University of York

Mapping Food Processing Waste in Yorkshire & the Humber

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University of York

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Table of contents

Table of figures

1   Executive Summary

Food manufacturing is a key sector for the Yorkshire and Humber economy, especially in the Humber region which has the largest UK concentration of food related industries, employing ~48,000 people.

The world will need to feed more than 2bn extra people by 2050. Currently for every two tonnes we eat, another tonne is wasted, worth £17bn each year . Waste prevention and reduction are key actions to address food loss however, there will always be unavoidable by-products and wastes. Recognising this, the 2025 Courtauld Commitment , an ambitious, collaborative action to cut the resource needed to provide our food and drink by one-fifth over ten years, includes finding innovative ways to make best use of wastes and surpluses as one of its four themes.

Who we are: University of York School of Management and BioVale

The BioVale Innovation Cluster (funded by HEFCE and ERDF, steered by industry and chaired by the University of York) aims to establish Yorkshire and the Humber as an internationally recognized centre for bio-based innovation, especially renewable raw materials and agricultural technology. The VFW Special Interest Group (SIG) focuses on adding value to unavoidable food waste and includes representatives from food manufacturing industries, academia, specialist consultancies and the waste industry. This special interest group and the project detailed in this report focuses on waste generated in the early stages of the food supply chain (primary production and manufacturing) and does not extend to waste generated at the point of retail or consumption (household waste).

This study is part of a three-stage project funded by BBSRC Agri-Food Technology Seeding Catalyst Award Proof-of-Concept Funding, awarded to the School of Management at the University of York in partnership with the BioVale VFW SIG to bring together multi-disciplinary expertise in the University of York and its subsidiaries, with the regional food manufacturing industries to develop innovative solutions to unavoidable food waste.

This study responds to the first challenge in this project – the task of mapping, quantifying and characterizing waste generated by food and drink manufacturing sites in Yorkshire and the Humber.

Yorkshire and the Humber is home to over 8,500 sites operating in the food and drink manufacturing sector. More than 90% of these locations employ less than 10 staff (micro-business units), the remaining small, medium and large business units (625 in total) span a diverse range of sub-sectors with the largest number of all sizes operating in the bakery, mixed farming and poultry raising sub-sectors. The number of food and drink manufacturing units operating in Yorkshire and the Humber is dominated by small employers (74%), followed by medium sized operators (22%) and large sites (4%).

225 businesses in Yorkshire and the Humber are subject to the Environmental Permitting Regulations 2010 and are required to report waste data to the Environment Agency. The largest number of these businesses are those operating in poultry raising, raising pigs and animal/pet food manufacture. These businesses report the release of a total of over 300,000 tonnes per year of bio-wastes, the most significant of which are sludges (e.g. from on-site effluent treatment), animal tissue and manures. However, this is only part of the picture and the sector also generates other important bio-resources in the form of co-products and by-products which are not publicly reported as wastes and are used for other purposes, such as land spreading and animal feed.

In addition to employment data, an assessment of the relative scale of economic activity across the food and drink sector can be determined from Companies House data. Approximately 3,200 food and drink manufacturing

companies are registered in the Yorkshire and Humber region. The largest number of which operate in the mixed farming, beer/cider/fermented beverages and bread/biscuits/farinaceous products sub-sectors.

Bio-wastes generated within and around Yorkshire and the Humber are treated at over 280 facilities situated throughout the region. The largest recipients of bio-wastes for disposal/treatment are landfill, chemical and physical treatment and materials recycling facilities. Bio-wastes can be disposed of via at least 11 different routes. The routes most typically used by waste generators are driven by economics (cost of segregation, waste collection, disposal/treatment) and environmental regulation (disposal of certain bio-wastes such as animal by-products is strictly controlled). Certain animal by-products for example, can only be rendered or incinerated.

Beyond the generation of wastes the food and drink manufacturing sector in Yorkshire and the Humber produces a wide range of by-products, co-products and materials that are used for alternate purposes such as redistribution for human consumption, manufacture of pet food, animal feed and land spreading. Each sub-sector generates a broad spectrum of these products with a variety of management options. Fruit and vegetable processing, bakery production and poultry raising represent three sub-sectors in the region which have good potential to add value to bio-wastes. There are particular opportunities in finding higher value, alternative uses for bio-wastes that are currently being sent for anaerobic digestion, land-spreading or the manufacture of animal feed. Details of which can be found in the report from the parallel project: Innovation Opportunities from Food Processing Waste in Yorkshire and the Humber[1].

The Yorkshire and Humber region offers good opportunities to add value to food waste, based on the large number of small, medium and large food and drink business units located in the region (625), the large number of food and drink companies registered in the area (over 3,000) and the significant volumes of bio-wastes released for disposal and treatment (over 300,000 tonnes per year). Key opportunities for further exploration include engagement with the poultry raising, bread/biscuits/farinaceous products and mixed farming sub-sectors due to their prevalence in the region. And investigating options for adding value to sludges, animal tissue and manures due to the high volumes of these bio-wastes generated locally.

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[1] Innovation Opportunities from Food Processing Waste in Yorkshire and the Humber, March 2018, Setchfield et al.

2   Background and Context

Food manufacturing is a key sector for the Yorkshire and Humber economy, especially in the Humber region which has the largest UK concentration of food related industries employing ~48,000 people. The region is home to McCain, Nestle, PepsiCo, Arla and many medium size enterprises, including Seabrooks and Bettys & Taylors, as well as thousands of smaller manufacturers.

The world will need to feed more than 2bn extra people by 2050. Currently for every two tonnes we eat, another tonne is wasted, worth £17bn each year[2]. Waste prevention and reduction are key actions to address food loss and waste with many resources available to help companies, co-ordinated by organisations such as WRAP[3], Champions 12.3[4] and Refresh[5]. However, there will always be unavoidable by-products and wastes. Recognising this, the 2025 Courtauld Commitment[6], an ambitious, collaborative action to cut the resource needed to provide our food and drink by one-fifth over ten years, includes finding innovative ways to make best use of wastes and surpluses as one of its four themes.

The BioVale Innovation Cluster (funded by HEFCE and ERDF, steered by industry and chaired by the University of York) aims to establish Yorkshire and the Humber as an internationally recognized centre for bio-based innovation, especially renewable raw materials and agricultural technology. Membership includes ~140 companies and contacts number ~700 individuals from over 500, mainly private, organisations.

The BioVale Innovation Cluster has established a Special Interest Group (VFW SIG) focused on adding value to unavoidable food waste. The working group that steers SIG activities includes representatives from food manufacturing industries, academia, specialist consultancies and the waste industry. This special interest group and the project detailed in this report focuses on waste generated in the early stages of the food supply chain (primary production and manufacturing) and does not extend to waste generated at the point of retail or consumption (household waste).

This study is part of a three-stage project funded by BBSRC Agri-Food Technology Seeding Catalyst Award Proof-of-Concept Funding, awarded to the School of Management at the University of York in partnership with the BioVale VFW SIG to:

- map waste from food manufacturing in Yorkshire and the Humber
- analyse potential uses of the unavoidable fraction
- convene an open innovation workshop

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[2] FAO. 2011. Global food losses and food waste – Extent, causes and prevention. Rome
[3] http://www.wrap.org.uk/
[4] https://champions123.org/
[5] http://eu-refresh.org/
[6] http://www.wrap.org.uk/content/courtauld-commitment-2025

The overarching aim of this project is to bring together multi-disciplinary expertise in the University of York and its subsidiaries, with the regional food manufacturing industries to develop innovative solutions to unavoidable food waste.

This study responds to the first challenge in this project – the task of mapping, quantifying and characterizing waste generated by food manufacturing sites in Yorkshire and the Humber. It identifies the key food and drink manufacturing sectors in the Yorkshire and Humber region in terms of scale and numbers of operating units. It maps all food and drink manufacturing companies in the region and quantifies the wastes generated by the largest sites. Finally it maps the waste treatment facilities operating in this area and provides details of the typical disposal routes for wastes generated by the food and drink manufacturing sector.

3   Key Areas of Interest and Main Findings

The key areas of interest for this project are summarized in Figure 1. They constitute an assessment of the food and drink manufacturing sector from a variety of perspectives: economic activity, waste generation, geographical location and destinations for waste treatment. In order to produce interactive, searchable outputs that can be shared with the membership of the Biovale Innovation Cluster and beyond, the project utilized publicly available data from a range of sources which are highlighted in orange.

1 • Scale and nature of the food and drink manufacturing sector in Yorkshire & the Humber - **Inter-departmental Business Register**

2 • Scale, nature and location of waste generated by the food and drink manufacturing sector in Yorkshire & the Humber – **Environment Agency Pollution Inventory**

3 • Location and identity of food and drink manufacturing businesses in Yorkshire & the Humber – **Companies House**

4 • Location and scale of waste treatment facilities in Yorkshire & the Humber – **Environment Agency Waste Data Interrogator**

5 • Typical disposal routes for bio-wastes generated in Yorkshire & the Humber – **Environment Agency Waste Data Interrogator, Environment Agency Pollution Inventory**

6 • Priority sub-sector insights – sector knowledge

Figure 1: Key project tasks

The region encompassed in this study is referred to throughout this report as Yorkshire and the Humber. This region comprises the three Local Enterprise Partnerships (LEPs) of York and North Yorkshire, Humber and Leeds City. The postcodes that are covered either in whole or part, by these LEPs are listed in Appendix I. Mapping activity includes locations outside the Yorkshire and Humber region where postcode areas span LEP boundaries.

Standard Industry Classification (SIC) codes have been used to identify businesses of interest to this project and have been further grouped in order to create easy to understand sub-sectors. The SIC codes selected and their label groups are detailed in Appendix II.

3.1   Scale and nature of the food and drink manufacturing sector in Yorkshire and the Humber

The Inter-Departmental Business Register (IDBR) lists the number of business units by SIC code, size (number of employees) and location. This data is provided via the NOMIS portal[7] and is rounded to the nearest 5 units. The two main sources of input are the Value Added Tax (VAT) system from HMRC (Customs) and Pay As You Earn (PAYE) from HMRC (Revenue). Data for 2017, for the SIC codes and postcodes of interest were extracted and analyzed to determine the food and drink manufacturing sub-sectors of greatest significance to the Yorkshire and Humber region.

In total, the IDBR identifies over 8,500 businesses operating in the food and drink manufacturing sector. However, more than 90% of these units are micro-businesses employing less than 10 people. In order to identify sectors and sites likely to generate waste in sufficiently large volumes to consider adding value to it, the analysis that follows focuses on business units employing more than 10 people. Figure 2 identifies the total number of business units operating in the region in each sub-sector, **excluding** micro-businesses.

