multiple teams looking at sustainability and in particular plastic waste. The current focus is on packaging and construction sites (portacabins etc.) as they can be quite large facilities. For example, they give out reusable cups and are thinking about PPE. They have also run events for employees to promote sustainability including plastic waste. However, ultimately cost is king, and solutions need to consider this, although there is potential to make use of landfill tax. Branding is preventing reuse of plastic wrapping as suppliers like to have awareness of what is being used.
- Another large construction company has been pushing for change and has joined a science-based initiative. Again, the current focus is on wrapping, including pallets and pods. Also, façade protection is both recyclable and reusable. Pipe offcuts are also an issue and they have tried educating fitters, but they are on tight timelines especially if concrete is due to be poured. They also need segregable skips.

Current and Future Practices for Various Aspects of Plastic Waste

Current and future practices for various aspects of plastic waste

The previous 2 sections set out the current and future pressures for the whole of the business. To analyse their needs further, the companies were requested to complete: "Your organisation's current (C) and future (F) practices towards zero plastic waste: Please rank these activities in order of how important they are."
With options of: (H = high, M = medium, L= low, ? = I don't know, n/a = not applicable).

Specific potential development areas were identified as follows:

- Using suppliers pro-active in minimising plastic waste
- Maximising recycled plastic feedstock in the products we make
- Finding alternatives to the plastics we use in our products (e.g., bio-degradable plastic, non-plastic)
- Minimising plastic waste to landfill from our production/manufacturing processes
- Exploring alternative outlets/uses for the plastic waste we generate in our operations
- Minimising plastic waste at the end of life of the product (e.g., take back scheme)
- Minimising plastic waste in offices, warehouses, transportation etc.
- Exploring user/consumer behaviour to inform product design and/or sustainability strategy

Current importance of development areas

The data is shown in Figure 20, with the number of responses of High, Medium, Low and none set out for each area:

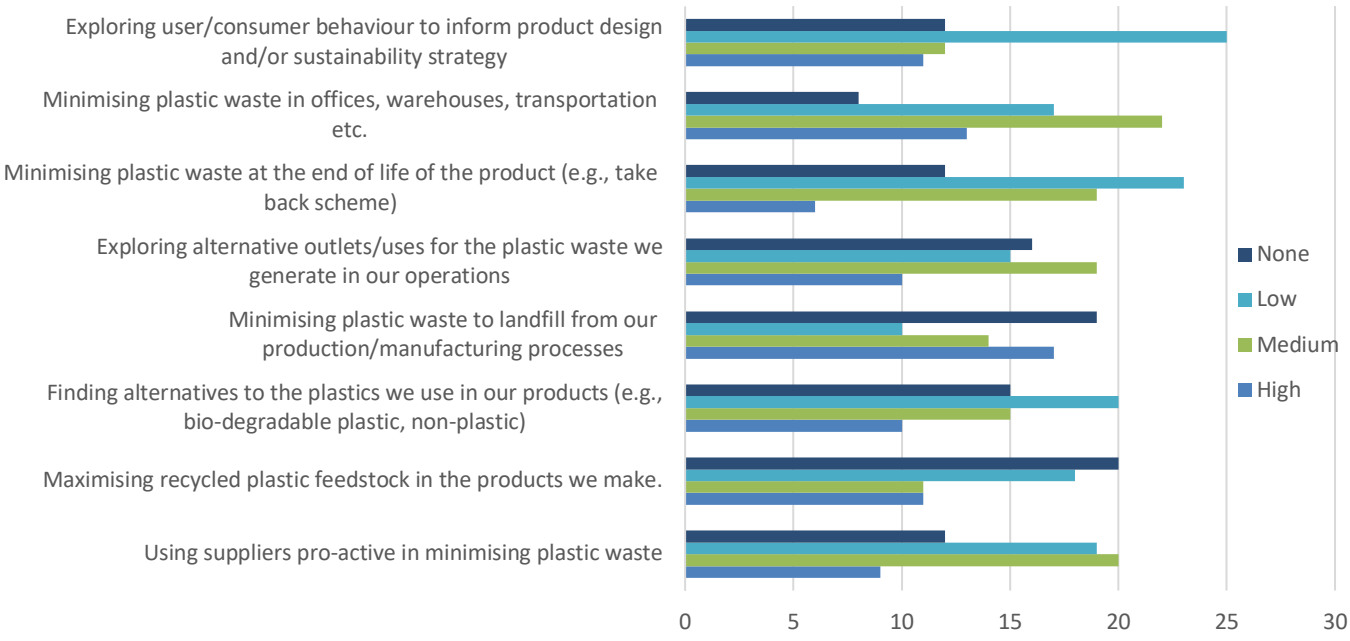


Figure 20: Distribution of number of responses current importance levels for potential development areas

The data shows an even split, but generally low priority currently across all development areas. The only area where more than 15 companies said they were giving 'high priority' was to minimising plastic waste to landfill. This could be financially driven by the cost of sending waste to landfill.

Future importance of development areas

A different scenario emerges when considering future importance in each of these areas and the data for this is shown in Figure 21.

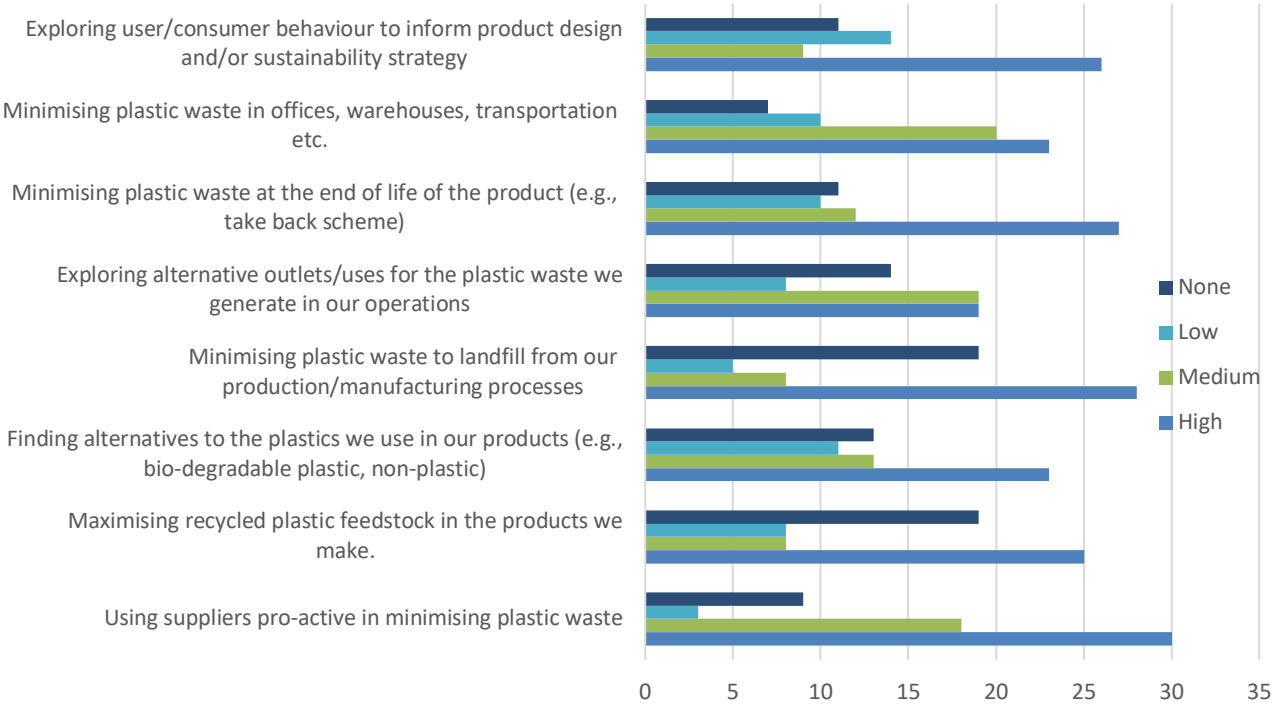


Figure 21: Distribution of future importance levels for potential development areas

The data shows that more of these areas will move to a higher priority in future, with very few having low priority. Particular examples include the use of pro-active suppliers to reduce plastic waste and examples of these are:

- A large producer of a meat alternative has "cast the net far and wide" to understand potential solutions for the plastic wrapping of their products. They have an in-house packaging development team, and this is supported by a strong senior management commitment to reducing plastic waste.
- A paint supplier, principally for the aerospace industry, is looking to reduce plastic waste by switching from buckets of paint (where not all of it is used) to blister packs where a 'portion' of paint is supplied. This also requires a change to their business model.

