UNIVERSITY OF EDINBURGH
Business School

Impact Measurement

Carbon Emissions of the Primary School Catering Service at Torfaen County Council

Spring 2024

MEALANALYSER

Contents

1. Your Catering Emissions Dashboard & Results Highlights

Your Catering Emissions Dashboard
(26 schools[1], 36 wks)

	Year 1 (2022-23)	Year 2 (2023-24)	% change
Total weight of food served (tonnes)	261	353	+35%
Total catering service emissions (tonnes CO_2e)[2]	929	852	-8%
Emissions intensity of service (kgs CO_2e per kg food served)	3.56	2.42	-32%
Emissions intensity compared with other services[3]	9th highest	4th lowest	-

[1]Based on analysis of one full cycle of the standard menu to all schools, and meal uptake figures for 3 week sample period at all schools

[2]Total emissions from purchased food, transport, kitchen activities and waste handling

[3]Other services = all other school catering services analysed by the Meal Analyser to date (21 in total)

Your Results Highlights

- In 2023-24 you purchased **35% more food** than 2022-23, but as whole**, your service generated 8% less emissions**.
- The main reasons were (i) **increased proportion of plant-based alternatives** relative to meat, particularly beef, (ii) **increased proportion of fruits and vegetables** on menu relative to other food groups, (iii) **switching food waste disposal method** from landfill to AD unit.
- Overall, **for every kg of food served in 2023-24, you generated 32% less kgs CO_2e** compared with the previous year.
- Compared with other services in the Meal Analyser database, your emissions intensity (kgs CO_2e per kg food served) has dropped from 9th highest (2022-23) to **4th lowest** (2023-24).
- The above results confirm that the **menu adjustments made for 2023-24 have been effective in lowering your emissions intensity**. The **switch from landfill to AD unit**, for waste disposal, also had a significant reduction effect.
- Your catering emissions can be reduced further by **encouraging more pupils to choose lower carbon options** (e.g. migrating 10% of pupils from high to low carbon options, for 5 days in a menu cycle, gives a further 3% reduction).

2. Objectives, Scope and Methods of Analysis

Objectives, scope and method

2.1 Objectives

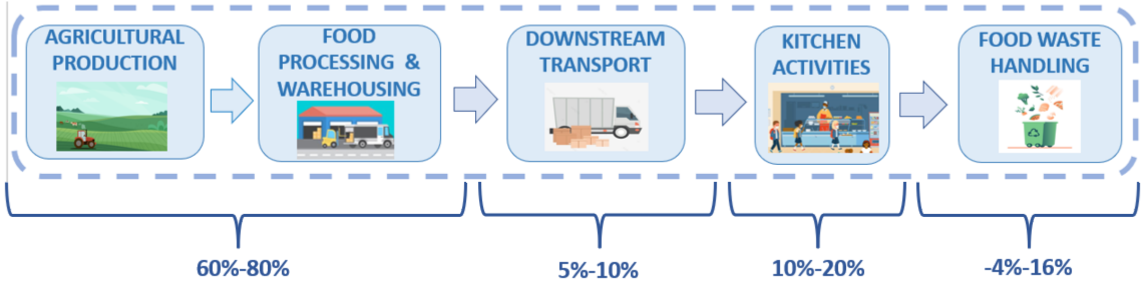
Torfaen County Council asked the Meal Analyser team to compare the carbon emissions of its primary school catering service in 2022-23 with the service in 2023-24. Various menu adjustments had been made in 2023-24, and food waste disposal method switched from landfill to AD unit. The Council wished to see how these changes have impacted the carbon footprint of the service.

2.2 Scope

Emissions are calculated as the total tonnes of $C0_2e$ generated from the production, processing, transportation, kitchen and waste-handling of food items from your service ("cradle to grave").

Our previous research (Tregear et al, 2022) shows that most emissions from a catering service are generated from the foods purchased (Scope 3). Therefore, our analysis pays particular attention to which foods you buy, and how you design your menus, as it is these choices which have the biggest impact on your total carbon footprint.

Typical percentage contribution of activities to total carbon emissions of a school catering service



2.3 Data Sources and Calculation Method

We gathered data on your purchased foods from the full set of recipes on the 2022-23 standard primary school menu, and the same for the 2023-24 menu.

We combined these menu data with uptake figures from a three-week sample period for 2022-23 and 2023-24, each representing one full menu cycle. We then multiplied those totals by the number of weeks in the school year (36 weeks), to arrive at an estimate of your annual food emissions.

2.3 Data Sources and Calculation Method (cont.)

We added emissions relating to transport and kitchen activities using default values drawn from previous research. We used information provided by you on your food waste disposal method (landfill in 2022-23 and AD unit in 2023-24) to estimate emissions from food waste.

A full explanation of our calculation methodology is given in Appendix 1. Our method has been designed to comply with the following carbon accounting standards: ISO Standard 14067; BSI (2011) PAS Standard 2050; WRAP (2024) Courtaulds Commitment Scope 3 GHG Measurement and Reporting Protocols.

3. Your Purchased Foods and their Emissions

Your purchased foods & emissions 2022-23

- **Which foods did you purchase?**
- In 2022-23, you purchased 261 tonnes of food in total (Figure 1a).
- Fruits and vegetables were the biggest proportion (45%), followed by grocery (24%) and dairy (18%). You purchased small amounts of fish (4%), red meat (3%) and other meat (6%).

- **What emissions from your purchased foods?**
- In 2022-23, your food emissions were 675 tonnes of CO_2e (Figure 1b).
- Red meat comprised 29% of your food emissions, although it represented only 3% of food weight.
- Fruits and vegetables comprised only 14% of your food emissions, although these represented 45% of food weight.