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[7] https://www.nomisweb.co.uk/query/construct/summary.asp?mode=construct&version=0&dataset=141
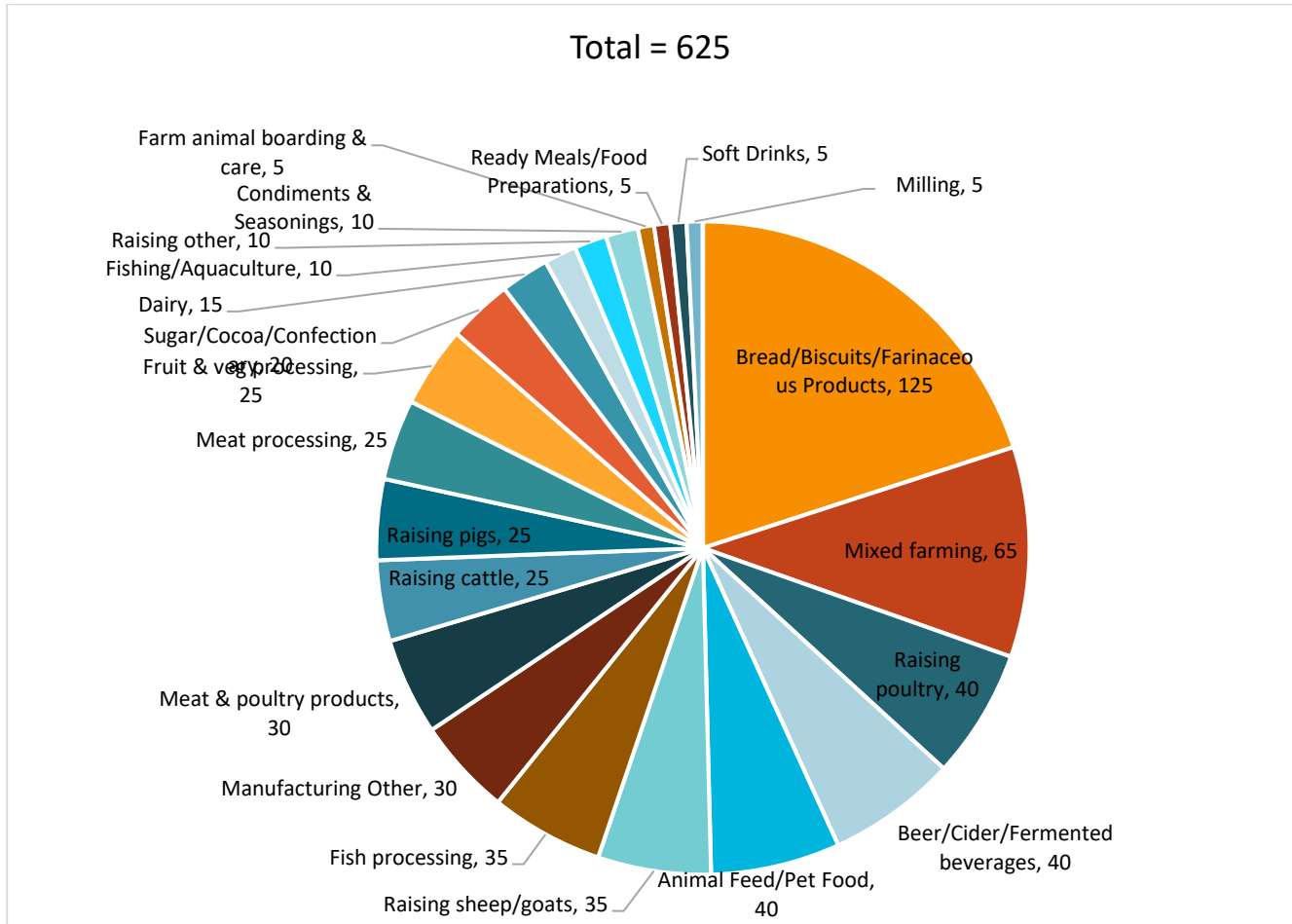
Figure 2: Total number of business units employing more than 10 people in Yorkshire and the Humber by sub-sector

The IDBR identifies 625 business units employing more than 10 people in the Yorkshire and Humber region. The five sub-sectors operating the largest total number of such units, in order of size are:

1. Bread/Biscuits/Farinaceous products
2. Mixed farming
3. Raising poultry
4. Beer/Cider/Fermented beverages
5. Animal feed/Pet food

Figure 3, Figure 4 and Figure 5 show the distribution of business units in terms of size (number of employees) and sub-sector.
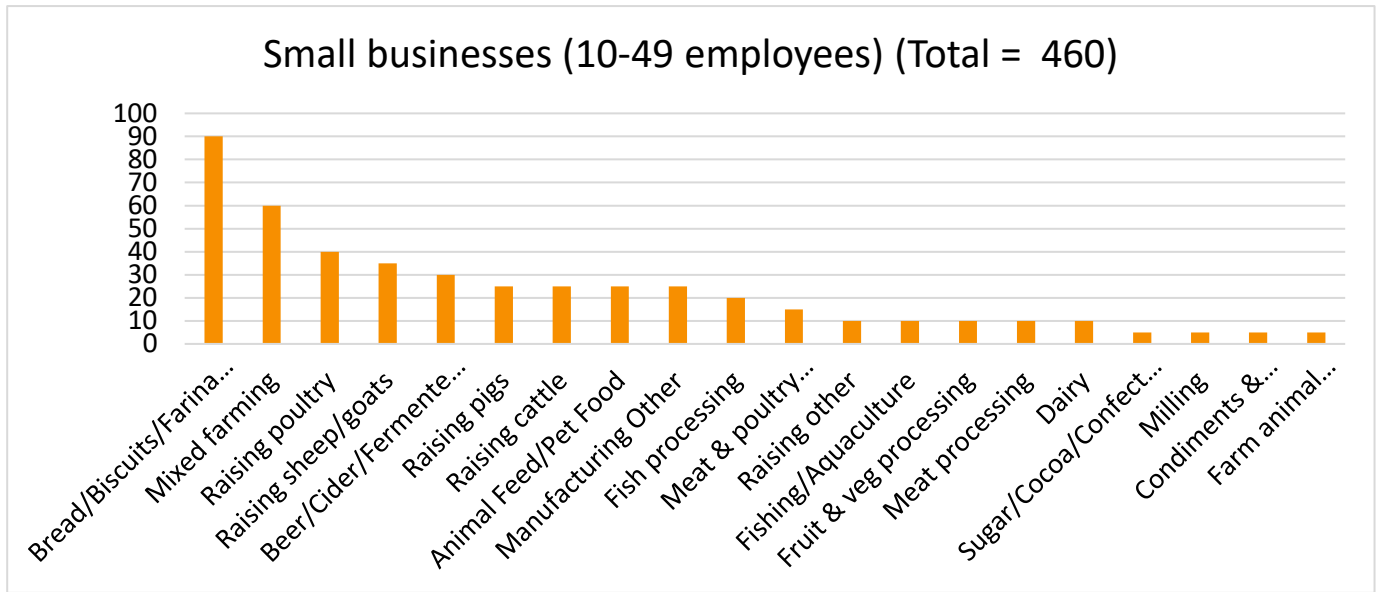
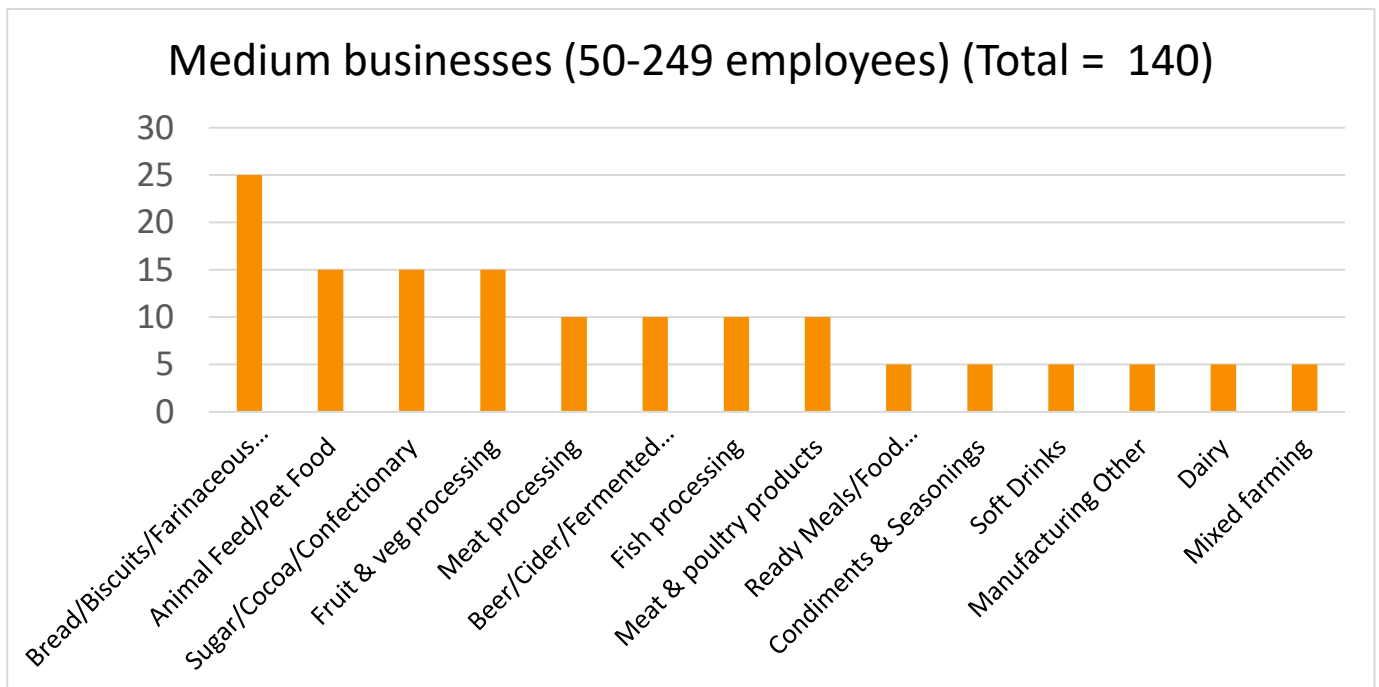Figure 3: Number of small business units operating in Yorkshire and the Humber by sub-sector