Government Intervention Needed to Reduce Plastic Waste

Government intervention needed to reduce plastic waste

The data in the sections above show that companies are being proactive and making preparations to reduce plastic waste. The follow up question was designed to assess what support they need to reduce plastic waste – "How much can your company directly affect change in moving towards zero plastic waste with/without government intervention and policy?" with four options:

- We can fully implement the change ourselves through normal business activity.
- Working alongside a UK network facilitated by government is the best way to implement change.
- It is very difficult for us to change without significant government intervention.
- We are concerned that too much government intervention will drive value out of our business.
- Don't know.

The split between each of the five options is shown in Figure 22.

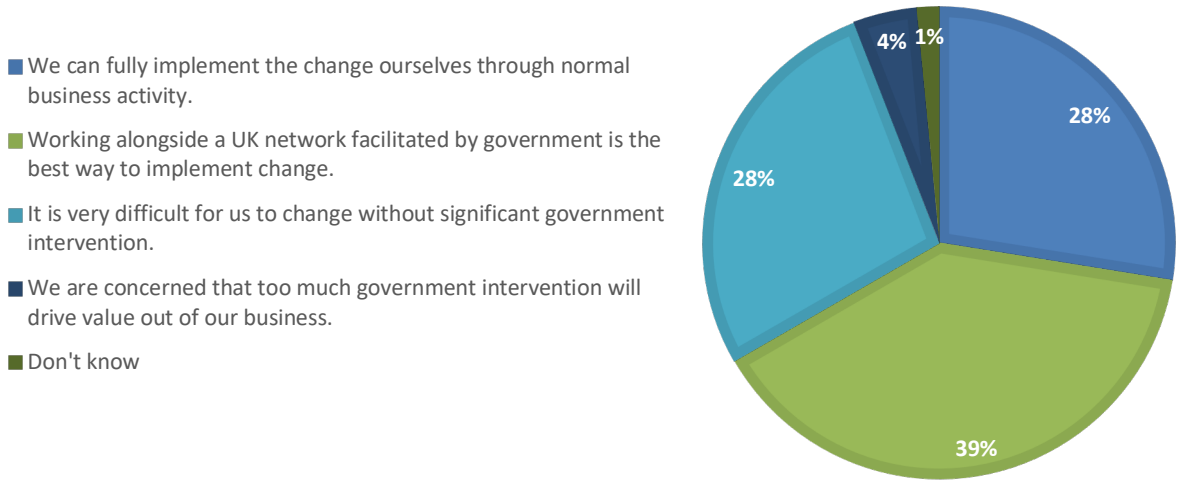


Figure 22: Distribution of opinion on how much intervention is needed to affect plastic waste reduction

The data is encouraging in that only 4% of respondents feel that that currently planned government interventions (e.g. plastic tax, EPR scheme) will take value from the business. Although the other options have a reasonably similar size of split, the largest segment is around how a network facility through the government is the best way forward.

The data can again be split across sectors and company size and these are shown in Figures 23, 24 and 25.

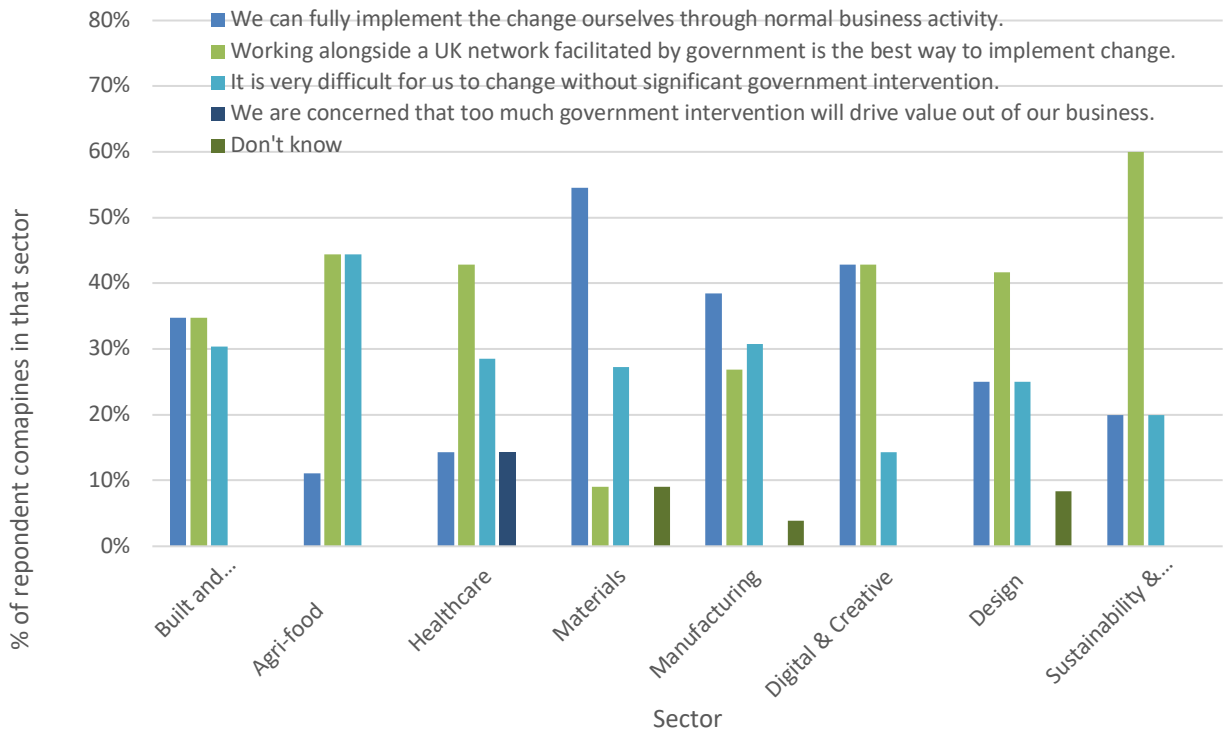


Figure 23: Distribution of opinion on how much intervention is needed to affect plastic waste by sector

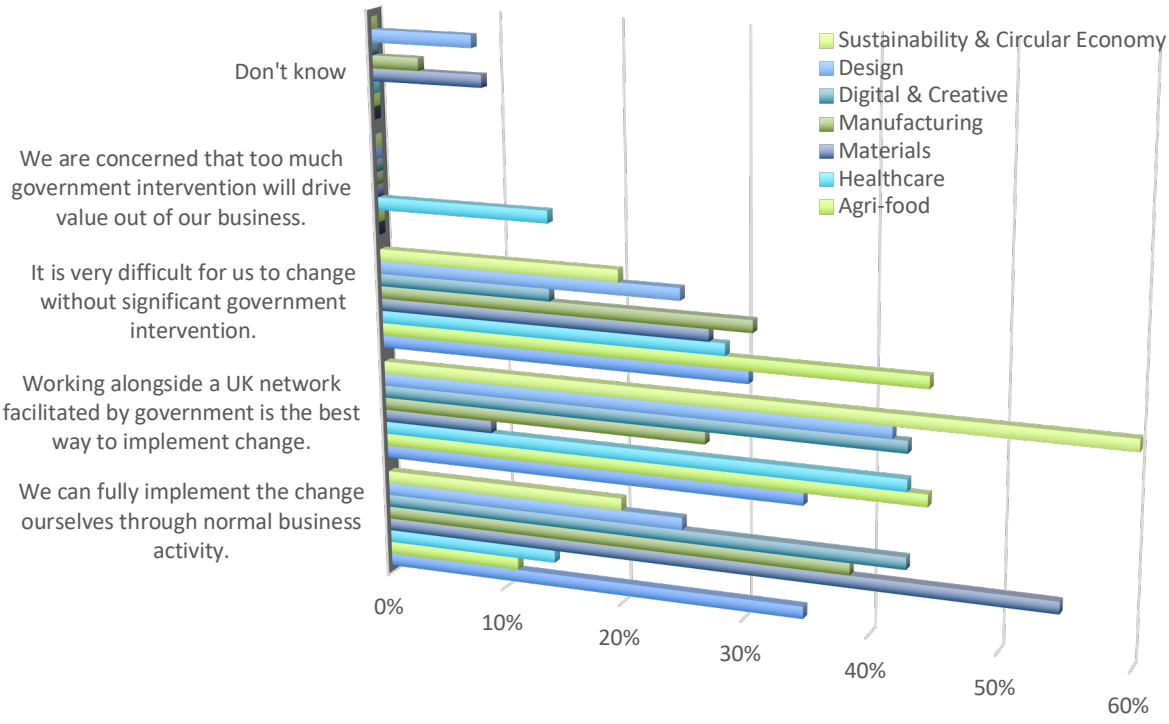


Figure 24: Distribution of opinion on how much intervention is needed to affect plastic waste by sector

Figures 23 and 24 indicate that the sector requiring most intervention is agri-food, which has both the highest percentage requiring government intervention and also the highest percentage wanting to be part of a facilitated network. Only respondents from the healthcare sector were concerned about government intervention.

