HIAM SSD/CMP

HIAM Carbon Management Plan

2022

VERSION 1

Swindon
BOROUGH COUNCIL

Contents

1.0 Context 1
2.0 Introduction 2
3.0 Scope 5
4.0 Asset Considerations 5
4.1 Context 5
4.2 Carriageways 6
4.3 Road markings and High Friction Surfacing 6
4.4 Footways and Cycleways 6
4.5 Highway and Off-Highway Structures 6
4.6 Drainage Assets 7
4.7 Street Lighting and Illuminated Assets 7
4.8 Non-Illuminated Signs and Street Furniture 8
4.9 Traffic Signal Assets 8
5.0 Activity Considerations 8
5.1 Overview 8
5.2 Major Highway Improvement Works 9
5.3 LTP Highway Improvement Works 10
5.4 Planned Routine Maintenance 10
5.5 Preventative Maintenance 11
5.6 Cyclic Maintenance 11
5.7 Reactive Maintenance 11
6.0 Methodology to Measure and Estimate Carbon 12
7.0 Methodology to Reduce Carbon 14
7.1 Carbon Reduction Hierarchy 14
7.2 Carbon Reduction Methodology 16
7.3 Setting Targets 16
7.4 Establishing the Maintenance Strategy 16
7.5 Estimation of the Carbon Cost of Projects 17
7.6 Performance Measurement and Monitoring 17
7.7 New Infrastructure Construction 18

8.0 Embracing the Challenge 18
8.1 Key Stakeholders 18
8.2 Key Stakeholders: SBC 19
8.3 Key Stakeholders: Suppliers 20
8.4 Key Stakeholders: Designers and Contractors 20
9.0 Next Steps 21
10.0 Programme and Resources 23
11.0 Monitoring and Review Process 25
12.0 Bibliography 26
Appendix 1: Detailed Carbon Measurement and Estimation Methodology 28

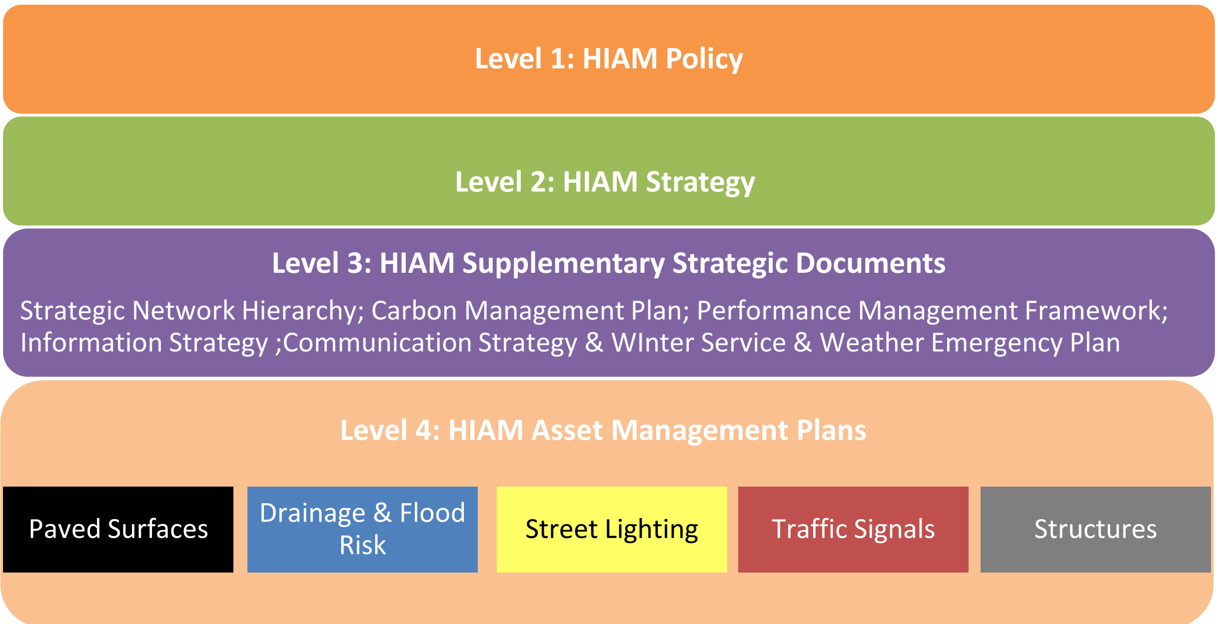
1.0 Context

The Vision for Swindon 2030 sets out how Swindon Borough Council (SBC) will shape the borough and deliver the growth to allow the community to prosper. To deliver the vision, SBC has developed a series of priorities and pledges, which enable officers to prioritise their work.

These priorities and pledges have been used to influence the Highway Infrastructure Asset Management (HIAM) Policy and Strategy, which have been approved by Cabinet and are available to view on the SBC website. A suite of Supplementary Strategic Documents (SSD's) including asset specific operational; inspection; maintenance and management plans for existing highway assets support these high-level documents.

This HIAM Carbon Management Plan is one of the key SSD's. A summary of the HIAM Asset Management Framework and status of this SSD within the hierarchy of this suite of documents is illustrated in figure 1.

Figure 1: SBC HIAM Documents Suite - Hierarchy



2.0 Introduction

At the UN Climate Change Conference (COP21) in Paris, 2015, a landmark agreement was reached to combat climate change and accelerate a sustainable low carbon future through limiting global warming to well below 2 degrees celsius, compared to pre-industrial levels. Within this context, the UK has committed to achieve ‘net zero’ carbon emissions by 2050 and the UN Climate Change Conference (COP26) in Glasgow, 2021, aimed to accelerate action to achieve the Paris Agreement goals.