Figure 4: Number of medium sized business units operating in Yorkshire and the Humber by sub-sector
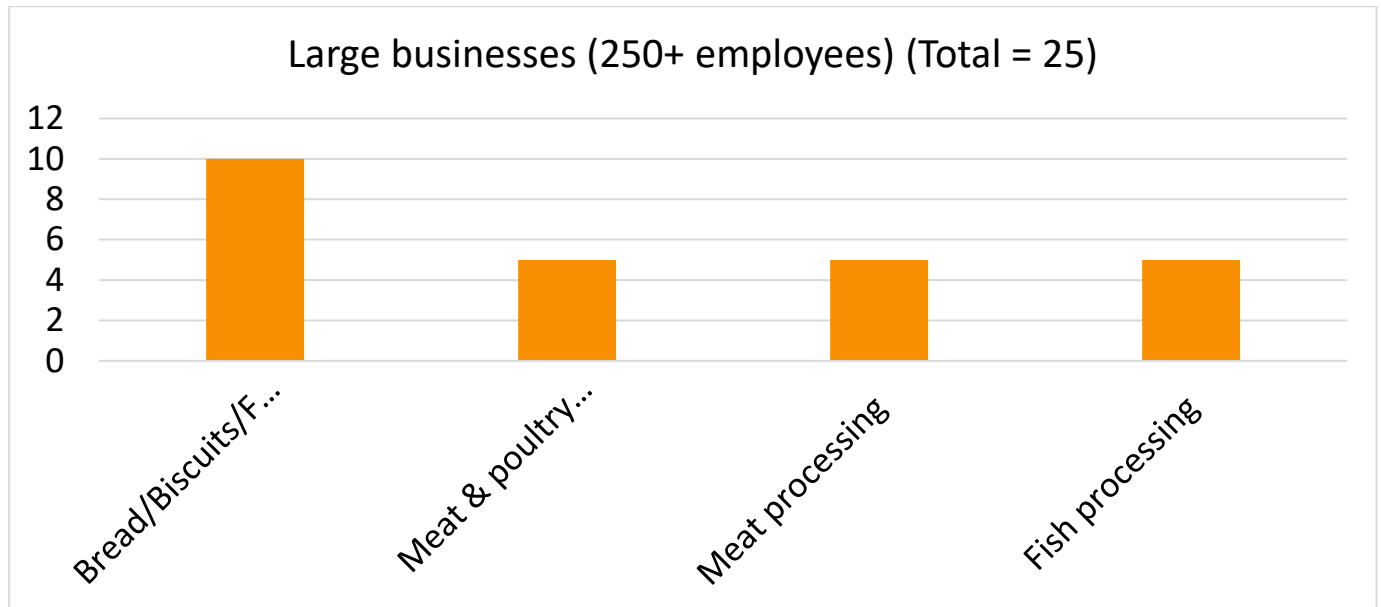
Figure 5: Number of large business units operating in Yorkshire and the Humber by sub-sector

As would be expected, the number of food and drink manufacturing units operating in Yorkshire and the Humber is dominated by small businesses (74%), followed by medium sized operators (22%) and large businesses (4%). Small businesses are predominantly operating in the baking, agriculture and brewing sectors. Medium sized businesses occupy space further up the food processing and supply chain, mostly operating in baking, animal/pet feed, confectionary and fruit/veg processing sectors. The few large employers (25) in the region are spread relatively evenly across four sub-sectors: baking, meat and poultry products, meat processing and fish processing. For the purposes of this study, it is important to note that whilst these businesses are the most significant employers in the region, they might not be the largest generators of waste. Highly mechanized operations can produce large volumes of waste, yet employ very few staff. Conversely, labour intensive activities can be highly resource efficient and generate very little waste. To identify the largest waste producers it is necessary to examine waste data, which is addressed in Section 3.2.

3.2 Scale, nature and location of waste generated by the food and drink manufacturing sector in Yorkshire and the Humber

In addition to an analysis of the key sub-sectors that represent greatest economic activity in terms of employment, an assessment was undertaken to identify the largest producers of waste in the region and the types and tonnages of waste that these sites generate. For this task, data was extracted from the Environment Agency Pollution Inventory[8] (EA PI) for the SIC codes and postcodes of interest. The EA PI is completed by businesses that operate under a Part A (1) Environmental Permit and have received a notice under Regulation 60 of the Environmental Permitting Regulations 2010. It collates information on the annual tonnage of specified substances released to air, controlled waters and sewers, as well as quantities of waste transferred off site from large industrial sites

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[8] https://data.gov.uk/dataset/pollution-inventory

regulated by the Agency. These are substances considered to be important in relation to environmental protection. The EA PI for 2016, lists 225 businesses operating within the Yorkshire and Humber region.

Figure 6 identifies the number of food and drink manufacturing businesses listed in the EA PI by sub-sector.
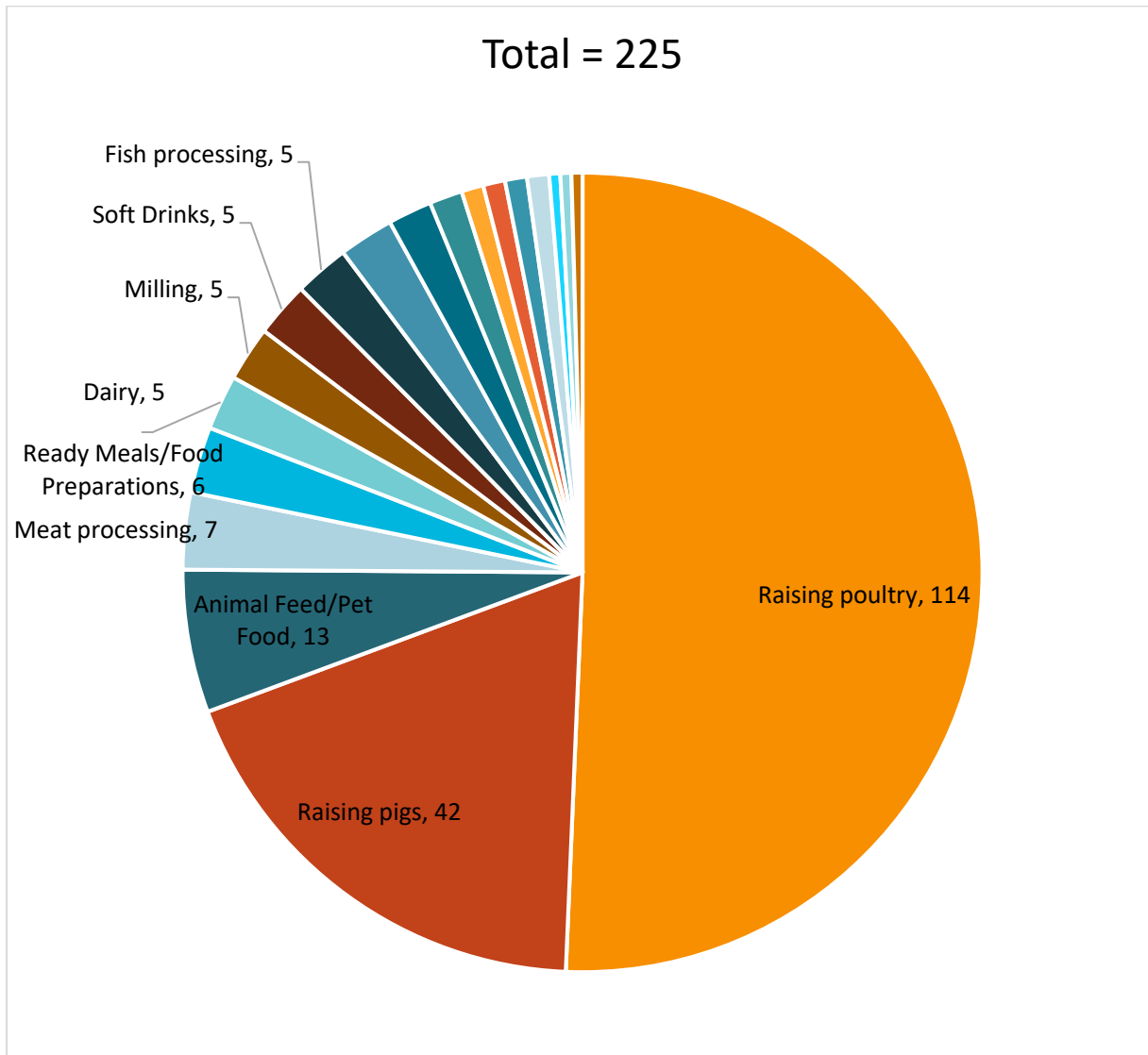

Figure 6: Number of businesses listed in the EA PI in Yorkshire and the Humber by SIC code

This assessment identifies the following five sub-sectors as those listing the largest number of businesses in the EA PI, in order of size:

1. Raising poultry
2. Raising pigs
3. Animal feed/pet food
4. Meat processing
5. Ready Meals/Food preparations

The EA PI lists the waste types and tonnages reported by each location categorized by European Waste Catalogue (EWC) code. As the key area of interest for this work is adding value to bio-wastes, data was extracted for the following key wastes with innovation potential:

- Manures
- Sludges
- Animal tissue
- Plant tissue
- Paper/Card
- Wood

EWC codes have been grouped into easy to understand categories and details of the codes selected and the label groups are given in Appendix III. Waste types and tonnages were mapped for each of the 225 food and drink manufacturing businesses recorded on the EA PI. An interactive map was created using the mapping and data visualization tool, Tableau, which allows users to filter by waste type or SIC code (see Figure 7). Where data is marked by a single point, this indicates that the company has reported waste volumes which are below the reporting threshold (5 tonnes per year). All Tableau files created as part of this project are available on-line, via the members area of the BioVale website[9].

