ADEPT Live Labs 2 – CEDR South Campus

Transport for West Midlands and Colas

Carbon Report 2024

Contents

Introduction

Trials of innovative materials happen throughout the UK on a continual basis with authorities demonstrating locally that materials work in practice, but these demonstrators occur within silos and rarely compare against other materials in the market. Without comparison, we never really move forward, update standards or gain confidence in what others are doing/have done.

Centre of Excellence for Decarbonising Roads (CEDR) aims to demonstrate, showcase, and evaluate a wide range of innovative decarbonised highway materials, contrasting techniques against each other across a range of complementary networks in Local Authorities who are members of the West Midlands Combined Authority.

CEDR comprises of two campuses, the South campus being Transport for West Midlands and the North campus being North Lanarkshire and Amey.

CEDR is delivered by an experienced and diverse UK-based team comprised of a Regional Authority, Local Authorities, Tier 1 contractors, and suppliers supported by academic partners which include University of Nottingham and Aston University, TRL and Connected Places Catapult. The carbon accounting is supported by the Future Highways Research Group (FHRG). CEDR aim to break down silos in materials-testing and support the national deployment of the best materials to help Local Authorities to catapult over trial phases and immediately start making progress towards their net zero targets, whilst also developing an international reputation for excellence.

Overview of our service demonstration groups

Trials are conducted at various service level categories, each with its own specific methodology and data collection template. These trials are performed for both benchmarking purposes and actual experimentation. Data collection for carbon baselining and evaluation is carried out during both winter and summer seasons.
The initial service activity that was trialled was potholes, with trials taking place in March. Data was collected for both innovative materials and Business as Usual materials during the winter trials. However, the results will only be published after the second round of trials carried out in late summer, to ensure the robustness of the carbon baselining.
The next service activity to be investigated is surface treatments. The trial methodology for this activity was developed by TRL (Transport Research Laboratory). The following trials scenarios are taking place in August 2024 with the associated benchmark solutions:

- Trial 1: Preservers vs Do nothing.
- Trial 2: Rejuvenators vs Do nothing.

- Trial 3: Surface Dressing (chip sealed) vs 2nd generation Micro.
- Trial 4: Surface Dressing vs mesh SD (both with chip seal).
- Trial 5: 2nd generation Micro vs Mesh Micro.

Additionally, resurfacing activities to potentially include the following comparisons:

- Innovative Surface Course replacement (Surfacing) vs Business as Usual (AC 10/6 or SMA, etc.)
- Innovative Surface and Binder Course replacement (Reconstruction) vs Business as Usual (AC 10/6 or SMA, etc.)

Overview of Approach to Carbon from the SOBC & delivery of commitments

*Points consistent with the original SOBC in green
*Points deviating from the original SOBC in Blue

In the SOBC, we stated" Carbon measurement will be carried out principally by term maintenance providers working on behalf of the local authorities. Additional central support will be provided by the CO_2llaboration Centre (This has now changed from the CO2llaboration centre, to more an Expert Research Group support team) and support from Colas given its involvement in the testing and roll-out of the FHRG Scope 3 tool (one of just three contractors undertaking this work). In addition, Colas brings expertise through the application of SEVE, developed, and used globally as a calculator for surfacing and earthworks. TRL will report operational GHG emissions from their demonstrations of NRMM. (TRL are now more of an evaluation partner, supporting with methodology, site selection and technical evaluation)
SEVE will occasionally be used to compare the results as and when needed. As SEVE uses carbon factors from the European carbon databases, it might not always give the best results. We will be using Asphalt-IQ as well.
A thorough benchmarking exercise will be undertaken at each demonstrator site to understand the current carbon footprint of planned maintenance operations and therefore provide the comparison or control scenario. The baselining process will be carried out using the FHRG toolkit to ensure consistency.
Data is now also collected for each Local Authority for their Business as Usual (BAU) operations to calculate the carbon footprint of activities in which trials will be carried out. The activity carbon baselining process is carried out using the FHRG toolkit to ensure consistency.