Figure 1a. Foods* Purchased 2022-23 (total 261 tonnes)

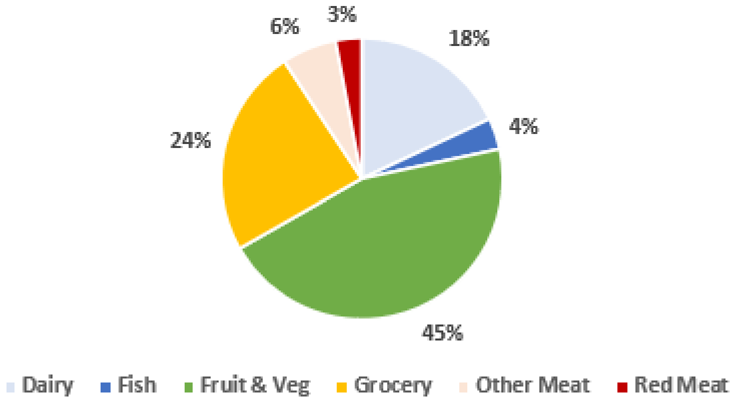
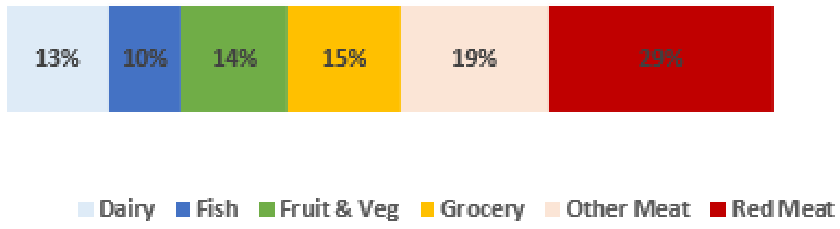


Figure 1b. Food* Emissions 2022-23 (total 675 tonnes CO_2e)

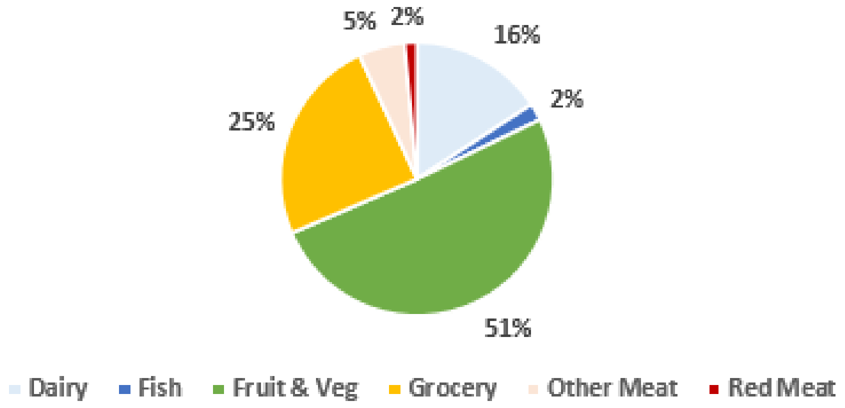


*Grocery= bakery, pasta, rice, oils, sauces, mixes. Red Meat= beef only. Other Meat= pork, poultry and plant-based alternatives

Your purchased foods & emissions 2023-24

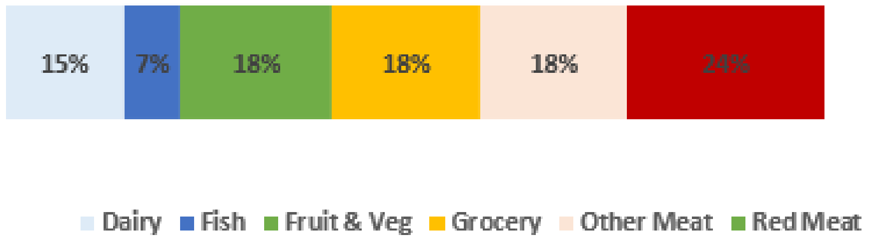
- **Which foods did you purchase?**
- In 2023-24, you purchased 353 tonnes of food (Figure 2a). This was 92 tonnes (35%) more food than the previous year.
- Compared to the previous year, you purchased:
  - A greater proportion of fruits and vegetables
  - Slightly less dairy, fish, red and other meats
  - More plant-based alternatives relative to pork and poultry

Figure 2a. Foods* Purchased 2023-24 (total 353 tonnes)



- **What emissions from your purchased foods?**
- In 2023-24, your food emissions were 716 tonnes of CO_2e (Figure 1b). This was 41 tonnes (6%) more than the previous year.
- Red meat remains the single biggest contributor to your food emissions.
- However, the proportion dropped from the previous year (from 29% to 24%), as you purchased less red meat in 2023-24.

Figure 2b. Food* Emissions 2023-24 (total 716 tonnes CO_2e)



*Grocery= bakery, pasta, rice, oils, sauces, mixes. Red Meat= beef only. Other Meat= pork, poultry and plant-based alternatives

4. Carbon Profile of your Menus

- For both the 2022-23 and 2023-24 menus, we measured the carbon emissions for every dish (mains, sides and desserts).
- We allocated each dish a carbon score, according to the method described in Appendix 1.
- We compile the scores to show the total proportion of ‘low’ to ‘high’ carbon dishes on each menu.

Carbon Profile of your Menus

- In **2022-23:**
  - 38% of all dishes were 'very high' carbon.
  - 17% were 'low' and 2% were 'very low' carbon. These were mostly vegetable side dishes.

- In **2023-24**:
  - A lower proportion of all dishes (29%) were 'very high' carbon.
  - A greater proportion of all dishes (38%) were 'medium' carbon.
- Very similar proportions of 'low' and 'very low' carbon dishes are seen compared with 2022-23. This is because recipes for vegetable sides were largely unchanged from the previous year.

