



Planning and Transportation Committee

ADDENDUM

Date: TUESDAY, 7 MARCH 2023
Time: 10.30 am
Venue: LIVERY HALL - GUILDHALL

15b) To note the draft minutes of the special Streets and Walkways Sub-Committee meeting on 14 February 2023 (Pages 3 - 10) **FOR INFORMATION**

18a) Consultation Responses and Finalisation of the Planning Advice Note: Whole Life-Cycle Carbon Optioneering (Pages 11 - 82) **FOR DECISION**

Items received too late for circulation in conjunction with the Agenda.

Ian Thomas
Town Clerk and Chief Executive

This page is intentionally left blank

STREETS AND WALKWAYS SUB (PLANNING AND TRANSPORTATION) COMMITTEE

Tuesday, 14 February 2023

Minutes of the meeting of the Streets and Walkways Sub (Planning and Transportation) Committee held at Committee Room 1 - 2nd Floor West Wing, Guildhall on Tuesday, 14 February 2023 at 2.30 pm

Present

Members:

Deputy Graham Packham (Chairman)
John Edwards (Deputy Chairman)
Alderswoman Susan Pearson
Deputy Shravan Joshi
Deputy Randall Anderson
Deputy Marianne Fredericks
Alderman Ian David Luder (Open Spaces Committee Appointed Member)

Officers:

Zoe Lewis	-	Town Clerk's Department
Jayne Moore	-	Town Clerk's Department
Simon Owen	-	Chamberlain's Department
Gillian Howard	-	Environment Department
Bruce McVean	-	Environment Department
Olumayowa Obisesan	-	Environment Department
Kristian Turner	-	Environment Department

1. APOLOGIES FOR ABSENCE

Apologies were received from Deputy Lord, Judith Pleasance, Oliver Sells and Ian Seaton. Oliver Sells KC observed the meeting virtually.

2. MEMBERS' DECLARATIONS UNDER THE CODE OF CONDUCT IN RESPECT OF ITEMS ON THE AGENDA

There were no declarations.

3. MINUTES

RESOLVED, That the public minutes of the meeting of 17 January be approved as an accurate record of the proceedings subject to the following amendments:

100 Minorities Phase Two: Public Realm Enhancements (pages 39-54 of the agenda pack)

The sentence, 'A Member asked for further clarification on the permeable paving to be used that limited water going into drains.' Be amended to read, 'A Member asked for further clarification on the permeable paving (that comprises resin/rubber material) to be used that allows some rainwater to pass directly into the ground, thereby reducing storm water flow into sewers.'

Vision Zero Plan 2023-2028 (pages 191-200 of the agenda pack)

The wording of the minute be revised to read as follows –

‘The Committee considered the report of the Executive Director, Environment.

A discussion ensued, during which the following points were made:

- Focus should be concentrated going forward on safe behaviours – approximately 50% of City accidents are caused by inattention, there are a significant minority of cyclists who flout the highway code and pedestrians who put themselves and others at risk by using their smart phones when crossing busy streets.
- A commitment to eliminate KSIs by 2040 is unachievable – this is an admirable aspiration which should be maintained - but we should not be committing to outcomes that we know are unrealistic.
- Proper enforcement of existing speed limits is critical, otherwise the benefit of recent reductions to 20mph is reduced;
- Lower speeds reduce the incidence of serious injury in the event of a collision;
- Consistent speed limits across boroughs would be welcome;
- A cyclist could reasonably expect to travel at 15mph so if the speed limit was reduced to 15mph, cyclists would feel safer and this would encourage cycling;
- Speed-limiting devices are currently fitted to about a third of TfL buses travelling through the City;
- It is important for the City to continue to be accessible to vehicles, particularly for those servicing our businesses;
- Further low-tech measures including pedestrian refuges which help traffic-calming are worth considering; and
- There are fewer pedestrian barriers and more dropped kerbs in the City than there used to be, which has altered the pedestrian environment.

A Member disagreed with elements of the draft Plan, noting the change of classification of serious injury and the cumulative effect to the City of the action points, including speed reductions that could negatively impact vehicle movement.

A Member asked whether evidence was available to support a reduction from 20mph to 15mph. The Committee heard that such figures were not currently available and heard that research strongly suggested that speed reductions reduced injuries. The Committee asked for further data on the impact of a reduction from 20mph to 15mph.

RESOLVED, That the Committee agree with the recommendation to progress the draft Vision Zero Plan to the Police Authority Board and to the Planning & Transportation Committee for further consideration, noting the points made above.’

Matters Arising

A Member advocated for reducing the speed limit in the City to reduce the number of deaths and serious injuries. The Chairman stated that the Sub-Committee had requested more data on the benefits of changing the speed limit from 20mph to 15mph. An officer confirmed that at the last meeting the Sub-Committee had requested that further data be provided in the report being submitted to the next Planning and Transportation Committee meeting. This

data would be provided in the reports to the next Police Authority Board and the Planning and Transportation Committee meeting.

4. **BANK JUNCTION IMPROVEMENTS (ALL CHANGE AT BANK): TRAFFIC MIX AND TIMING REVIEW UPDATE**

The Sub-Committee considered the report of the Executive Director, Environment which outlined the reasons why the option to allow general traffic (all traffic) through the junction at all times was not feasible.

Officers advised that the next report due in May 2023 would be more detailed and would include more traffic modelling.

A Member asked the reason as to why Members were being asked to eliminate Recommendation D from the options. Officers advised that this option was forecast to increase the bus journey times on eight routes by 15 minutes and it would not be possible to mitigate these to a level acceptable to TfL.

A Member asked whether it would be possible to close a different arm to the one proposed. Officers advised that building work had already commenced following Committee and TfL agreement.

A Member commented that reducing traffic at the weekend should be encouraged.

Following a Member's question about whether there was a clear definition of non-black taxi cab and whether 'except taxi' signage exemptions applied to them, an officer advised that this would be clarified in the May report to the Sub-Committee.

A Member asked for the definition of 'powered two wheelers' and an officer advised that this related to motorcycles and mopeds.

An Officer stated that modelling was only one part of the decision making and recommendation making process. It also included road danger reduction, equalities impacts and the look, feel and ambience of the space. TfL had made a number of changes to routes to facilitate the improvements.

A Member asked for clarification on why Finch Lane was one-way from North to South and not South to North. Officers advised that this had been in place for some time and was not a result of the Bank scheme. Officers stated that although no complaints had been received this could be looked at separately.

A Member suggested that discussions could take place with TfL about using electric buses on core bus routes through Bank to improve air quality and make it emission free. Officers advised that it could only be emission free if other permitted vehicles e.g. delivery vehicles were electric too and there could be difficulties in enforcing this. The buses were, however, Ultra Low Emission Zone (ULEZ) compliant and many were hybrid.

RESOLVED, That the Sub-Committee

1. Note the contents of the report;
2. Approve that no further work on the option of introducing general traffic into Bank at all times be undertaken, based on paragraphs 14-17;
3. Note the complexities of the work moving forward as explained in paragraphs 18 -19 and 21-25;
4. Note the updated indicative programme of work in Appendix 1.

5. PEDESTRIAN PRIORITY STREETS GATEWAY 5

The Sub-Committee considered the report of the Executive Director, Environment which presented the results of the experimental traffic order's statutory and public consultation, sought approval for making the traffic changes permanent at King Street, Old Jewry and King William Street and reported on work that needed to be taken at other locations.

An Officer stated that this Gateway 5 report updated a report to the Sub-Committee in September 2022 which detailed a shift in focus from delivering interim improvements at various locations to delivering permanent Highway changes. This Gateway 5 report set out findings from the public consultation, the statutory consultation on the traffic order monitoring of the traffic experiment and the equalities and healthy streets assessments that had been undertaken. The formal traffic experiments began in January 2022 and would conclude in July 2023. An experimental traffic order for Chancery Lane would be commencing in the next week and would follow a separate timeline and pathway.

The Chairman asked for more information on the use of wands as there had been negative feedback in the consultation. An Officer advised that there were currently wands with a plastic footing secured by four bolts on King Street. An assessment was taking place of the suitability of the standard poles used in the City for these streets. If used, they would be less closely spaced than the existing wands. The number of wands required depended on how many were required to discourage vehicles from stopping and loading and unloading in cycle lanes. Screwed fittings into carriageways were being considered. A raised kerb was not possible as it could not be removed for events such as the Lord Mayor's Show. Low plastic barriers called Armadillos were an option but vehicles could park and drive over these and they could not always be seen.

A Member, who was also a cyclist, stated that wands made her feel safer and prevented vehicles from travelling too close to the cycle lane.

A Member expressed concern about the aesthetics of wands, missing wands and the possibility that changing the street scene could mean those wanting filming locations might seek alternative locations. She suggested that wands at the entrance to the Guildhall should be in keeping with the design of the building.

A Member suggested that a decision could be taken under delegated authority with consultation with the Chairman and Deputy Chairman of the Operational Property and Projects Sub-Committee to progress the work more quickly. An

Officer stated that this could be looked into by Officers, however one of the factors driving the timetable in relation to starting work was Utilities works taking place. Collaborative work would be taking place and the Utilities works would include holes being dug for this scheme.

RESOLVED: That the Sub-Committee,

- 1) Approve, subject to the three schemes, King Street, Old Jewry and King William Street receiving approval from TfL and noting the objections to the statutory consultation, the experimental traffic measures be made permanent on: a) King Street (one-way northbound with contra-flow cycle lane); b) Old Jewry (closed to motor vehicles from Poultry to the junction with Fredericks Place and remainder of street two-way); c) King William Street (traffic restricted at certain times, except for vehicles loading, accessing properties or drop off/pick up of passengers);
- 2) Delegate to the Executive Director Environment, in consultation with the Chairman and Deputy Chairman of Streets and Walkways, approval of the final detailed design of the measures at the three locations;
- 3) Note that a separate report would be submitted in May 2023 for Cheapside and Old Broad Street/Threadneedle Street experimental traffic orders and that the results of the Chancery Lane traffic experiment would be reported following the completion of the six-month statutory period;
- 4) Approve the adjustment of the existing Phase 1 budget of £2,402,628 (including Costed Risk as detailed in Section 3, below), to progress the detailed design of three locations and the development of the remaining schemes in the Phase 1 programme;
- 5) Approve the drawdown of the Costed Risk provision of £56,000 as outlined in paragraph 6 of the officer report;
- 6) Approve the costed risk register in Appendix 9 and delegate authority to the Executive Director Environment to draw down funds from this;
- 7) Delegate authority to the Executive Director Environment, in consultation with the Chamberlain, to make any further adjustments (above existing authority within the project procedures) between elements of the budget.

6. ANNUAL ON-STREET PARKING ACCOUNTS 2021/22 AND RELATED FUNDING OF HIGHWAY IMPROVEMENTS AND SCHEMES

The Sub-Committee considered the report of The Chamberlain which detailed the on-street parking accounts 2021/22 and the related funding of Highway improvements.

An Officer reported that there had been an annual net surplus of £9m to £10m in recent years so it was unlikely that the account would be in deficit in future years. Legislation stated that if there was ever a deficit, this would have to be remedied within four years and before any money could be spent on any capital revenue schemes.

The Chairman stated that the Sub-Committee had asked for details of future projects. An Officer stated that the currently approved schemes for revenue and capital would be submitted to the Priorities Board and any recommendations

would be submitted to the Resource Allocation Sub (Policy and Resources) Committee.

The Officer stated that when there was an annual capital bidding process there had been delays but having a quarterly Priorities Board would reduce delays.

The Officer advised that a substantial amount of money was spent on capital and revenue schemes and money was also generated through on-street parking.

In response to a Member's question about a need for a clearer understanding of the projects that funds could be used on, the Officer stated the criteria were stringent. A Member stated that the Resource Allocation Sub (Policy and Resources) Committee had requested training on schemes for which the Community Infrastructure Levy funds, On Street Parking Reserves and other ring-fenced funds could be used. It was suggested that Members of the Streets and Walkways Sub-Committees and all other Members be invited to attend.

Officers were thanked for providing the data for the public agenda. A Member stated that although the Sub-Committee no longer controlled the allocation of funds, the Sub-Committee might have a view on how funds should be spent. If the Sub-Committee knew about the proposals and disagreed with any of them, these preferences could be raised. An Officer stated that details of schemes that were subject to approval, had not been included in the report in order that decisions were not pre-empted. However, Members of the Sub-Committee could be provided with details of unspent but approved projects and non-public funding proposals with the caveat that some of them were subject to approval. It was suggested that these details could also be useful to Members of the Planning and Transportation Committee.

RESOLVED, That the Sub-Committee

- 1) Note the contents of the report before submission to the Mayor for London.
- 2) Receive details of unspent but approved projects and non-public funding proposals at its March or May meeting.
- 3) Request that all Members be invited to the training requested by the Resource Allocation Sub (Policy and Resources) Committee on schemes for which the Community Infrastructure Levy funds, On Street Parking Reserves and other ring-fenced funds could be used.

7. OUTSTANDING REFERENCES

The Sub-Committee noted the report of the Town Clerk detailing the Sub-Committee's list of outstanding references.

Officers advised that meetings were taking place with dockless bike scheme operators and there would be a future report back to the Sub-Committee on this matter.

A Member commented that TfL were trying to lead on a pan-London approach and aimed to share proposals in June 2023. There could be a split in views between inner and outer London as issues were more significant in inner London.

Officers advised that the Beech Street consultation would close on 6 March.

The Healthy Neighbourhood consultation was being undertaken in parallel with the Beech Street consultation. Participants were providing feedback on aspirations and problems across the area and a consultant was pulling together key themes across all locations. Monthly working party meetings were taking place with Islington colleagues to develop proposals.

RECEIVED.

8. QUESTIONS ON MATTERS RELATING TO THE WORK OF THE SUB COMMITTEE

A Member raised concern about the alterations to the Number 11 bus route. An Officer advised that a response to the consultation had been submitted and the Chairman proposed that he and the Deputy Chairman would look into whether an alternative was proposed and decide whether it was necessary to raise concerns with the Chair of the Policy and Resources Committee.

9. ANY OTHER BUSINESS THAT THE CHAIRMAN CONSIDERS URGENT

A member commented that Alderman Luder was an appointee rather than an ex-officio member of the Open Spaces Committee and Paul Martinelli was an appointee rather than an ex-officio member of the Finance Committee and asked that this therefore be corrected in terms of future agenda sheets and Sub-Committee minutes.

10. EXCLUSION OF THE PUBLIC

The Committee agreed to exclude the public from the Non-Public part of the meeting in line with Section 100A(4) of the Local Government Act 1972.

11. NON-PUBLIC MINUTES

The Sub-Committee considered the non-public minutes of the meeting of 17 January 2023 and approved these as a correct record.

12. NON-PUBLIC QUESTIONS ON MATTERS RELATING TO THE WORK OF THE SUB COMMITTEE

There were no questions raised in the non-public session.

13. ANY OTHER BUSINESS THAT THE CHAIRMAN CONSIDERS URGENT AND WHICH THE SUB COMMITTEE AGREES SHOULD BE CONSIDERED WHILST THE PUBLIC ARE EXCLUDED

There were no additional, urgent items of business for consideration in the non-public session.