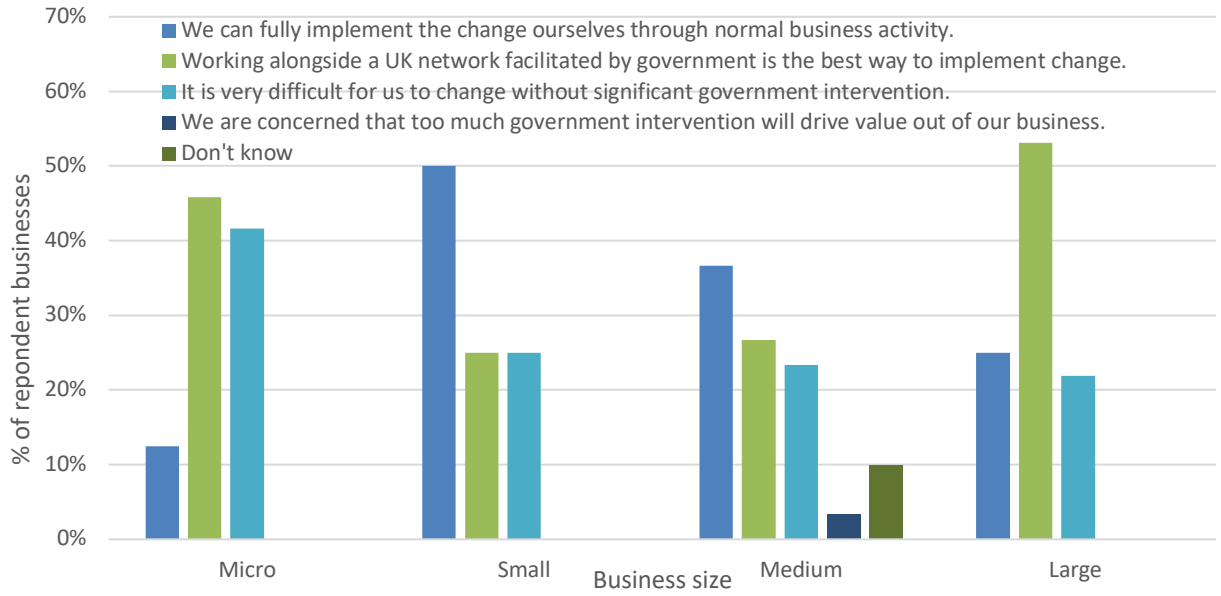


Figure 25: Split of opinion on how much intervention is needed to affect plastic waste by size

Figure 25 suggests that smaller businesses feel more able to tackle the problem of plastic waste themselves, with twice as many selecting this option compared to large companies. To complement this, twice as many large businesses want to be part of facilitated network compared to small businesses. This could present a barrier when UKCPN is trying to engage with small businesses if they feel they can handle plastic waste themselves. The data also show the number of businesses who need significant intervention is not dependent on company size.

Conclusion

Conclusions

- When considering the data presented, it should be noted that the survey was taken amongst companies who were participating in external events and are therefore likely to be proactive companies.
- For the large majority of the companies in the survey, reducing plastic waste is a live issue. Indeed, the majority of companies believe they have a proactive or leading-edge policy towards reducing plastic waste.
- This is encouraging as less than a quarter of the companies surveyed currently have significant pressure to reduce plastic waste.
- However, half believe that supply chain pressure will increase and the majority of these are expecting it within 2 years.
- There are a range of issues that companies are considering, with largest number of responses being around end of life of the product.
- Companies that are closer to the end user/consumer are feeling the most pressure to reduce plastic waste. Further up the supply chain, cost remains the predominant factor in business decisions.
- There is significant need for government intervention to help with innovation uptake to reduce plastic waste, as 2/3 of companies surveyed said they need government intervention or at least a facilitated network to implement change.
- Some interventions could be targeted at specific sectors whereas other interventions will be equally applicable across sectors, depending on the part of the supply chain or issue they are addressing.

Appendices

Appendix 1: Method and limitations

Data acquisition for survey

The survey data used for this report was collected at 12 events over a 6-month period between September 2019 and February 2020 and questionnaires that were also completed online until April 2020. The range of sectors was determined from the standard set adopted by KTN and the number of companies from each of the sectors is shown in Figure A1-1. Note that a company may be included in multiple sectors, in particular manufacturers who manufacture goods for a specific sector or multiple sectors.

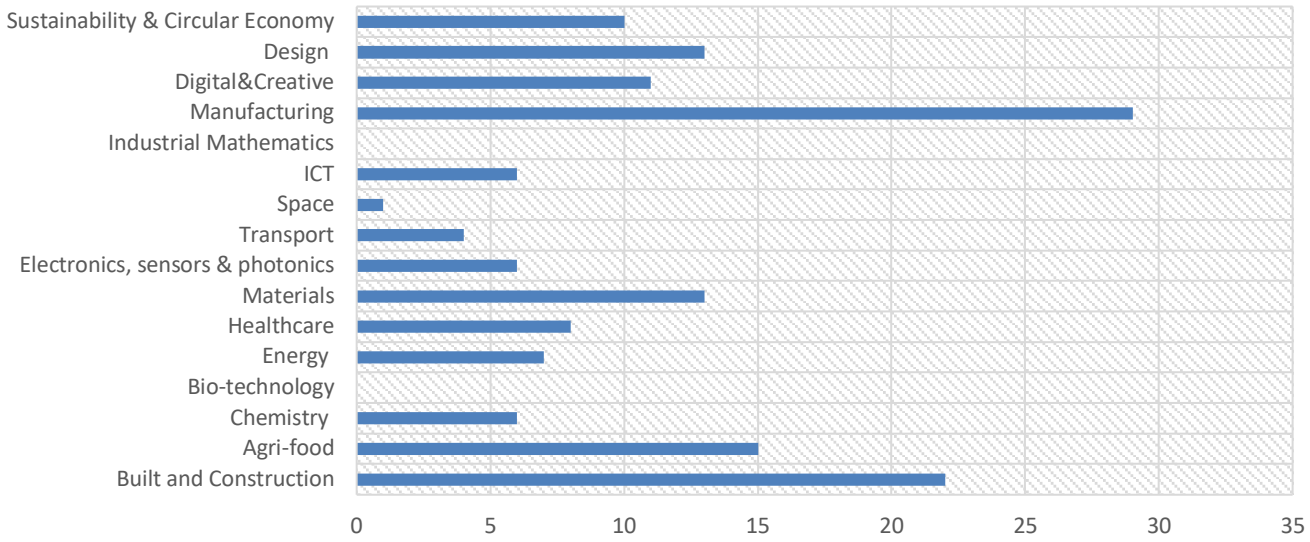


Figure A1-1: Distribution of interviewed/responder companies by sector

There is significant representation from the sectors that are particular targets of the SIG, in particular manufacturing, materials, agriculture and construction.

Another aspect of the investigation was the variation in opinion by company size, with representation needed across different company sizes. This data showing the distribution of company size is shown in Figure A1-2, with a good spread of companies by size.