In July 2021, the Department for Transport (DfT) published Decarbonising Transport: A Better, Greener Britain. This plan details the steps that need to be taken for transport and infrastructure to help realise the vision for a net zero future. Within the plan, the DfT committed to publishing a toolkit of guidance and information to help local authorities build business cases, develop innovative sustainable transport policies, secure funding and deliver measures on the ground. When released, the guidance in the DfT toolkit will be adopted where possible within the scope of this plan or will be incorporated into a revised version.

Swindon Borough Council (SBC) pledged to bring down greenhouse gas (GHG) emissions to net zero by 2030, 20 years ahead of the UK Government target and have made a low carbon environment a central part of the Vision for Swindon, 2030.

In order to deliver the Vision for Swindon 2030, SBC has developed a series of priorities and pledges, which will enable Councillors and Officers to prioritise their work and ensure that SBC is using its resources effectively.

Priority Three, Pledge Eight specifies that:

Priority 3, Pledge 8:	**‘We will continue our war on potholes to ensure that our highways are safe for all road users and do all we can to improve our roads and car parks.’**

Priority Five states that SBC will:

Priority Five:	**'Make Swindon greener and more sustainable: we will help residents reduce their environmental impact and, as a council, we will aim to achieve net zero emissions by 2030.'**

In 2020, SBC developed a Carbon Reduction Strategy, which sets out the steps which SBC need to take to become a carbon neutral organisation, including:

- Reviewing and calculating all SBC construction activities; materials used; and energy consumed to determine a baseline (detailed in figure 2);
- Reducing the emissions from SBC construction activities (detailed in figure 4); and
- Ensuring that SBC construction policies align with the authority's net zero carbon ambitions.

The Vision for SBC to be a net zero organisation by 2030 is a very challenging deadline. This is because Highway infrastructure is by far the largest and most valuable physical asset which the authority owns.

In addition, there is comparatively finite guidance or learning which can be adopted from other organisations within the highways and construction sector. This is due to the fact that some of the major participants, for example National Highways (formerly Highways England), have thus far only committed 'to delivering net zero road maintenance and construction by 2040' for the major roads network.

As a result, SBC must be at the forefront of carbon management in Highway Infrastructure and ensure that carbon management is reflected in all of our Policies; Strategies and Plans. We must ensure that this plan is adequately resourced and that all parts of the organisation commit to making significant progress as quickly as possible.

In this regard, a HIAM Policy has been developed which will be presented to Cabinet for approval at the same time as this Carbon Management Plan. The HIAM Policy reflects the six priority areas of the Vision for Swindon 2030 and will ensure that highway assets are managed in a manner that will enable SBC to reach carbon neutrality by 2030.

HIAM Policy Statement 5 details that:

Statement 5: 'We will ensure that proposals for new highway infrastructure promote sustainable travel choices. We will develop a highways specific carbon management plan to measure the impact of our activities and work to become carbon neutral by 2030.'

These Policy Statements are supported by **Defined Service Levels** which enable SBC to track progress against achieving the vision.

The Service Levels, which require the management of carbon, include:

- **Service Level 1:** Increase the resilience of key transport routes and promote consistent journey times;
- **Service Level2:** Protect and enhance Swindon's character;
- **Service Level 3:** Keep Swindon moving safely,
- **Service Level 5:** Make Highways greener and more sustainable; and
- **Service Level 6:** Ensure Highways are accessible; facilitate healthy travel choices, and are safe.

A HIAM Strategy has been prepared to identify how the statements and service levels in the HIAM Policy influence investment decisions and the planning of management; construction and maintenance activities.

The core concepts championed in the HIAM Strategy have been used to develop a suite of management and operational plans including this HIAM Carbon Management Plan, which will be used to direct the management of existing highway infrastructure.

3.0 Scope

This HIAM Carbon Management Plan covers the work that needs to be carried out in the next three years to understand and minimise the carbon footprint associated with managing highway infrastructure. Once the proposals in this plan have been actioned, this plan will be refreshed to reflect upon progress and to determine how the authority may offset any unavoidable carbon costs that remain, to net zero before 2030 in line with the strategic vision.

The scope of this plan is restricted to the management of carbon in existing highway infrastructure using assured long-term revenue and capital funding streams. It does not consider the management of carbon in projects subject to one-off funding such as competitive grants or regional Local Enterprise Partnership (LEP) support as this funding is not assured and the scale of these projects could skew the plan significantly.

This plan and any learning made when implementing it will be shared across SBC with a view to adopting a similar process during the design and construction of other infrastructure and public realm projects.

4.0 Asset Considerations

4.1 Context

The highway infrastructure in Swindon is the biggest capital asset that SBC own. It is valued at well over £1 billion pounds and is vital to the town's economic and social prosperity. Highway infrastructure assets include carriageways; footways; cycleways; structures; drainage; street lighting and traffic signals.

It is important to plan for the whole-life management of carbon early in the design process for highway infrastructure, as there can be a high level of initial embodied carbon in the materials and techniques that are traditionally specified. Decisions made in the design process that have not been given adequate consideration to the carbon cost of operating; maintaining and decommissioning these assets can lock in substantial costs later in the lifecycle that cannot be avoided.

4.2 Carriageways

SBC manages around 820 km of carriageways, which are primarily constructed from natural aggregates; bitumen and concrete. The quantity of these carriageway materials and the requirement for carriageway surfaces to be frequently maintained, indicates that this asset group is likely to have the highest total carbon cost.