The meeting ended at 3.40 pm

Chairman

Contact Officer: Zoe Lewis
Zoe.Lewis@cityoflondon.gov.uk

Committee(s)	Dated:
Planning and Transportation Committee	7 th March 2023
Subject: Consultation Responses and Finalisation of the Planning Advice Note: Whole Life-Cycle Carbon Optioneering	Public
Which outcomes in the City Corporation's Corporate Plan does this proposal aim to impact directly?	1, 5, 7, 10, 11, 12
Does this proposal require extra revenue and/or capital spending?	N
If so, how much?	£0
What is the source of Funding?	n/a
Has this Funding Source been agreed with the Chamberlain's Department?	n/a
Report of: Juliemma McLoughlin, Executive Director, Environment	For Decision
Report author: Kerstin Kane, Environment Department	

Summary

This report provides information on the consultation responses received for the Whole Life-Cycle Carbon Optioneering Planning Advice Note. It sets out the consultation engagement undertaken, the type of responses received and the subsequent changes that were made to this Planning Advice Note in response to the received comments and feedback.

Recommendation(s)

Members are asked to:

- Agree the adoption of the Whole Life-Cycle Carbon Optioneering Planning Advice Note (Appendix 2 – WLC PAN Pre-Design Version)

Main Report

Background

1. On 7 June 2022, the Planning and Transportation Committee approved the draft Whole Life-Cycle Carbon Optioneering Planning Advice Note (WLC PAN) for public consultation. At that meeting, Members suggested that the WLC PAN should be widely consulted on, and feedback should be sought particularly from industry experts and other relevant stakeholders.

2. This report and the accompanying consultation statement (see Appendix 1) describe the consultation responses received and the subsequent changes made to the WLC PAN, for Members' information.

WLC PAN Consultation Process

3. The Whole Life-Cycle Optioneering Planning Advice Note will be used by developers and those designing new development. It is a technical document, standardising the information and process required for an applicant to demonstrate their proposed development is optimising whole life-cycle carbon impacts.
4. The consultation was launched on 6 July 2022, with email notifications sent to a wide variety of recipients, including around 500 groups or individuals that are signed up to the Local Plan consultation database as well as a range of other stakeholders. (Documents were loaded to the website prior to the notifications being sent, in order to verify information and validate links.) Given the timing of the consultation, it was run across the summer and through to 30 September 2022, giving stakeholders full opportunity to engage. This twelve week consultation period was substantially longer than the four week period that the regulations require for Supplementary Planning Documents. Engagement events were held in September 2022, to maximise availability, and notifications about those events were sent in advance.
5. A wide variety of stakeholders were invited to attend engagement sessions, including professionals involved in developments, other London government bodies, organisations such as LETI, and local residents. The engagement sessions comprised:
 - a. Two public sessions to ensure the public interest and their priorities are reflected in the PAN.
 - b. Two sector experts sessions, to allow stakeholders involved in developments to scrutinise and buy into the approach. These sessions were attended by professionals - including architects, planning consultants and sustainability experts-, London boroughs, and other organisations.
 - c. A separate meeting was held with the GLA to clarify the approach and alignment with the GLA Whole Life-Cycle Carbon Assessments Guidance.
6. Feedback from stakeholders was captured at all of the engagement sessions, and additional written submissions were received via email. All feedback was collated and a consultation statement was produced alongside the final PAN, setting out how the engagement informed the final document (Appendix 1).
7. Stakeholders have been kept notified throughout the process, including the engagement period, after it closed, and as the document is adopted.

WLC PAN Consultation Responses

8. Comments and questions raised during the engagement sessions were noted and reviewed. Written consultation responses were received via email. All comments have been collated in a spreadsheet, and responses have been set out for each comment. Due to some duplication and similarity between questions, comments and responses were grouped together where appropriate and presented in the consultation statement (Appendix 1).
9. While a lot of comments were received, on the whole most responses were supportive of the broad approach being taken by the PAN and welcomed it as a way to help guide development and inform decision-making. Most comments were asking for clarification on the role of optioneering in the wider planning process as well as technical clarifications on the methodology and presentation of results. Some feedback raised specific issues, such as the risk of making some options appear better than others by using different carbon factors and assumptions. Amendments were made to the PAN to address these types of comments (see point 10 and 11 for more detail). The three most significant shifts in the updated PAN are:
 - a. A request for independent third-party verification for all schemes that undertake optioneering to ensure the accuracy of the optioneering results.
 - b. A firmer steer on the types of schemes that would be required to undertake the optioneering process. This has now been changed to all major and referable schemes as well as non-major applications that do not retain the majority of the sub- and superstructure.
 - c. The option to be used as the baseline scenario. This was previously the existing building with no intervention, which has now been changed to a minor refurbishment option. This is a more realistic baseline, as in most cases some works will be required to the existing building to keep the building in use.
10. **Planning process** – Part of the specific feedback relates to the planning process. Questions included how the PAN relates to other planning policy and guidance, how planning officers consider the optioneering results in the planning process, and when optioneering is required. Adjustments were made to the PAN to clarify that optioneering takes place at pre-application stage to guide the discussion with planning officers around retention options and the associated constraints and opportunities. The links between the PAN and other guidance documents on whole life-cycle carbon were described in more detail, highlighting that the PAN methodology forms a pre-cursor to the GLA Whole Life-Cycle Carbon Assessments Guidance and is our preferred way to demonstrate that different options were considered early in the process. It was explained that optioneering is done at an early-stage and is based on many assumptions, and therefore the results will only be used to compare options for a specific site and not to make comparisons across different schemes. It was clarified that the lowest carbon option is not automatically the preferred option, and that other sustainability and planning considerations will

be taken into account when evaluating the optioneering results. It was emphasised that only the preferred option needs to be developed further at planning stage.

11. **Technical Clarifications** – Other feedback relates to the technical side of the PAN to better understand how to apply the methodology correctly and how to avoid bias towards the applicants preferred option. The dashboards and figures were revised to capture all necessary information and avoid misinterpretation. Recommendations were made for the use of operational carbon factors and justification is requested if different factors are used. It was emphasised that assumptions need to be the same across all options and clearly stated to prevent bias towards the applicant's preferred option. Clarification on some of the terminology and abbreviations were requested. To address this, the wording of technical information was revised where needed and specific terms were added to the glossary. The desire for a template or digital tool was expressed to allow for standardised visualisation of the optioneering results. Therefore, an Excel template has been prepared to be used by the applicants to input data for the generation of standardised figures. The PAN methodology will be reviewed frequently and updated when needed to reflect the latest industry and technological advances.

WLC PAN Design and Formatting

12. Some changes were made to the structure and layout of the document to improve the flow and allow for easier navigation. This included shifting some background text to the appendices to keep the main body concise and the focus on the methodology. A section on the scope of the document was added at the start. The design has been improved to ensure the document is fully accessible for visually impaired readers.

Corporate & Strategic Implications

13. **Strategic implications-** The WLC PAN supports the delivery of the following outcomes in the Corporate Plan:
- Outcome 1: People are safe and feel safe
 - Outcome 5: Businesses are trusted and socially and environmentally responsible
 - Outcome 7: We are a global hub for innovation in financial and professional services, commerce and culture
 - Outcome 10: We inspire enterprise, excellence, creativity and collaboration
 - Outcome 11: We have clean air, land and water and a thriving and sustainable natural environment
 - Outcome 12: Our spaces are secure, resilient and well-maintained.
14. **Financial implications-** There are no financial implications arising from this report.

15. **Resource implication-** Delivery of the Planning Advice Note will be through existing Environment Department staff resources.
16. **Equalities implications-** The WLC PAN will be published in an accessible format, in line with the requirements for publication of Corporation documents.
17. **Climate implications-** Delivery of the Planning Advice Note will contribute towards meeting the objectives of the Climate Action Strategy and ensure that as relevant applications come forward, the whole life-cycle carbon implications of the development they propose is considered as part of the application process.
18. **Legal implications** -There are no legal implications arising from this report.
19. **Risk implications** - There are no additional new risks arising from this report.
20. **Security implications** - There are no security implications arising from this report.

Conclusion

21. A large number of responses were received from a broad range of stakeholders throughout the engagement process, which were predominantly positive and in support of the optioneering approach. As a result, the PAN remains largely unchanged. Some specific feedback was received in relation to clarifications on the role of optioneering in the wider planning process as well as some technical clarifications, which have been addressed in the updated version of the PAN. The public consultation helped to raise awareness of the optioneering methodology, to achieve buy-in from a range of stakeholders and to fine-tune the PAN to create a robust, clear and practical document. Adopting this document will help the City to reach its goal of achieving net zero for the Square Mile by 2040.

Appendices

- Appendix 1 – WLC PAN Consultation Responses
- Appendix 2 – WLC PAN Pre-Design Version

Report author

Kerstin Kane, Principal Sustainability Officer – Policy and Strategy, Environment Department

E: kerstin.kane@cityoflondon.gov.uk

T: 07598 404355

This page is intentionally left blank

Whole Lifecycle Carbon Optioneering Planning Advice Note 2022 - Consultation Statement

Introduction

The City of London Corporation undertook public engagement on the draft Whole Lifecycle Carbon Optioneering Planning Advice Note (WLCO PAN) between 6 July 2022 and 30 September 2022.

This document sets out the main issues that were raised in written responses and at events, and how those issues have been addressed in the final version of the PAN.

Consultation events

- Hybrid in person/virtual public consultation event on Wednesday, 7th September 2022, 6-7:30pm
- Virtual public consultation event on Thursday, 8th September 2022, 12:30-1:30pm
- Expert workshop on 13th September 2022, 9-10:30am
- Expert workshop on 15th September 2022, 9-10:30am

Policy responses

This table sets out the issues raised during the engagement and how it has been addressed.

Number	Issue	How this issue has been addressed
1	The WLCO PAN should be clearer on the Climate Action Strategy goals.	We will clarify and set into context our CAS goals in the introduction to the PAN.
2	The WLCO PAN should clarify when optioneering is recommended and define technical terms.	<p>The optioneering exercise is a means of comparing a limited number of development options in order to find the best balance in carbon emissions terms prior to adding other considerations into the planning balance.</p> <p>This approach will aid the review and decision-making process through the submission of more in-depth information that demonstrates how developers have arrived at a particular proposal. This process can be</p>

Number	Issue	How this issue has been addressed
	Some respondents suggested that optioneering should be required for every proposed development and others suggested that optioneering should be limited to only those schemes that propose substantial demolition.	<p>relevant to various application types that have a significant proportion of new built elements including replacing existing built elements.</p> <p>The types of development that the WLCO PAN applies to has been clarified. The PAN is now clear that optioneering is required for all major schemes. Other developments should carry out optioneering if they do not retain the majority of substructure and superstructure.</p> <p>Schemes that propose to retain the majority of the substructure and superstructure are classed as retrofits for the purposes of this PAN. While such schemes are not required to undertake a full optioneering exercise, applicants are encouraged to explore different options during the pre-application process, with the aim of incorporating design approaches that minimise the carbon intensity of the development. The purpose of the optioneering exercise is to compare bespoke development options for a particular site, which can mean that comparison with other City development proposals may not be relevant.</p> <p>The PAN advises on the consistent presentation of options in planning applications (see dashboard 1) and of the whole life-cycle carbon assessment results of the planning application scheme (see dashboard 2), so that this information is easier to understand and assess as part of the application consultation process.</p>
3	<p>Why is optioneering required?</p> <p>How are options chosen, in particular where there appears to be no beneficial re-use scenario?</p>	<p>The optioneering exercise is a means of comparing a limited number of development options in order to find the best balance in carbon emissions terms prior to adding other considerations into the planning balance.</p> <p>The GLA's Whole Life-Cycle Carbon Assessment Guidance and Circular Economy Statement Guidance – which apply to applications that are referable to the Mayor of London – require the full exploration of options before considering substantial demolition. The PAN sets out a methodology by which this can be carried out, and how this should be demonstrated in the planning application.</p> <p>Options will be developed in early discussions with applicants in the pre-application process and their details will vary on a case-by-case basis. The number of options will be limited and agreed based on presenting clearly discernible, feasible design approaches to the proposal in order to inform the optimum design for the application scheme, both in WLC terms and in considering other environmental opportunities such as urban greening and climate resilience opportunities.</p>

Number	Issue	How this issue has been addressed
		<p>The final preferred option may or may not be one or a combination of the assessed options.</p> <p>Options are hypothetical. They should be based on the same assumptions including which energy strategy is thought to be the most advantageous in carbon reduction terms, in order to be able to compare the options - unless there are reasons for not doing so which should be clearly stated.</p>
4	The guidance appears to be geared more toward the land use preference of the developer rather than what the existing building could be. The question should be whether optimal site capacity can be achieved through retention.	In addition to the GLA requiring carbon calculations per square meter, we also request and evaluate the absolute figures and ensure that we understand the upfront proportion of carbon emissions. The land use proposal should be in line with our land use policies. We need to ensure that a well-balanced development is coming forward that considers both low carbon impact and future proofing generally. The focus of this exercise is on reducing carbon emissions, notwithstanding whether this is through a high or low level of retention.
5	How will the optioneering results be used in the later planning stages?	The optioneering exercise will stand on its own and not be used to challenge the preferred/planning application proposal which is developed based on much more detail than the options. The methodology has been developed to inform the design approach to the preferred option that will become the planning application scheme. Once this has been given planning permission, the Energy, Whole Life-Cycle Carbon and Circular Economy strategies of the approved scheme will be further detailed and approved during the planning conditions stages.
6	Will the options be monitored?	We will consider how we monitor post-completion Whole Life-Cycle Carbon information across all relevant applications. We are not intending to monitor options in order to compare optioneering results across CoL sites. However, the optioneering results may prove useful to learn more about the opportunities and constraints of certain building types which may help with pre-application discussions. The GLA monitors the Whole Life-Cycle Carbon Assessments of all referable planning application schemes.
7	Clarify how other policy considerations and issues are	We will make clearer how other policy considerations and opportunities influence the optioneering results. The WLC carbon impact of each option will be presented in the context of the evaluation of other

Number	Issue	How this issue has been addressed
	<p>integrated into the Optioneering exercise.</p> <p>How about considering land use, e.g. change of use to residential?</p>	<p>environmental opportunities and constraints as well as social and economic sustainability issues such as commerciality, quality of the spaces and building, health and wellbeing.</p> <p>We will update the PAN to include all recent and emerging policy guidance and regulations.</p> <p>The City has a number of successful schemes that convert office buildings or sites to hotel or student accommodation. The review of the Local Plan (City Plan 2040) will consider the overall balance of uses across the City. There is still demand for offices in the City as a place for business.</p>
8	Third-party verification should be required.	We have incorporated third-party verification in the updated version of the PAN, which should be done by all schemes that undertake the optioneering exercise.
9	How is CoLC collaborating with other organisations and keeping up-to-date?	<p>CoLC is engaged with ongoing discussions about how to reduce WLC carbon emissions effectively across the whole industry. CoLC officers are involved in collaboration meetings on a variety of platforms that include other Local Authorities, London Councils, ReLondon, LETI and NLA expert panels.</p> <p>The methodology is designed and will be refined to be flexible to respond to different development types and needs – this will be discussed with applicants on a case-by-case basis – and that the methodology is easily updatable in accordance with changing and emerging national and GLA policies and standards.</p> <p>We are liaising with the GLA and keep up to date with government initiatives to ensure that the methodology remains up-to-date. This is easier to be achieved if the methodology itself remains an adaptable Planning Advice Note while the requirement for optioneering is already a requirement through London Plan SPDs, and which will be written into our forthcoming policy documents.</p>
10	Do planning officers have the necessary skills to assess whole life-cycle carbon assessments?	<p>Specialist CoLC officers (sustainability, climate resilience, biodiversity, SuDS, engineering etc) review proposals with the help of all available internal and external guidance currently available. Applicants' consultants will be approached to provide additional explanations and justifications as required to underpin the review of the proposals. Further upskilling, however, is ongoing.</p> <p>We are happy to arrange knowledge exchange meetings with or training for individual authorities and organisations, and we regularly attend CPD events on the subject.</p>