At each demonstrator site, the actual carbon generated by the activities will be measured using agreed carbon calculators and the results of the M&E activities. As projects will be located across multiple authorities, and undertaken by different contractors, we will agree a consistent approach to measurement. This will include:

- Using the FHRG carbon calculator across all demonstrators
- Using shared data sets for carbon information as appropriate
- Having a clearly defined scope – what elements of the service are included within the calculations, and which are excluded. This will be aligned to international standards, as well as the FHRG guidance for measurement of Scopes 1 & 2 (plus the guidance for Scope 3 which is currently in development)."

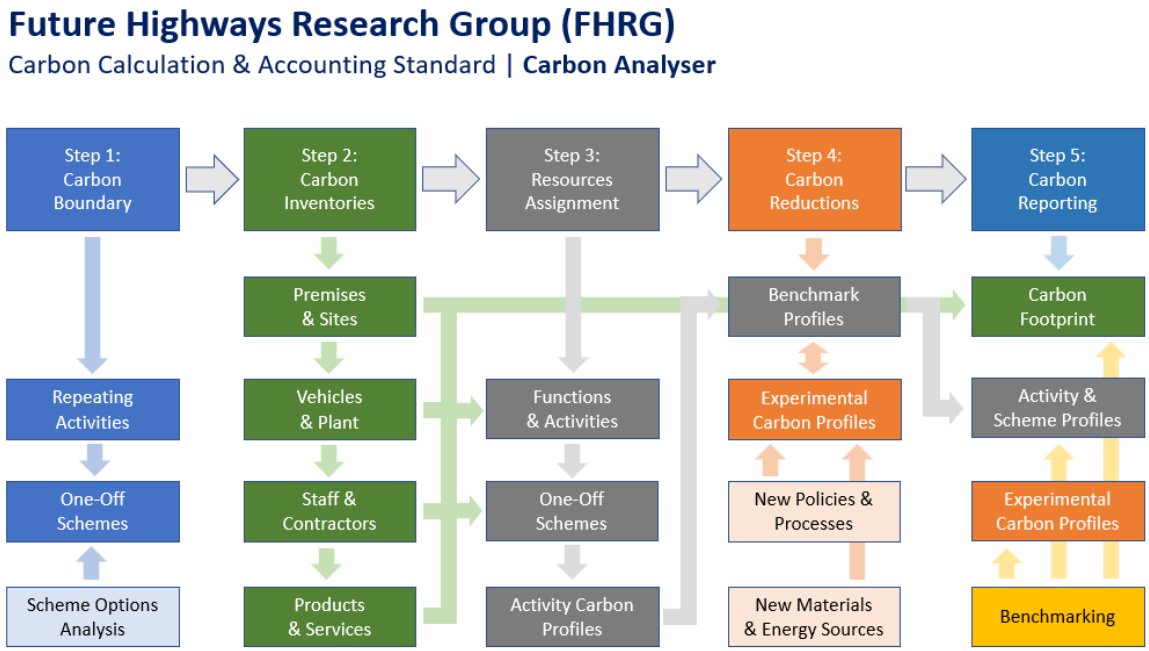
Carbon baselining approach

FHRG Carbon analyser tool is used for the carbon baselining process. FHRG CCAS (Carbon Calculation and Accounting Standard) recommends an Inventory-Based Carbon Accounting approach, supported by Activity Based Carbon Analysis.

1. The inventory-based carbon accounting method. This method entails calculating carbon emissions by considering inventories of all significant sources of emissions. This includes resources directly owned or controlled by the Local Authority, as well as emissions stemming from supply chain partners.
2. The activity-based carbon analysis method. This method calculates carbon emissions based on the activities commissioned and completed on highways throughout the reporting year. This method may be applied to all activities within the service or selectively to specific activities that require closer examination and potential redesign.