4.3 Road markings and High Friction Surfacing

Road markings; coloured surfacing and high friction surfacing is present on many carriageways and cycle-ways. These assets are commonly melted and screeded whilst hot but in some applications they may be cold laid adhesive compounds spread with a paddle. Markings are constructed from thermoplastic; natural aggregates; bauxite ore; glass; chemical adhesives and pigments. The quantity of these assets and the requirement for them to be frequently maintained, indicates that this asset group is likely to have a significant carbon cost.

4.4 Footways and Cycleways

There are around 1200 km of footways and cycleways managed by SBC, which are primarily constructed from natural aggregates; bitumen and concrete. The quantity of these footway and cycleway materials and the requirement for the assets to be frequently maintained indicates that this asset group is likely to have a substantial carbon cost.

4.5 Highway and Off-Highway Structures

SBC manages in excess of 300 highway and off-highway structures, including bridges; retaining walls; culverts and multi-storey car parks. Structures are primarily constructed from natural aggregates; concrete; brick; steel and timber but can include bespoke elements. The codes that structural assets are designed to and the durability of materials from which they are constructed, mean that they may be less frequently replaced than other assets. Notwithstanding this, the quantity and type of materials utilised in each structure indicates that this asset group is still likely to have a substantial carbon cost.

4.6 Drainage Assets

Drainage assets within the borough comprise of approximately 36,000 highway gullies and associated drainage assets including chambers; grips; pipe connections; highway drains and ditches. Drainage assets are primarily constructed from natural aggregates and earthworks; concrete; clay; ductile steel and brick.

The quantity of materials used to construct drainage systems and their requirement for frequent cyclic and reactive maintenance indicates that this asset group is likely to have a substantial carbon cost.

4.7 Street Lighting and Illuminated Assets

There are approximately 30,000 street lighting columns; illuminated signs; subway units and bollards within the borough. Illuminated signs include fixed regulatory and advisory signs; Vehicle Activated Signs (VAS); Flashing Warning signs (for schools), Variable Message Signs (VMS) for car park occupancy and for traffic management messages. These Illuminated assets are primarily constructed from steel; concrete; glass; aluminium; copper and plastic.

The quantity of materials used to construct illuminated assets and their requirement for frequent cyclic and reactive maintenance and replacement indicates that this asset group is likely to have a substantial carbon cost.

Electricity usage from illuminated assets, even when generated from renewable supplies has one of the largest and most direct impacts on the embodied carbon of the Council of any service. For this reason, in 2020 and 2021, SBC replaced the majority of inefficient luminaires with Light-Emitting Diode (LED) alternatives to realise in the region of a 60 per cent energy saving compared to the 2019 baseline.

4.8 Non-Illuminated Signs and Street Furniture

There are in excess of 13,000 non-illuminated signs and poles and a wealth of other street furniture equipment such as pedestrian guardrails; safety fencing; bollards; street name-plates; benches; stiles; gates and bus shelters. These assets are primarily constructed from steel; aluminium; concrete; glass; timber and plastic. The quantity of materials used to construct street furniture assets and their requirement for frequent cyclic and reactive maintenance and replacement indicates that this asset group is likely to have a substantial carbon cost.

4.9 Traffic Signal Assets

SBC manages around 200 traffic signal sites including Junctions; Puffin; Toucan; Pegasus, and Pelican crossings. Traffic signal assets are primarily constructed from steel; concrete; glass; aluminium; copper and plastic. The quantity of materials used to construct traffic signal assets and their requirement for frequent maintenance and replacement due to obsolescence signifies that this asset group is likely to have a substantial carbon cost.

Electricity usage from traffic signal assets, even when generated from renewable supplies has a large and direct impact on the embodied carbon of the authority. For this reason, over 50 per cent of these assets have been converted to Extra-Low Voltage (ELV) and LED.

It is planned that the remainder will be converted as soon as practicable to promote lower carbon costs.

5.0 Activity Considerations

5.1 Overview

To ensure that highway infrastructure assets remain fit for purpose, they are improved and maintained throughout their life. Works are prioritised and programmed in accordance with Local Transport Plan (LTP); regional development plans or the HIAM Policy and HIAM Strategy to ensure that any investment contributes to the delivery of the Vision for Swindon 2030 and the Priorities and Pledges contained therein. Typical activities that are carried out include:

- Highway improvement works;
- Planned routine maintenance;
- Preventative maintenance;
- Cyclic maintenance; and
- Reactive maintenance.

5.2 Major Highway Improvement Works

Major Highway improvement works are usually integrated projects that have been identified in the SBC Local Plan; LTP; or regional Local Enterprise Partnership (LEP) plans. They often make improvement to all the asset groups within identified zones and can afford the opportunity to realise a wide range of benefits. These may include improvements to:

- Efficiency;
- Capacity;
- Accessibility;
- Safety;
- Sustainability;
- Serviceability;
- Resilience; or
- Appearance.

Projects may be funded using locally available capital funds, regional (LEP) funding or competitive grant funding. Examples of major highway improvement works include constructing new link roads or widening carriageways to increase capacity.

5.3 LTP Highway Improvement Works

Minor Highway improvement works are usually integrated projects that have been identified in the SBC Local Transport Plan (LTP) and pursuant Local Cycle and Walking Infrastructure Plan (LCWIP) or Road Safety Plans. They often make improvement to all the asset groups within identified zones and can afford the opportunity to realise a wide range of benefits. These may include improvements to:

- Efficiency;
- Capacity;
- Accessibility;
- Safety;
- Sustainability;
- Serviceability;
- Resilience; or
- Appearance.

Projects may be funded using locally available capital funds or funding provided by Central Government through the revenue support grant.

Examples of minor highway improvement works include installing cycleways; installing bus or cycle priority measures and installing speed mitigation measures.