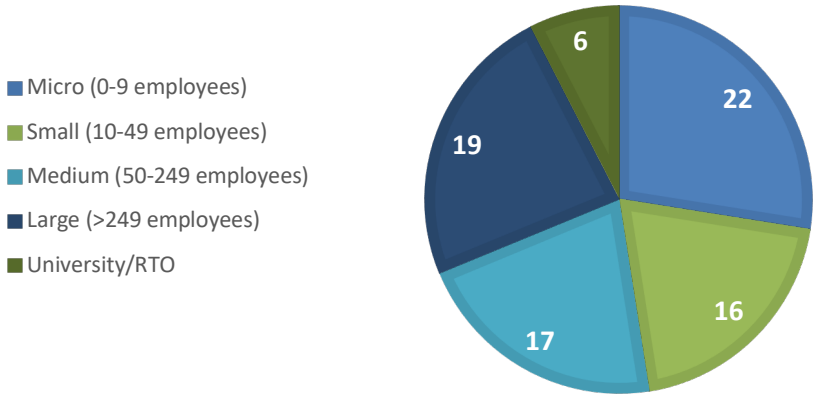


Figure A1-2: Distribution of the number of companies by size

Subject areas of the questions and discussion

A number of areas were chosen to explore with the companies on "Sustainability and plastic waste: your organisation current and future practices and challenges". The approach was designed both to understand the current issues being faced and also the supply chain pressure that it is beginning to be applied to their operations. The survey was designed to understand trends in perceptions of where companies are on their journey to reducing plastic waste.

The areas and questions covered in the survey were:

1. Plastic waste: which are the problematic areas in life cycle of your product/offering?
    - Supply of materials/equipment
    - Production/manufacturing
    - Offices/warehouses
    - Transportation
    - Use/consumption
    - End of life
2. Is your supply chain currently putting pressure on you to reduce plastic waste?
3. How would you describe your organisation's current policy towards zero plastic waste?
4. Is sustainability a standard agenda item in your management meetings?
5. Are you expecting your supply chain to increase pressure on you to reduce plastic waste?
6. If so, when?
7. Are you preparing for this e.g. by exploring current innovations in your sector?
8. Your organisation's current (C) and future (F) practices towards zero plastic waste: Please rank these activities in order of how important they are. (High, medium, low, not applicable)
    - Using suppliers pro-active in minimising plastic waste
    - Maximising recycled plastic feedstock in the products we make.
    - Finding alternatives to the plastics we use in our products (e.g., bio-degradable plastic, non-plastic)
    - Minimising plastic waste to landfill from our production/manufacturing processes
    - Exploring alternative outlets/uses for the plastic waste we generate in our operations
    - Minimising plastic waste at the end of life of the product (e.g., take back scheme)
    - Minimising plastic waste in offices, warehouses and transportation etc.
    - Exploring user/consumer behaviour to inform product design and/or sustainability strategy
9. What past/current practices have proved more and less successful in reducing/eliminating plastic waste?
10. How much can your company directly affect change in moving towards zero plastic waste with/without government intervention and policy?

Limitations

- This data was obtained prior to the Covid-19 pandemic, and some of the priorities of the companies interviewed are likely to have changed after April 2020.
- The survey is a cross section of 100 companies in the UK, with some further inputs from other organisations e.g. RTOs.
- The survey was designed to understand trends in perceptions of where companies believe they are in their journey to reducing plastic waste. There was no follow up to validate the answers given. However, this is useful in understanding attitudes towards plastic waste both across company size and sectors, in addition to their place in the supply chain.
- The survey was carried out at events around the UK, however it could be suggested that companies that take time away from the site/office to attend events e.g. Bradford Manufacturing Alliance or at KTN business breakfast, are likely to be more proactive thinkers than those who do not attend these events. This would then bias the results when compared to a random cross-section of businesses in the UK.

Appendix 2: Questionnaire

Your organisation:

11. Which best describes the type or organisation you represent today (please tick all relevant):

Micro (0-9 employees)		Small (10-49 employees)		Medium (50-249 employees)		Large (>249 employees)	
University/RTO		Other. Please, specify:					

12. Which best describes the R&D sector(s) for your organisation (please tick all relevant):

Built Construction		Agri-food		Chemistry		Bio-technology	
Energy		Healthcare		Materials		Electronics, sensors & photonics	
Transport		Space		ICT		Industrial Mathematics	
Manufacturing		Digital&Creative		Design		Sustainability & Circular Economy	
Textiles		Food/drink		AI/VR		Other:	

Sustainability and plastic waste: your organisation current and future practices and challenges

13. Plastic waste: which are the problematic areas in life cycle of your product/offering? (Please circle all relevant)

Supply of materials/equipment	Production/ manufacturing	Offices/ warehouses	transportation	Use/consumption	End of life
Other. Please, specify:					

14. Is your supply chain currently putting pressure on you to reduce plastic waste? (Please circle one)

Not at all	A little bit	Somewhat	Yes	Our future orders depend on it

15. How would you describe your organisation's current policy towards zero plastic waste? (Please circle one)

Non existent	Ad-hoc & reactive	Proactive	Leading edge

16. Is sustainability a standard agenda item in your management meetings? (Please circle one)

Yes	No	Don't know

17. Are you expecting your supply chain to increase pressure on you to reduce plastic waste? (Please circle one)

Not at all	A little bit	Somewhat	Yes	Our future orders will depend on it

18. If so, when? (please circle one)

Within 6 months	6 months to 2 years from now	More than 2 years

19. Are you preparing for this e.g. by exploring current innovations in your sector? (please circle one)

Not at all	A little bit	Somewhat	Yes	Critical to our future business

20. Your organisation's current (C) and future (F) practices towards zero plastic waste: Please rank these activities in order of how important they are. (H = high, M = medium, L= low, ? = I don't know, n/a = not applicable)

	C	F
Using suppliers pro-active in minimising plastic waste		
Maximising recycled plastic feedstock in the products we make.		
Finding alternatives to the plastics we use in our products (e.g., bio-degradable plastic, non-plastic)		
Minimising plastic waste to landfill from our production/manufacturing processes		
Exploring alternative outlets/uses for the plastic waste we generate in our operations		
Minimising plastic waste at the end of life of the product (e.g., take back scheme)		
Minimising plastic waste in offices, warehouses and transportation etc.		
Exploring user/consumer behaviour to inform product design and/or sustainability strategy		

21. What past/current practices have proved more and less successful in reducing/eliminating plastic waste?

Briefly describe what has been tried, what did/didn't work and why.

22. How much can your company directly affect change in moving towards zero plastic waste with/without government intervention and policy? (Please circle one)

We can fully implement the change ourselves through normal business activity.	Working alongside a UK network facilitated by government is the best way to implement change.	It is very difficult for us to change without significant government intervention.	We are concerned that too much government intervention will drive value out of our business.

Appendix 3: Output from discussion groups

Event at Materials Processing Institute, Middlesbrough – 10th Dec 2019

Group 1

1. Current and future challenges/barriers	• There is no single solution to the plastic waste problem which leads to multiple challenges and barriers. • A major challenge is making changes to the feedstock for current plastic applications. • The plastics pact: Is it realistic for 30% via collecting and conversion when the UK is really only collecting bottles? • Coloured PET is considered a waste, need to change this. • Wrong recycled content – need to look much more at trays. • Too little available plastic for recycling means the price goes up. • Need to look at legislation to avoid selling plastic abroad – there is no reason the UK cannot use all its own plastic waste. • But also avoid mixed messaging and government meddling, so that businesses can get value from the supply chain. • Need to understand the economics of chemical recycling so that people can get bought into the concept and commercialisation of it.

2. Opportunities (based on UK capabilities, key trends and drivers)	• Brand owners need to take the opportunity to get recycled content into products. – "We need to do this"
	• Look elsewhere to understand which countries do it best.
	• A good example is Germany, but there are key differences currently between the 2 countries in plastics recycling:
	  o Many people in Germany have been recycling their whole life.
	  o They have a green culture.
	  o They have a "rule based" behave yourself culture. In the UK there will always be 20% who will break the system on purpose.
	  o However, the UK does innovation better, so need to capitalise on this.
	• Great opportunity if we would be able to process contaminants.
	• Opportunities would exist for new/different suppliers in the supply chain.
	• Big opportunity comes with the ability to make food grade plastic.
	• Need to replicate what happened with milk bottles where the whole supply chain came together to come up with a solution.

3. What government (and other?) interventions are needed	• Balance the need for legislation (stick) and opportunity (carrot) • The majority of the longer term/large scale solutions require investment in large scale manufacturing capability – which will be dirty. This type of manufacturing investment is not supported by the government.