Data collection for inventory-based carbon baselining

For 3 of the 7 Local Authorities inventory-based carbon accounting methodology was used for carbon baselining. For the rest of the Local Authorities carbon baselining will be conducted on activities where trials are carried out.



Data was collected for the following categories:

Premises & Sites Inventory

- Electricity, water, gas readings, and fuel usage for all LHA owned or controlled premises or sites used to deliver the service.

Staff & Contractors Inventory

- Commute distance, vehicle fuel type
- No. of homeworking days

Vehicles & Plant Inventory

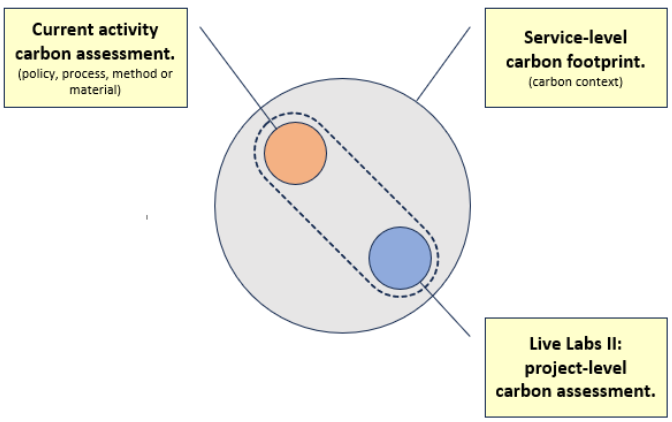
- Fuel or mileage for all owned, hired, leased or contractor-provided vehicles and plant.

Purchased Products & Services Inventory

- Quantities of all purchased products and services. This includes all construction and maintenance materials and treatments, third-party services, water, transport, and waste services.

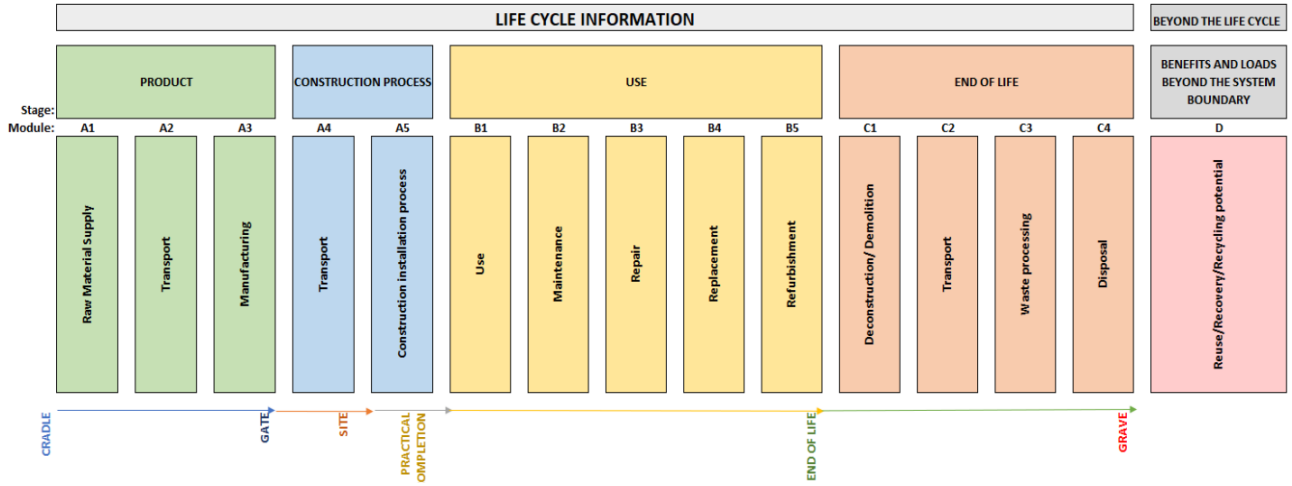
Roadshows were conducted in the WMCA Local Authorities to introduce the program and our approach to carbon evaluation. An Excel data proforma was sent out to all Local Authorities, however, most of them did not have the necessary data to send back. This was either due to a lack of resources or because their subcontractors did not provide the data. After discussions with FHRG on simplifying the process, a simplified proforma was created and sent out to the Local Authorities to forward to their contractors. Both expanded and simplified proforma data were used for carbon foot printing.