5.4 Planned Routine Maintenance

These comprise large refurbishment or renewal projects primarily affecting a single asset group and are usually capital funded. These projects are often prioritised after analysing objective condition surveys.

Treatments may involve replacing or refurbishing several asset components at once.

Examples include, deep resurfacing of carriageways or replacing street lighting columns and luminaires.

5.5 Preventative Maintenance

Preventative maintenance works are typically capital funded. These projects are often prioritised after analysing objective condition surveys. They are most advantageous early in the deterioration cycle of an asset where inexpensive and quick treatments can restore asset life or prevent further deterioration.

Often this type of treatment can be applied several times over successive years to keep assets in good condition.

Examples include surface dressing carriageways and painting steel structures.

5.6 Cyclic Maintenance

Cyclic maintenance works are typically revenue funded. This activity helps to maintain asset safety and serviceability by replacing small components; cleaning; sweeping; gritting; trimming vegetation and killing weeds.

Examples include safety testing and inspection of electrified assets; cleansing of highway gullies and regular cyclic servicing of pumps in the road underpasses.

5.7 Reactive Maintenance

Reactive maintenance works are typically revenue funded and include any activities that are essential to be undertaken swiftly to ensure that public safety is maintained.

This type of maintenance is discussed extensively in the Carriageway and Footway Inspection and Management Plan, which forms part of this suite of documents.

Examples include repairing potholes or replacing street furniture that has been damaged in a road traffic collision.

6.0 Methodology to Measure and Estimate Carbon

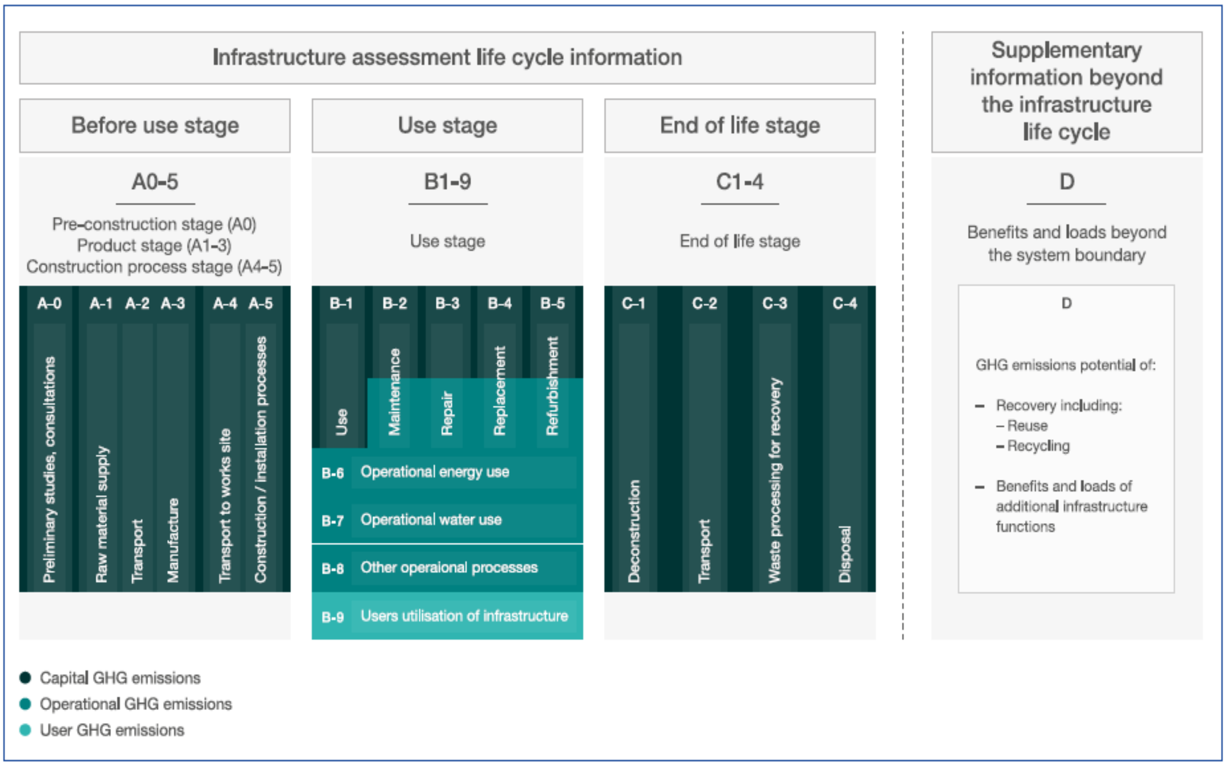
The Publicly Available Specification (PAS) 2050 (BSI, 2011) and PAS 2080 (BSI, 2016) are the key guidance documents outlining the processes and methodology involved in calculating whole-life carbon and the carbon cost of activities.

PAS 2050 focuses on the methodology of quantifying the lifecycle greenhouse gas (GHG) emissions of goods and services.

The principles in this specification will be used throughout the carbon assessment to ensure that the carbon calculations align with best practice.

The modular approach from PAS 2080 (detailed in figure 2) will be used to analyse the whole-life carbon cost of past, ongoing, or future activities discussed in section 5.0.

Figure 2: PAS 2080 Modular Approach to Evaluate Lifecycle Carbon (BSI, 2016)



When calculating the whole-life capital GHG emissions of a scheme, three stages will be considered:

- Before-Use Stage: Considers the carbon costs of pre-construction investigations and consultations; of the products specified and of the construction process;
- Use Stage: Considers the carbon costs of operating the asset, including energy and water use and any maintenance processes and the carbon costs of users utilising the assets; and,
- End of Life Stage: Considers the carbon cost of deconstructing the assets, including the transport and processing of waste.