Number	Issue	How this issue has been addressed
11	<p>Clarify other reporting requirements mentioned in the PAN, e.g. through conditions.</p> <p>Updates to WLC Carbon Assessments should be requested at the time of submission to building control (design and as built) to reduce burden on applicants.</p>	<p>We encourage every major application, not just GLA referable applications, to include a WLC carbon assessment. We encourage minor development proposals to include information of how carbon emissions have been reduced in their design approach. We will strengthen this approach in our forthcoming Local Plan (City Plan 2040).</p> <p>For each major application, we request by condition an updated Detailed Whole Life-Cycle Carbon Assessment to be submitted before construction begins. Whole life-cycle carbon assessments submitted with planning applications are based on RIBA stage 2 design, therefore calculations are based on a number of intentions and assumptions. CoLC's approach to request RIBA stage 4 updates prior to construction is to understand more clearly how the detailed design evolves and impacts on carbon emissions. This might include new technologies, structure, material and construction choices that can be incorporated as a scheme evolves, and that contribute to a lower carbon impact. This information will help with managing the planning process, managing expectations of all involved and to document the progress during the detailed design phase. However, this is independent from the optioneering approach at pre-application stage.</p> <p>All submitted Whole Life-Cycle Carbon Assessments are available on the planning register for the public to view. We also request post-completion statements by condition.</p>
12	What sanctions are proposed for exceeding whole life-cycle carbon emissions – please not offsets?	<p>There are no standards that are required by policies to be achieved at the moment. The GLA has published the Standard benchmark and the Aspirational benchmark following their study of cases. The current requirement for developments to submit WLC carbon emissions to the GLA (for referable schemes) is to gather further evidence as to achievable carbon emission reduction for typical development types (by use).</p> <p>Policies are aiming for net zero whole life-cycle carbon emissions, however, this is not yet achievable as decarbonisation, alternatives in low carbon construction materials and materials exchange/reuse/recycling and processes/technologies to remove carbon from the atmosphere are not advanced enough yet. Net zero implies offsetting by means of carbon removal from the atmosphere and reducing energy use/production of renewable energy elsewhere. Zero whole life-cycle carbon development is not possible at the moment as every development activity (even minor refurbishment) will result in carbon emissions. Zero WLC carbon development will only become possible once the grid is fully decarbonised, materials sourced and transport</p>

Number	Issue	How this issue has been addressed
		and processes carried out that don't rely on the burning of fossil fuel. Hence, carbon targets are expressed as net zero targets.
13	How is optioneering affected by risks due to policy conflicts, such as the preference to connect to district energy systems?	<p>Options are hypothetical, all based on the same assumptions including which energy strategy is thought to be the most advantageous in carbon reduction terms. It is important that all options are based on the same energy strategy (where possible), in order to assess and compare the options, unless there are reasons for not doing so which should be clearly stated.</p> <p>Networks such as Citigen do have a strategy to decarbonise, however, for the sake of the optioneering exercise, the most realistic and best energy strategy should be applied to all options.</p> <p>Discussion on district energy will require practical dialogue at pre-application stage in relation to the planning application scheme.</p>
14	Clarify details of the expected operational energy modelling.	<p>At pre-application stage it will be very difficult to provide a TM54 (operational energy performance) or NABERS UK (certification scheme for operational energy performance) review, however reasonable assumptions on consumption should try and align with targets for the project. Methods should be consistent across options and include the upgrade of refurbished facades to highest level of energy efficiency. The dashboard will be adapted following feedback to make this clearer.</p> <p>The EPC rating was included into the dashboard information as reference only. The energy assumptions should not be based on the EPC for the optioneering exercise.</p>
15	Photovoltaics - clarify why it appears that the PAN suggests they are not effective over the building lifetime.	This was not the intention and will be clarified in the update. A review of low and zero carbon technology solutions should be provided as part of the energy strategy of planning applications.

Technical responses

Number	Subject	Response
1	How will data reviews and misrepresentation of options/third-party review be accounted for?	<p>The intention of the document is for an initial review and transparent reporting for officers to make an informed decision. Planning Officers will seek out inconsistencies across documents and scrutinise approaches. Officers are taking part in training to identify inconsistencies in options and propose adjustments where necessary. Additionally, third-party verification has been included as a requirement for all schemes that undertake optioneering, in the revised version of the PAN.</p> <p>It should be noted that the lowest carbon option may not always be the best option for development in the overall planning context, or it could have significant technical challenges that need to be overcome.</p>
2	How will operational energy Carbon Factors be accounted for?	<p>A number of queries were raised relating to the use and declaration of carbon factors, which were welcomed.</p> <p>The updated PAN will set out the recommended approach to applying carbon factors. These should be kept consistent across options for the given energy source type. All options will require the carbon factor(s) to be reported in the dashboard. An operational energy carbon factor to be used as a basis for reporting will be included in the reporting template for B6. Teams will need to declare the energy carbon factors for each option. Where deviation occurs this will need to be clearly explained.</p> <p>The operational energy strategy would be more detailed for the planning application scheme in accordance with TM54 (operational energy performance modelling tool) or NABERS UK Design for Performance as required and recommended, respectively, by the GLA. At optioneering stage, this is unlikely to be feasible.</p>

Number	Subject	Response
3	Will the PAN account for decarbonisation of materials and/or declare carbon factors for the embodied carbon of materials?	<p>Grid decarbonisation will not be included in the embodied carbon assessment for this exercise. Supply chains are global and it is currently difficult to ascertain with any accuracy the decarbonisation pathways for materials with unknown procurement routes or locations.</p> <p>The decarbonisation carbon factor will not be altered for embodied carbon estimations (as in the energy decarbonisation effect on embodied carbon results).</p>
4	Dashboard 1 - Please clarify the % material retained relating to existing/recycled content	The aim of this reporting metric is to demonstrate what is being considered for reuse. We will clarify this in the final document . At an early stage, it would be appropriate to provide estimations of the substructure and structure by mass and the facades by square meter. It would be sensible to be on the conservative side at this early stage. The % retained is purely for providing a metric for elements reused in situ. The industry is undertaking wider work in relation to circular economy metrics.
5	What benchmarks are being used in the PAN?	<p>The PAN is trying to align with the GLA benchmarks for initial assumptions. It should be noted that taller buildings may fall outside of this range and should be considered very carefully from an early stage.-Dashboard 2 would require more detailed information, based on the selected option and this would be refined in the final documentation.</p> <p>The Built Environment Carbon Databases (BECD, https://www.becd.co.uk/) should help in future with better collated data and future benchmarks.</p>

Number	Subject	Response
6	How will data collection/databases and the understanding of embodied carbon impacts be accounted for in terms of as-built real-world numbers?	The PAN will not currently be monitoring results in a database. As built data could inform the estimations made in the PAN as other datasets improve over time.
7	<p>How is waste and demolition accounted for in the assessment?</p> <p>Where does the waste go?</p>	<p>Waste and the end of life of new products is considered in WLC carbon assessments. Waste generation (from the building materials) would be considered in the estimations for life-cycle module C at the end of the building life.</p> <p>Waste from the existing building (where there is one) would have formed part of the previous building's assessment.</p> <p>Guidance and best practice (EN 15978 & RICS guidance) does not currently account for the demolition waste as part of the assessment, however it is recognised there is an impact associated with removing a building. The updated RICS guidance in 2023 will be addressing and clarifying this. EN 15978-1 is due for an update in 2024 (https://standardsdevelopment.bsigroup.com/projects/2020-01551#/section).</p> <p>Demolition estimations should be added using the GLA rate as a default. The GLA do require reporting on demolition waste as a separate metric using an assumed value of 50 KgCO₂e/m² (where a defined number has not been calculated). The revised PAN will clarify that options should consider this based on the area of the existing building.</p> <p>It is worth noting that a refurbishment with major changes would make demolition impacts difficult to predict (for example carbon impact of soft strip and facade replacement compared to full demolition). In time the availability of data will improve.</p> <p>The question as to where the waste goes falls outside the remit of the PAN. Relevant UK legislation on waste already exists and the amount of waste diverted from landfill has improved greatly in the last 10-15 years.</p>

Number	Subject	Response
8	<p>“Façade interfaces” and “Health and wellbeing” ignore opening windows as a means of ventilation without increasing carbon emissions. Is there a contradiction in the “design considerations” should be “intervention considerations”?</p>	<p>This will be reviewed. Openable windows are not a means of consistent ventilation but a means of free cooling. This is often confused. Windows should ideally be open in mild weather conditions only (and managed - we can see a 3kWh/m² increase on consumption in deep plan offices if mismanaged). The benefits of open windows or facades have the potential to save energy if used correctly, as well as the sense of wellbeing due to occupant control.</p> <p>Our view is that “considerations” is the correct term for the detailing of the options.</p>
9	<p>Is more ambition needed than the stated reduction of global emissions by 43% by the end of this decade?</p>	<p>The IPCC stresses the need to reduce greenhouse gas emissions by 43% by 2030 compared to the 2019 baseline. This is the minimum reduction needed to stay within a 1.5 degree increase in temperature by the end of this century, in line with the Paris agreement.</p>
10	<p>Will more in-depth analysis of two specific options be acceptable/ a better way of evaluating options?</p>	<p>There is no requirement for a set number of options but a view on variations in project should be undertaken. The PAN is about the fundamentals of building decisions for reuse. Approaches should be discussed with the planning officers to be practical but also to consider what could be done technically to try and reduce carbon, rather than defaulting to a new build position.</p> <p>In many cases, detailed analysis will not be feasible yet due to the lack of information and reliance on assumptions. Should a team want to look into two viable options with more detail that would be acceptable if the options cover the anticipated opportunities of a site, and this should be discussed with the planning officer. This will be clarified in the PAN revision. Applicants will not be required to undertake detailed WLC assessments of more than one option in the following planning and design stages.</p>

Number	Subject	Response
11	How is the PAN methodology accounting for the progress towards net zero by corporate entities?	The PAN is not intended as a tool for reporting or demonstrating progress towards net zero by corporate entities. However, developers and occupiers or incoming tenants may want to understand the choices that have been made in terms of the carbon impacts of the developments they occupy, and the information and data presented as part of the optioneering exercise can provide useful insights.
12	How are carbon factors used for specific materials and how do you deal with the risk of consultants using different factors for the same materials across the options?	<p>Detailed decisions about the fundamentals of a building design and about procurement can cause variation in embodied carbon performance-</p> <p>The PAN methodology recommends using the RICS Whole Life Carbon Assessment for the Built Environment default specification that is due to be updated in 2023, as a baseline approach (Page 18, Table 6: https://www.rics.org/profession-standards/rics-standards-and-guidance/sector-standards/building-surveying-standards/whole-life-carbon-assessment-for-the-built-environment). This approach should be confirmed as part of the optioneering exercise or justified if a different approach is taken.</p> <p>The initial appraisal may be based on structural and material assumptions plus estimated breakdowns of elements to build an options profile. All assumptions about materials or structure must be declared and be consistent between options where the detail is the same.</p>
13	The capacity of the grid and ensuring that there is sufficient investment in the infrastructure to deliver all-electric buildings will be critical.	This is one of the critical areas in terms of energy consumption reduction. UKGBC have set out a pathway relating to capacity. The Net Zero Building Standard will set out performance criteria as a leading standard (due to be launched in 2023/2024). NABERS UK is based on energy consumption rather than carbon. Both are critical for driving a lower carbon future and targets to be achieved in use.
14	Why is NABERS UK stated to be the more onerous approach in the section	There are varying levels of energy modelling. NABERS UK (Design for Performance) is the most complicated type of modelling standard than currently exists, hence why it is more onerous - however, it is currently voluntary. The wording in the PAN will be reviewed to clarify this point.

Number	Subject	Response
	‘Operational Energy Modelling’ in chapter 2 of the PAN (Related Reporting Requirements), since its requirements seem to warrant the use of “rational” instead?	
15	Is it better to do 5 high level options or work closely with design team to develop one viable option that can be interrogated in more detail? Not all 5 options will be developed further in the later stages.	Options will be limited and agreed based on presenting clearly different, feasible design approaches to the proposal in order to inform the best approach to the application scheme, both in WLC carbon terms and in considering other environmental opportunities such as urban greening and climate resilience opportunities. This will be discussed and agreed with the applicants at an early stage during the pre-application process.
16	What is the difference between the whole life-cycle carbon assessments developed by the GLA and the PAN, are there any concerns about clashes?	<p>The intention of the CoLC is for this exercise to be a standalone assessment of high-level options rather than the detailed Whole Life-Cycle Carbon Assessment required in line with the GLA’s guidance for an application proposal. It forms a precursor to the GLA guidance in which different options are compared, before undertaking detailed assessments of the selected option.</p> <p>The results of the optioneering are based on different data (some estimated or assumed) and design details than those of the assessment of a planning application scheme and therefore can vary and will not be compared with each other.</p> <p>For the same reason, whole life-cycle carbon options will not be compared to GLA benchmark data as part of the evaluation presented to the CoLC. However, GLA benchmarks – as they firm up through assessing the growing evidence base of post-completion data - can help developers making initial decisions, and the PAN approach has been designed to keep consistency between the two.</p> <p>The GLA (and other London boroughs) have been consulted on the PAN methodology during this process and their comments will be incorporated.</p>

Number	Subject	Response
17	Going from RIBA stage 2 to 4 is critical, as stage 2 may promise the world and later on it is found not to be feasible. This should be acknowledged in the PAN or SPD. How will it be accounted for?	The aim is to ensure carbon reductions are considered at the earliest possible stage of the project. Possible changes resulting from later stage details should be acknowledged but the detailed design stages of an application scheme are not subject to this advice note. All major applications are expected to undertake Whole Life-Cycle Carbon Assessments to the GLA's standards, and this requires planning reporting and as built reporting. All applications with new build elements will be encouraged to undertake life-cycle assessments of the associated construction works. Further detail will be provided in the forthcoming City Plan 2040.
18	What is the basis of the required life cycle of 60 years?	<p>The PAN methodology is aligned with the GLA guidance requirement of reporting carbon emissions on a standard baseline of a 60-year life cycle as set out in the RICS Whole Life-Cycle professional statement.</p> <p>We use the 60-year period, as this is the industry metric for LCA based professional guidance documents, such as RICS Whole life carbon assessment for the built environment. We therefore use this as the basis for the PAN.</p>
19	What about the development of a pre-redevelopment audit guide document?	Pre-redevelopment audits are required by the adopted GLA Circular Economy Statement Guidance which include the consideration of development options relating to the retention of buildings and building elements. The suggested guide would be a useful separate exercise with a wider focus compared to this PAN.
20	What is the purpose of the updated Whole Life-Cycle Carbon Assessment at pre-commencement stage and at practical completion?	This section of the PAN refers to the future planning stage proposals that are outside the scope of this advice note. It explains the whole life-cycle carbon reporting required at planning stage and recommends how the optioneering results can be developed to the required detail. This includes the request for applicants to submit an update of the whole life-cycle carbon assessment before construction begins to demonstrate how further details of the design, materials and construction would impact on whole life-cycle carbon emissions. The post-completion statement is required by GLA guidance and will provide important evidence about the real whole life-cycle carbon impact of development in order to help develop future standards.