Data collection for activity-based carbon baselining



ADEPT / FHRG Research Partnership

Carbon calculation for the activity-based carbon baselining is based on the life cycle approach. Data is collected for all the 'A' stages and for the stages 'B' to 'D' depending on data availability.



Overview of the contractors and subcontractors in each Local authority

	Coventry	Dudley	Sandwell	Solihull	Walsall	Wolverhampton
Suppliers	Balfour Beatty Direct Labour Organisation (DLO)	J A Bates Colas Thomas Bow Aggregate Industries Kiely Bro's JPCS DLO	J A Bates Colas Thomas Bow Aggregate Industries Kiely Bro's JPCS DLO	Balfour Beatty Direct Labour Organisation (DLO)	Tarmac	J A Bates Colas Thomas Bow Aggregate Industries Kiely Bro's JPCS DLO

Collecting data proved to be a challenging task due to the complexity associated with the involvement of multiple Local Authorities and contractors. Each Local Authority has its own unique contract agreements.

Birmingham city council has it delivered through a PFI contract with Kier.

The highways maintenance contract for Coventry City Council and Solihull Metropolitan Borough Council is divided between the Council's Direct Labour Organisation (DLO) and Balfour Beatty (via Warwickshire CC contract).

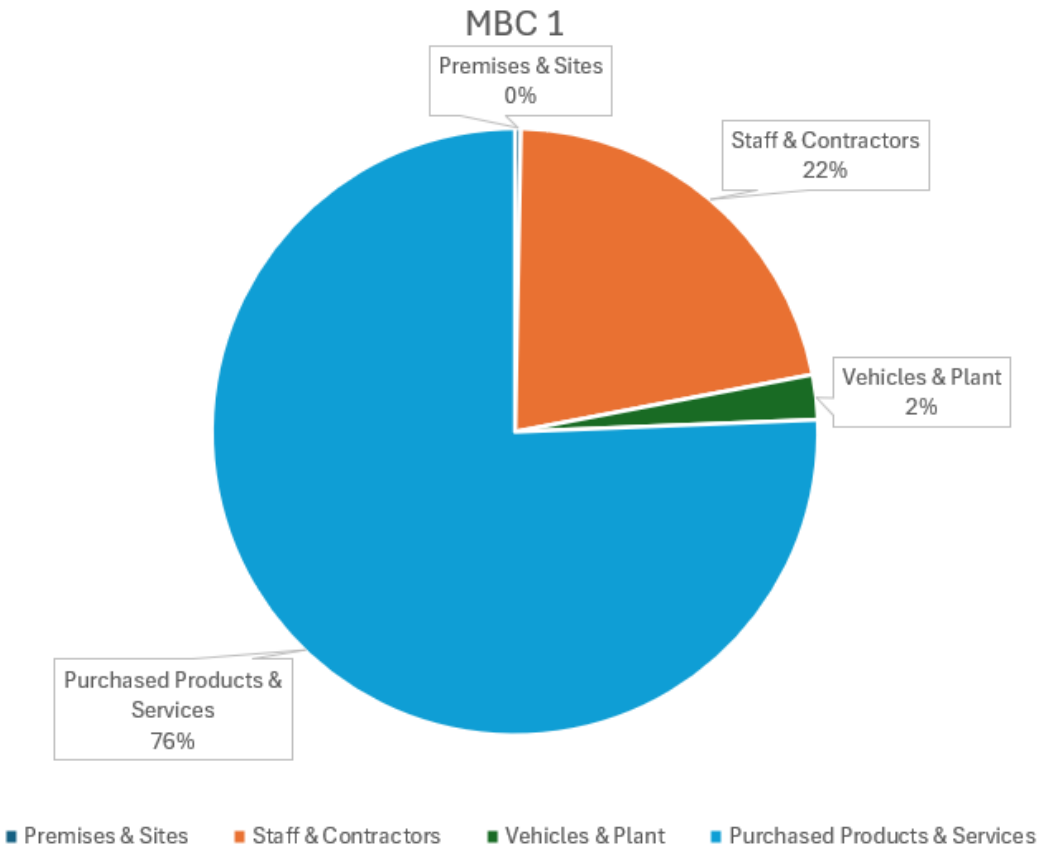
The highways maintenance contract for Dudley Metropolitan Borough Council, Sandwell Metropolitan Borough Council and City of Wolverhampton Council are managed with the Council's Direct Labour Organisation (DLO) and contractors who are part of the Black Country Framework. The highways maintenance contract for Walsall Metropolitan Borough Council are managed by Tarmac.