	• The infrastructure is needed where the plastic waste is generated and/or collected. Teesside provides an ideal location to place this infrastructure. • There needs to be collection uniformity across collection, which is being worked on.

Group 2

1. Current and future challenges/barriers	• Household education. • Effective sorting processes. • Unified national collection/sorting. • No standard approach or consistency in delivery.
2. Opportunities (based on UK capabilities, key trends and drivers)	• Seeing plastic waste as a valuable commodity – domestic, industry, commercial, local authorities. • Specification for waste sorting output – accept different processes between councils. • Government directive, leading to specifications, leading to industrial value. • Better use of existing tech for decentralised sorting (national sorting programmes). • Potential to differentiate design for single use vs. 20-year lifetime. It is done for the PET bottle. • Rationalising the 10 different types of plastic is the design process to help the recycling process e.g. changing PET trays to PP trays. • Design out the use of polystyrene as a widely used plastic.
3. What government interventions are needed	• Develop a national waste management audit: Energy, re-use, recycle.

Event at Stirling Enterprise park, Stirling – 28th Feb 2020

1. Current and future challenges/barriers	• There is risk in purchasing products with recycled content e.g. silage wrap recycled planks shrinking overnight which would not happen with 'normal' plastic. • Confusing messaging e.g. 'Subway' separate bins are same bin underneath. • Do recycling business benefit from having more PET available or will prices drop? C.f. oil.
2. Opportunities (based on UK capabilities, key trends and drivers)	• (Continue to) provide education to both companies and the general public. • Learn from others in developing solutions e.g. bring in technology from Denmark where recycling has been successfully done for many years and align to government plans. • Develop business models that understand the true value in in reuse/recycle. • Establish how repurposing links into revenue generation

	• Establish how reduction can lead to revenue increase for companies who may not think of it. • Look for alternative materials that fit with situation e.g. pasta straws are better with ice cold drinks than paper straws (it gets harder at low temperatures and doesn't soak up the water to become soggy)
3. What government (and other?) interventions are needed	• Stop giving permission to set up non-recycling facilities and this needs to be international. • Consistent messaging e.g. glass vs. plastic.

Event at Northern Ireland Advanced Composites and Engineering Centre, Belfast - 23rd Jan 2020

Group 1

1. Current and future challenges/barriers	• Problems with some plastics, in particular film, mixed plastics and dirty plastics. • For these there is no end use, so they go to landfill. • PRNs are a big pressure – 3 times the cost of 2 years ago – "something has to give" • Suppliers are not currently involved; how can they be pushed? • Can the recycled content challenge of 30% be achieved? • Companies are unclear what is happening with the plastic they are supposedly recycling. Does it matter what state it is in? • The core of the wrap (for food packaging) is not recycled. How can this be overcome?
2. Opportunities (based on UK capabilities, key trends and drivers)	• Could the complexities of the laminate be reduced? • Look at the benefits across the recycling chain for supplying cleaner materials out of the farms/food processors. • Help to put in a place a simple process to help those companies that do not understand polymers. • PE is recycled and 40% post-consumer resin (PCR) can be included in packaging, but a continuous supply is needed. • Hughes recycles 80% of the plastic waste it generates internally and is actively looking for ways of recycling the rest.
3. What government (and other?) interventions are needed	• Help with the supply of PCR. • Connect people together who can help with hard to recycle plastics. • Move towards a reduction in the number of different types of plastic available. (10 types of plastic)

Group 2

1. Current and future challenges/barriers	• Can't recycle contaminated plastic e.g. ex oil tanks • Availability of post-consumer recyclate (PCR). • Lack of suitable biodegradable plastic. • Awareness of issues amongst the general public. • Policy driven intervention. • Regulatory requirements limit acceptance of recycled material.
2. Opportunities (based on UK capabilities, key trends and drivers)	• More bioplastics e.g. sugar cane, non-fossil fuel, renewable source. • Organic filler to displace % of virgin polymer e.g. chalk. • Put more R&D into options to displace virgin polymer. • Traceability of waste post-consumer. • Carbon capturing products. • Carbon sinks.
3. What government (and other?) interventions are needed	• Set up centre of excellence. • Include in school syllabus. • Government procurement to drive change. • Policy to standardise/reduce number of different plastics. • Reward good behaviour. • Deposit return schemes. • Reward companies who embrace design for circularity. • Public visibility of independent recognition of good practice. • Design for end of life and link back into supply chains. • Full understanding of unintended consequences.

Group 3

1. Current and future challenges/barriers	• Sorting/separation – so many plastic grades within each family. • Reduce expectation for food to last as long as it does (simplified packaging).
2. Opportunities (based on UK capabilities, key trends and drivers)	• Have same rules for recycling across councils (coloured bins, what can and cannot be recycled). • Education. • More collaboration between researchers and industry at universities. • Design for assembly (but also disassembly) of products with mixed materials.
3. What government (and other?) interventions are needed	• Legislate to ask for % of recycled content in products. • Support for industry standards body to research why recycled material can't be used – standards dictate what business can do. • A more unified voice from government on recycling objectives. • More education.

Group 4

1. Current and future challenges/barriers	• Legislation issues for the use of recycled materials. • Standards – medical/automotive. • Quality of recycled materials

2. Opportunities (based on UK capabilities, key trends and drivers)	• Recycled PE (HDPE/LDPE)
	  o Technical challenge/mech properties.
	  o Contaminated versus virgin regrind.
	  o Multi-layer systems – especially foam layers.

3. What government (and other?) interventions are needed	• More R&D related to large plastic products. • Quality of scrap recycled plastic a big issue. • More focus on construction, transport, marine, agricultural industries. • Products often up to 1000Kg (10-year warranty). • Have funding specifically for non-fast moving consumer goods.

Group 5

1. Current and future challenges/barriers	• Reduced salt, reduced sugar means need packaging even more to extend shelf life.
	• Consumers don't know what to do i.e. wash, rip off films.
	• Unclear what is right – Paper, plastic, black plastic, compostable (not circular)
	• Design
	  o Very low net profit % in supply chain
	  o High volumes.
	• Carbon footprint vs. recyclability – what is best?

2. Opportunities (based on UK capabilities, key trends and drivers)	• Design investment – light, less plastic, same friction. • Logistics – real costs start to finish. • Consumers need to be well informed.
3. What government (and other?) interventions are needed	• Clear guidance what is better – reduced carbon footprint or increased recycling? • Educate consumers – how to recycle and what to buy. • Standardised recycling solutions across UK/ROI. • Brexit – change packaging and opportunity to include UV marking. • Financial support for UV marking.

Group 6

1. Current and future challenges/barriers	• Economies of scale • Lack of collaboration • Knowledge Sharing • Education • Regulations and cross over
2. Opportunities (based on UK capabilities, key trends and drivers)	• Recycling polyester textiles • Lycra recycling
3. What government (and other?) interventions are needed	• Norther Ireland demonstrator site – unique circumstances. • Large plastic industry, but most recycling facilities in GB – shipping/logistics expensive so special need in NI. • NI has large SME population – How can they engage/bare intervention rates? • Reduction in use that is behaviour driven in NGO sector.

Group 7

1. Current and future challenges/barriers	• Vast number of plastics and variation between recyclability of each plastic strain.
	• Public education:
	  o "Zero plastic" isn't a solution. It heightens awareness but that is not educating.
	  o Glass over plastics could/does require more energy
	  o Reusable plastic.
	• Monopoly on local recycling facilities/capacity leads to increasing costs.
	• Health impact of any new polymers.

2. Opportunities (based on UK capabilities, key trends and drivers)	• Reduce number of plastics. • Promote recycling of mixed plastic waste. • Improved sorting mechanism. • Recycling mixed plastic waste/compatibilizer. • RFID technology to correctly identify polymer. • New sustainable polymers – plant based (how do you recycle them?) • Supermarkets have massive opportunity/blame policy/incentives/regulations to reduce. • Amazon not even focusing on packaging, carbon footprint is worse. • Get ahead of other markets/countries: time delays lead to reduced collaboration. • Opening communication between sectors/industries/polymer areas.
3. What government (and other?) interventions are needed	• Funding for academia – industry and government direct funding. • Provide support for companies – education, research and testing before taking the leap. • Need better links to match similar grades. • Legislation to remove 'opt in' requirements. • Single use ban step 1: focus on bigger issues – packaging target key suppliers to reuse PS from packaging.