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[9] https://www.biovale.org/wp-login.php?redirect_to=https%3A%2F%2Fwww.biovale.org%2Fmembers-area%2F&reauth=1
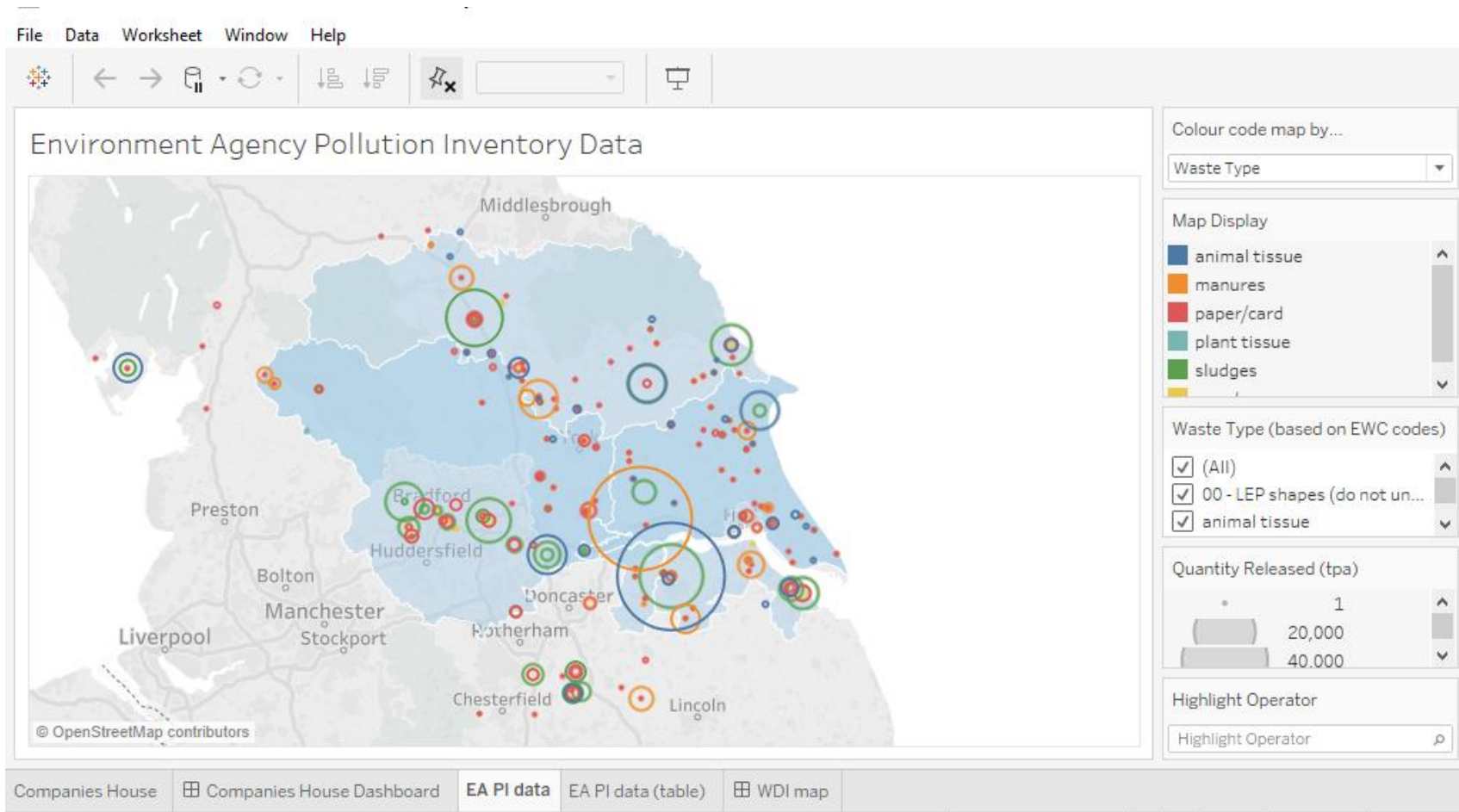
Figure 7: Interactive map of food and drink manufacturing companies in Yorkshire and the Humber showing waste types and tonnages

Figure 8 shows that a total of over 304,000 tonnes bio-wastes are released annually by companies listed in the EA PI. The most significant of which are sludges, animal tissue and manures. Figures for plant tissue are not included, as the volumes released are below the reporting threshold. This would indicate that plant tissue is, in the main, either land spread for agricultural benefit or utilized as animal feed.
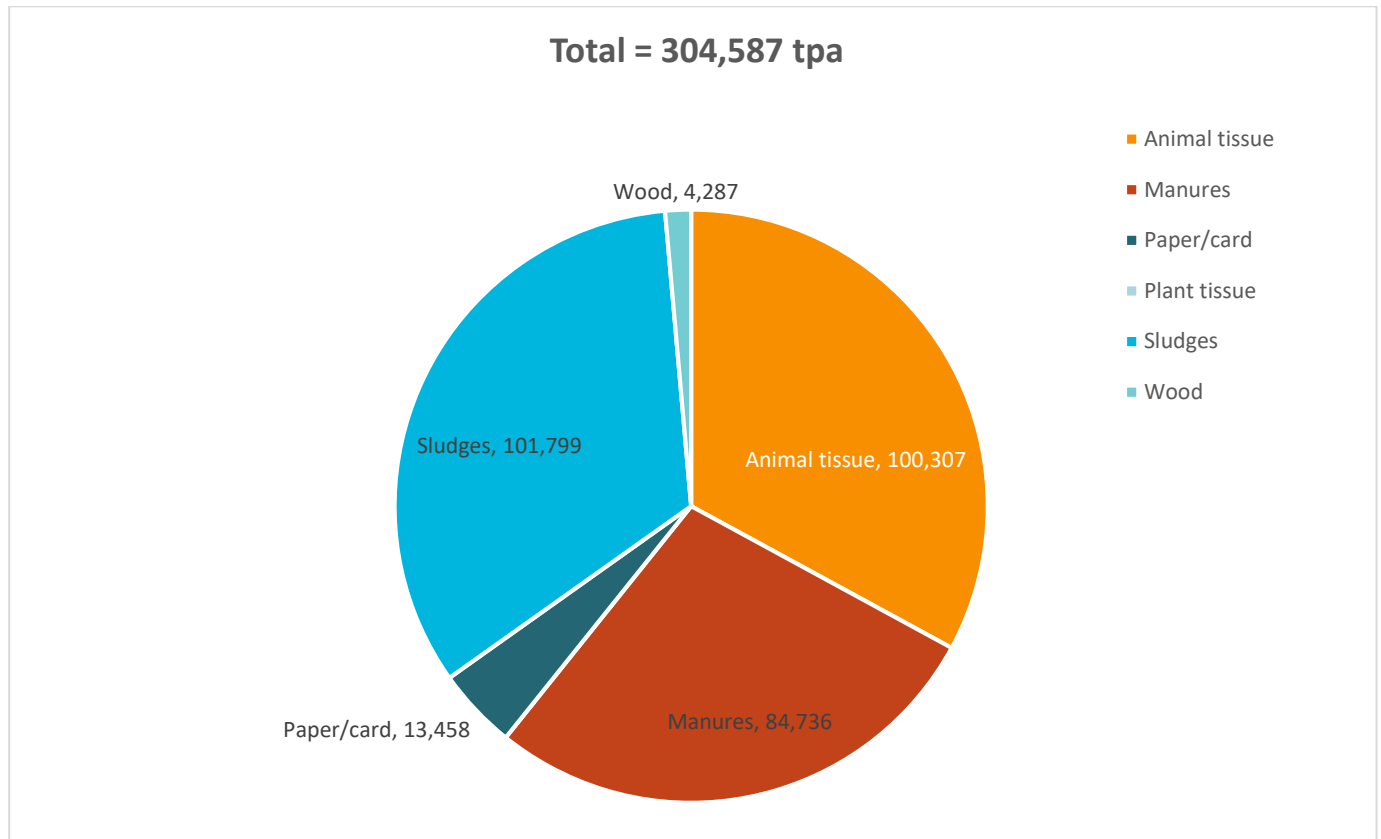

Figure 8: Quantities of waste released by companies listed in the EA PI by EWC category

In addition to the mapping format, data has also been made available in tables that can be filtered by individual company, waste type or SIC code, as illustrated in Figure 9.

Figure 9: EA PI waste types and tonnages by company and SIC code

Filtering using this tabulated format shows, for example, that Moy Park is listed in three locations in the Yorkshire and Humber region and reported the release of over 6,500 tonnes manures in the EA PI.

Whilst comprehensive, this data does have some limitations, which are important to note here. This data only lists those businesses that are required to submit waste tonnage information to the Environment Agency Pollution Inventory. It is therefore likely to cover the largest 'potential polluters' in the region, but not medium and small operations that fall outside the Environmental Permitting Regulations 2010. Furthermore, it only covers **waste** and does not include by-products, co-products or any materials that are reused in some way either on-site or with a partner organization. For example, blood from a meat processing site which is dried and sold on for animal feed or as ingredient in other products for human consumption, such as haggis. These alternative routes are discussed in Section 3.6.

3.3   Location and identity of food and drink manufacturing businesses in Yorkshire and the Humber

IDBR data provides information on the number of business units operating in a region and their associated employment numbers, however it does not provide identifying information such as company name or location. In order to map food and drink manufacturing businesses in Yorkshire and the Humber, data from Companies House[10] were mined for name and location details for the SIC codes and postcodes of interest. Companies House data lists incorporated businesses and can be assumed to be a sub-set of the IDBR dataset.

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[10] http://download.companieshouse.gov.uk/en_output.html