Challenges with Carbon baselining and Evaluation within WMCA

- **Reliance on Paper Records:** Some suppliers to Metropolitan Borough Councils (MBCs) are still heavily reliant on paper-based systems to manage various work tasks and historical job data. This occasional reliance poses a significant challenge in accurately tracking, recording, and evaluating carbon emissions. Paper records are often fragmented, making it difficult to consolidate data systematically. Additionally, the manual process is time-consuming, prone to errors, and lacks the transparency and ease of access that digital systems offer. The transition to digital record-keeping is crucial for more efficient and accurate carbon baselining and evaluation.
- **Funding Constraints:** Many MBCs experience budgetary challenges, having only just enough money to keep the network in a usable and safe condition, which directly impacts their ability to invest in the necessary tools and technologies for effective carbon data collection and analysis. Limited financial resources mean that these councils struggle to upgrade their systems, hire specialised personnel, and implement comprehensive carbon management strategies. Without improvements to work order management systems, the accuracy and comprehensiveness of carbon baselining maybe compromised in some areas, making it difficult to track progress and make informed decisions for emission reductions.
- **Inconsistent Emission Factors:** A significant challenge in carbon baselining is the inconsistency in emission factors used for different materials. For example, in the case of bitumen, Eurobitume, a leading authority on bitumen uses a lower carbon factor and other suppliers use higher emissions factors for bitumen. This discrepancy creates problems when comparing the carbon footprint of bituminous materials versus alternative materials, such as resin-based products. The lack of standardised emission factors across the industry leads to inconsistencies in carbon accounting and makes it challenging to perform accurate comparisons and evaluations. Aligning emission factors or adopting industry-wide standards could mitigate these issues and enhance the reliability of carbon baselining and evaluation.
- **Data Sharing Resistance Among Contractors:** Another significant challenge arises from some of the MBC's supplier's reluctance to share their carbon data with a a separate organisation for publishing. We have also found that the primary Tier 1 contractors of some of our local authority partners are reticent to share their carbon data with the Live Lab team, due to sharing intellectual property with potential competitors and so we have been unable to comprehensively model the Scope 3 emissions for a number of our LA partners.

Carbon Baseline Summary

Below is a partial carbon data summary obtained from three out of the seven Local Authority (LA) partners. Please note that these datasets are incomplete as the LAs were unable to provide a full set of data and some sections of their services lack data. Absolute numbers have been removed for now, and we will provide them once we have the complete dataset.