Event at The Royce Centre, Manchester – 18th July 2019

At this event the tables were divided by sector.

Agriculture

1. Current and future challenges/barriers	<u>Bioplastics</u> • Bioplastics could make a difference in this sector as a lot of plastic is left to be ploughed into the land. • However, there are issues with putting bioplastics into the Materials Recovery Facility (MRF) • End users do not want bio-plastic and need to keep the PET separate <u>Business Case: Transport vs. Plough in</u> 1. What are the economics of processing these waste materials? 2. How to deal with contamination – in particular from those used in crop protection. 3. Need to understand the compatibility with existing infrastructure. 4. Currently only 1 silage wrap recycling company. This is a challenge for logistics. 5. Should the plastic be left to degrade where released? Avoids transport, but what about ecological unknowns? 6. Need to understand final state of plastic that is ploughed in. 7. Link into microplastics work. <u>Problem areas</u> • BASF believe that the plastic recycling of fertiliser/pesticide containers is in hand with washing on return. • They have challenges with the crop protection covers and how to get it out.
2. Opportunities (based on UK capabilities, key trends and drivers)	• New processes can put farm food waste into packaging • Put biodegradables into the food waste stream using labelling of packaging. • Homogeneity of the waste stream • Opportunities with a thermally robust dye. Or • Deal with biodegradables on farm. • Chemical recycling can help with the dirty workstream. • Utilise psychology to understand across the supply chain (consumers, farmers etc.)

3. What government (and other?) interventions are needed	Labels • Need a decision • Clear simple signal to the consumer Plough in solutions • Need measurement and standards around degradability • How does degradation change with soil type and weather patterns?

Construction & Built Environment

1. Current and future challenges/barriers	• Logistics and number of potential end users • End markets for recyclate: Reach + legacy additives • Feedstock consistency and supply • Technical constraints of products • Segregation at construction site – education • Potentially bigger issues that waste: Health & safety and performance • No/little value associated to plastic – negative image.
2. Opportunities (based on UK capabilities, key trends and drivers)	• Opportunities to both improve use of recycled materials and also increase recycling rates in current products. • Offsite manufacture – made to fit reduces waste i.e. reducing usage rather than recycling. • Willingness to change in the sector but don't know when /what to do and be first mover. • Drive from customers and clients is starting. • Digitisation of the construction industry can incorporate smart deconstruction.
3. What government (and other?) interventions are needed	• Incentives for segregation at site and/or contractor fines. • Education and training e.g. make it like health & safety. • Potential for toolbox talks and onsite training. • Develop green procurement policies. • More funding in "valley of death" to improve uptake of innovative materials – more follow through on funding.

Medical

4. Current and future challenges/barriers	• Societal barriers – People don't want 'contaminated' plastics in products. • Difficult to separate waste streams – all waste in hospital is designated as being 'hazardous' • Need behavioural/individual change • Long time to market and regulations – one size fits all? • Need to understand sustainability vs. risk management considerations.

5. Opportunities (based on UK capabilities, key trends and drivers)	• Change materials (to include recyclables). • Understand and prepare for next market after medical recycling. • Classification of actually hazardous waste and more benign waste streams. • Recycle more plastic items. • Opportunity to re-use items not contaminated by biological products.
6. What government (and other?) interventions are needed	• Report on supply chain of plastics – reduction of plastics prior to contact with patients. • Sustainability needs to be incorporated into procurement – help by using standardisation/interoperability. • There is a need for more NHS incubators/living labs/testbeds.

Textiles

1. Current and future challenges/barriers	• Identifying and separating polymers. • Additives in recycle – recipes proprietary. • Colours – mixed colours only get darker. • Consumers are not good at segregating • Textiles are hard to process in plant/machinery rotating
2. Opportunities (based on UK capabilities, key trends and drivers)	• Knowledge of what is available – charity sector downcycle. • Could public use an app on mobile phone to identify the type of plastic? • The big textile companies need to lead and develop – some large companies do take back, but this is not viable for small manufacturers. • Behaviour change and public awareness.
3. What government (and other?) interventions are needed	• Assess viability and introduce labelling/tagging schemes, however this has to be automated. • Current economic model for energy recovery creates incentive to landfill high energy feedstock. • Limit the range of materials for consumers to deal with? • Harmonisation of collection/separation systems to simplify.

General Non-packaging (1)

1. Current and future challenges/barriers	• Looking to develop a supply chain, not sure what materials are available / should be used. • Collaboration with packaging industry needed. • Opportunities around design (from setting up an oil recycling facility, to how to reduce plastic waste within a TV set / studio) • Support to reduce packaging waste. • Use of design and LCA at very early stage of product and / or service lifecycle.? • A more consistent recycling infrastructure is needed across Local Authorities. There is a disconnect, whereby the type of

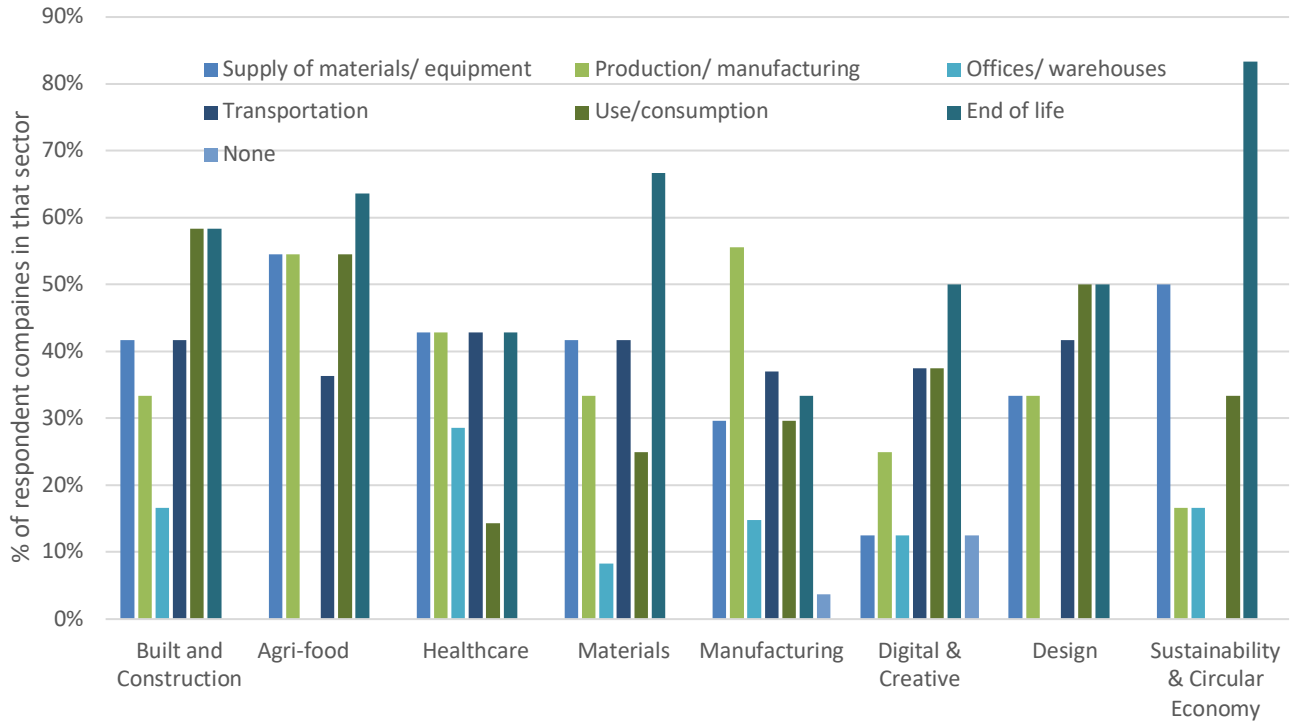
	materials collected and recycled varies greatly from one area to the next.
2. Opportunities (based on UK capabilities, key trends and drivers)	• Develop a landscape map for the waste sector. • Design / business models / LCA. • Build on momentum (in the media). Drive emotion in the best way – towards facts / science / solutions. • Behavioural change seen as a very important component of any solution – people need nudging in the right direction.
3. What government (and other?) interventions are needed	• Consistent collection and recycling infrastructure. • Behavioural change – potential use of celebrities. • Education – e.g. low awareness of the non-recyclability of black plastic packaging. • Clarity around rules (specific example was waste to fuel regulations). • Funding was mentioned, but wasn't the primary intervention noted by the group.