A detailed carbon estimation and measurement methodology of each of these three stages is outlined in appendix 1.

7.0 Methodology to Reduce Carbon

7.1 Carbon Reduction Hierarchy

In order to reduce the carbon cost of projects, the carbon emissions reduction hierarchy (PAS 2080), will be applied as illustrated in figure 3. The methodology in figure 3 was established to assess the whole asset lifecycle and the same overarching principles may be applied to the improvement and maintenance of existing assets.

Figure 3: Carbon Emissions Reduction Hierarchy for Infrastructure Lifespan (BSI, 2016)

Figure 4 details how the hierarchy for constructing new assets may be applied to the management of existing assets.

Figure 4: Activity Hierarchy for the Construction of New Assets and Management of Existing Assets

Constructing New Assets	Management of Existing Assets	Action	Potential Activity Using the Carriageway Asset as an Example
Building Nothing	Maintaining existing assets in the most carbon efficient way	Calculate a carbon baseline and use it to set targets.	Calculate the carbon cost of all carriageway works undertaken in a recent (pre-Covid) financial year where funding and programmes remained stable.
Building Less	Focussing construction efforts on critical infrastructure	Carry out lifecycle modelling to establish a maintenance strategy.	Refine and update the 2018 financial life cycle modelling to understand the carbon impact of different treatment strategies. For Example: over the whole lifetime of a road, is it more carbon efficient to surface dress the top surface every 8 years or to excavate and fully resurface every 20 years?
Building Cleverly	Using low-carbon materials	Develop a database to estimate the carbon cost of different options.	Investigate the whole life carbon cost of different materials and identify optimum whole life treatments for a range of scenarios. For example, warm asphalt is likely to require less upfront carbon cost but it may be unsuitable for use or deteriorate far quicker in some applications resulting in higher carbon cost than hot asphalt.
Building Efficiently	Using low-carbon construction methods		
Operating, maintaining and decommissioning efficiently	Applying low-carbon solutions to the appropriate activities	Monitor carbon costs during projects against estimates; report findings and use data to refine the estimation database or targets to drive further improvement.	Designers will be able to use the carbon database at feasibility and detailed design stages to calculate the baseline carbon cost of a project using generic asphaltic materials and estimated quantities. Project managers will liaise with contractors to re-measure completed works and supply actual manufacturer product data and waste tickets. Project Managers will report the carbon cost to Project Board against the project carbon baseline as a project progresses.

7.2 Carbon Reduction Methodology

Applying the methodology in section 6.0 and appendix 1, SBC will undertake a carbon baselining exercise based on a full year of historical schemes containing all assets detailed in section 4.0 and all activities detailed in sections 5.3 to 5.6. The sample will include all activities and projects that were carried out with revenue and LTP capital support grant funding.

Projects funded by one-off funding, such as competitive grants or regional LEP support, will not be included in this phase as the funding is not assured and the scale of these projects could significantly skew the baseline.

Baselining using reasonably assured long-term funding streams will allow SBC to identify key carbon contributors and understand how carbon can be effectively and practically reduced.

7.3 Setting Targets

Once the carbon has been calculated for each asset and activity, the activities can be ranked to identify the key contributors. This will highlight to Officers which activities offer the biggest opportunities to save carbon and at what point in the lifecycle of each asset can most of the carbon be saved. Using their knowledge of the service, the data can also help Officers to identify which savings are easier to achieve quickly and which may take years to realise. Once this assessment process has taken place, an annual target performance metric for each asset and activity will be set, aligning to the overarching net zero 2030 target.

7.4 Establishing the Maintenance Strategy

The data collected during the carbon baselining process will be used to complete lifecycle modelling to ascertain which design and maintenance options provide the optimum balance between financial cost and carbon cost for the remaining life of each asset and group.

The lifecycle modelling will be considered during the Strategic and Tactical Level planning process as detailed in the HIAM Strategy. This will enable Senior Decision Makers to allocate an appropriate proportion of any available funding to the asset groups where the most benefits may be realised. It will also enable asset engineers to target the funding at a high level towards the optimum balance of treatments to maximise the impact of the allocation.

7.5 Estimation of the Carbon Cost of Projects

SBC will follow the methodology in PAS 2080 when considering options to improve and maintain existing highway infrastructure by developing a bespoke carbon database to estimate carbon usage in the initial design phase.

During the design optioneering process, the carbon database will be used to compare the carbon costs of initial design and maintenance options.

Once the optimum design is selected, the initial cost estimates may be further refined in the detailed design stage.

The carbon estimation database will remain a live tool, which is constantly added to and refined as new projects are considered and designed. Carbon values obtained from material suppliers and contractors during construction will be used to track actual usage against the estimates and to help refine the estimation database.

7.6 Performance Measurement and Monitoring

During construction, the use and transportation of materials as specified in the Bill of Quantities and disposal of materials will be monitored. Once schemes are completed, the initial and detailed estimates will be reconciled with the actual quantities and included in the annual HIAM Asset Status Report. The results will also be used to progressively refine the estimation process.

Performance will be reported during the year by adapting the Project Governance process to report carbon performance data from live schemes along with metrics of cost, quality and time to Project and Operational Boards. The governance process will be used to highlight where carbon has not been sufficiently reduced and enable improvements to be made on future schemes to reduce carbon or amend targets.

7.7 New Infrastructure Construction

Although the scope of this plan is restricted to the management of carbon in existing highway infrastructure using assured long-term funding streams, the learning will be shared across the authority with a view to adopting a similar process during the design and construction of other infrastructure and public realm projects that are financed with one-off funding.