Carbon Statement Summary

Service
Highways [2022]

Functions & Activities
0 Functions
0 Activties

Vehicles & Plant
33 Items
130,573 kgCO2e

Premises & Sites
1 Sites
16,996 kgCO2e

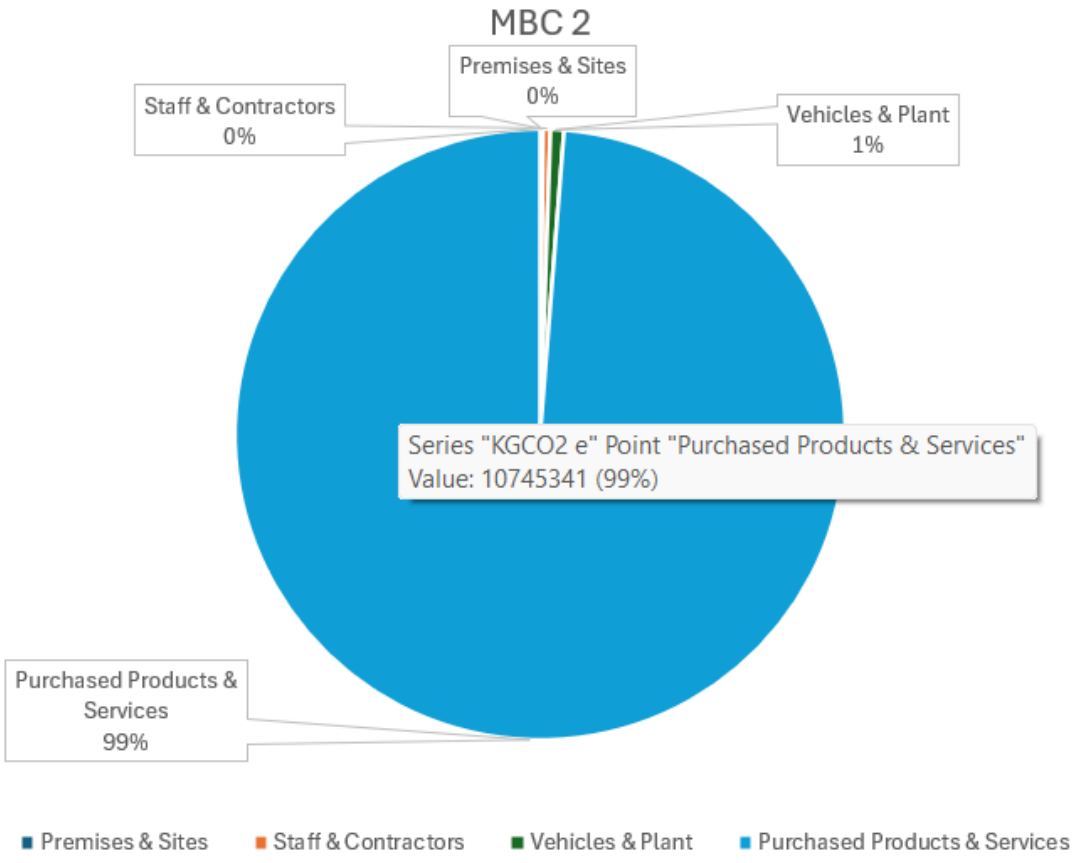
Purchased Products & Services
39 Items
4,133,095 kgCO2e

Staff & Contractors
7 Staff (Extrapolations)
1,183,943 kgCO2e

Projects & Schemes
0 Schemes
0 kgCO2e

Carbon Offsets
0 Items
0 kgCO2e

Total (kgCO2e)
5,464,607.6 kgCO2e



Carbon Statement Summary

Service
Highways [2022]