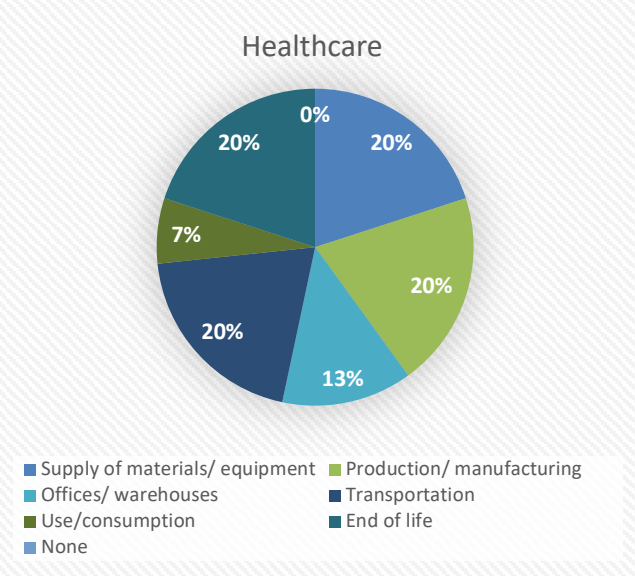
General Non-packaging (2)

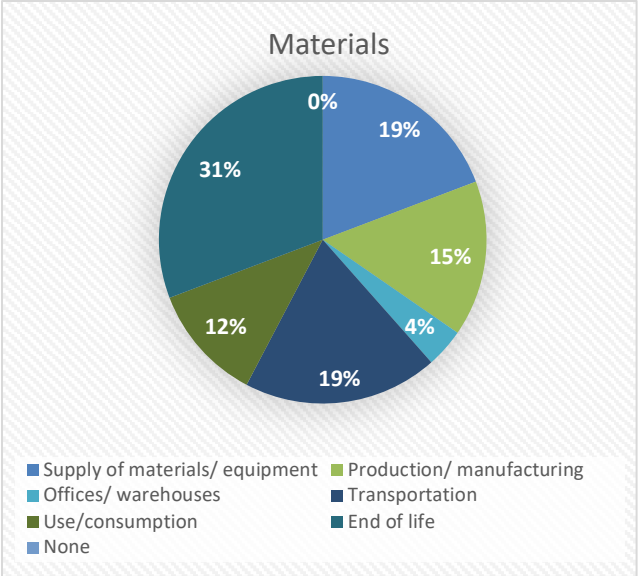
1. Current and future challenges/barriers	• Understanding the supply chain. • Product quality in Industry/manufacturing limiting intake of recycled plastic. • Visibility of complete circle of economy/cycle – there are very many products/businesses – what can we do to help general public understanding. • Regulatory standards need to be improved – only 1 EU approved standard. • Single use – what can we do? What is allowed? • Not-for-profit industry have different 'values' • Price is a barrier to uptake in usage. • Does the public "care" about plastics other than packaging? • End use accountability for choosing the 'right' bin.
2. Opportunities (based on UK capabilities, key trends and drivers)	• Public is starting to ask about what is in products • Brand awareness is key – 'brand regard'. • Kite mark for recycled materials? (self-certification and validation?) • Advertising/promotion/staff understanding of waste streams • Recyclable 'paper cup' manufacturing available, but not available locally (available in Kent – but only 1 person aware) • Companies to affiliated with recycling companies.
3. What government (and other?) interventions are needed	• Sustainability budgets within businesses • Something similar to R&D tax credits? • Better understanding for the general public – public perception on recyclables may be wrong. • Trading standards and accountability for claims that may not be true – need to trust (based on evidence). Could introduce a certificate of conformity.

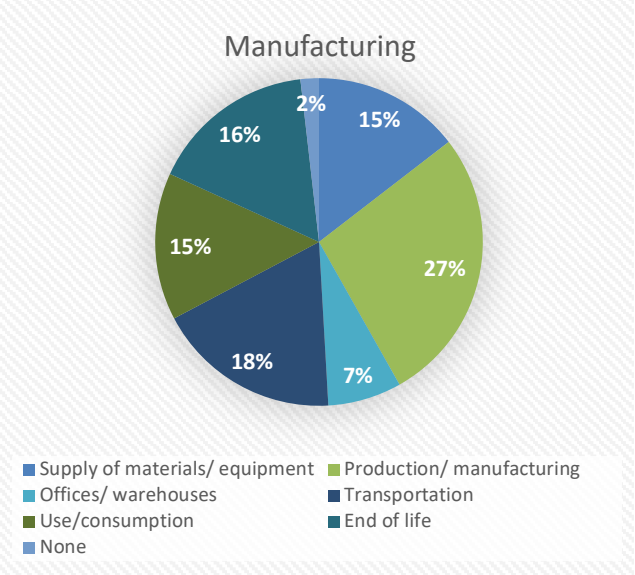
	• Industry needs to look further up and down the supply chain – much more understanding needed than just their end user. They need to bring together design, end user, manufacturer etc. • Need a recycling base in Manchester for plastics – currently in London, Leeds and Scotland. • Waste collection needs to be unified.

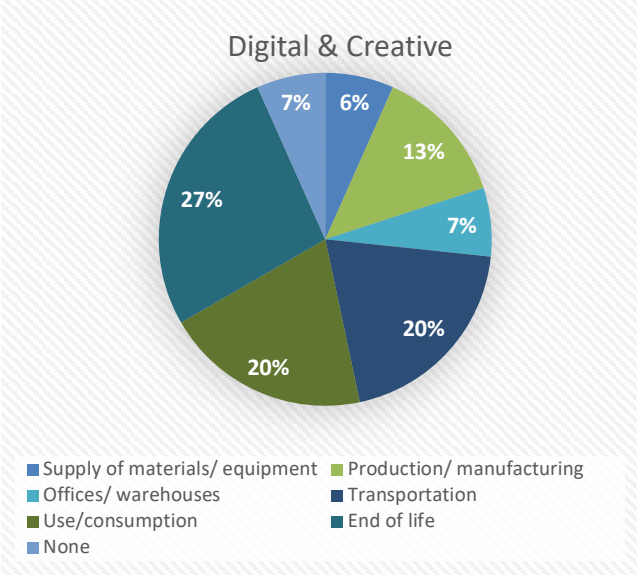
Appendix 4: Distribution of problematic areas by sector

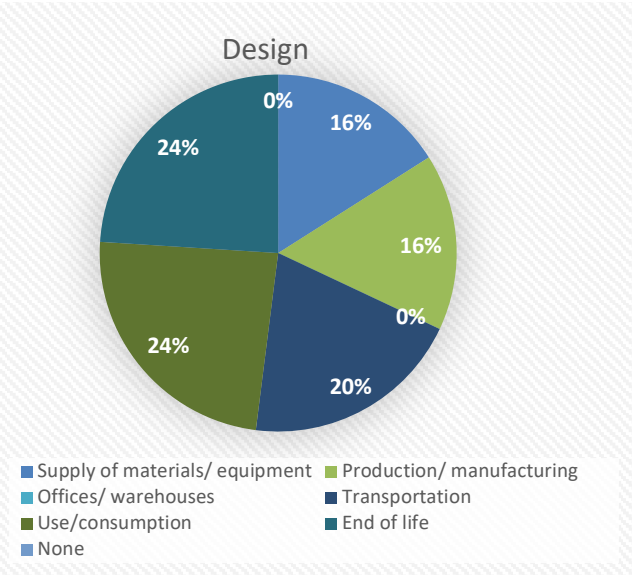


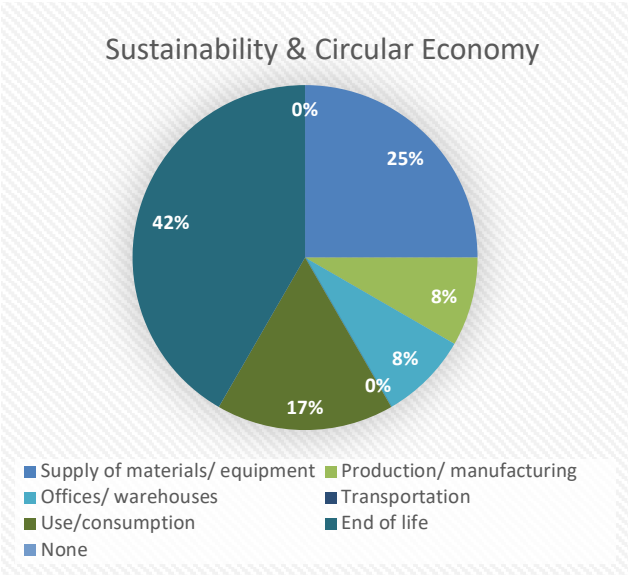

Healthcare
0%
20%
20%
7%
20%
13%
Supply of materials/ equipment
Production/ manufacturing
Offices/ warehouses
Transportation
Use/consumption
End of life
None