A searchable map was created (from data available at month end, December 2017), showing information for 3,228 active companies, which is illustrated in Figure 10. Companies can be filtered by postcode and SIC code, to identify clusters of manufacturing activity (see Figure 11). It is important to note that whilst these sites will be registered to food and drink manufacturing businesses, not all of them will be operating units, some will be offices or company registration addresses.
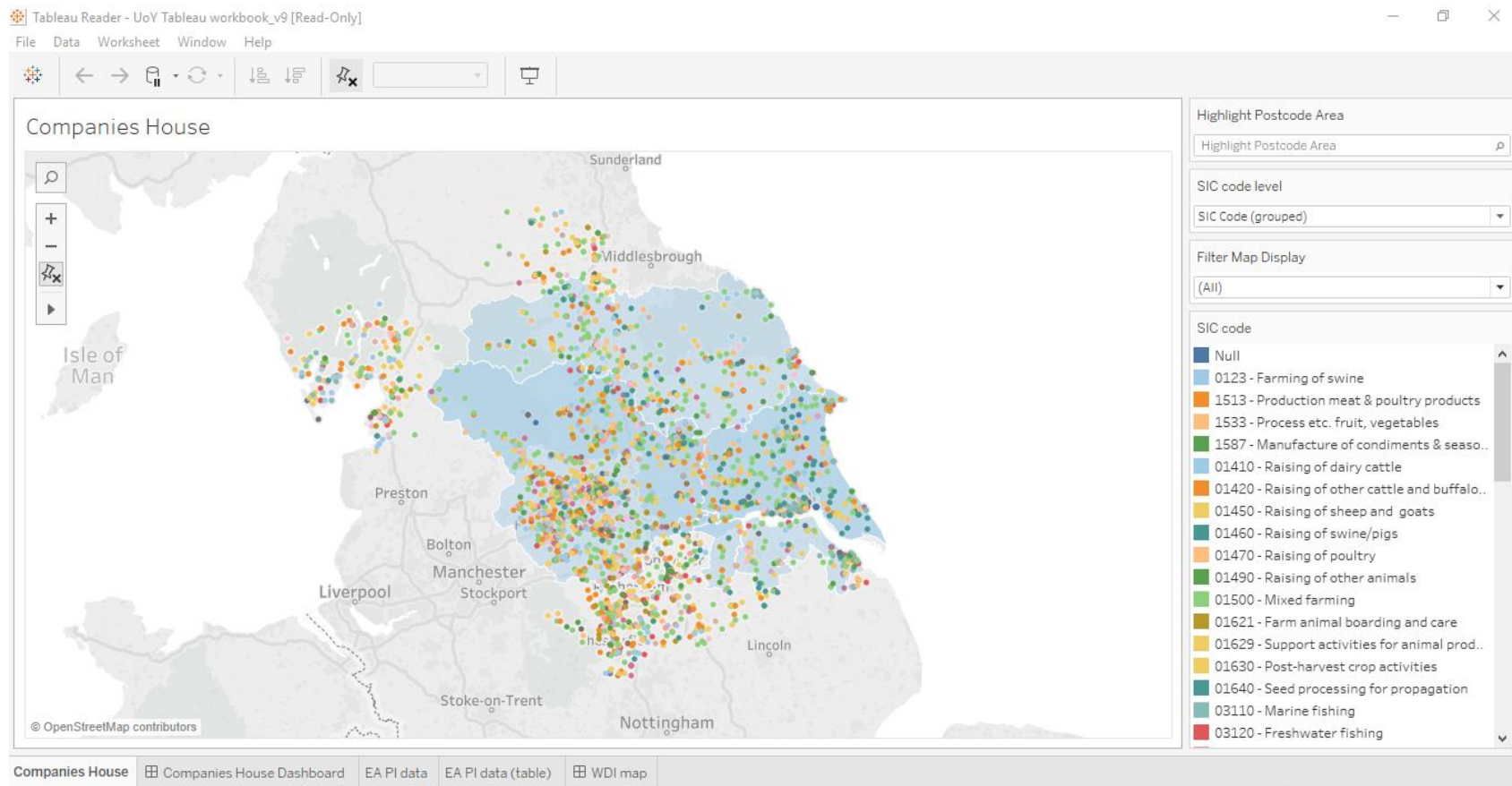
Figure 10: Searchable map of all food and drink manufacturing companies in Yorkshire and the Humber by sub-sector
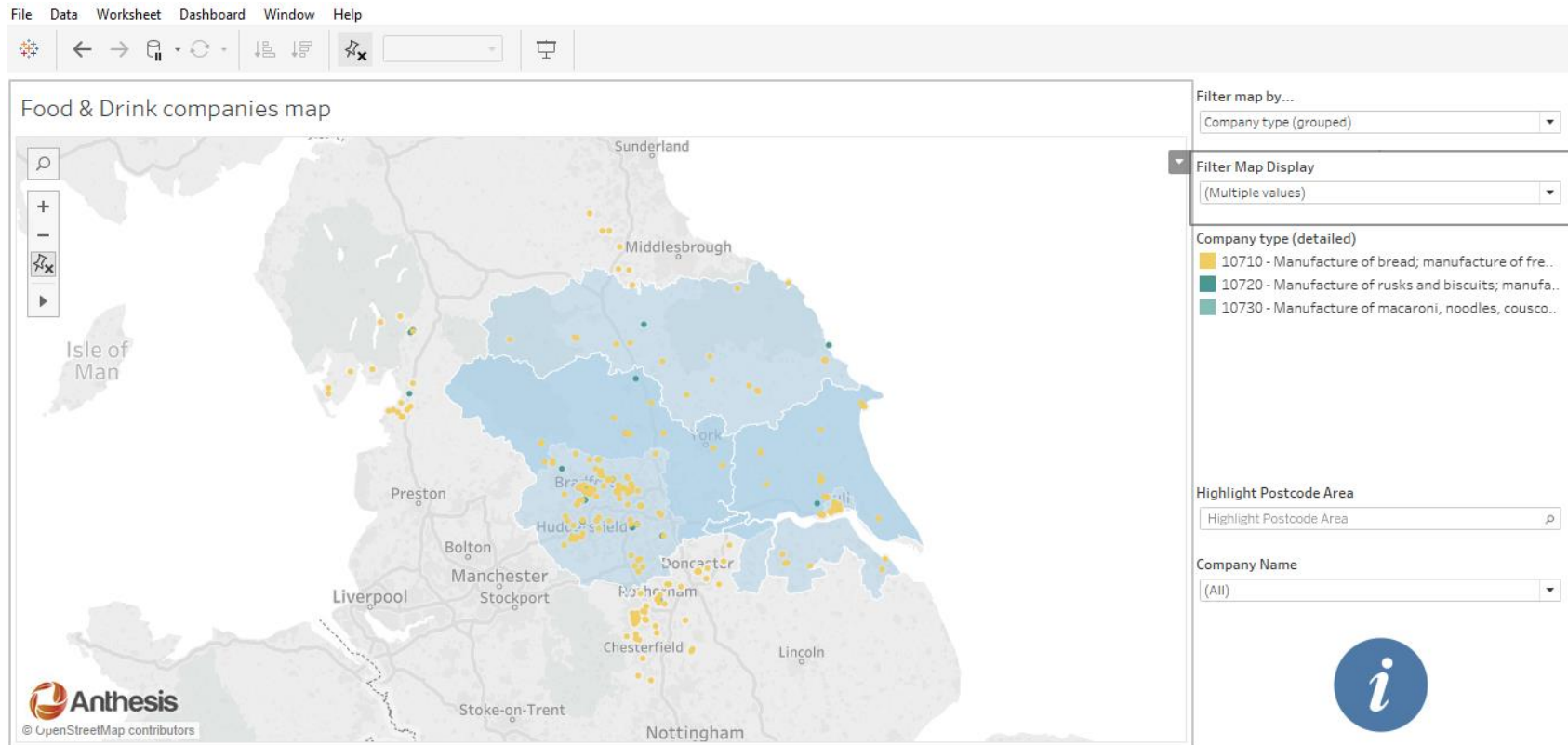
Figure 11: Food and drink manufacturing companies in Yorkshire and the Humber filtered by bread, biscuits and farinaceous products sub-sectors

Further insights can be secured from the dashboard format (Figure 12), which allows users to select a SIC code group and then see details of each company name, status, postcode and individual SIC code.
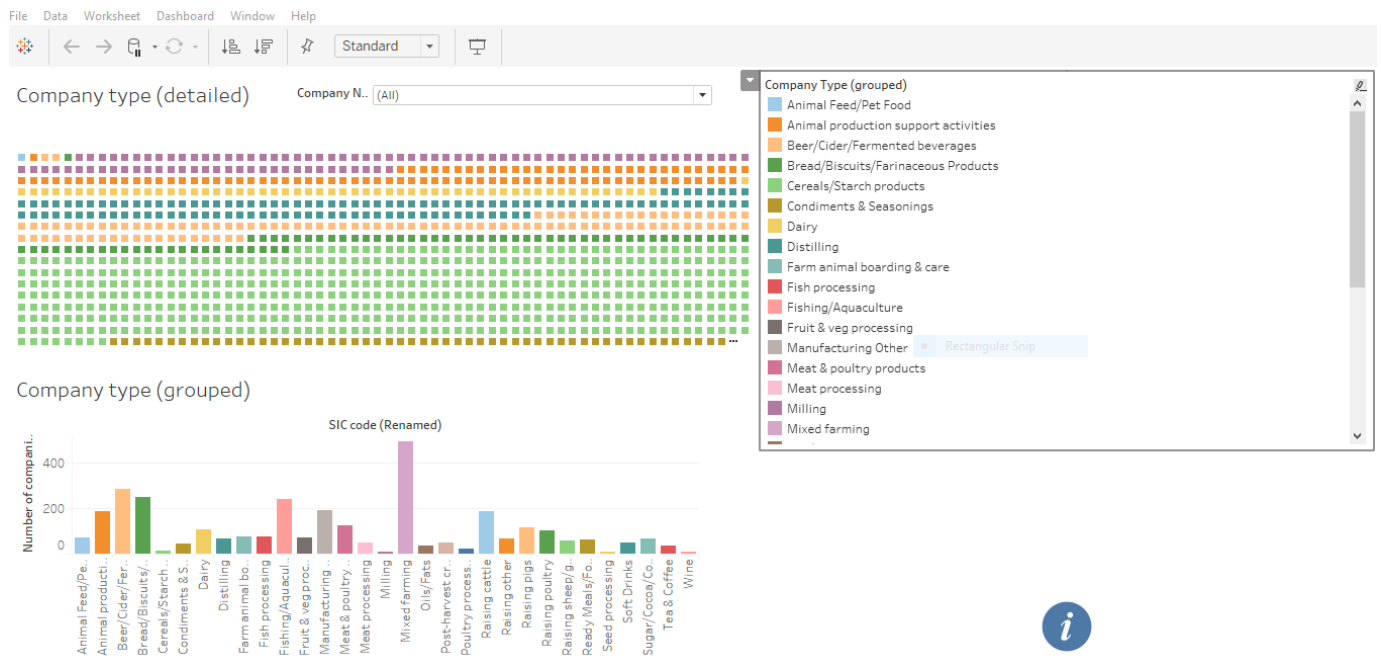
Figure 12: Companies listed by SIC code