Figure 3a: Percentage 'very low' to 'very high' carbon dishes on 2022-23 menu

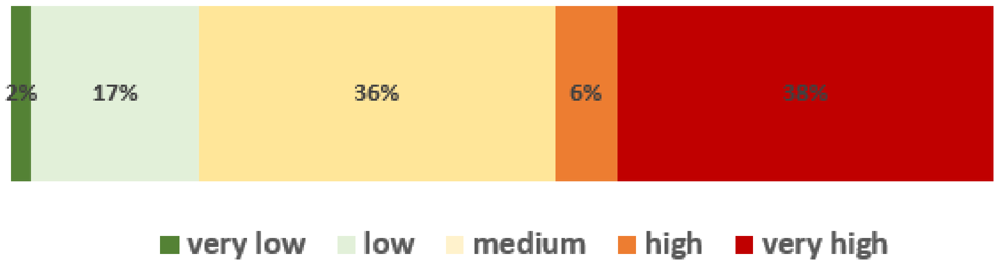
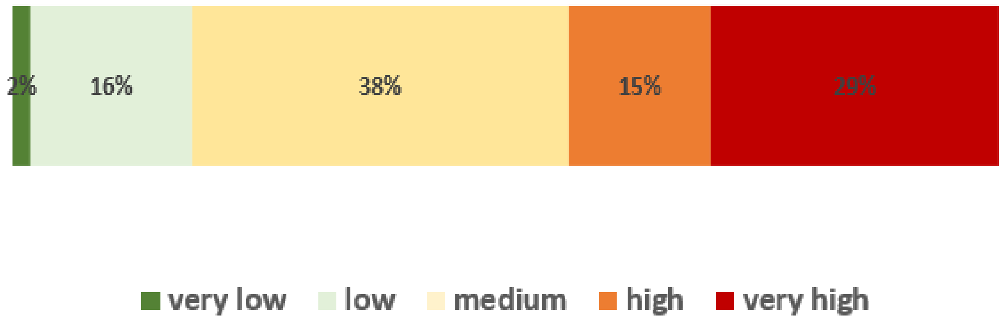


Figure 3b: Percentage 'very low' to 'very high' carbon dishes on 2023-24 menu



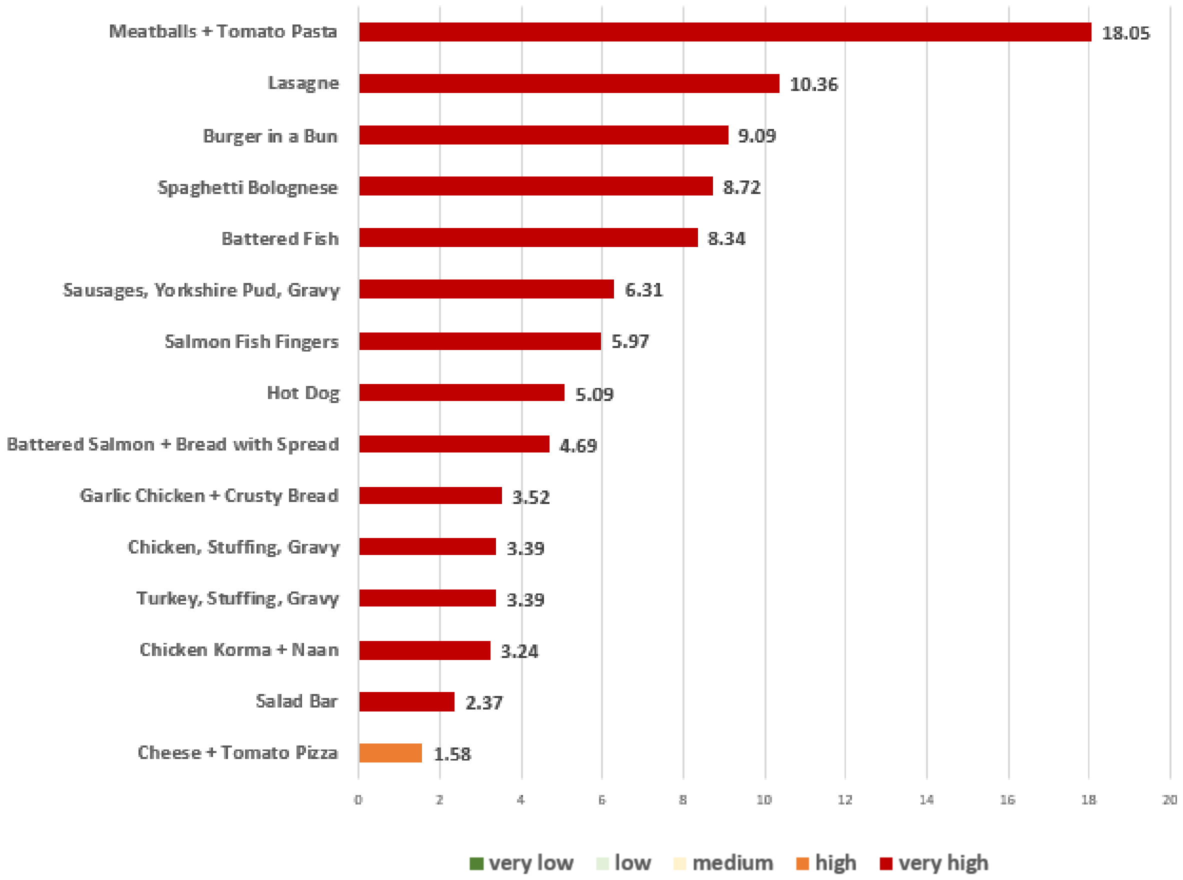
5. Carbon Profile of your Dishes

- Here we show the carbon intensities of your individual dishes (mains only), in both 2022-23 and 2023-24.

Carbon Profile of your Dishes 2022-23

- In 2022-23:
- The highest carbon mains were all beef-based dishes (meatballs + pasta, lasagne, burger in bun, spaghetti bolognese).
- These dishes exceed the 'very high' carbon threshold (2kgs CO_2e per kg) by large margins.
- The lowest carbon mains were either vegetarian or poultry-based (e.g. chicken korma, salad bar, cheese + tomato pizza).
- ALL main dishes on the menu, except the pizza, were 'very high' carbon.