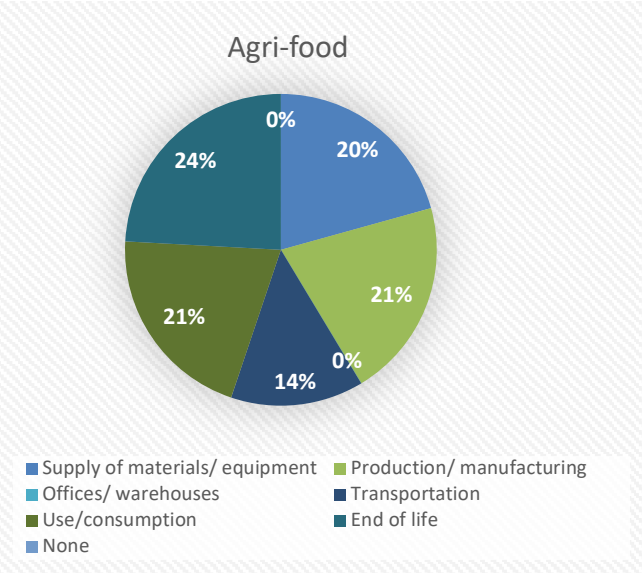

Materials
0%
19%
31%
15%
4%
12%
19%
Supply of materials/ equipment
Production/ manufacturing
Offices/ warehouses
Transportation
Use/consumption
End of life
None

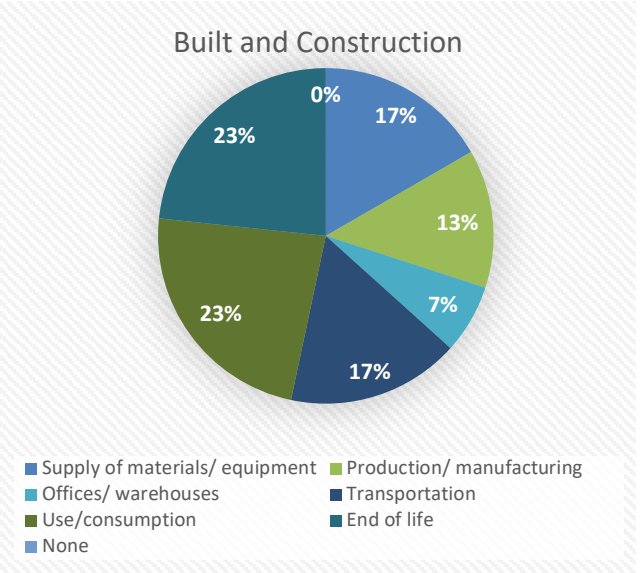

Manufacturing
2%
15%
16%
27%
15%
18%
7%
Supply of materials/ equipment
Production/ manufacturing
Offices/ warehouses
Transportation
Use/consumption
End of life
None

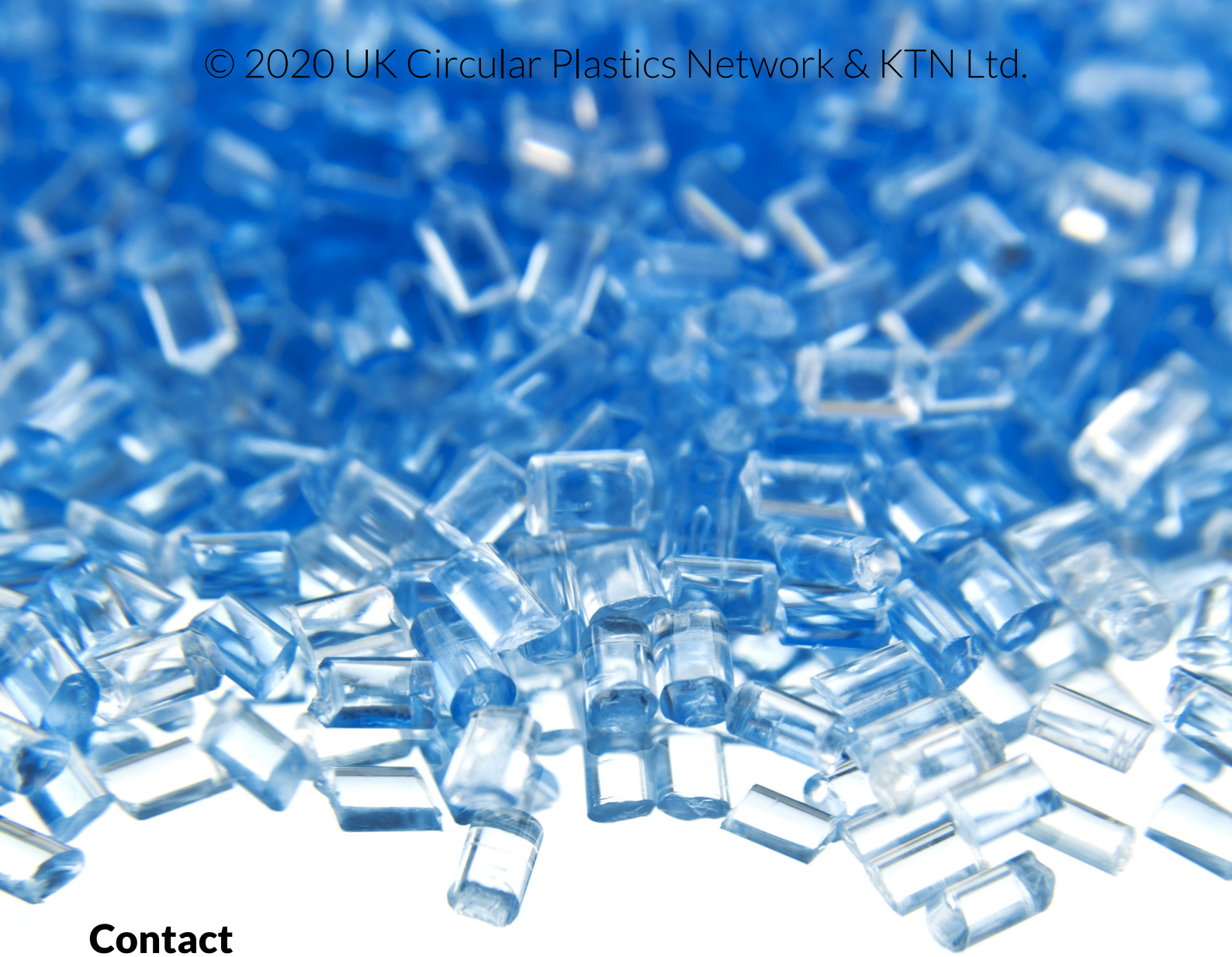

Digital & Creative
7%
6%
13%
27%
7%
20%
20%
Supply of materials/ equipment
Production/ manufacturing
Offices/ warehouses
Transportation
Use/consumption
End of life
None


Design
0%
16%
24%
16%
0%
24%
20%
Supply of materials/ equipment
Production/ manufacturing
Offices/ warehouses
Transportation
Use/consumption
End of life
None


Sustainability & Circular Economy
0%
25%
42%
8%
8%
0%
17%
Supply of materials/ equipment
Production/ manufacturing
Offices/ warehouses
Transportation
Use/consumption
End of life
None


Agri-food
0%
20%
24%
21%
21%
0%
14%
Supply of materials/ equipment
Production/ manufacturing
Offices/ warehouses
Transportation
Use/consumption
End of life
None


Built and Construction
0%
17%
23%
13%
7%
23%
17%
Supply of materials/ equipment
Production/ manufacturing
Offices/ warehouses
Transportation
Use/consumption
End of life
None



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