Number	Subject	Response
21	The PAN is unclear about updates to Part L in relation to LZCT i.e. PV, please can this be clarified?	<p>The new Part L 2021 applies renewable energy to the notional building as a way to reduce target carbon emissions relative to the previous target and to encourage a fabric-first approach. The use of renewable energy is therefore not discouraged. However, designers should be aware of the embodied carbon of all building services, which are responsible for a significant proportion of embodied carbon emissions of a development, especially in refurbishments due to their relatively shorter lifecycle. 7</p> <p>The optimum solutions will vary on a project-by-project basis. They will depend on opportunities for energy storage and demand-side energy management, and more detail would be expected in applications.</p> <p>The comments relating to this PAN section have been very useful and detailed. It has become clear how this chapter can be misinterpreted, and therefore it will be revised accordingly.</p>
22	Does the PAN methodology apply to commercial proposals only? In the executive summary, should the fourth to last paragraph also refer to the commercial and residential built environment?	The PAN optioneering methodology should apply to all development types, but this will be confirmed on a case-by-case basis for each scheme. We will make this clearer in the revised document.
23	<p>Options should also be reviewed for refurbishment cases where there might be a number of possible variations.</p> <p>Opportunities for strategic reductions in embodied carbon that have been</p>	<p>The PAN will be reviewed to clarify that there is no precise threshold for the expectation that an optioneering exercise will be undertaken.</p> <p>We will however provide examples of development proposals for which we expect optioneering, such as schemes that only retain a small proportion of an existing building. However, schemes that are classed as retrofits (retention of structural elements, alterations, to include facades in most cases, and extensions, new building services) are likely to only be assessed qualitatively, including requiring details as to the need for carbon intensive alterations. This will be discussed and agreed between developers and planning officers.</p>

Number	Subject	Response
	considered but are not taken forward, need to be justified.	The purpose of the PAN is to demonstrate how a development can reduce whole life-cycle carbon emissions, including through encouraging retention.
24	Can the PAN show more regard to the benefit of new buildings that are adaptable, and the beneficial impact this can have on extending the lifespan of buildings?	<p>Noted. However, the purpose of this note is to reduce carbon emissions throughout the full life-cycle of a building, including limiting the upfront carbon emissions before designing with major adaptation in mind, i.e. to another use type. This aspect could be included in the justification where appropriate.</p> <p>There could be a case that the new building would become outdated in future, too, and that occupiers then will have to start compromising to ensure the WLC emissions remain low.</p>
25	How does the PAN address responsible sourcing?	<p>This is an important sustainability aspect, but this cannot be covered by the PAN methodology as responsible sourcing can only be confirmed at later RIBA stages. This should, however, not affect the interpretation of the optioneering exercise, which needs to be based on comparable assumptions about material choices.</p> <p>Sourcing is covered by Local Plan development policies and by BREEAM assessments (Credit Mat 03).</p>
26	Despite low carbon emissions, minor refurbishment is not considered to be good in carbon terms due to required maintenance/replacement/upgrade work within a short timeframe - how will this be accounted for?	<p>Carbon emissions are an important factor in the decision-making process but planning also covers a range of other issues and requirements. The question will depend on the level of quality of the existing building and the detailed extent of intervention and renewal under consideration. It is difficult to set a general rule. A minor refurbishment may extend the life of the building which could be beneficial in carbon terms and reduce upfront carbon emissions in the near future.</p> <p>We want the PAN to guide developers to make better decisions and consider options in the wider context of carbon emissions and the climate. Planning committees will then have an enhanced ability to make an informed decision.</p>

Number	Subject	Response
27	Will a template/digital tool be created?	<p>An Excel template will be created for consistency and graph set up/reporting as part of the final version.</p> <p>A digital tool is not currently planned.</p>
28	Some guidance should be provided to ensure consistency and transparency of input data and carbon factors, will this be added?	We have recommended an approach in the WLC PAN following consultation and require applicants to report the figures used in each option for greater transparency . see response 2 for further information on carbon factors.
29	Why is the PAN not allowing comparison across different schemes?	<p>The purpose of the PAN is to compare options of a site with specific opportunities and constraints that may not be comparable to other sites. However, over time, the assessment of optioneering exercises may help to build an experience base for planning officers and the industry generally.</p> <p>For detailed WLC assessments The Built Environment Carbon Database (BECD) database is designed to make comparisons across schemes, if desired. Comparison should be treated with caution as there are so many variations within the built environment sector. Sometimes impacts will be contextual to a specific site, i.e. ground conditions affecting substructure options.</p>
30	<p>In relation to the comparison graph, how much confidence do we have in the comparison of different options?</p> <p>It's our opinion that different software tools lead to</p>	<p>Consultants should be following RICS (Royal Institute of Chartered Surveyors) Whole Life Carbon Assessment for the Built Environment guidance for the baseline and GLA guidance, consistently across all options. RICS is due to provide an update in 2023 which should add clarity to this issue. In many cases, at optioneering stage, there may not be sufficient data available to model individual elements. Substructure, superstructure and facade are the crucial elements at this stage.</p> <p>Hilson Moran have reviewed a few projects using both tools (etool and Oneclick). The variation when the same information and assumptions made are about 2-4%, which is not a significant difference (as</p>

Number	Subject	Response
	different results and are influenced by people using different assumptions.	<p>both tools use the ecoinvent databases as a basis). From our reviews (although a small sample size) and looking at several applications, a number of buildings at planning stage seem to have selected materials with limited availability, which makes a bigger difference. Hopefully these projects will be able to procure the materials or the as built numbers will increase (they will also increase due to greater materials quant accuracy at later stages).</p> <p>Often bigger differences are down to the model and making lower material choices that may be very challenging to procure. This is the danger of using low target but using the same construction methods.</p>
31	The PAN omits technologies such as the creation of bio-solar roofs, will measures like this be included?	This PAN methodology is not designed to be a detailed dive into solutions. The positive or negative impact of carbon emissions from photovoltaics and green roofs could be factored into the optioneering as long as it is consistently applied across the options or reported where such solutions cannot be incorporated for some of the options.
32	How are tenants' impacts accounted for?	<p>It should be estimated as part of the optioneering exercise and included in the estimations. It would be reasonable to assume the levels would be similar across the options. Reporting should include assumptions made. The impacts of internal finishes & FF&E are estimated to be around 21% (GLA WLC guidance estimates) of the impact over a 60-year period, due to the number of anticipated replacements.</p> <p>Note: for an office, the tenant fit-out is not included if not in the applicants' scope of works.</p>

Number	Subject	Response
33	The term embodied carbon is misleading and shouldn't be used, as we are talking about carbon that is being emitted. Can you please clarify your choice in terminology	<p>Embodied carbon is part of the agreed industry wide terminology. Carbon is being emitted, but it is also contained within certain materials, which is why it is appropriate to use in this way.</p> <p>Upfront and in-use carbon may also be referenced. The definitions and terms used in the PAN are part of industry wide terminology and align with current guidance and standards such as RICS, UKGBC, World Green Building Council (WGBC) definitions. The terms in the glossary are in line with NABERS, GLA, RICS and LETI terminologies.</p> <p>LETI have just released a Whole Life-Cycle Carbon definition document (Jan 2023) to which the PAN will be aligned.</p>
34	The "Cumulative Carbon Emissions" in Figure 11 do not account for the phasing out of fossil fuels.	<p>Figure 11 will be changed and updated. This is a graphic that CoLC members requested, however it does not reflect the estimated nature of changes. It is likely that fossil fuels will not be phased out for a while, so there is a need to account for other fuel types. It will be some time before the grid reaches 'zero emissions' on an annual basis.</p> <p>In terms of options, the change in carbon emissions as a result of the phasing out of fossil fuels would often be consistent regardless of type (unless a different system is used).</p>
35	Terminology - please expand on abbreviations where used?	We will expand on abbreviations to make them clearer in the final version.
36	Can the references to existing structures be clarified, as this requires qualification rather than generalisation (page 24 of the draft PAN)?	Current industry experience shows that particular care should be taken when considering 1950s / 60s concrete structures, due to the construction techniques and curing of the concrete used in buildings of this age, as well as the grading of the concrete and steel used at the time. However, each project should ideally check the condition of the existing building materials quality as far as practically possible to enable informed decisions to be made.

Number	Subject	Response
37	What is the role of hydrogen and other fuel types?	This is part of the solutions applicant teams can propose if viable. Hydrogen has its complexities at the building level. Other heating sources are more likely to produce satisfactory results in the near future.
38	What is the role of commerciality in the PAN?	An acknowledgment that commerciality is a factor to be considered will be added. Commerciality should be included into the evaluation of the options in the Dashboard.
39	What is the role of transport in the PAN?	Transport of materials is accounted for in the whole life-cycle carbon assessment methodology. Transport impacts of building users is not accounted for in WLC assessments.
40	LETI support the inclusion of references to existing guidance and initiatives, including the RICS Professional Statement, Part Z and LETI. Please see our suggestions for additional materials to be included in the PAN. Can these be included?	Sources will be reviewed and updated wherever possible.

Number	Subject	Response
41	<p>How does variation in building use type and hours affect operational energy? And how is demand for types of space considered i.e. gyms and labs?</p> <p>How is this accounted for?</p>	<p>Operational hours can vary, for instance food establishments use a lot of unregulated energy. It's just one example given for context. The operational energy calculations for options will be based on very early estimates and should be consistent across the options.</p> <p>The different use types in the PAN are just cited as examples of certain considerations that may be needed. Light types labs (life sciences) are becoming a fast-growing sector, so we need to be adaptable to this use type and the City adapts to future needs. This links to circular economy principles and ensuring adaptability and flexibility in the change of use over time.</p>

Stakeholders

The following list provides an overview of the key stakeholders that were invited to one of the consultation sessions and/or submitted written comments on the PAN.

Stakeholder group	Organisation
Professional bodies and expert organisations	CIBSE
	Low Energy Transformation Initiative (LETI)
	Historic England
	Institute of Structural Engineers
	New London Architecture (NLA)
	Royal Institute of Chartered Surveyors (RICS)
	Royal Town Planning Institute (RTPI)
	The Architects' Journal
	UK Green Building Council
	Architects Climate Action Network
	Building Research Establishment (BRE)
	Royal Institute of British Architects (RIBA)

Professional companies involved in the built environment (architects, engineers, environmental and planning consultants, property managers, landowners etc.)	Hilson Moran (Authors of the PAN)
	DP9
	Brookfield Asset Management
	Waterman Group
	Igloo Regeneration
	Etude
	Make architects
	Shaw Corporation
	Hertshten Properties
	3XN
	AECOM
	Arcadis
	Arup Group
	Atelier Ten
	Buro Happold
	Chapmanbdsp
	Greengage Environmental
	Hoare Lea
	Milieu Consult
	Ramboll
	Sweco
	TFT Consultants
	British Land
	City Property Association (CPA)
	Dominvs
	Gerald Eve
	Land Secs
	Lichfields
	London First
	Montagu Evans
	Stanhope
	Turley

	Concrete Centre
	Ray King
London government bodies & Statutory authorities	Greater London Authority (GLA)
	Environment Agency
	London Councils
	Natural England
	Transport for London (TfL)
	Central London Forward
	Diocese of London
	North London Waste Plan (NLWP)
	Port of London Authority (PLA)
London boroughs	Camden
	Hackney
	Islington
	Kingston
	Lambeth
	Newham
	City of Westminster
	Richmond and Wandsworth
	Southwark
	Tower Hamlets
Business Improvement Districts	Aldgate Connect
	Cheapside Business Alliance
	City Property Advisory Team (CPAT)
	The Eastern City Partnership (EC Partnership)
	Fleet Street Quarter/Partnership
Other	A number of individuals, including subject matter experts, City of London residents, people working in related fields and others generously gave their time and feedback during the production of the Planning Advice Note. Individuals are not listed for data protection purposes.



Contents

Executive Summary 3

Scope of Document 4

Climate Change 5

Climate Action Strategy 2020-2027 6

Whole Life-Cycle Carbon Optioneering.....7

1. Carbon in Planning Policy 8

2. Whole Life-Cycle Carbon Assessments10

3. Introduction to Carbon Optioneering 12

4. Optioneering Considerations13

5. Other Policy Opportunities 15

6. Outline Methodology16

7. Dashboard18

8. The Consideration of Options in the Planning Application Process..... 24

Appendix 1 Climate Action Strategy 2020-2027 25

Appendix 2 Related Reporting Requirements..... 28

Appendix 3 Detailed Building Element Scope.....31

Appendix 4 GLA WLCA Pre-App Reduction Principles Proforma..... 33

Appendix 5 Indicative Example of Completed Table A 34

Appendix 6 Planning Application Trends.....36

Appendix 7 Related Reporting Requirements 38

Glossary41

Page 40

Executive Summary

The City of London Corporation (CoLC) has committed working towards net zero carbon (NZC) for both embodied and operational carbon emissions. The Climate Action Strategy (CAS) specifically commits to

- **NZC for by 2027 in the CoLC's operations**
- **NZC by 2040 across the CoLC's full value chain and in the Square Mile.**

These targets include embodied carbon emissions for the CoLC's own capital projects, but they do not include embodied carbon emissions of other Square Mile buildings that occur outside the boundaries of the City of London. However, in addition to setting up a fully funded action plan to deliver and achieve annual targets against a decarbonisation pathway, the CAS is also supporting workstreams to address the reduction of embodied carbon emissions that make up a large proportion of overall emissions from the built environment.

Planning applications under consideration in 2021 and early 2022 have reported carbon optioneering and WLCA in various ways. The diversity of approaches was making it difficult for planning officers to assess and evaluate proposals as well as to report consistent key results and conclusions to the CoLC's members for decision making.

Hilson Moran was appointed to develop a Planning Advice Note (PAN) on Whole Life-Cycle Carbon Optioneering. The purpose of this study is to advise on:

- The merits of a whole life-cycle carbon (WLC) emission options appraisal as part of the pre-application process to ensure that development proposals maximise the reduction of carbon emissions.
- The scope and methodology of comparative WLC emission options for development proposals at the earliest project stage.
- To ensure a like for like comparison, enable consistency of reporting of carbon emissions and the evaluation of pre-application schemes as a substantive basis for the planning application scheme.

The majority of planning applications, 76%, fall under the definition of major development, (which includes the provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more). The remaining applications are varied full applications covering change of use, external works and extensions. This means that major development will be responsible for a large proportion of new carbon emissions in the City of London.

The review of data concludes that there is a need for emissions to be accounted for and for options to be considered in the City of London for **all major and referable applications**. Major applications are to consider development options and carbon impacts, applying the methodology presented later in this document. Optioneering should also be carried out for non-major applications, where the majority of the substructure and superstructure is not retained. All schemes should undertake independent third-party verification as a quality assurance mechanism for their optioneering results.