Future Highways Research Group

Functions & Activities
2 Functions
3 Activties

Vehicles & Plant
26 Items
77,406 kgCO2e

Premises & Sites
1 Sites
15,955 kgCO2e

Purchased Products & Services
45 Items
10,745,351 kgCO2e

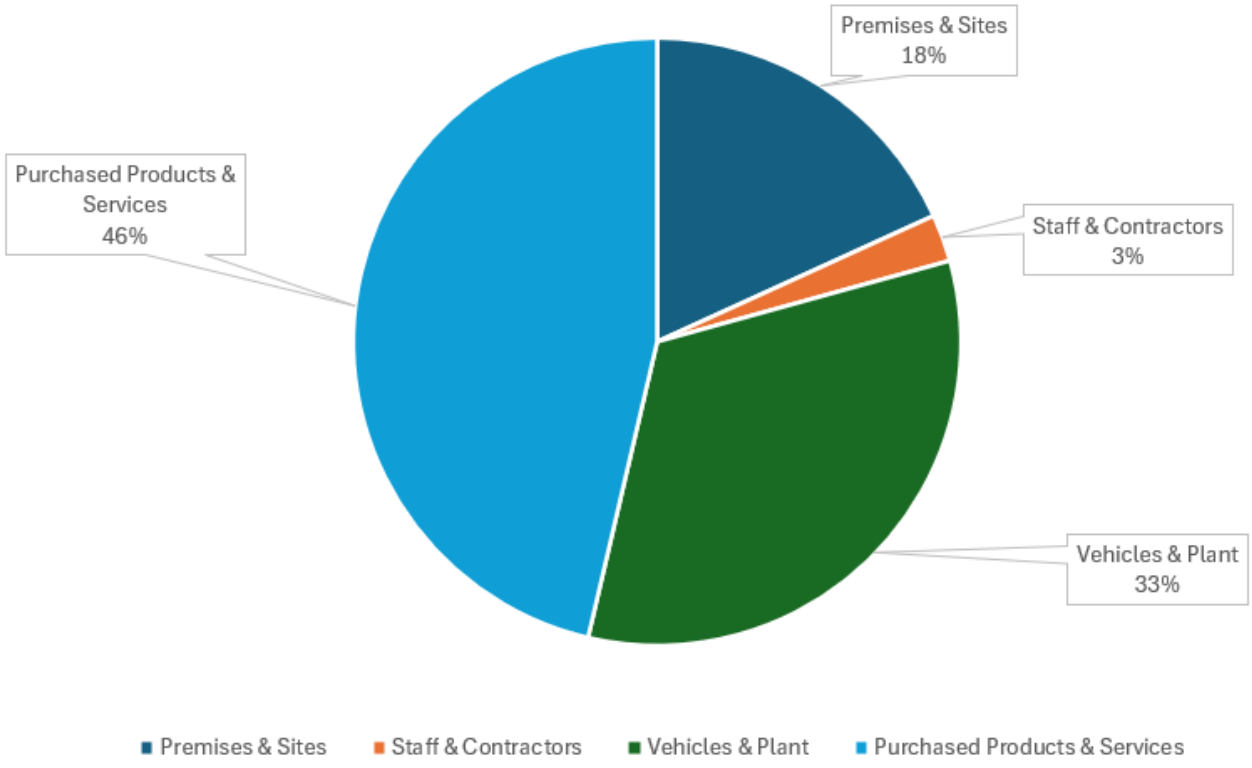
Staff & Contractors
43 Staff (Extrapolations)
42,680 kgCO2e

Projects & Schemes
Schemes
kgCO2e

Carbon Offsets
0 Items
0 kgCO2e

Total (kgCO2e)
10,881,393.0 kgCO2e

MBC 3



Carbon Statement Summary

Service
Highways [2022]

Future Highways Research Group

Functions & Activities
5 Functions
34 Activties

Vehicles & Plant
39 Items
550,418 kgCO2e

Premises & Sites
2 Sites
30,928 kgCO2e

Purchased Products & Services
18 Items
774,081 kgCO2e

Staff & Contractors
49 Staff (Extrapolations)
41,863 kgCO2e

Projects & Schemes
Schemes
0 kgCO2e

Carbon Offsets
0 Items
0 kgCO2e

Total (kgCO2e)
1,397,290.0 kgCO2e

Insights & limitations to the carbon baselining of the authorities of WMCA

When analysing the outcomes within the West Midlands Authorities, it is essential to consider certain limitations and insights: These include:

Data Availability: The availability of data varied across the different authorities. Some authorities have incomplete datasets or missing data, which can impact the accuracy and comprehensiveness of the findings.