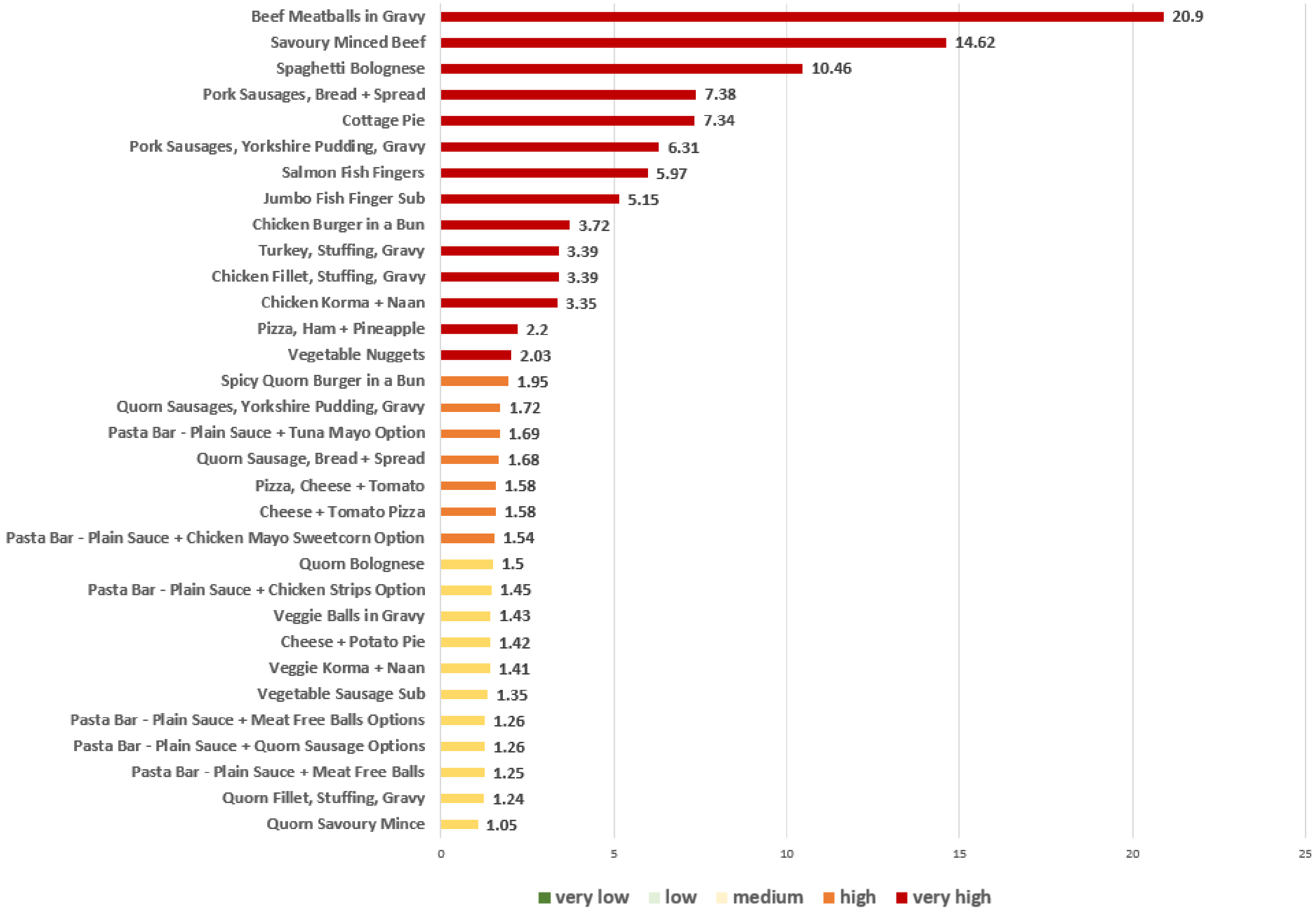
Figure 4a Highest to lowest carbon MAINS on the 2022-23 menu (kgs CO_2e per kg of food)



Carbon Profile of your Dishes 2023-24

- In 2023-24:
- A daily vegetarian hot option is offered alongside meat/fish option
- The highest carbon mains were again beef-based (meatballs in gravy, minced beef, spaghetti bolognese).
- Again, these dishes exceeded the threshold of ‘very high carbon’ (2kgs CO_2e per kg) by large margins.
- The lowest carbon dishes were all plant-based and ‘medium’ carbon intensity (pasta bar with meat-free balls, quorn fillet, quorn mince).
- 18 out of 32 main dishes on the menu were NOT ‘very high carbon’, compared to only one in 2022-23 menu.

Figure 4b Highest to lowest carbon MAINS on the 2023-24 menu ($kgs CO_2e$ per kg of food)



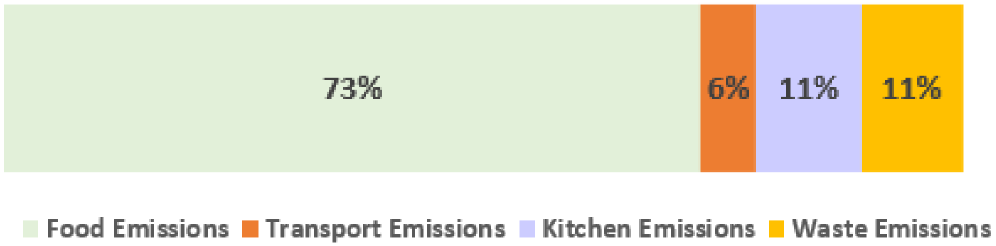
5. Carbon Footprint of your Whole Catering Service