Other applications should aim to follow this guidance wherever possible, setting out how carbon emissions have been reduced in the design of the proposed works.

Following the optioneering study, planning officers expect that all major developments undertake a whole life-cycle carbon Assessment (WLCA) for the chosen option in the planning application.

This is supported by Greater London Authority (GLA) WLC assessment guidance, recommending that all major applications undertake whole life-cycle carbon assessments (WLCA).

This PAN establishes the variety of ways by which carbon is estimated in the current planning process and proposes a methodology that recommends options for different degrees of major interventions in development to be considered and presented.

The methodology establishes the minimum data set required at the pre- planning and planning stages, and the level of transparency to be disclosed to planning officers. The proposed methodology aligns with the GLA's adopted guidance on Whole Life-Cycle Carbon Assessments (March 2022). The detailed WLC for the chosen option should be provided as part of the planning application.

Two dashboards have been created to equip planning officers with visual and quantified information that is clear and benchmarkable, enabling informed discussions between the applicants, planning officers and other stakeholders. Both the proposed dashboards, for the options and for the planning application scheme, are designed to clearly and consistently present data and results in the planning application documents so they can be more easily scrutinized by all stakeholders and interested parties.

An excel reporting tool accompanies this report which enables a format for consent reporting to be established based on the dashboards.

The WLC PAN is designed to be adaptable to the evolving carbon policies and procedures. However, future updates of the methodology may be required as the market matures, industry standards are updated and as assessment tools become more robust and reliable.



Scope of Document

This PAN is designed to provide guidance for development site WLC optioneering evaluations. The PAN is a first step of carbon evaluation and is designed to enable a consistent, early-stage approach to assessing options.

The optioneering exercise is a means of comparing a representative number of development options, in order to find the optimum balance in carbon emissions terms, prior to evaluating other considerations in the planning process.

This is considered to be one of the first steps in the CoLC's pursuit to achieve outstanding, best in class buildings that contribute to an attractive and vibrant City environment.

This approach will be recommended to aid the review and decision-making process, through the submission of more in-depth information that demonstrates how applicants have come to a development decision. This process can be relevant to various application types, that have a significant proportion of new build elements.

The assessment will contribute to the justification for the application proposal and may help with achieving a successful outcome.

An evaluation of recent planning applications and types has been undertaken, based on the City of London Corporation Development Schedule '*Development Schedules March 2021 - Updated Jan*' issued to Hilson Moran by CoLC. The details can be viewed in Appendix 6.

The document sets out a recommended approach to optioneering and provides a reporting dashboard template. An Excel reporting spreadsheet is available and should be completed, to enable applicants to provide the information for pre- applications and submissions, should it be required. Section 8 details the consideration of options in the planning process.

Once completed, it is advised that applicants complete the full WLCA analysis for the chosen option for the planning application, in line with the Mayor of London's (Greater London Authority, GLA) '*Whole Life-Cycle Carbon Assessment Guidance (March 2002)*' or, where updated, in line with the guidance in force at the time of application.



Climate Change

Human activities which result in the release of greenhouse gases, including carbon dioxide (CO₂), are estimated to have caused 1°C of global heating above pre-industrial levels. As a result, there have already been sea level rises, increased likelihoods of extreme weather events and melting of sea ice and permafrost. This has direct and devastating impacts on society, including land loss; increased severity and occurrence of wildfires; drought; and difficulties producing food.

Alongside this, there have been unprecedented declines in global biodiversity, with the average abundance of native species in most major land-based habitats falling by at least 20%, mostly since 1900. The quality of habitats which support this biodiversity has also declined, with a 30% reduction in global terrestrial habitat integrity caused by habitat loss, fragmentation and deterioration.' (CIEEM, 2019).

Global emissions need to decrease by 43% by the end of this decade to stay under the preferable 1.5 degrees C global warming target set as part of the Paris Agreement (2015). This is the current recommended threshold to avoid unprecedented heatwaves, terrifying storms, flooding and widespread water shortages (Intergovernmental Panel on Climate Change IPCC, 2022).

The built environment contributes 25% of UK greenhouse gas emissions (CO₂e) that it has direct control over. If emissions influenced by the built environment are included (surface transport vehicle emissions) the built environment contributes around 42% of the UK's total greenhouse gas emissions, MtCO₂e. (Net Nero Whole Life Carbon Roadmap, UKGBC, 2021).

The property and construction industry has a moral duty to act and reduce the environmental impacts of this sector as well as mitigate the effects of climate change.



Climate Action Strategy 2020-2027

The City of London is major global commerce centre with huge influence and opportunity to lead the net zero carbon and climate change mitigation and adaptation agenda.

The City of London Corporation (CoLC) has adopted a radical Climate Action Strategy which breaks new ground and sets out how the organisation will achieve net zero, build climate resilience and champion sustainable growth, both in the UK and globally, over the next two decades. By adopting the strategy, CoLC has committed to:

- **Achieve net zero carbon emissions from their own operations by 2027**
- **Achieve net zero carbon emissions across their investments and supply chain by 2040**
- **Support the achievement of net zero for the Square Mile by 2040**
- **Invest £68m over the next six years to support these goals of which £15m is dedicated to preparing the Square Mile for extreme weather events.**

CoLC has set out a fully funded action plan for 2020-2027 and set annual targets. Data on progress will be shared via a programme dashboard, expected to go live for the public mid-2022. At the end of each year CoLC will publish a report of progress against targets for that year. Stakeholders will be invited to participate in a survey to help us understand how well they are reaching and engaging with them.



Whole Life-Cycle Carbon Optioneering

Page 45



1. Carbon in Planning Policy

This section outlines the means by which carbon emission quantification and reduction are required or encouraged to be reported for planning applications in the City of London.

Part 2 R.2.i of the National Model Design Code (Ministry of Housing, communities and Government, 2021) states a preference for reuse/ refurbishment of buildings over new build development.

Development proposals are generally required to report, for GLA/ CoLC, both the:

- **Embodied carbon emissions, i.e. carbon emissions resulting from materials, construction and the maintenance of a building's life-cycle, and**
- **Operational carbon emissions, from energy consumption throughout the life-cycle of the building.**

However, the scope of reporting in applications is determined by several factors relating to the type of application, the size of the building and the scope of the intervention proposed.

There are a number of policy and guidance documents that determine reporting requirements:

Building Regulations:

At a national level, 'Approved Document L2: Conservation of fuel and power in new buildings other than dwellings 2021 edition' ('Part L2') regulates some elements of design and specification of buildings that affect energy consumption, including insulation, solar control, the efficiency of building services and renewable energy generation. Part L sets minimum requirements and targets for carbon emissions and defines the carbon intensity of fuel and power. The Part L 2021 update tightens target requirements and introduces a minimum Primary Energy metric to place more emphasis on reducing energy demand and on site renewable energy generation.

'Unregulated emissions' refer to the elements of energy use that sit outside Part L and includes carbon emissions from plug-in equipment and cooking.

Embodied carbon emissions are not regulated at a national level. A bill was proposed in Parliament in February 2022 to change this based on a proposed Part Z, developed by industry experts. Whilst Part Z has been widely supported by industry, at the bill's second reading the Government declined to support it. However, the UK Government have committed to undertake consultations on embodied carbon in 2023 and 2024 (*Environmental Audit committee - Building to net zero: costing carbon in construction: Government Response to the Committee's First Report, third special report of session 2022-2023, September 2022*).

The UK Government has recently set out a project to evaluate Measurement and Reduction of Embodied Carbon in New Buildings with the research to be concluded in Q1 2024.

Greater London Authority (GLA) policy:

The Mayor of London's London Plan 2021 requires proposals referable to the MGLA to be net zero carbon.

The London Plan Policy SI 2 sets out the strategies for GLA referable projects to minimise carbon emissions. Part F of Policy SI 2 requires development proposals referable to the GLA should calculate whole life-cycle carbon emissions through a nationally recognised whole life-cycle carbon assessment and demonstrate actions taken to reduce life-cycle carbon emissions. There is a separate GLA (London Plan) policy guidance document - *Whole Life-Cycle Carbon Assessments Guidance, March 2022* - which sets out the requirements applicants must undertake.

Reporting requirements and the scope of the assessment are defined in the London Plan Guidance for WLCA [https://www.london.gov.uk/what-we-do/planning/implementing-london-plan/](https://www.london.gov.uk/what-we-do/planning/implementing-london-plan/london-plan-)



Figure 1: The proposed amendment of the Building Regulations, Part Z, to regulate embodied carbon on a national scale.

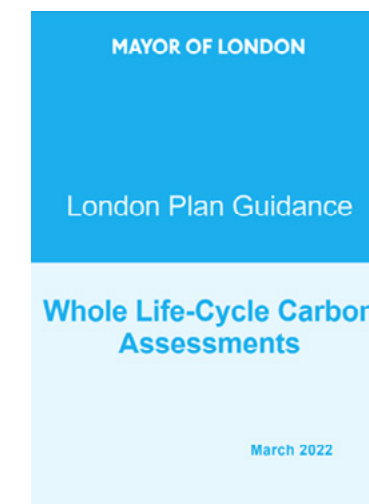


Figure 2: The new London Plan Guidance 'Whole Life-cycle Carbon Assessments' March 2022, sets out a framework of priorities and carbon information required

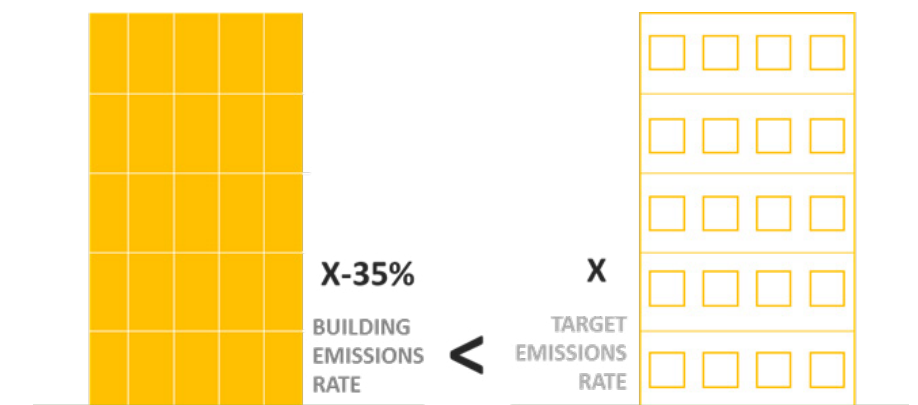


Figure 3: Regulated target operational carbon emissions are reduced further by local planning policy minimum requirements

[guidance/whole-life-cycle-carbon-assessments-guidance](#). WLCA reporting is required at pre-application, application and post-completion stages of schemes that are referable to the GLA, but it is also encouraged for all major developments. All studies account for a 60-year life-cycle period, as standard. Provisions for a different assessment period can be established if accompanying explanations are provided.

The guidance document is recognised as industry-leading. It contains a detailed methodology and list of information to be included for materials across a number of Life-Cycle Assessment (LCA) modules (Table 1) as well as including requirements for reporting emissions for demolition of existing assets on site and from refrigerants.

The Mayor of London's London Plan 2021 sets out a clear energy hierarchy for net zero operational carbon emissions. It defines the process required for reducing these emissions, clarifying local priorities for heating and cooling strategies, setting minimum target savings and local carbon offsetting mechanisms. The carbon savings targets are based on regulated operational carbon and a 30-year life-cycle. Reporting unregulated carbon is encouraged through the design process and building infrastructure provision. Other policy requirements are in place for on-site energy generation and energy storage.

The Mayor of London's 'Energy Assessment Guidance (June 2022)' clearly outlines reporting requirements for planning applications to demonstrate that the proposed climate change mitigation measures comply with London Plan energy policies, including the energy hierarchy and energy performance metrics in terms of Energy Use Intensity for regulated emissions (EUI). It also introduces a new 'be seen' stage to calculate whole building EUI (including unregulated emission), to monitor and report its energy performance post-construction. This will help to ensure that the actual carbon performance of the development is aligned with the Mayor's net zero carbon target.

The 'Be Seen Energy Monitoring Guidance' (September 2021) explains the process that needs to be followed and reporting requirements to demonstrate compliance with the London Plan policy addressing the monitoring, verifying and reporting of energy performance after a building's practical completion ('Be Seen' level of the Energy Hierarchy). It also requires undertaking analysis for regulated and unregulated energy loads using a process such as TM54 (it is aligned with the London Plan guidance for 'Whole Life-cycle Carbon Assessments (WLCA)' module B6 approach.

City of London Corporation policy:

City of London's Local Plan (2015) aligns with the London Plan (see point 3) at the time of its adoption. The London Plan has subsequently been updated (2021). The adopted Local Plan focusses on reducing operational 'regulated' carbon emissions resulting from energy used in operation, low and zero carbon technologies for on-site and local energy generation (including existing and planned District Energy Networks), local and national carbon offsetting mechanisms. Carbon offsets are required for a 30-year period of operation but there is no specific mention of unregulated carbon and embodied carbon (WLCA) in this policy document. However, Policy CS 15 does state that development should 'avoid demolition through reuse of existing building or their main structures...'

The Local Plan is being reviewed and a replacement Plan, City Plan 2040, is in preparation. This City Plan will reference the London Plan's carbon emissions requirements towards achieving whole life-cycle net zero carbon emissions. The City Plan is in the process of being drafted and will ensure that it aligns with the London Plan, recent Mayoral guidance and best practice in the City development market.

Related Reporting Requirements:

There are other carbon-related planning reports that should be taken into consideration. They include Greenhouse Gas impact assessments, the Circular Economy Statement, operational energy and operational water assessments. Where relevant, these should be referenced in WLCA reporting, in particular to highlight discrepancies and overlaps in design considerations and decisions. The related reporting requirements are in Appendix 7.

The current CoLC planning policy for major developments in the City of London does not require a WLCA. However, it does require the achievement of a minimum BREEAM 'Excellent' certification rating, with a provision to ideally achieve 'Outstanding'. BREEAM does include criteria relating to Life-Cycle Assessment, Environmental Product Declarations and Circular Economy. These aspects of design and procurement are therefore typically addressed in proposals targeting a minimum 'Excellent' rating.

The BREEAM scope for Life-Cycle Assessments extends between life-cycle stages A and C, but the scope of building elements to be included is optional and limited compared to the GLA approach (see Table 2, page 16). BREEAM does not currently require a post-completion review of embodied carbon performance.