Figure 13 shows that the largest sub-sectors listed on the Companies House register are mixed farming, beer/cider/fermented beverages and bread/biscuits and farinaceous products.
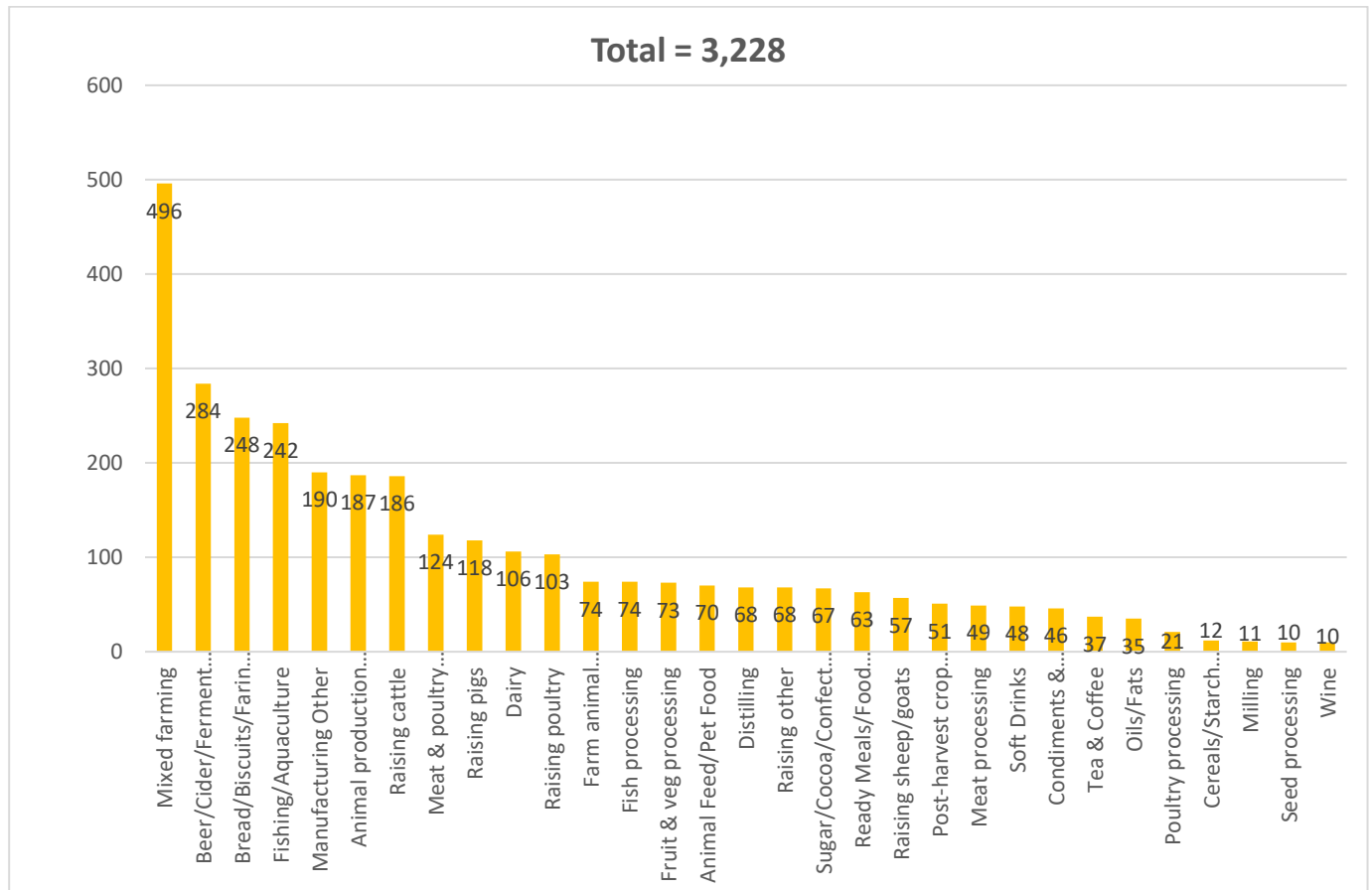
Figure 13: Number of active businesses by sub-sector

3.4   Location and scale of waste treatment facilities in Yorkshire and the Humber

The Environment Agency's Waste Data Interrogator portal[11] provides details of all regulated waste treatment facilities operating in England (around 6,000 sites) and provides details of the quantities and types of waste they deal with i.e. waste received into site and waste sent on to other facilities or processes. The 2016 dataset was mined for sites with a relevant permit type and postcode. Permit types have been grouped into easy to understand categories and full details can be found in Appendix IV. The permit categories are:

- Timber manufacture & treatment of waste wood
- Reclamation
- Construction
- Soil manufacture

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[11] https://data.gov.uk/dataset/waste-data-interrogator-2016

- Biological treatment
- Material Recycling Facility
- Composting
- Anaerobic digestion
- Chemical & Physical treatment
- Land spreading
- Landfill

A searchable map was created, showing the permit types and tonnages accepted for treatment. The map can be filtered by permit type, postcode or individual business, and is illustrated in Figure 14.

Figure 14: Searchable map of regulated waste treatment facilities in Yorkshire and the Humber by permit type

Filtering using this format shows, for example, that Biffa operates two landfill sites, one composting facility and a site undertaking chemical and physical treatment of waste in the Yorkshire and Humber region.

Waste data interrogator lists 286 waste treatment facilities in Yorkshire and the Humber, processing approximately 14.8 million tonnes of waste per year. The largest recipients of waste are landfill, chemical and physical treatment and materials recycling facilities.
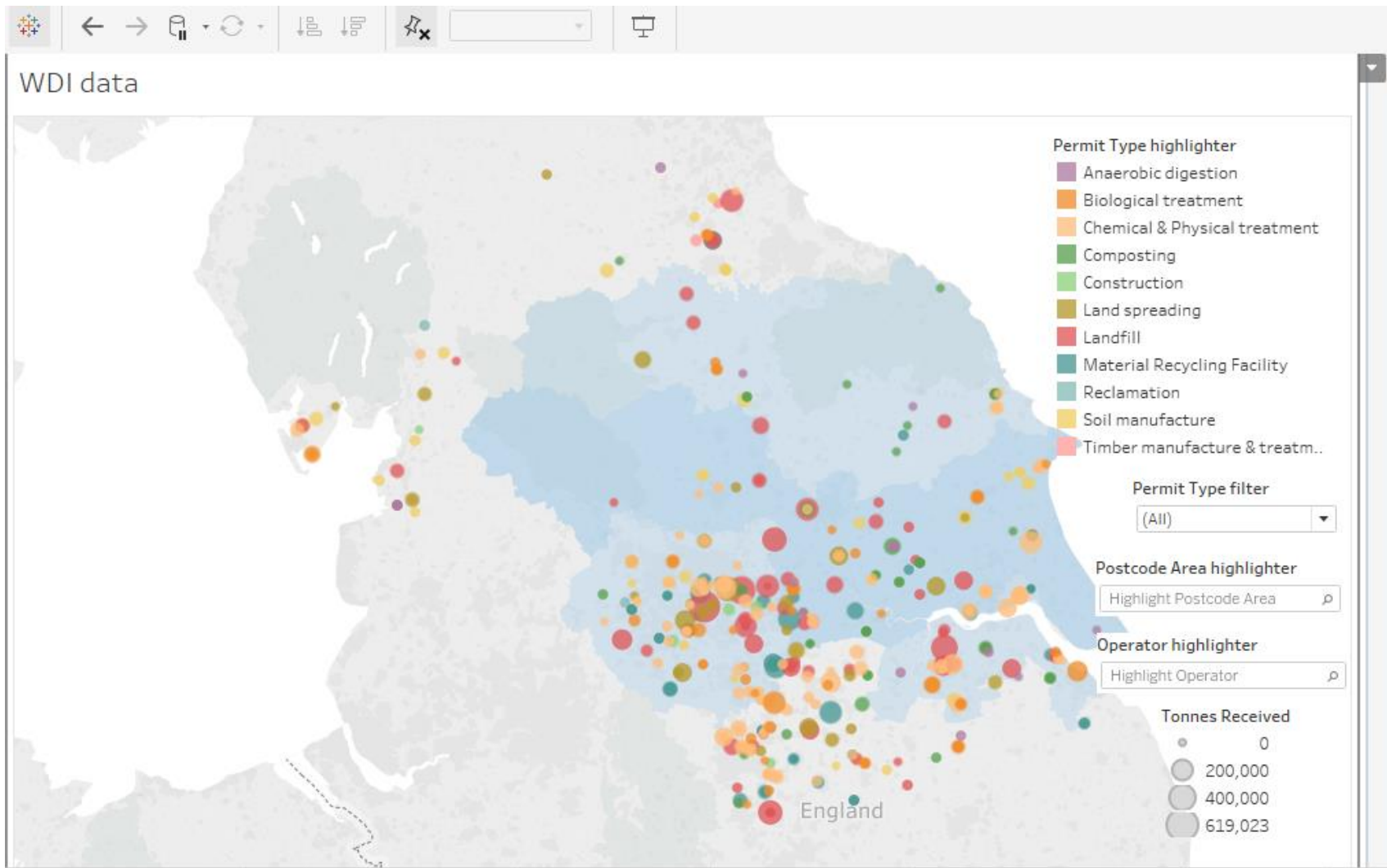
3.5 Typical disposal routes for bio-wastes generated in Yorkshire and the Humber
The six key groups of bio-wastes generated in the Yorkshire and Humber region are:

- Manures
- Sludges
- Animal tissue
- Plant tissue
- Paper/Card
- Wood

These materials can be treated and disposed of via at least 11 different primary routes. These routes are illustrated in Appendix V. 'Typical' routes are those by which the majority of wastes of these types are treated. This is often driven by commercial or regulatory pressures. So for example, category 1 animal by-products must be either incinerated or rendered, however manures can be treated through many potential routes, but would typically be land spread rather than incinerated, as this is the most commercially viable route.

The disposal and treatment of animal by-products are highly regulated activities, and in England are subject to the Animal By- Products (Enforcement) (England) Regulations 2011. Animal by-products are categorized according to their potential to harbour disease and therefore the type of waste treatment that is necessary to control the risk of spreading disease. Category 1 materials are highest risk and must be either rendered or incinerated. Category 3 materials are lowest risk and can be treated through a much wider range of routes including land spreading, composting, digestion or for the manufacture of pet food.

The vast majority of manures and sludges are spread to agricultural land for the benefit of crop nutrition and soil organic matter content. These materials are typically high in readily available nitrogen, generated close to the source of application, spread using widely available technology, with restrictions on the time of year or land use to which it is applied. This generally makes land spreading the most cost effective route for disposal. Manures and sludges are also processed through composting or anaerobic digestion facilities for the purposes of generating energy and manufacturing soil improvers.

Small quantities of paper/card and wood can be composted, but due to their high carbon and low moisture content, they can only be used in small proportions. The most typical route for segregated paper/card is via materials recycling facility for onward dispatch to the paper and card recycling industry. Segregated wood is typically sent for further treatment (chemical or physical to remove problematic residues such as paint, varnish, adhesives) or sent for processing for use in the particle board industry.

Plant tissue is an excellent feedstock for composting or digestion, alternatively waste from activities such as fruit/vegetable processing and packing are regularly sent for animal feed.

3.6 Priority sub-sector insights

As discussed in Section 3.2, the publicly available data on waste reported in the EA PI does not include co-products, by-products, or materials which are sent for animal feed, land spreading or redistribution. The broader range of bio-wastes produced by three priority sub-sectors in Yorkshire and the Humber are explored below. The sub-sectors selected are those with high levels of waste, large numbers of business units located in the region and with good opportunities for innovation.

3.6.1 Fresh fruit and vegetable processing

Fruit and vegetable processors in Yorkshire and the Humber will be grading and packing fresh produce for supply to end markets, or processing fruit and vegetables within the manufacturing sector, including for frozen products, such as McCain. Examples of the surpluses and bio-wastes produced by this sub-sector are summarized in Table 1.