Out of the seven Local Authorities in the West Midlands Combined Authority (WMCA), only two have completed the carbon baselining process. This means that comprehensive data has been collected and analysed for these two authorities.

One Local Authority has partially completed the carbon baselining since one of their contractors has not yet submitted the required data. As a result, the carbon baselining for this authority is incomplete until the missing data is provided. Additionally, one Local Authority was unable to complete their baseline as they did not participate in any of the Live Lab activities.

The remaining two Local Authorities did not have sufficient resources or time to submit their data for carbon baselining. However, they did actively participate in the trials conducted. To still assess their carbon impact, activity-based carbon baselining will be performed for these authorities. The results of this baselining will be released once the benchmarking data collection is complete.

Data Quality: As the data was completed using a simplified data proforma for some Local Authorities, generalised carbon factors were used, and extrapolations and assumptions were made on staff commute data.

Resource Constraints: Limited resources, such as time and human resources have affected the ability of the authorities to collect and provide comprehensive data. This has led to gaps or limitations in the analysis and understanding of certain aspects.

Generalisability: The findings are specific to the West Midlands Authorities and may not be directly applicable to other regions or contexts. It is important to consider the unique characteristics and circumstances of each authority when interpreting the results.

Confidentiality and Anonymity: To protect confidentiality and anonymity, certain information have been anonymised or removed, which could limit the level of detail or specificity in the findings. Due to concerns raised by the contractors responsible for highway maintenance activities, sharing a detailed breakdown of the carbon baseline is not possible. Instead, only an overall percentage is shared to provide a general understanding of the carbon impact. This decision was made to respect the contractors' preferences and maintain their confidentiality.

Conclusion

Through meticulous trials and evaluations of various innovative materials and techniques, CEDR endeavours to establish a comprehensive, comparative framework that transcends the limitations of isolated, siloed testing practices. The systematic carbon baselining efforts, supported by tools like the FHRG Carbon Analyser and methodologies such as the Inventory-Based Carbon Accounting and Activity-Based Carbon Analysis, aim to provide an accurate measure of the carbon footprint associated with different road maintenance activities. Despite encountering significant challenges—including reliance on outdated paper records, inconsistent emission factors, and resistance to data sharing—the initiative has made commendable progress. Notably, the collaboration with esteemed academic institutions and industry experts adds a layer of rigor and credibility to the findings.

However, the insights and limitations identified, such as varying data quality and availability across local authorities, emphasise the need for a unified, standardised approach to data collection and reporting. Moreover, addressing resource constraints and fostering a more cooperative data-sharing environment among contractors are critical to enhancing the reliability and completeness of the carbon baseline assessments.

As the project advances, the ongoing engagement with Local Authorities and contractors, coupled with the iterative refinement of methodologies, will be vital. Future efforts should focus on overcoming identified barriers, enhancing data collection processes, and ensuring that comprehensive, high-quality data is available for all participating authorities. This will not only bolster the robustness of the project's findings but also facilitate the broader implementation of best practices and innovative materials, thus accelerating progress toward net-zero targets.

In conclusion, CEDR's work is laying a foundational stone for a future where sustainable and decarbonised road infrastructure is the norm. By continuing to address current challenges and leveraging the collective expertise of its partners, CEDR is well-positioned to set new standards in the industry, fostering a resilient, low-carbon future for the UK's roadways.

Appendices

MBC 1 Baseline

MBC 1 Carbon baseline

MBC 2 Baseline

MBC 2 Carbon Baseline

MBC 3 Baseline

MBC 3 Carbon Baseline