The total life-cycle carbon emissions of major, non-referable planning applications with reduced scopes, e.g. limited to addressing BREEAM requirements for fewer building elements, are not comparable to

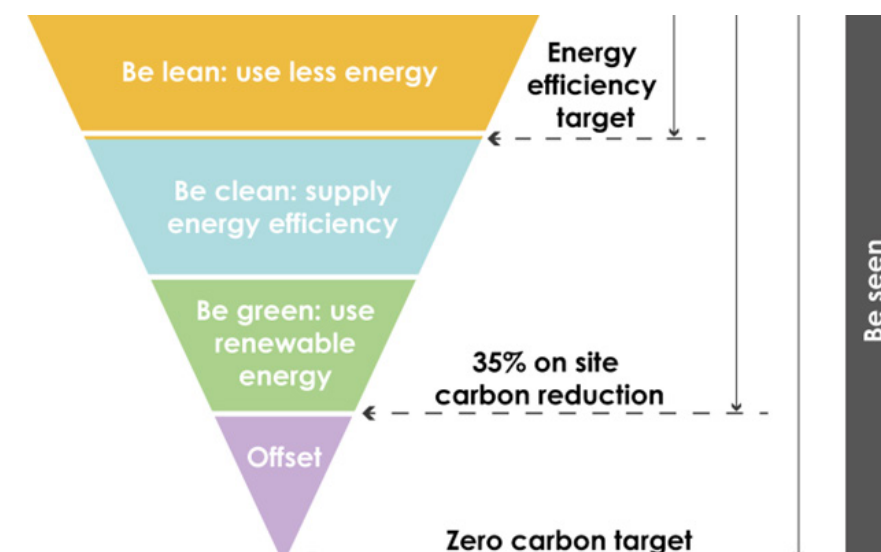


Figure 4: The Energy Hierarchy defines policy priorities and interim



Figure 5: The draft City Plan 2040 is currently under development targets to Net Zero Carbon in operation

GLA benchmarks. Note that Modules B6, B7 and D (EN 15978: 2011 Sustainability of construction works. Assessment of environmental performance of building) are excluded from the GLA WLCA benchmarks.

Table 1 in the following section outlines the typical current carbon reporting scopes driven by national, GLA and local policy requirements.

There are a number of forthcoming updates to guides and standards relating to whole life-cycle carbon and whilst the document aims to account for these, they may require further clarification in future updates to this PAN.

2. Whole Life-Cycle Carbon Assessments

There is currently a variety of different approaches and scopes relating to Whole Life Carbon and what information should be included within the review. Tables 3 and 4 include a comparison between industry drivers such as the UK Green Building Council (UKGBC), GLA, Low Energy Transformation Initiative (LETI) and BREEAM scopes in terms of [EN 15978:2011 Sustainability of construction works](#). The assessment of environmental performance of buildings is broken down into modules / stages and building element groups to be included.

Modules A1-A3 include the product manufacture, modules A4-A5 cover transport to site and installation processes. Combined these is known as upfront **embodied carbon (i.e. at Practical Completion (PC) of the building)**. Modules B1-B5 cover operational emissions relating to use, maintenance, repair, replacement and refurbishment, modules C1-C4 cover demolition, transport to a disposal facility, waste process and disposal. Module D covers emissions beyond the system boundary, accounting for consideration of what happens to material at the end of the building life-cycle. In a WLCA, operational energy use, B6 and operational water use, B7, are also included.

Table 1: Comparison of life-cycle stages. Whole life-cycle carbon Scope of whole life-cycle carbon reporting in the City of London. Major developments' scope of works is currently dictated by BREEAM requirements

Scope (Stages based on EN 15978)	Sub-groups	National –Building Regulations	GLA referable developments in CoL	Major developments in CoL*	Minor developments in CoL
Impact of Existing building					
Demolition impact of existing building structures (required to be reported separately for GLA)*			✓●	✓●	
Product and Construction Process (Practical Completion) Stage					
A1-A3 Construction product supply, transport and manufacturing			✓●	✓●	
A4-A5 Transport to site and Construction			✓●	✓●	
Use Stage					
B1-B5 Operational emissions			✓●	✓●	
B6 Operational energy use	Regulated	✓● 1 year	✓ 30 years for energy, 60 years for whole life carbon assessments#	✓ 30 years for energy, 60 years for whole life carbon assessments#	Depends on scope of works
B6 Operational energy use	Unregulated		✓●	✓●	
B7 Operational Water Use			✓●	✓●	
End of Life-Cycle Stage					
C1-C4 End of life stage including deconstruction, demolition, transport, waste processing and disposal			✓●	✓●	
Beyond the Project Life-Cycle					
D Stages beyond the life-cycle, including re-use, recovery, recycling			✓●		

* - Demolition of the existing assets is not currently required in the 2017 RICS PS WLC methodology, it is expected to be included in the 2023 version.

- Operational energy assessment i.e.TM54 or NABERS where possible, to enable a more accurate estimation of in use energy performance.

The policy drivers listed in Table 1 (previous page) and industry drivers by element also vary in scope as shown below in Table 2. It is worth noting that the source documents may change and the landscape is evolving and continually improving at pace. The GLA methodology is currently the most comprehensive of all the industry methods. This states that the EN 15978 principles and the RICS Professional Statement: Whole Life Carbon Assessment for the Built Environment, 1st edition (November 2017) should be followed as a methodology. It also sets out some additional requirements in Box 1, ‘Key requirements of this guidance that differ from the RICS PS methodology.’

It **should be noted that updates** to the RICS Whole Life Carbon Assessment for the Built Environment 1st edition will occur in 2023. BS EN 15978 will be updated and is likely to be published in Q1 of 2024, and methodologies may need to be adapted to account for these changes. The WLC PAN is designed to ensure these updates would not affect the intended outcomes of the process. The latest, most up to date version of guidance should be used for the optioneering assessment and be clearly stated in its assumptions.

For the GLA method, a minimum of 95 per cent of the capital cost allocated to each building element category should be included for at each stage of the WLCA. This should be approved by the project Quantity Surveyor. In addition, for building services the GLA guide includes a list from which the applicant is required to indicate in-scope items.

Table 2: Whole life-cycle carbon comparison of scopes vs building part element/group (full version including notes is located in Appendix 3).

Building part / Element group	UKGBC Full Assess-ment	UKGBC Minimum Reporting	GLA WLC Guide	RIBA 2030 CC Ver.2	LETI Embodied Carbon Primer	BREEAM NC 2018 and RFO 2014***
Demolition prior to construction			YES Reported separately. Benchmarks do not include these building elements.			
Facilitating works	✓		YES Reported separately. Benchmarks do not include these building elements.			
Substructure	✓	✓	✓	✓	✓	NC credit option RFO if in scope
Superstructure (Frame, upper floors, roof, stairs, ramps)	✓	✓	✓	✓	✓	NC mandatory RFO if in scope (excludes ramps)
Superstructure (External walls, windows, doors)	✓	✓	✓	✓	✓	NC mandatory RFO if in scope
Superstructure (Internal walls, partitions, doors)	✓		✓	✓	✓	NC mandatory education only RFO if in scope
Finishes	✓		✓	✓	✓	RFO if in scope
Fittings, furnishings and equipment (FF and E)	✓		✓	✓		RFO if in scope to CN7 limited furniture / shop fitting
Building services/ MEP	✓		✓	✓	✓	NC credit option RFO if in scope
Prefabricated Buildings and Building Units	✓		✓	✓	✓	
Work to Existing Building	✓		✓	✓		
External Works	✓		✓			NC credit option RFO if in scope: hard landscaping and boundary protection only

3. Introduction to Carbon Optioneering

This PAN provides the recommended methodology to compare a number of development options in order to find the best balance in carbon emission terms prior to adding other considerations into the planning process.

The PAN is a first step of carbon evaluation and is designed to enable a consistent, early-stage approach to assessing options, and is one of the first steps in the CoLC's pursuit to achieve outstanding, best in class buildings that contribute to an attractive and vibrant City environment.

This approach will be recommended to aid the review and decision-making process, through the submission of more in-depth information, that demonstrates how applicants have come to a development decision. This process can be relevant to various application types, that have a significant proportion of new build elements.

Optioneering is required for all major schemes. Other developments should carry out optioneering if they do not retain the majority of substructure and superstructure. All schemes should undertake independent third-party verification as a quality assurance mechanism for their optioneering results.

Schemes that propose to retain the majority of the substructure and superstructure are classed as retrofits for the purposes of this PAN. While such schemes are not required to undertake a full optioneering exercise, applicants are encouraged to explore different options during the pre-application process, with the aim of incorporating design approaches that minimise the carbon intensity of the development. The purpose of the optioneering exercise is to compare bespoke development options for a particular site, which can mean that comparison with other City development proposals may not be relevant.

The WLC PAN advises on the consistent presentation of options in planning applications (see Dashboard 1) to make the information is easier to understand and assess, as part of the application consultation process.

The development of this methodology is driven by the growing realisation that the construction of new buildings using the most common and current construction techniques and materials result in high carbon emissions over the building's life-cycle. For this reason, the assessment and benchmarking of embodied carbon to practical completion (Modules A1-3 and A4-A5) can be used as an effective way to evaluate and then mitigate emissions from construction and materials. It is also acknowledged that the majority of the existing building stock has relatively high operational emissions, primarily due to inferior energy efficiency standards and technologies at the time of their construction, compared to current requirements (insulation, air tightness, solar control glass, building services etc.).

Another major contributor to existing operational emissions is the common use of natural gas combustion equipment for space heating and hot water. Investments in alternative renewable power sources have resulted in the carbon emissions of electricity generation to decrease rapidly, to almost half that of gas, and this trend is set to continue. Therefore, a feasible carbon balance needs to be explored in any intervention of the built environment. This will help to provide clarity about the measures that would result in the greatest whole life-cycle carbon emissions reduction for each development proposal, both short term and long term, be it through the retention of buildings or building elements or through redevelopment.

This methodology recommends comparing a number of development options in order to find the best balance in carbon emission terms, prior to adding other considerations into the planning balance. These can be expressed as potentials and constraints of each option, ensuring that all primary and secondary considerations form part of the design process, so that informed decisions can be made. These considerations frequently encountered in the decision process are set out in this section.



4. Optioneering Considerations

Quality of existing building: The condition of materials and structures in an existing building will be a critical determinant of the extent of elements that can be retained in an intervention aimed at improving an asset and bringing it up to current performance and functional market standards.

For example, a structure that was poorly constructed or maintained may require too many life-cycle interventions to maintain structural integrity for retention to be feasible. Often, existing assets require extensions to validate the Capital Expenditure (CAPEX) of a major intervention. Extension potential will be dictated by structure and substructure design from the existing building.

Adding piles and foundations to an existing building could mean a level of complexity that increases cost and programme to a degree that the proposition becomes unviable. Current industry experience shows that due to the construction techniques and curing of the concrete in building of this age, as well as the grading of the concrete/steel used at the time, particular care should be taken when considering 1950s/60s concrete structures. However, each project should check the condition of the existing building materials quality as far as practically possible, to enable informed decisions to be made. Poorly maintained windows can be restored to improve air permeability, but conductivity, light transmittance and solar control are difficult to achieve without additional material or complete replacement.

Façade interfaces: As well as quality, decisions around façade retention need to take into consideration new interfaces with the internal environment, for example for on-floor ventilation systems and mixed-mode ventilation opportunities. The two examples are increasingly being adopted by commercial buildings to improve energy efficiency, spatial adaptability (as part of a health and wellbeing design strategy) and to free up roof area for amenity uses.

Health and wellbeing: Design considerations and interventions around health and wellbeing have become more prevalent in workspace over the past few years, and increasingly so in a post-pandemic era. More consideration is being given to quantities of fresh air to dilute indoor pollutants, for example through the application of enhanced on-floor ventilation systems. Aligning a ventilation strategy to an existing façade retention can be challenging. Increased fresh air rates are also leading to increases in operational carbon emissions.

Other design considerations for healthier internal environments include internal levels of daylight and thermal comfort, which may shift a decision to replacing existing glass in a refurbishment; and the presence of toxic materials, such as asbestos, which could result in the removal of existing building elements.



Floor to ceiling heights: Existing floor to ceiling heights could constrain the functional adaptation of an existing structure and new building services solutions. For example, low floor to ceiling heights may not lend themselves to certain uses, and optimised clear heights, by transferring heating, cooling and ventilation plant to an underfloor system is often limited by existing lift lobby and stair landing levels.

Land use and building type: It is important to note that different land uses and building types have an effect on the structural requirements of a building due to loading expectations and flexibility requirements. A few examples include uses that require wider clear spans, such as retail, which could make the structural solution and carbon impact more intense; and uses that have higher loading requirements and need vibration control, for example in science labs (life sciences) and gymnasiums; and increased structural materials due to lateral loading on tall buildings.

The way a building is operated and managed also has a direct effect on operational carbon emissions from energy consumption, for example longer hours of operation by food and beverage establishments.

Power infrastructure: For the reason described in point 1 above, substituting gas-fired heating systems with energy efficient electric alternatives is a very effective way of reducing operational carbon emissions. However, in some cases, securing enough power to serve a development's decarbonisation initiatives can be challenging due to utilities infrastructure constraints. This is another reason why reducing energy demand should be prioritised. A mitigating action could be that a building's systems and controls are set to prioritise electricity and thermal storage, before gas is consumed.

Buildings that apply electric heating may still have other intermittent uses of fossil fuel, such as life safety generators and façade maintenance equipment. These systems require on-site storage of fuel, which is frequently diesel. Alternatives that can be explored for generators are secondary utility high voltage supply fed from a primary network substation that is independent from that of the primary supply, or uninterruptible power supply equipment incorporating an appropriately sized battery installation (subject to authority approval). An alternative fuel that is considered due to low environmental impact relative to diesel is Hydrotreated Vegetable Oil, a synthetic diesel, manufactured from waste products comprising a mix of vegetable oils and animal/fish fats.

Building complexity: Design complexity and the number of elemental sub-components increases carbon intensity. Therefore, simplification of structure, façades, systems, etc. has carbon benefits and is encouraged.

Procurement: The options and availability of low carbon building products on the market are currently limited. In some cases, lower carbon options are available from longer distances, increasing the emissions associated with transport (Stage A4), although these can be comparatively minor compared to the product manufacture. However, this is changing rapidly as manufacturing processes are adapting and supply chains recognise the high value of low carbon in sections of the market, for real estate in London in particular.

Invariably, a limited quantity of higher value products is less attractive during a time of economic inflation. Applicants of major developments could be asked to state what measures they have in place to increase the probability of lowering embodied and operational carbon in procurement processes.

Assumptions: In addition to fewer options of low carbon products, information about the quantity of carbon in products is also limited. A requirement for EPD certificates, or similar third party verified information, should be a requirement in procurement. For products with no certified embodied carbon data, assumptions and metrics should be clear and reliable market-average databases should be used, derived from a verifiable tool or software, such as One Click LCA and Cerclos (eTool).

Supply chains can be constrained by a very long lead time, impacting the construction programme and leading to product changes with potentially higher carbon impact.

Due to market fluctuations and limitations, it is recommended that, at application stage, the WLCA is based on market averages of a committed specification, based on a Quantity Surveyor's bill of quantities. Product-specific Environmental Product Declaration (EPD) certificates should not be used in early design stages (unless the manufacturer is known, sector level data e.g. EPDs that use data covering several manufacturers could be used) because they may be giving a false impression of future procurement opportunities. This is an area the industry needs to improve upon over the next few years.

Commerciality: A critical factor in decision making around the level of intervention in a building is the commerciality of the asset. In commercial buildings, the net lettable area and lease value are imperative metrics. The market in City of London is shifting demand for net zero carbon, fossil fuel free, health and wellbeing conscious and smarter workspace. As market demands change, a number of asset holders are racing to update their lettable spaces at the end of the next lease term. This is to ensure that buildings don't become stranded assets, and equity and operating value are maintained.