Ensuring that lifecycle modelling of the carbon and financial cost of new infrastructure is carried out at the design stage will enable senior decision makers and asset engineers to ensure that assets proposed for adoption do not lock the authority in to excessive financial or carbon costs later in the lifecycle.

8.0 Embracing the Challenge

8.1 Key Stakeholders

The process of highway carbon reduction relies on the collaborative efforts of a wide range of key stakeholders. These include the wider authority as a client organisation and manager of a wide range of:

- Publicly owned property;
- Infrastructure; and
- Environmental Assets.

SBC will work in partnership with other stakeholders to deliver the plan, including Suppliers; Designers and Contractors.

Each key stakeholder has a significant role to play in meeting the carbon reduction targets set by the authority.

8.2 Key Stakeholders: SBC

It is vital that key stakeholders across the authority work together to identify and implement low carbon initiatives and reduce highway carbon. Key stakeholders include:

- HIAM Asset Managers;
- Project Managers;
- Designers;
- Procurement Services;
- Legal Services and
- Operational Services.

Key stakeholders will need to work together to develop:

- Enhanced asset management practices to minimise carbon intensive maintenance procedures and maximise asset longevity;
- Innovative design promoting the utilisation of less and/or low-carbon materials and activities such as reducing the amount of excavation;
- Better specification including the sourcing of products within the UK or from as locally as possible to minimise transportation carbon costs;
- Proficient procurement procedures which ensure that the quality evaluation process rewards tenderers who invest in carbon reduction throughout their organisation;
- Value-added contracts, for example incentivising contractors to propose and adopt lower carbon techniques and materials; and
- Improved operational management, for example the use of low-carbon plant and equipment.

8.3 Key Stakeholders: Suppliers

By means of the procurement process, SBC can request suppliers provide Environmental Product Declarations (EPD) for their products to quantify the carbon cost of materials specified. An EPD is a third party verified Lifecycle Assessment carried out in accordance with the requirements of BS - EN15804. Should EPD's be unavailable, technical drawings; method statements and/or information on the breakdown of different components and their source would be required to estimate and/or track the product embodied carbon.

8.4 Key Stakeholders: Designers and Contractors

SBC will engage in Early Contractor Involvement (ECI) and soft-market testing during the procurement process to ascertain how carbon may be reduced and learn about any advances in materials and processes.

Tenders will include questions related to quality in order that SBC may understand the progress made by tenderers in minimising the carbon footprint of their organisation and the subsequent works being undertaken.

Tenders for professional services contracts will require design organisations to calculate the whole-life carbon and financial cost of design options using similar methodology to that detailed in this plan. Designers will be required to refine initial estimates once an option is selected as part of the detailed design phase.

Works information will include Key Performance Indicator (KPI) targets to set limits upon the amount of carbon that can be produced during the execution of the works based upon estimates made during the design phase and the results of the ECO and soft market testing.

After contract award and throughout the construction process, designers and contractors will be invited to propose the use of innovative materials and construction methods, which further limit or reduce carbon to align with the carbon emissions reduction hierarchy (detailed in figure 3).

Contractors will be requested to monitor and disclose data on the actual materials; construction plant; fuel type and consumption rates which are used during the execution of the works to allow SBC to monitor progress against the KPI targets set at tender stage.

In accordance with the requirements of the Environmental Protection Act (1990) and Duty of Care Regulations, contractors will be required to disclose the quantities; destination and treatment of any waste materials from the construction process. Monitoring of waste materials will ensure that the value of embodied carbon is retained where possible and the data will be assessed against a Performance Indicator (PI), aligned with the SBC Carbon Reduction Strategy.

9.0 Next Steps

The following actions are recommended as next steps to build upon this HIAM Carbon Management Plan:

1. Build resource plan and appoint responsible persons;
2. Conduct carbon baselining across all assets and activities using historical schemes that have been constructed with assured long-term funding;
3. Use baselining data to set appropriate carbon targets in line with SBC's 2030 net zero ambition;
4. Use baselining data to develop a bespoke database that can be used to estimate the carbon of different scheme design options at the feasibility and detailed design stages;
5. Liaise and educate internal teams including HIAM Asset Managers; Project Managers; Designers; Procurement; Legal and Operational Services teams to ensure that carbon saving initiatives are implemented during the planning; procurement; design and management of works;

6. Liaise with Stakeholders to set expectations to help manage and reduce highway carbon. This will also allow key stakeholders to provide feedback on the HIAM Carbon Management Plan and raise issues regarding their obligations;

7. Carry out lifecycle modelling across all assets to determine the type and proportion of treatments that will deliver the optimal long-term balance of cost and carbon;

8. Use lifecycle modelling to inform the Strategic and Tactical Planning stages identified in the HIAM Strategy to prepare and prioritise works programmes;

9. Use the carbon database to estimate and compare the carbon cost of options at design feasibility stage;

10. Use the carbon database to estimate the carbon cost of options at detailed design stage;

11. Collect supplier and contractor data to measure and monitor live schemes to evaluate actual carbon against estimates and to understand whether targets have been met;

12. Adapt the governance process to report carbon performance data from live schemes along with metrics of cost; quality and time to Project and Operational Boards;

13. Use the governance process to highlight where carbon has not been sufficiently reduced and understand whether further work is required on future schemes to reduce carbon or amend targets;

14. Report progress against these actions to Senior Decision Makers by means of the annual HIAM Asset Status Report to ensure that this strategy continues to reflect the latest capital funding; vision; and strategic objectives whilst providing maximum benefit to its residents and businesses;

15. Maximise the opportunities of being one of the service areas to develop detailed carbon management processes and share learning across the authority in conjunction with the corporate carbon savings team. Work together with other

service areas and departments to help them identify and implement low-carbon initiatives where appropriate; and

16. Once the proposals in this plan have been actioned and no later than 3 years' time, this plan will be refreshed to reflect upon progress and to determine how the authority may offset any unavoidable carbon costs that remain, to net zero before 2030 in line with the strategic vision.