- Here we show the total footprint of your catering service, by adding emissions from other activities in your service to your total food emissions:
- Transport: Downstream transport of procured food from warehouse to kitchen.
- Kitchen: Includes storage, cooking, warewashing and employee commuting.
- Food waste disposal: 26% of your procured food is assumed to end as plate waste and your disposal method was landfill in 2022-23, but AD unit in 2023-24
- Full explanation of assumptions and calculation method in Appendix 1

Carbon footprint of your whole catering service

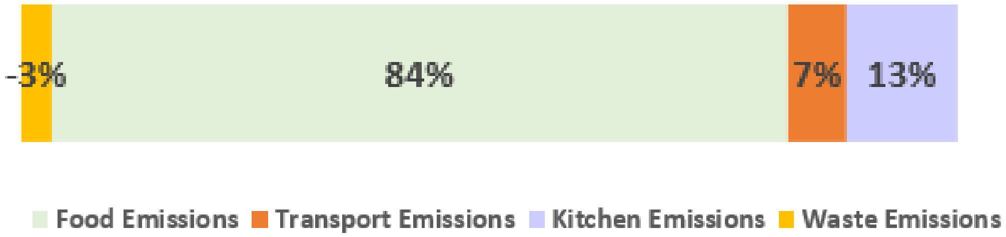
- In **2022-23**:
- Your whole service emissions were 929 tonnes CO_2e.
- 73% of these were from your purchased foods, 6% from transport, 11% from kitchen activities and 11% from food waste disposal (landfill).

Figure 5a Whole Service Emissions 2022-23 (929 tonnes CO_2e)



- In **2023-24**:
- Your whole services emissions were 852 tonnes CO_2e.
- 84% of these were from your purchased foods, 7% from transport and 13% from kitchen activities. Waste disposal via AD unit gives small net negative emissions (-3%).

Figure 5b Whole Service Emissions 2023-24 (852 tonnes CO_2e)



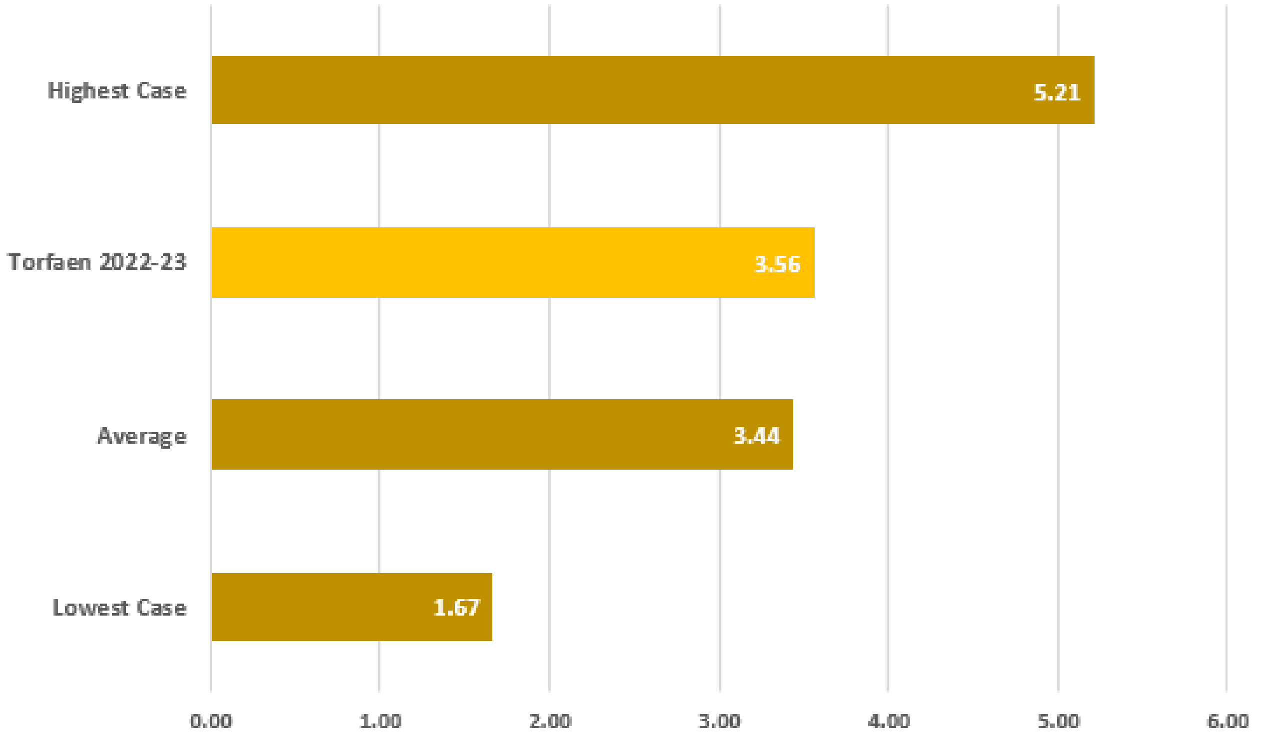
6. Your Emissions Compared with Other Services

- To compare your emissions with other services, we use your **emissions intensity**, or kgs CO_2e per kg food served.
- We do this by dividing your whole service emissions (i.e. food+transport+kitchen+waste) by your total purchased food weight.
- We can then compare your emissions intensity with the other services we have analysed to date, using the same method.
- Emissions intensity gives a consistent method of assessing emissions, regardless of the different sizes/scales of services.

Your emissions intensity 2022-23

- Figure 6a shows the emissions intensity for Torfaen **2022-23**, alongside the lowest and highest carbon services in the Meal Analyser database. It also shows the average emissions intensity across all cases (n=21).
- For 2022-23, **your emissions intensity was 3.56** (929 tonnes CO_2e / 261 tonnes food). This means **your catering emissions were three and a half times the physical weight of your purchased food**.
- Your emissions intensity was slightly higher than the average across all cases.
- Your emissions intensity was the 9th highest of all services.