The standard for what is required in a building update needs to be competitive in the market that it is trying to attract, and the cost of the intervention needs to be justified by a likely return on investment.

Densification: As London tries to move towards a polycentric city to release infrastructural pressures and improve quality of life, its existing 'mega-centres' remain very relevant. Urban densification (the increasing density of people in urban areas) is accepted as a necessary part of limiting land take while serving population growth. Densification tends to occur in fast growing population centres with a combination of demographic change, economic pressure and large transport infrastructure projects. The City of London is very well served by sustainable transport infrastructure and planning policies are in place to limit pressures on utility infrastructure and the existing community (the people who live, work and use the City of London).

Densification, e.g. extensions and taller buildings, tend to increase the carbon intensity of structural elements relative to benchmarks derived from mid-height buildings.

Striking the right balance between the environmental (and social) costs and benefits of increasing NIA on brownfield sites is a critical factor that policy makers have to deal with, in particular in addressing climate change. Resilience and sustainability should be central priorities for increasing existing building heights.

5. Other Policy Opportunities

This section addresses circumstances where other planning policy requirements may result in lower or higher carbon emissions. All factors need careful consideration on a project-by-project basis, and policy requirements need to be fine-tuned depending on priorities discussed at pre-application stage.

Circular Economy:

The Mayor of London has introduced a requirement for referable proposed developments to develop a circular economy strategy and produce a statement as part of an application. The approach is defined in the 'Circular Economy Statement Guidance' (adopted 25th March 2022). The principles encourage building reuse, recovery of material for reuse and recycling, material efficiency, waste management and infrastructure to support material reuse (such as storage and collection systems).

The circular approach often aligns with the principles of low carbon interventions. For example, it encourages refurbishment and efficient use of materials and requires consideration of the end-of-life stage by a proposed new building (building as a material banks/materials passport approach). This area is still evolving and can significantly reduce carbon.

There are, however, some circumstances where actions that align with circular principles can increase carbon emissions. For example, on occasion, it has been found that recovering/repurposing a material for re-use on site frequently requires the material to be reformulated into a new high value use (or upcycled), a process that requires transport to and from the site and energy to repurpose the materials. Recovering material can also lengthen construction programmes prolonging stage A5 of the life-cycle and local environmental impact.

Therefore, it is important to compare the carbon emissions of the product stages of recycled elements to their newly made equivalents with the lowest carbon opportunity established.

Low and zero carbon technologies:

Planning policy, building regulations and the BREEAM assessments have for years required the inclusion of low carbon and zero carbon technology in the energy hierarchy of proposed developments. One example, and the most viable option in the City of London, is frequently to install a maximum area of roof-mounted photovoltaics (PV) and air source heat pumps (ASHPs). Policy prioritises operational energy and carbon reduction in advance of renewable energy

generation, but no consideration is given to reducing the embodied carbon of PV and other renewable energy sources. An array in London can achieve carbon break-even within a decade, but as the electrical grid decarbonises, there is an argument that the array will displace less carbon and could never recover the embodied carbon emitted. For this reason, it is recommended that circularity principles are applied to their specification (e.g. reusable mounting and take-back schemes) and energy storage is incorporated to increase the proportion of renewable energy uptake at time of use.

It is important to note that PV can bring other benefits like localised power, and we tend not to factor in the impact or wider power networks' embodied carbon (i.e. the impact of the power plant construction upgrades, cabling etc.). PV will be a crucial piece of the UK energy and decarbonisation strategy.

District Energy Networks:

Another local policy requirement is connecting to existing District Energy Networks (DEN) or preparing for a future connection to a planned DEN. This is emphasised by both the London Plan's and draft City Plan's heat infrastructure priorities. The City of London includes the extensive Citigen network, which is planned to extend south in the near future and eastwards at a later date. However, due to the drive to remove fossil fuel combustion from buildings, for reasons relating to both carbon reduction and air quality targets, electrically heated buildings tend to have much lower carbon emissions than existing heat networks. This is because the Energy Centres that serve the DENs still run on gas systems, and while they are intended to decarbonise over time, there is very little information about their programme. In addition, the carbon intensity of planned networks is unknown at this stage. Therefore, the policy can be interpreted to contradict the Climate Action Plan and can impact life-cycle aspirations, such as high NABERS UK energy ratings.

Public realm and urban greening:

The City of London includes a network of gardens, small open spaces and squares that are maintained by the Corporation. Nevertheless, the area of green and open space per capita is relatively small, and the discrepancy will increase as the population and densification rises.

Planning policy encourages urban greening and biodiversity net gain, for which the City of London has adapted the London Plan's Urban Greening Factor (UGF) calculation which is required for proposed developments to demonstrate higher value green infrastructure.

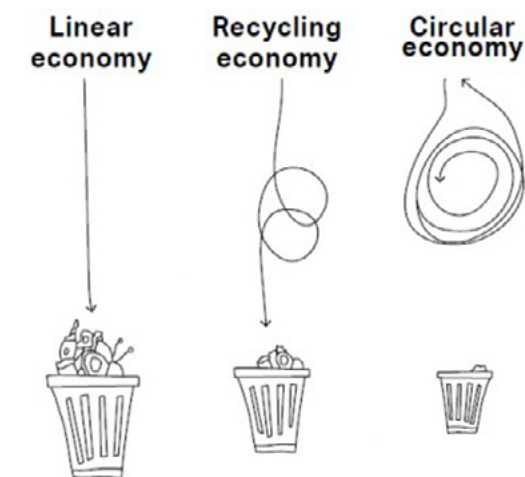
However, urban greening does not often translate into open space, because private roof gardens and green walls are often used to satisfy the UGF target.

In order to increase the amount of open and green space in the City, brownfield and lower quality space may need to be upgraded. This may result in decisions to demolish lower quality infrastructure. In addition, the UGF can be difficult to achieve on existing structures mostly due to loading limits and plant requirements, however, all solutions to overcome this should be explored and communicated.

In addition, major developments are required to carry out ecological surveys of the site, and propose ecological protection, enhancement and maintenance measures.

Climate resilience:

Adapting to climate change is crucial in the City as a densely built environment which is especially prone to local flooding and urban heat island effects. Integrating measures to minimise the risk of local flooding and overheating of buildings as well as the public realm are key to making the City a resilient area as the effects of climate change become more pronounced. Space constraints and loading limits of existing buildings can make it challenging to incorporate measures such as green roofs and walls, sustainable urban drainage measures such as blue roofs, rainwater harvesting and attenuation tanks, adapted façade systems and sustainable heating, ventilation and air conditioning (HVAC) systems. Opportunities and constraints must be clearly communicated to identify the balance between climate change mitigation and adaptation.



FROM TAKE • MAKE • USE • DISCARD TO RE-MAKE • USE-AGAIN

Diagram courtesy of Circular Flanders

Figure 7: Circular Economy compared to Linear Economy (Source: Circular Flanders)

6. Outline Methodology

The GLA's Whole Life-Cycle Carbon Assessments Guidance and Circular Economy Statement Guidance require the full exploration of options before considering substantial demolition. This PAN recommends a methodology to do so, and it recommends how this should be demonstrated in the planning application.

Due to the significant impact on carbon emissions and climate change by major interventions and new construction, proposed developments need to demonstrate reduction and mitigation of carbon emissions using a consistent optioneering approach.

Options will be developed in early discussions with applicants in the pre-application process, and their details will vary on a case-by-case basis. The number of options will be limited and agreed based on presenting clearly discernible, feasible design approaches to the proposal in order to inform the optimum design for the application scheme, both in WLC carbon terms and in considering other environmental opportunities such as urban greening and climate resilience measures.

Options are hypothetical, they provide an indication of the potential for a given site. They should be based on the same assumptions including which energy strategy is thought to be the most advantageous in carbon reduction terms, in order to be able to compare the options - unless there are reasons for not doing so, which should be clearly stated. Option review reporting and their considerations should be transparent with clearly identified opportunities and constraints.

The CoLC requires all major developments to consider and assess both operational and embodied carbon emissions over a whole life-cycle. There may be development proposals where an optioneering exercise would not provide useful information in which case the consideration of options should be discussed and agreed with officers.

Optioneering should also be carried out for non-major applications, where the majority of the sub- and superstructure is not retained.

Pre-Application stage

Optioneering as part of pre-application discussions with the City of London should include the following:

1. Well-considered options that are realistic and feasible development proposal for a specific site.
2. Demonstrating different levels of interventions to the existing buildings on site in the design process.
3. Providing options information in Table A of the WLCA Dashboard 1 (section 7 and the Excel tool), including:
 - Gross internal area (GIA)
 - Increase in net internal area (NIA)
 - Embodied carbon to practical completion (Modules A1-A5)
 - Life-cycle embodied carbon (A1-A5, B1-B5, C1-C4)
 - Percentage of material retained (by volume, relative to existing building)
 - Operational carbon from energy consumption (Module B6) (see carbon factors below)
 - Regulated operational carbon savings relative to current Part L Target Emissions Rate
 - EPC rating
 - Fuel source for operational energy (gas, electricity, other to be defined)
 - Carbon factor(s) used for operational energy
 - Whole life-cycle carbon (A1-A5, B1-B6, C1-C4) in kgCO₂e/m²GIA and tCO₂e
 - Opportunities and constraints, specifically in relation to carbon emissions and other policy areas.
 - Any assumptions and justifications for the above in the estimations
4. Using consistent carbon factors across options for the type of fuel used. Figure 8 shows the Part L carbon factors for Part L 2013 and Part L 2021, however these figures do not account for grid decarbonisation.

Guidance on carbon factors for grid electricity is provided for the optioneering statement. The electricity figure is based on the average decarbonisation figures from the UK Government, from the latest

Carbon Emissions Factors kgCO₂/kWh

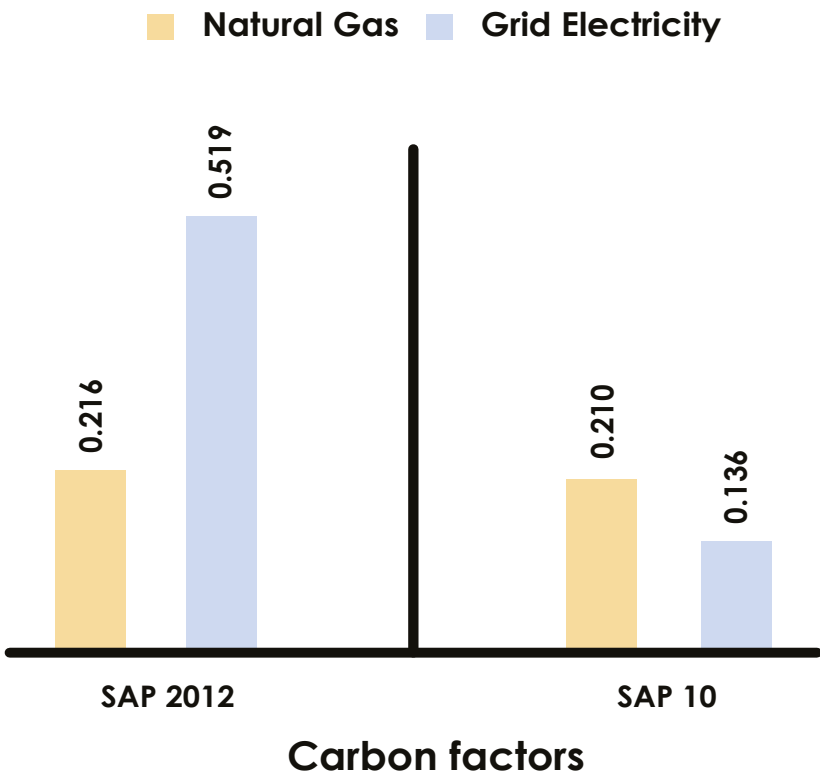


Figure 8: Investments in renewable energy and infrastructure are resulting in rapid decarbonisation of grid electricity compared to natural gas. SAP 10.1 was published in October 2019 with subsequent updates.

BEIS tables supporting the Treasury Green Book supplementary appraisal guidance on valuing energy use and greenhouse gas (GHG) emissions; [Table 1: Electricity emissions factors to 2100, kgCO₂e/kWh, Long-run marginal](#) figures. Note: BEIS was dissolved on 7th February 2023, and split into different departments, including the Department for Energy Security and Net Zero.

These should be used for evaluating each option for consistency. Where a district energy network is used, the carbon factor should be stated based on information from the network provider. Should a different factor be used, this must be declared for each option with clear justification provided. The suggested factor to use are:

- Electricity: 0.0067 KgCO₂/kWh (to be adjusted in accordance with forthcoming industry guidance)
- Gas: 0.2035 kgCO₂/kWh
- District Network: Based on supplier information (follow GLA Energy Assessment Guidance) and report assumptions in Dashboard 1.

Where a mix of carbon factors are used, estimations depending on consumption by fuel type should be calculated.

5. Ensuring like-for-like reporting, without bias to favour one option against the others. For example, the opportunity for energy and carbon improvements should be equivalent across all options, except where constraints can be clearly demonstrated, and the equivalent level of aspiration to reduce elemental embodied carbon should be applied equally across all options.
6. Presenting the development options on the basis of consistent, assumed and proposed data including:
 - An equivalent approach to the level of assumptions and certainty applied to embodied carbon estimates
 - Equivalent scope for the WLCA (life-cycle stage and building element scopes)
 - Embodied carbon impact of further interventions to be included with justifications provided i.e. what has been assumed. For example, estimated impact of plant replacement every 15 years of operation over the life-cycle, using life-cycle modules B1-B5, C1-C4.
7. Excluding Module B7 'Water Consumption' at this stage, because it does not vary significantly between options. Any variances, in particular where an opportunity or constraint occurs for one option and not another, should be clearly presented.

It should also be noted that the WLCA emissions fluctuate and are likely to be different in later design and construction stages. Generally, this is due to the availability of more detailed design and cost plans. Emissions at practical completion may also change due to procurement variations and the market. As more data becomes available it will inform future projects to refine early estimations.

Application stage

The preferred option to be developed after the pre-application optioneering should include the following:

1. Justification to support the decision of the application proposal
2. Calculations of the WLCA in alignment with GLA guidance at the time of the assessment, and completion of the GLA reporting template spreadsheet, i.e. including all modules and building elements.
3. Clarification of the scope of the WLCA (life-cycle stage and building element scopes), by completion of Table B (section 7).
4. Clarification of all assumptions, exclusions and level of certainty of the data used in the assessments.
5. Plotting of the life-cycle stages A1-A5, B-C (excluding B6 and B7) against the GLA WLCA benchmarks (see Figure B):
 - By stage for the proposed land use
 - By building element for Stage A1-A5 (embodied carbon to practical completion)
6. Reporting of the total kgCO₂e/m² GIA and the total whole life-cycle Carbon in tonnes.

The WLCA should be based on the cost plan in line with GLA guidance. The GLA WLCA reporting template should be completed and submitted to the CoLC and GLA where applicable. The post-completion report should follow the GLA WLC guidance and include CIBSE TM 65 data for building services as required in the GLA guidance.



7. Dashboard

Dashboard 1: Pre-application Options Appraisal

Completion of Dashboard 1 is required to improve reporting consistency, transparency and standardisation across applications. An Excel reporting tool has been created for design teams to use. This should be completed and presented at pre-application stage. The template should be completed with project information, which will populate some of the required graphs.