10.0 Programme and Resources

As detailed in the introduction, the Vision for Swindon to be a fully net zero organisation by 2030 is a very challenging in terms of Highway infrastructure.

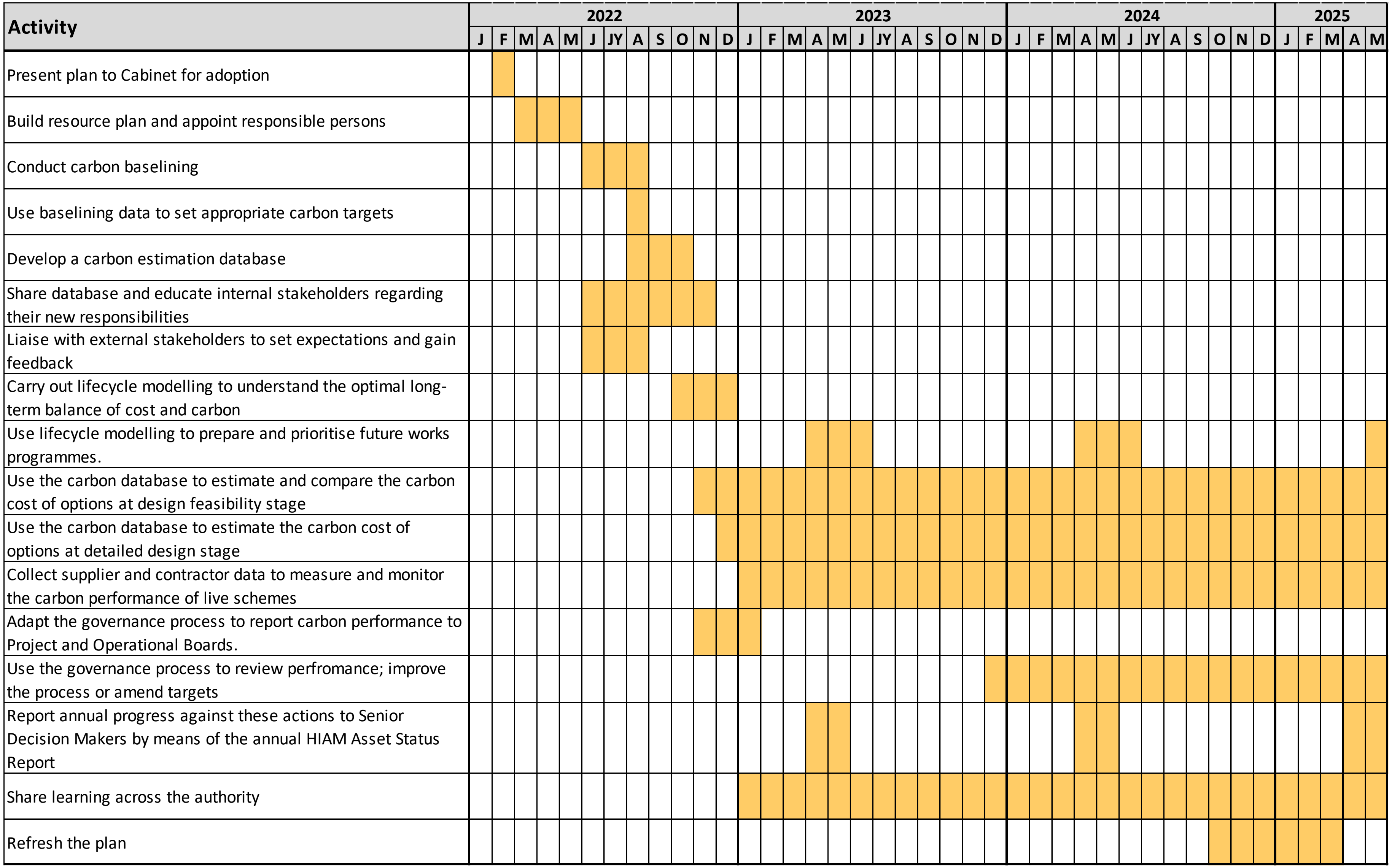
It is important that this plan is adequately resourced and that all parts of the service commit to making significant progress as quickly as possible.

This plan covers the work that needs to be carried out in the next 3 years to understand and minimise the carbon footprint associated with managing highway infrastructure.

Once the proposals in this plan have been actioned, this plan will be refreshed to reflect upon progress and to determine how the authority may offset any unavoidable carbon costs that remain, to net zero before 2030 in line with the strategic vision.

A high level programme against the identified activities in the plan is detailed in figure 5.

Figure 5: SBC Carbon Management Programme



11.0 Monitoring and Review Process

A summary of the progress made against the requirements of this plan will be included within the annual HIAM Asset Status Report. The report will disclose the volume of carbon that has been generated during the year from projects funded from routine Capital and Revenue budgets compared to the baseline and the target that has been set for the period.

This will enable Senior Decision Makers to track progress and reveal how much carbon is required to be offset by the service to achieve the Vision for Swindon to be a net zero organisation by 2030.

This HIAM Carbon Management Plan was published in 2022. It will be regularly monitored and reviewed in three years, or earlier, if there are any changes in legislation or policy which affect the content; or if the actions detailed herein are completed ahead of programme.

The review process will be managed and implemented by the SBC HIAM Group.

12.0 Bibliography

BSI (2011) PAS 2050: Specification for the assessment of the lifecycle greenhouse gas emissions of goods and services.