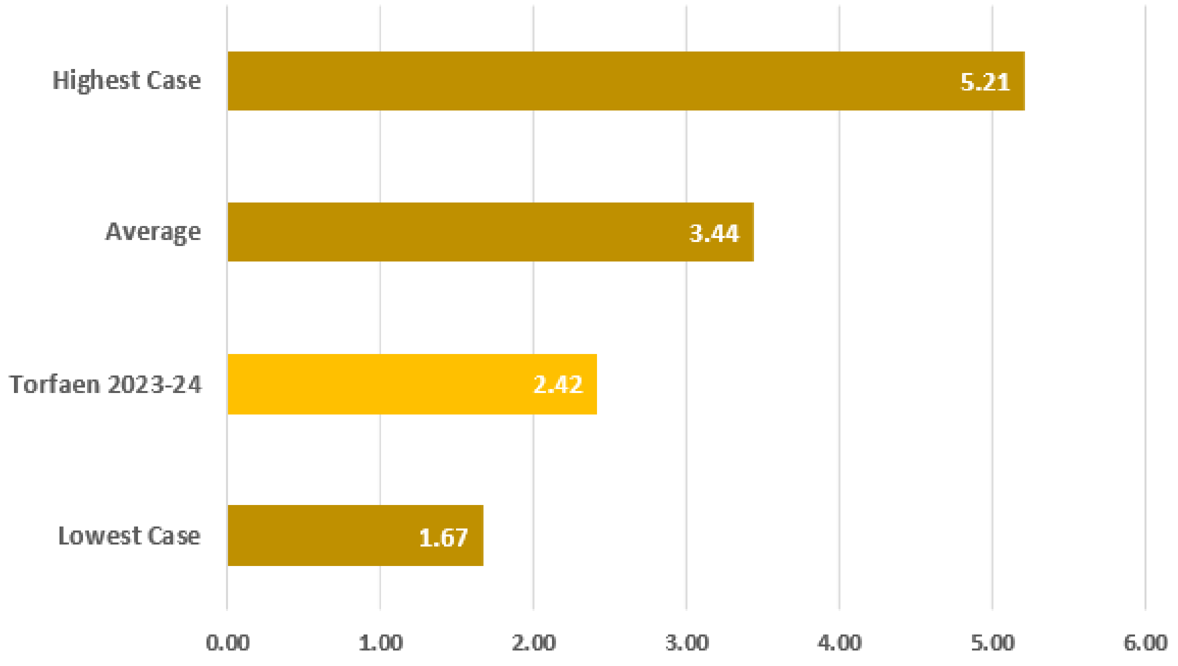
Figure 6a. Emissions Intensity 2022-23 compared with other services in Meal Analyser database (kgs CO_2e per kg food served)



Your emissions intensity 2023-24

- Figure 6b shows the emissions intensity for Torfaen 2023-24, again alongside the lowest, highest and average from the Meal Analyser database.
- For 2023-24, **your emissions intensity was 2.42** (852 tonnes CO_2e / 353 tonnes food). This means **your catering emissions were less than two and a half times the physical weight of your purchased food**.
- Your emissions intensity was considerably lower than the average across all cases.
- Your emissions intensity was the 4th lowest of all services.

Figure 6b. Emissions Intensity 2023-24 compared with other services in Meal Analyser database (kgs CO_2e per kg food served)



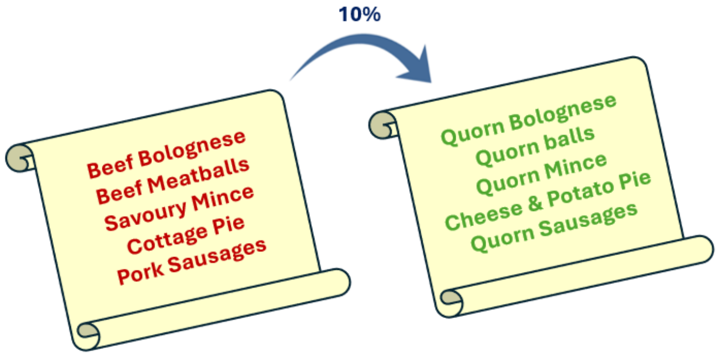
7. Opportunities for further Carbon Reductions

- In this section, we show you one option for further carbon reduction:

i. Migrating more pupils towards lower carbon menu options

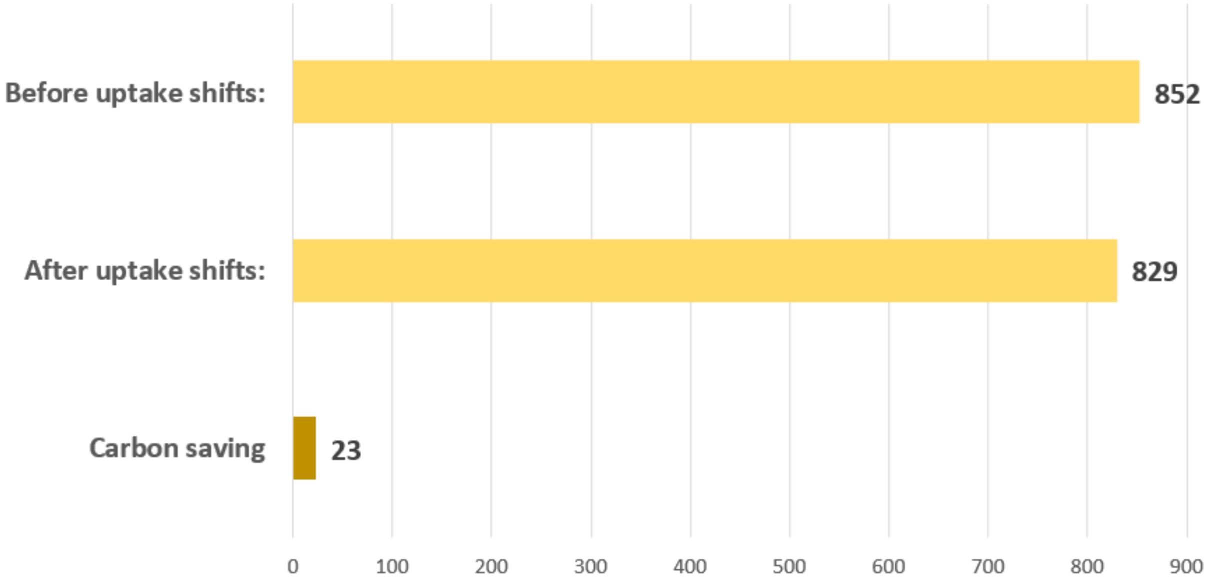
Carbon reductions from migrating uptake

- Your 2023-24 menu contains two daily hot options, one meat-based (higher carbon) and one vegetarian (lower carbon).
- We analysed the reductions from shifting 10% of pupils from the higher to lower carbon option, **for 5 days only** in the menu cycle:



- The carbon savings from a 10% migration **on 5 days alone** would be **23 tonnes CO_2e** (c.3% of current total).

Figure 8 Your whole service emissions, migrating 10% of pupils from high to low carbon options, for 5 days only (tonnes CO2e)

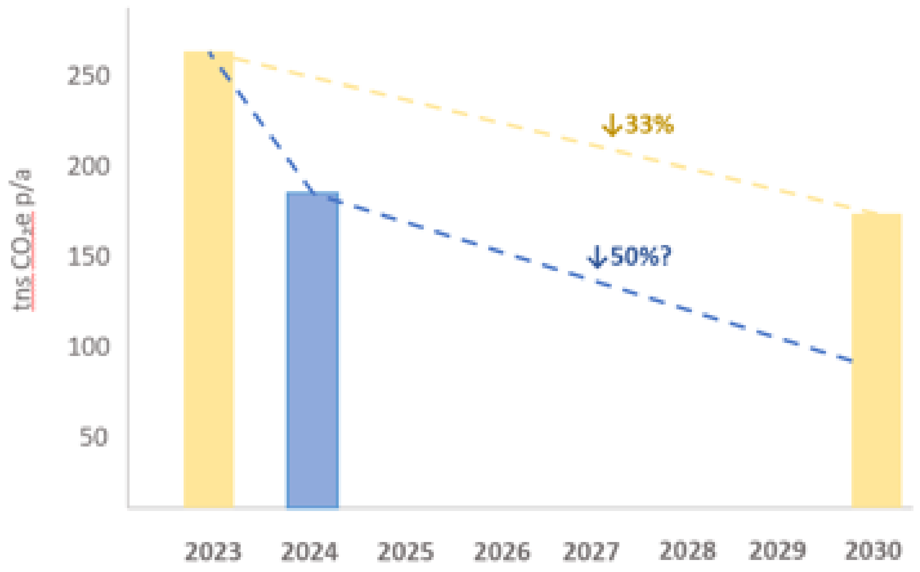


Next Steps?

Next steps?

- This report has shown the carbon reductions achieved from menu and waste disposal changes you already made from 2022-23 to 2023-24.
- It has also shown the further carbon reductions possible from modest migration of uptake.
- Those additional changes could reduce your emissions by a further 3%.
- <u>Next steps</u>: set an emissions reduction target in line with your local authority ambitions (e.g. -50% by 2030), and track your progress annually. A generic example of a target reduction pathway is shown in Figure 9.

Figure 9. Generic example of carbon reduction target setting and pathway tracking



Appendices

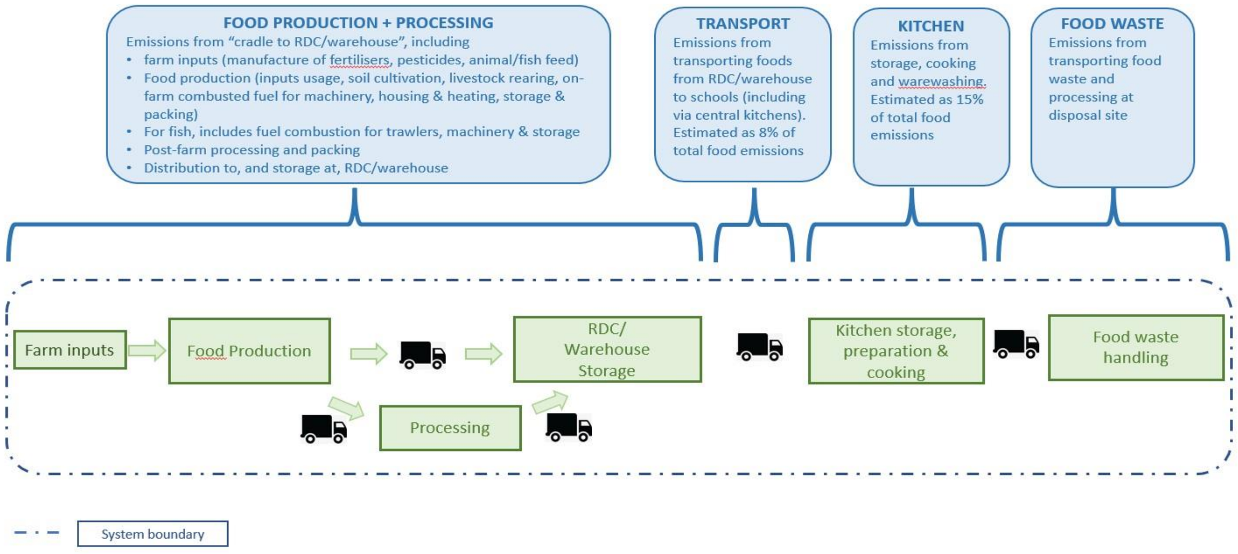
Appendix 1: Calculation Method in Detail

- Emissions have been calculated in accordance with the Courtaulds Standard (WRAP, 2024), ISO Standard 14067 and PAS Standard 2050. The calculation method was developed within the EU Horizon 2020 project "Strength2Food", led by Edinburgh University (www.strength2food.eu): see Tregear et al (2022).