Materials	Source	Example Management Approach
Down-graded produce	Inbound product at pack house does not meet Class I or Class II specification; may be due to over-sized/under-sized produce or to wider variety of reasons: poor handling/bruising, moulds, pests/disease, physiological changes (e.g. greening of potatoes), poor temperature management.	To lower value markets (cut, sliced, batons as a by-product), animal feed or AD.
Grading errors	During grading processes, good quality produce may be mis-identified and down-graded as a result.	To animal feed or AD.
Rejected whole loads	Inbound product; if the quality is too low, it is not worth sorting/grading; there is considerable interaction between pre-farm gate losses and rejects at pack houses.	Returned to farm.
Soil and stones	Washed from incoming produce before grading.	Captured in on-site effluent treatment sludges; stones caught in screens; some sites operate settling ponds; soil may be sent back to farm.
Surplus to redistribution	Class II produce being sent to redistribution (not down-grade) e.g. carrot batons where the	Sent to redistribution.

	produce was not sufficiently orange for the intended market specification.	
Bunched produce	Undersize items within bunch or yellowing of carrot leaves.	To animal feed.
Rejected packaged product, leaf crops	Seal failure/leaf salad with leaves trapped within seal	To AD.
Inedible material rejected from fruit/vegetable processing	Inedible food material from peeling, stoning, stalking.	To AD.
Sludges	From routine washing, testing and plant de-sludging operations.	To on-site lagoon system, sludge to land spreading.

Table 1: Example surpluses and wastes – fresh fruit and vegetable processing sub-sector[12]

3.6.2 Bakery product manufacturing

This sub-sector includes sites manufacturing a range of baked products including biscuits, cakes and bread. Key companies operating within Yorkshire and the Humber include xx, yy and zz. Examples of the surpluses and wastes produced by this sub-sector are summarized in Table 2.

Materials	Source	Example Management Approach
Ingredients	QA/shelf life/handling issues/contamination.	To animal feed or AD. In the case of hazardous waste (e.g. pest infestation) to disposal.
Work in progress	QA/technical issues/handling issues/changeovers/cleaning and maintenance.	To re-work, animal feed, AD.
By-products e.g. bread crumbs	Production process.	Sold as a separate product.
Finished products	R&D/QA/shelf life/handling issues/packaging failure/customer returns	To re-work, animal feed, redistribution, staff shop sales.

Table 2: Example surpluses and wastes – bakery product manufacturing[12]

3.6.3 Poultry raising

This sub-sector includes operators producing poultry (e.g. broiler chickens, turkeys) for the poultry meat supply chain. Key companies operating within Yorkshire and the Humber include Moy Park and P.D. Hook. Examples of the surpluses and wastes produced by this sub-sector are summarized in Table 3.

Materials	Source	Example Management Approach
Poultry manure/litter	QA/shelf life/handling issues/contamination.	To land spreading, AD.
Sludges	From routine production facility washing and plant de-sludging operations.	To on-site lagoon/effluent treatment system, sludge to land spreading.

[12] Quantification of food surplus, waste and related materials in the grocery supply chain, WRAP, 2016

| Animal by-products | Hatchery waste/dead birds. | Rendering, incineration. |

Table 3: Example surpluses and wastes – poultry raising

4 Conclusions

Yorkshire and the Humber is home to over 8,500 sites operating in the food and drink manufacturing sector. More than 90% of these locations employ less than 10 staff (micro-business units), the remaining small, medium and large businesses (625 in total) span a diverse range of sub-sectors (22 in total) with the largest number of business units of all sizes operating in the bakery, mixed farming, poultry raising, brewing and animal feed/pet food sub-sectors. The number of food and drink manufacturing units operating in Yorkshire and the Humber is dominated by small businesses (74%), followed by medium sized operators (22%) and large businesses (4%). Any engagement activity will need to take account of this diversity and the resources available to the different sizes of business.

225 businesses in Yorkshire and the Humber are subject to the Environmental Permitting Regulations 2010 and are required to report waste data to the Environment Agency. The largest number of these businesses are those operating in poultry raising, raising pigs, animal/pet food manufacture, meat processing and ready meals/food preparations. These businesses generate a range of common bio-wastes, including manures, sludges, animal tissue, plant tissue, paper/card and wood. The most significant bio-waste streams by annual tonnage reported in the EA PI are sludges, animal tissue and manures. It is important to recognise that this assessment relates to waste only and excludes resources, co-products and by-products that are used for other purposes such as land spreading and animal feed.

Companies House holds data on approximately 3,200 businesses registered in the Yorkshire and Humber region. The largest number of registered businesses operate in the mixed farming, beer/cider/fermented beverages and bread/biscuits and farinaceous products sub-sectors. Once again, it is important to understand the focus of this data, which will include a mixture of operating sites, registered addresses and offices.

Bio-wastes generated within and around Yorkshire and the Humber are treated at over 280 facilities situated throughout the region. The largest recipients of bio-wastes for disposal/treatment are landfill, chemical and physical treatment and materials recycling facilities. Bio-wastes can be disposed of via at least 11 different routes. The routes most typically used by waste generators are driven by economics (cost of segregation, waste collection, disposal/treatment) and environmental regulation (disposal of certain bio-wastes such as animal by-products is strictly controlled). Certain animal by-products for example, can only be rendered or incinerated.

Beyond the generation of wastes the food and drink manufacturing sector in Yorkshire and the Humber produces a wide range of by-products, co-products and materials that are used for alternate purposes such as redistribution for human consumption, manufacture of pet food, animal feed and land spreading. Each sub-sector generates a broad spectrum of these products with a variety of management options. Fruit and vegetable processing, bakery production and poultry raising represent three sub-sectors in the region which have good potential to add value to bio-wastes. There are particular opportunities in finding higher value, alternative uses for bio-wastes that are currently being sent for anaerobic digestion, land-spreading or the manufacture of animal feed. Details of which can be found in the report from the parallel project: Innovation Opportunities from Food Processing Waste in Yorkshire and the Humber[1].

I.   Yorkshire and the Humber Postcodes

Postcode[13]	City	LEP[14]		
		Humber	Leeds	York
Bradford	BD	X	√	X
Darlington	DL	X	X	√X
Doncaster	DN	X	√X	X
Huddersfield	HD	X	√	X
Harrogate	HG	X	√	√
Hull	HU	√	X	√X
Halifax	HX	X	√	X
Lancaster	LA	X	X	√X
Leeds	LS	X	√	X
Sheffield	S	X	√X	X
Wakefield	WF	X	√	X
York	Y	X	√	√

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[13] http://www.postcodearea.co.uk/
[14] http://www.ukassistedareasmap.com/

II.   Standard Industry Classication (SIC) Codes[15] and Label Grouping

Agriculture, Forestry & Fishing
Raising cattle = 01410 Raising of dairy cattle 01420 Raising of other cattle and buffaloes
Raising equines/camelids = 01430 Raising of horses and other equines 01440 Raising of camels and camelids
Raising sheep/goats = 01450 Raising of sheep and goats
Raising pigs = 01460 Raising of swine/pigs
Raising poultry = 01470 Raising of poultry
Raising other = 01490 Raising of other animals
Mixed farming = 01500 Mixed farming
Farm animal boarding & care = 01621 Farm animal boarding and care
Animal production support activities = 01629 Support activities for animal production (other than farm animal boarding and care) n.e.c.
Post-harvest crop activities = 01630 Post-harvest crop activities
Seed processing = 01640 Seed processing for propagation
Fishing/Aquaculture = 03110 Marine fishing, 03120 Freshwater fishing, 03210 Marine aquaculture, 03220 Freshwater aquaculture

Manufacturing
Meat processing = 10110 Processing and preserving of meat
Poultry processing = 10120 Processing and preserving of poultry meat
Meat & poultry products = 10130 Production of meat and poultry meat products
Fish processing = 10200 Processing and preserving of fish, crustaceans and molluscs
Fruit & veg processing = 10310 Processing and preserving of potatoes, 10320 Manufacture of fruit and vegetable juice, 10390 Other processing and preserving of fruit and vegetables
Oils/Fats = 10410 Manufacture of oils and fats, 10420 Manufacture of margarine and similar edible fats
Dairy = 10511 Liquid milk and cream production, 10512 Butter and cheese production, 10519 Manufacture of other milk products, 10520 Manufacture of ice cream
Milling = 10611 Grain milling
Cereals/Starch products = 10612 Manufacture of breakfast cereals and cereals based food, 10620 Manufacture of starches and starch products
Bread/Biscuits/Farinaceous Products = 10710 Manufacture of bread; manufacture of fresh pastry goods and cakes, 10720 Manufacture of rusks and biscuits; manufacture of preserved pastry goods and cakes, 10730 Manufacture of macaroni, noodles, couscous and similar farinaceous products
Sugar/Cocoa/Confectionary = 10810 Manufacture of sugar, 10821 Manufacture of cocoa and chocolate confectionery, 10822 Manufacture of sugar confectionery
Tea & Coffee = 10831 Tea processing, 10832 Production of coffee and coffee substitutes
Condiments & Seasonings = 10840 Manufacture of condiments and seasonings
Ready Meals/Food Preparations = 10850 Manufacture of prepared meals and dishes, 10860 Manufacture of homogenized food preparations and dietetic food
Manufacturing Other = 10890 Manufacture of other food products n.e.c.

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[15] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/455263/SIC_codes_V2.pdf

Animal Feed/Pet Food = 10910 Manufacture of prepared feeds for farm animals, 10920 Manufacture of prepared pet foods
Distilling = 11010 Distilling, rectifying and blending of spirits
Wine = 11020 Manufacture of wine from grape
Beer/Cider/Fermented beverages = 11050 Manufacture of beer, 11030 Manufacture of cider and other fruit wines, 11040 Manufacture of other non-distilled fermented beverages
Malting = 11060 Manufacture of malt
Soft Drinks = 11070 Manufacture of soft drinks; production of mineral waters and other bottled waters

III.   European Waste Catalogue (EWC) Codes[16] and Label Grouping

Manures = animal faeces, urine and manure (including spoiled straw), effluent, collected separately and treated off-site
Animal tissue = animal-tissue waste
Paper/card = paper and cardboard; paper and cardboard packaging
Plant tissue = plant-tissue waste
Sludges = septic tank sludge; sludges from on-site effluent treatment; sludges from washing and cleaning sludges from washing, cleaning, peeling, centrifuging and separation
Wood = wood; wood other than that mentioned in 20 01 37; wooden packaging

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[16] http://www.legislation.gov.uk/uksi/2005/895/schedule/1/made