BSI (2014) PAS 2060: Specification for the demonstration of carbon neutrality.

BSI (2016) PAS 2080: Carbon management in infrastructure.

Swindon (2020) Carbon Reduction Strategy 2020. Available from: https://www.swindon.gov.uk/downloads/file/7017/swindon_borough_council_carbon_reduction_strategy_2020

Department for Business, Energy & Industrial Strategy (2020) Government conversion factors for company reporting of greenhouse gas emissions. Available from: https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting

Department for Business, Energy & Industrial Strategy (2018) Updated Short-Term Traded Carbon Values Used for UK public policy appraisal. Available from: https://www.gov.uk/government/publications/updated-short-term-traded-carbon-values-used-for-uk-policy-appraisal-2018

Department of Energy & Climate Change (2011) Guidance on estimating carbon values beyond 2050: an interim approach. Available from: https://www.gov.uk/government/publications/guidance-on-estimating-carbon-values-beyond-2050-an-interim-approach

Department for Transport (2021) Decarbonising Transport: A Better, Greener Britain. Available from:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1009448/decarbonising-transport-a-better-greener-britain.pdf

Hammond, G., & Jones, C., (2019) Inventory of Carbon & Energy (ICE) Version 3.0, Sustainable Energy Research Team (SERT), Department of Mechanical Engineering, University of Bath, United Kingdom. Available from: https://circularecology.com/embodied-carbon-footprint-database.html

Appendix 1: Detailed Carbon Measurement and Estimation Methodology

This appendix outlines the detailed carbon measurement and estimation methodology for the modules detailed in figure 2.

1.0 Before Use Stage

Module A0 (Preliminary Studies and Consultations)

To estimate the carbon of this module, the designer will provide a programme of the preliminary studies and consultations required. Carbon rates from the UK Government's GHG conversion factors database (2021) will then be applied to these activities. For example, the expected carbon implications of transportation of staff for site visits and the like within the design process will be considered. To track the carbon of this module, carbon rates from the GHG conversion factors database will be applied to the actual programme of the preliminary studies and consultations.

Modules A1-A3 (Raw Material Supply, Transport and Manufacture)

A carbon database will be used to estimate the carbon of these modules where product-specific information is unknown. An example is the Inventory of Carbon and Energy (ICE) (Hammond & Jones, 2019) which provides the 'cradle-to-gate' embodied carbon rate of common construction materials. 'Cradle-to-Gate' is the sum of carbon emissions from raw material supply, transportation, and manufacturing of the product (modules A-1 to A-3). When tracking the carbon estimated and product-specific information are known, the supplier's Environmental Product Declaration (EPD) will be used to ensure maximum accuracy. An EPD is a third party verified Lifecycle Assessment carried out in accordance with the requirements of BS - EN15804.

Module A4 (Transport to Works Site)

The GHG conversion factors database will be used to calculate the transportation carbon emissions. This database includes carbon emissions of freighting goods via van, heavy goods vehicle (HGV), flight, rail, and ship and are provided in kg CO_2e per tonne of transported goods and distance travelled (kgCO_2e / tonne.km). Where product-specific information is unknown, general sourcing data will be provided by the contractor. Known product-specific information on sourcing will be provided by the contractor and applied to the transportation carbon factors in the GHG conversion factors database.

Module A5 (Construction and Installation Process)

To estimate the carbon for Module A5, the expected fuel consumption of the construction plant required to undertake the construction activity will be calculated. When tracking the carbon, the contractor will provide fuel consumption data on the plant used to undertake the construction activity. The fuel carbon emission factors provided in the GHG conversion factor database, in kg CO^2e per unit of fuel, will then be used to calculate the construction carbon emissions.

2.0 Use Stage

Modules B1-B5 (Use, Maintenance, Repair, Replacement & Refurbishment)

To estimate the carbon, all maintenance activities throughout the life of the scheme will be identified and the carbon associated with the preliminary tasks, products, transportation, construction, and installation will be calculated through the methodology detailed in the 'Before Use Stage'. To track the carbon, the methodology will be applied to known information on the maintenance activities.

Modules B6-B8 (Operational Energy Use, Operational Water Use & Other Operational Processes

All operational energy; water and other fuel consuming activities will be identified throughout the life of the scheme, for example, electricity consumption of street lighting assets. The fuel carbon emission factors provided in the GHG conversion factor database, in kg CO_2e per unit of fuel, will then be applied to estimate the total carbon emission for Modules B6-B8. Known information will be applied to the carbon emission factors of the GHG conversion factor database to track the carbon.

Module B9 (User's Utilisation of Infrastructure)

The carbon cost of Module B9 can be calculated by applying carbon emission factors from the GHG conversion factors database to user utilisation activities. For highways, the utilisation activity is commuting, therefore traffic count data broken down into different modes is required. Expected or forecasted traffic count data will be used to estimate the carbon, whereas the actual traffic count data will be used to track it.

3.0 End-of-Life Stage

Modules C1 – C2 (Deconstruction & Transportation)

The carbon in the end-of-life stage will be estimated and tracked through:

- Plant usage, as detailed in Module A5, for Module C1 (Deconstruction); and
- Transportation, as detailed in Module A4, for Module C2 (Transportation)

Modules C3 – C4 (Waste Processing for Recovery & Disposal)

By applying carbon factors of waste recovery and disposal - from databases such as the GHG conversion factors or the Waste & Resources Action Programme (WRAP) carbon calculator - to disposal activities, the carbon of these modules can be calculated. Expected waste data will be used to estimate the carbon, whereas the actual waste data will be used to track it. Care will be taken when using these rates as to not double count the carbon from modules C1 and C2.

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