- **1. What was included?**

- Total chain emissions are calculated as the kgs $C0_2e$ per kg food purchased, from the production, processing, transportation, handling/cooking and waste of food items ("cradle to grave"). Figure 9 describes the system boundary in full:

Fig 9. Emissions calculation method – full system boundary



Appendix 1: Calculation Method in Detail

2. How were Food Production and Processing Emissions Calculated?

- From the information supplied to us, each purchased food item was coded against a database of 260+ emission factors (compiled by us specifically for UK school catering), and its total purchased weight recorded. We then multiplied the total weight by the relevant emissions factor. The emissions factors themselves capture all emissions from farm inputs to storage at RDC/warehouse. The main source of factors was Agribalyse (https://nexus.openlca.org/database/Agribalyse), a database of over 2500 food products.

3. How were Transport Emissions Calculated?

- These emissions capture the transportation of food items from wholesalers to school kitchens, and were estimated as a fixed proportion (8%) of your food emissions. This estimate was based on a weighted average of the percentage contributions of transport to total emissions, as found in the catering services studied in the EU research project “Strength2Food”, led by University of Edinburgh (www.strength2food.eu). That research tracked suppliers' delivery round distances and frequencies, the types of vehicles and fuel used, load proportions and number of drops to other customers in the rounds (Defra, 2013).

4. How were Kitchen Emissions Calculated?

- Kitchen emissions refer to energy use from refrigerated storage, cooking and warewashing, and were estimated as a fixed proportion (15%) of your food emissions. The estimate is based on data provided by the Carbon Trust (2011) which states an average energy use of 0.75 kWh per school meal. This converts into 0.18 kgs $C0_2e$ per meal, which represents, on average, 15% of the food emissions of the UK school catering services studied by University of Edinburgh.

Appendix 1: Calculation Method in Detail

5. How were Waste Emissions Calculated?

- To estimate emissions from food waste, the total weight of your annual plate waste (estimated as 26% of total food weight purchased) was multiplied by a per kg waste disposal emissions factor. Different factors apply to anaerobic digestion, incineration and landfill (Moult et al, 2018): see below. The factor we used for your service is based on the information you provided on your waste disposal method.

- Anaerobic digestion has a net negative carbon impact (-0.314 kgs $C0_2e$ per kg waste), on the basis of two assumptions: (i) this process captures and combusts all biogas produced to generate electricity, which mitigates emissions otherwise occurring through electricity from the national grid; (ii) the digestate produced is used as fertiliser, which mitigates emissions from the use of mineral-based fertilisers.

- Incineration has a marginal net negative carbon impact (-0.058 kgs $C0_2e$ per kg waste), on the assumption that (i) waste is combusted completely in a municipal solid waste incinerator, without incurring any non-biogenic emissions; (ii) net thermal energy from combustion is used to generate electricity onsite, mitigating emissions otherwise occurring through electricity from the national grid.

- Landfill has a net carbon burden of 1.45 kgs $C0_2e$ per kg waste. As practices vary across landfill sites, this factor is an average of the emissions from three landfill types: (i) 70% of gases are collected and used for electricity generation (best practice), (ii) 70% of gases are collected and flared (converted to C02 and water) (iii) all gases are vented into the atmosphere (no capture or flaring).

Appendix 1: Calculation Method in Detail

6. How were carbon scores allocated to dishes on the menu?

- The carbon scores were allocated by the following steps (i) all ingredients in all dishes were manually coded with an appropriate, high quality, emissions factor (ii) the ingredient emissions were summed to give total emissions, per serving, for each dish (iii) the per serving emissions were converted into carbon intensities (kgs CO_2e per kg) for each dish (iv) the intensity scores were used to allocate each dish to one of five categories: ‘very low’ (0.0-0.5 kgs CO_2e per kg), ‘low’ (0.51-1.0 kgs CO_2e per kg), ‘medium’ (1.01-1.5 kgs CO_2e per kg), ‘high’ (1.51-2.0 kgs CO_2e per kg) and ‘very high’ (>2.0 kgs CO_2e per kg), using the categorisation system proposed by Lemken et al (2021).

Appendix 1: Calculation Method in Detail

- **References**

- British Standards Institute (2011). PAS 2050: Specification for the assessment of the life cycle greenhouse gas emissions of goods and services. British Standards Institute.
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- WRAP (2024). Scope 3 GHG Measurement & Reporting Protocols: Sector Guidance for Food & Drink Businesses. Courtauld Commitment 2030. Version 2, January 2024.

Appendix 2: More About the Meal Analyser

- The Meal Analyser has been co-developed by Professor Angela Tregear (University of Edinburgh Business School) and Adam Wilkinson (Impact Measurement Ltd). It began as a prototype developed within the EU research project "Strength2Food" (www.strength2food.eu). Drawing from the academic research conducted within that project, a calculation method was developed specifically for public caterers, to reliably estimate the carbon emissions of their services.
- Following completion of "Strength2Food" in 2021, the Meal Analyser has been improved and refined in partnership with the Local Authority Catering Association (LACA) and ASSIST FM Scotland. Now, Local Authorities and School Academy Trusts in the UK are using the Meal Analyser to understand, and reduce, the emissions from their catering services.
- More information about the Meal Analyser can be found on our website: https://www.mealanalyser.com/
- We are grateful to the following institutions and partners who have supported the development of the Meal Analyser:

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UKRI
Economic
and Social
Research Council

LACA
the school food people

ASSIST