IV.   Permit type and Label Grouping

Timber manufacture & treatment of waste wood: SR2010 No13: Use of waste to manufacture timber <75,000 tpy; SR2011 No4: Treatment of waste wood <75,000 tps,
Reclamation: SR2010 No9: Use of waste for reclamation etc <50,000 tps; SR2010 No10: Use of waste for reclamation etc <100,000 tps
Construction: SR2010 No7: Use of waste in construction <50,000 tps; SR2010 No8: Use of waste in construction <100,000 tps
Soil manufacture: SR2010 No12: Treatment of waste to produce soil <75,000 tpy
Biological treatment: A23 : Biological Treatment Facility
Material Recycling Facility: A15 : Material Recycling Treatment Facility; S0814 : Materials Recycling Facility
Composting: A22 : Composting Facility; SR2011 No1: Composting biodegradable waste <500 tonnes total; S1207 : Composting in open systems; S1203 : Composting in closed systems; S0816 : Composting in open windrows
Anaerobic digestion: S1212 : Anaerobic digestion facility inc use of biogas; S1210 : On-farm anaerobic digestion using farm wastes only; SR2010 No16: On-farm anaerobic digestion <75,000 tpy
**Chemical & Physical treatment**: A17 : Physico-Chemical Treatment Facility; A16 : Physical Treatment Facility; A21 : Chemical Treatment Facility
Land spreading: A25 : Deposit of waste to land as a recovery operation
Landfill: L02 : Non Haz (SNRHW) LF; L04 : Non Hazardous LF; L07 : Restricted LF; L05 : Inert LF

V. Typical Disposal Routes for main Bio-Wastes Generated in Yorkshire and the Humber
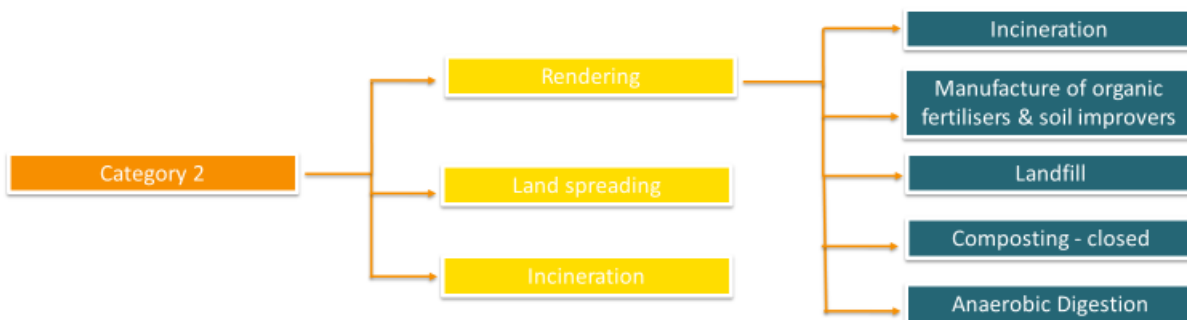

Typical disposal routes – Animal tissue – Category 1

Category 1 → Rendering → Incineration; Landfill
Category 1 → Incineration
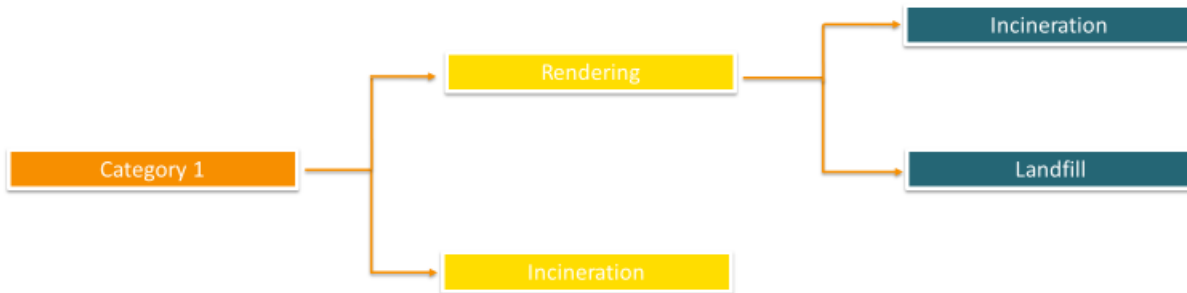
Category 1 material includes animal parts considered most likely to harbour disease, such as bovine spinal cord.

Anthesis

1

Typical disposal routes – Animal tissue – Category 2

Category 2 → Rendering; Land spreading; Incineration → Incineration; Manufacture of organic fertilisers & soil improvers; Landfill; Composting - closed; Anaerobic Digestion
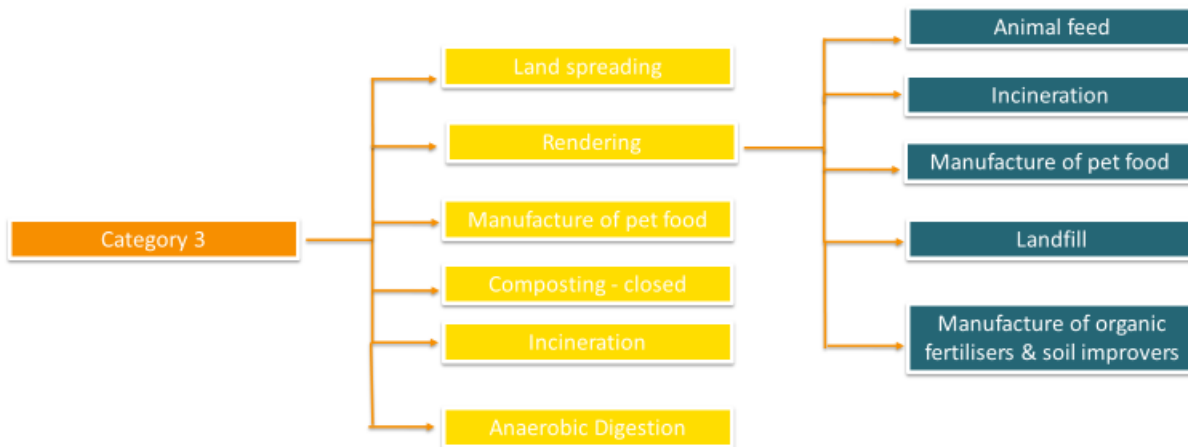
Category 2 material includes animal by-products such as milk, milk based products, digestive tract contents and others.

Anthesis

2

Typical disposal routes – Animal tissue – Category 3

Category 3 → Land spreading

Category 3 → Rendering → Animal feed; Incineration; Manufacture of pet food; Landfill; Manufacture of organic fertilisers & soil improvers

Category 3 → Manufacture of pet food

Category 3 → Composting - closed

Category 3 → Incineration

Category 3 → Anaerobic Digestion

Category 3 material includes materials such as former foodstuffs, inedible parts (e.g. hides, bones, feathers) and others.

Anthesis

3

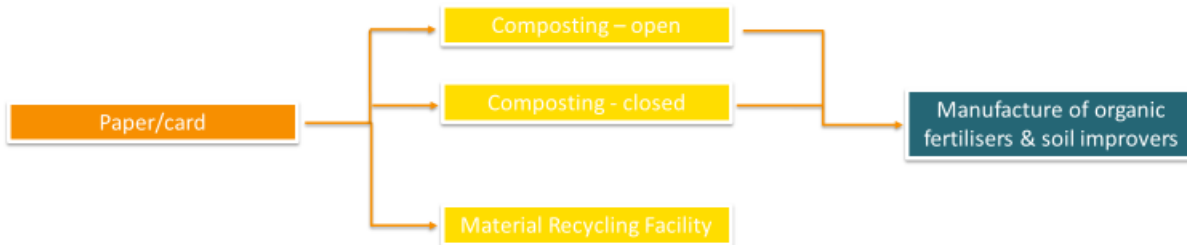## Typical disposal routes – Manures

Manures → Composting – open; Composting - closed; Anaerobic digestion; Land spreading → Manufacture of organic fertilisers & soil improvers

Note: Manures can be incinerated and landfilled, but these routes are not typical due to the availability of land spreading as a lower cost option.
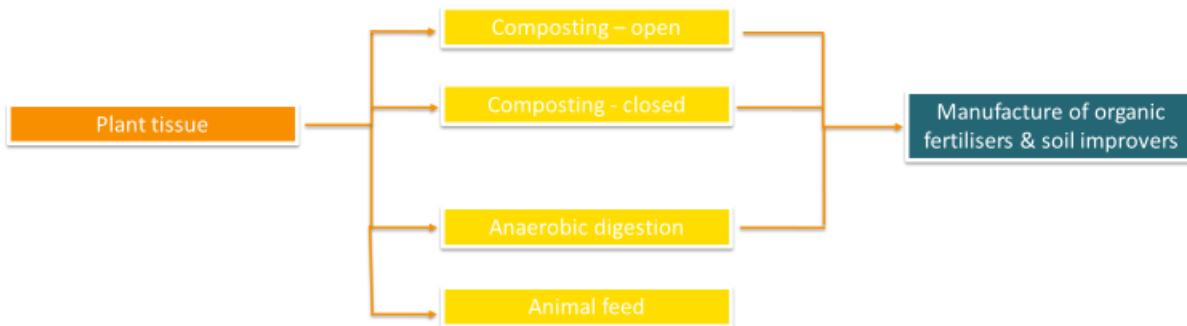
Anthesis

4

Typical disposal routes – Sludges

Sludges →
- Composting – open
- Composting - closed
- Anaerobic digestion
- Land spreading

Composting – open, Composting - closed, Anaerobic digestion → Manufacture of organic fertilisers & soil improvers

Note: Sludges can be used for land reclamation purposes, but this is not a typical disposal route.

Anthesis

7

Typical disposal routes – Wood

Wood →
- Composting – open
- Treatment of wood waste
- Composting – closed
- Timber manufacture

Composting – open, Composting – closed → Manufacture of organic fertilisers & soil improvers
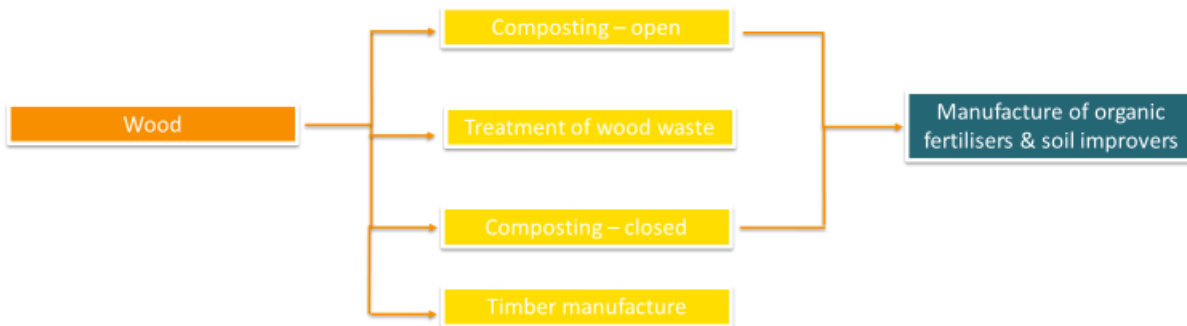
Note: Composting of wood is only suitable for small volumes of this material, due to its high lignin/low moisture content. These same characteristics typically make it unsuitable for anaerobic digestion.

Anthesis

8