The graph in **Figure A** will need to be created separately.

Dashboard Input Methodology: General Recommendations:

The optioneering information is not based on a prescriptive method. Assumptions and building information should be as transparent as possible. The following recommendations have been made to guide design teams:

Whole life-cycle operational energy:

- Scope of works should be summarised/defined for each option.
- The information should aim to be consistent across options where the fuel source is the same.
- The recommended carbon factors for electricity and gas should be used (as appropriate, see section 6).
- The applied carbon factor needs to be declared where district heating and/or cooling is proposed, i.e. from Citigen London Network. This should be listed in the assumptions. Reasonable estimations of energy use intensity should be used for the whole building. This should be reported based on GIA per m². If a lighter touch refurbishment is proposed, it is recommended to apply general assumptions in anticipation of future policy. After a 15–20-year period for example, building services upgrades may be required (due to forthcoming legislation and system life expectancy) as it is unlikely that the building could be left operating in situ over a period of 60 years or more. For operational energy reporting of estimated whole building operational energy in kWh if gas is used, it will need to be converted to an electric equivalent in kWh. To convert gas consumption (kWh/m²) to electrical equivalent (kWh/m²), by multiplying kWh gas by 0.75. Refer to latest guidance from NABERS/BRE/BBP/UKGBC as appropriate.

Embodied carbon estimates:

New Build

- The embodied carbon of the substructure and structure should be calculated for each option using structural engineer estimations.
- Other elements or layers can either be based on a detailed calculation, should the information be available, or on an estimation based on percentage rates from the GLA WLC (A-C, excluding B6 & B7) benchmarks. Where a different methodology/estimation is chosen, this should be clearly identified and explained.

Major Refurbishment/Retrofit

- The structure and substructure interventions should be calculated for each option using structural engineer estimations. The type of works should be declared in the assumptions section.
- Other elements can either be based on a detailed calculation, should the information be available, or on an estimation based on percentage rates from the GLA WLC benchmarks or similar building types. Where a different methodology is chosen, this should be clearly identified and explained.

Each option should clearly state the assumptions made in the determining factors for the outputs provided.

The graph below demonstrates, in general terms, the relationship between carbon emitted at practical completion of a building intervention and the estimated operational carbon over the building's life-cycle (year on year). The decarbonisation of the electrical grid and minor maintenance and replacement interventions during the life-cycle are also included. The existing building approach could not claim to be net zero carbon in operation where fossil fuels are used, and it would be likely to undergo upgrades at some point during the 60-year period. It is difficult to predict decarbonisation of materials and embodied carbon - this could be lower in future as sectors/global supply chains decarbonise, however currently it should not be accounted for.

The cumulative carbon emissions graph (Figure A) is an example showing options comparisons. This could vary depending on the levels of intervention and scope of works, especially in relation to the minor refurb/major refurb options.

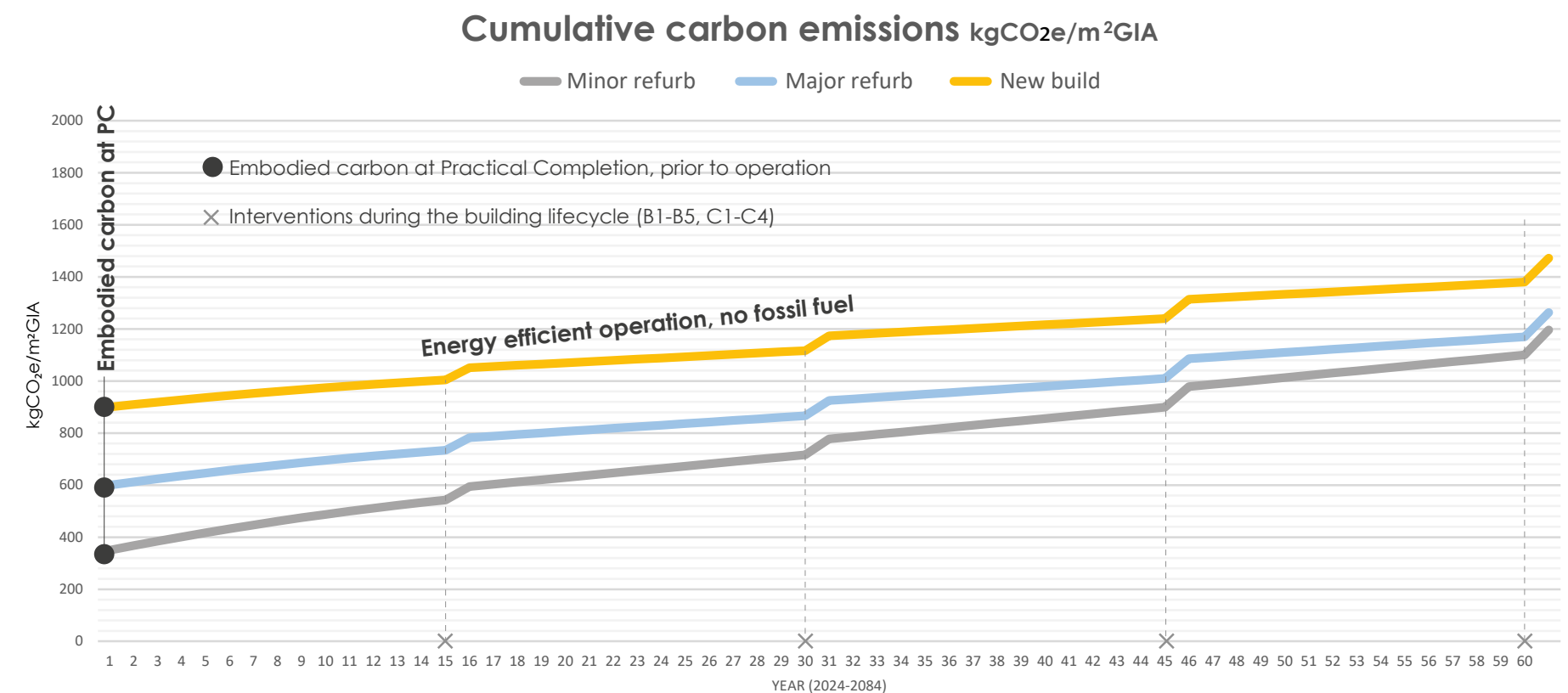


Figure A: Example of completed template optioneering graph over a 60-year period, including whole life-cycle carbon (embodied and operational) emissions, indicative only. Depending on scope and intervention, emissions parity may be achieved between options at a certain time during the life-cycle (Source: Hilson Moran).

The graph should be created on the basis of:

- The scope of works for each option should be identified (see dashboard 1) and assumptions clearly stated.
- The estimated / predicted energy consumption of each option should be provided.
- An equal rate of electrical grid decarbonisation over time applied to operational energy (derived from the latest ‘The Department for Business, Energy and Industrial Strategy (BEIS) Energy and Emissions Projection (EEP)’. See section 6 Outline Methodology. Note: BEIS was dissolved on 7th February 2023, and split into different departments, including the Department for Energy Security and net zero). See section 6.
- An equivalent approach to the level of assumptions and certainty applied to embodied carbon estimates.
- The declared fuel source and carbon factor used.
- An equivalent scope for the WLCA (life-cycle stage and building element scopes).
- The embodied carbon impact of further interventions to be included, for instance every 15 years of operation over the life-cycle, using life-cycle modules B1-B5, C1-C4. Where different, the method should be stated and clarified in the dashboard.
Note: Buildings will likely be de-gassed to meet future market demand and policy drivers for fossil-free heating / hot water. The above diagram does not currently take account of future de-gassing due to unpredictability. This would necessitate the refurbishment of existing heating infrastructure.”
- In addition to the cumulative carbon emissions graph showing data per square metre (Figure A), the absolute carbon emissions values should be demonstrated for each option in the table (right) showing the split between embodied carbon and operational energy in Table A.

TABLE A: Optioneering outcomes to be presented to planning officers at the pre-application stage.

Example of Applicable Option	Minor refurbishment	Major refurbishment	Major refurbishment with extension	New build, reclaim and recycle
	Provide building Image / Section	Provide building Image / Section	Provide building Image / Section	Provide building Image / Section
Scope of works summary	e.g. Change of plant /minor alterations to windows	e.g. Major interior modifications, change to façade, upgrade services	e.g. Major interior modifications, change to façade, upgrade services plus 2 storey extension	New build
Gross Internal area (GIA)	___m ²	___m ²	___m ²	___m ²
Net Internal area (NIA)	___m ²	___m ²	___m ²	___m ²
Change in NIA (compared to existing)	___m ²	___m ²	___m ²	___m ²
Substructure % Retained by mass	%	%	%	%
Superstructure % Retained by mass	%	%	%	%
Façade % Retained by area	%	%	%	%
Estimated existing building demolition	kgCO ₂ e/m ² GIA	kgCO ₂ e/m ² GIA	kgCO ₂ e/m ² GIA	kgCO ₂ e/m ² GIA
Embodied Carbon (A1-A5)	kgCO ₂ e/m ² GIA	kgCO ₂ e/m ² GIA	kgCO ₂ e/m ² GIA	kgCO ₂ e/m ² GIA
Embodied Carbon (A1-A5, B1-B5, C1-C4)	___kgCO ₂ e/m ² GIA	___kgCO ₂ e/m ² GIA	___kgCO ₂ e/m ² GIA	___kgCO ₂ e/m ² GIA
Estimated Whole building Operational Energy	Kwhe/m ² /yr	Kwhe/m ² /yr	Kwhe/m ² /yr	Kwhe/m ² /yr
Fuel source	<input type="checkbox"/> Gas <input type="checkbox"/> Electricity <input type="checkbox"/> Other (state)	<input type="checkbox"/> Gas <input type="checkbox"/> Electricity <input type="checkbox"/> Other (state)	<input type="checkbox"/> Gas <input type="checkbox"/> Electricity <input type="checkbox"/> Other (state)	<input type="checkbox"/> Gas <input type="checkbox"/> Electricity <input type="checkbox"/> Other (state)

TABLE A: continued

Example of Applicable Option	Minor refurbishment	Major refurbishment	Major refurbishment with extension	New build, reclaim and recycle
Estimated Whole Building Operational Carbon for building life time (B6)	___kgCO ₂ e/m ² GIA	___kgCO ₂ e/m ² GIA	___kgCO ₂ e/m ² GIA	___kgCO ₂ e/m ² GIA
Carbon Factor used for B6	___kgCO ₂ e/Kwh	___kgCO ₂ e/Kwh	___kgCO ₂ e/Kwh	___kgCO ₂ e/Kwh
District heating carbon factor	kgCO ₂ e/Kwh	kgCO ₂ e/Kwh	kgCO ₂ e/Kwh	kgCO ₂ e/Kwh
District cooling carbon factor	kgCO ₂ e/Kwh	kgCO ₂ e/Kwh	kgCO ₂ e/Kwh	kgCO ₂ e/Kwh
EPC rating				
Total WLCA	___kgCO ₂ e/m ² GIA	___kgCO ₂ e/m ² GIA	___kgCO ₂ e/m ² GIA	___kgCO ₂ e/m ² GIA
Total WLCA Opportunities Constraints Notes and assumptions made in calculations Please state detail here	___tCO ₂ e	___tCO ₂ e	___tCO ₂ e	___tCO ₂ e

Graphs for options should also be provided (the oposite are for illustrative purposes only), number of options and assumptions may vary.

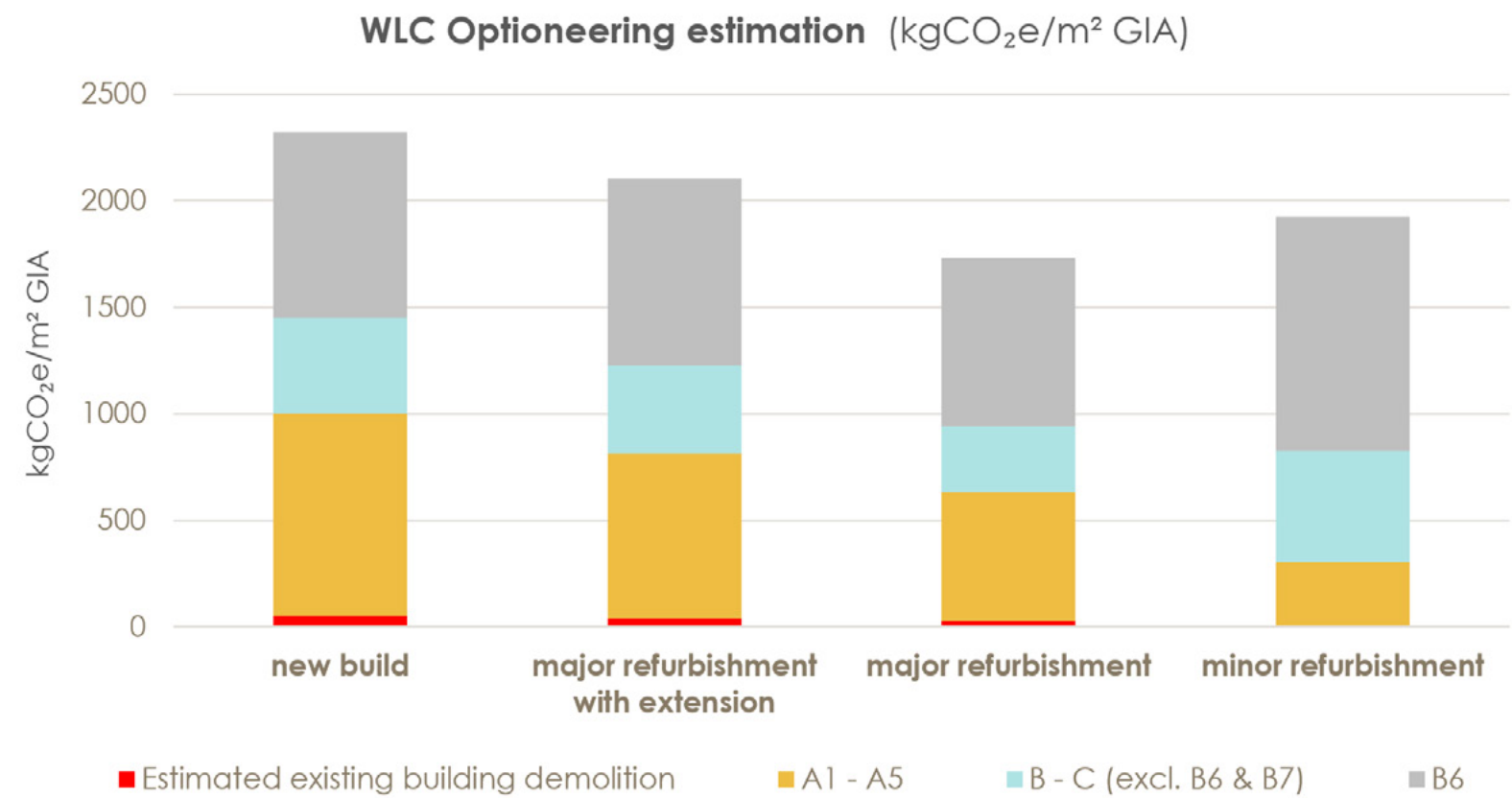


Figure B: Whole Life Carbon Options comparison for each in Kg CO₂e/m² GIA

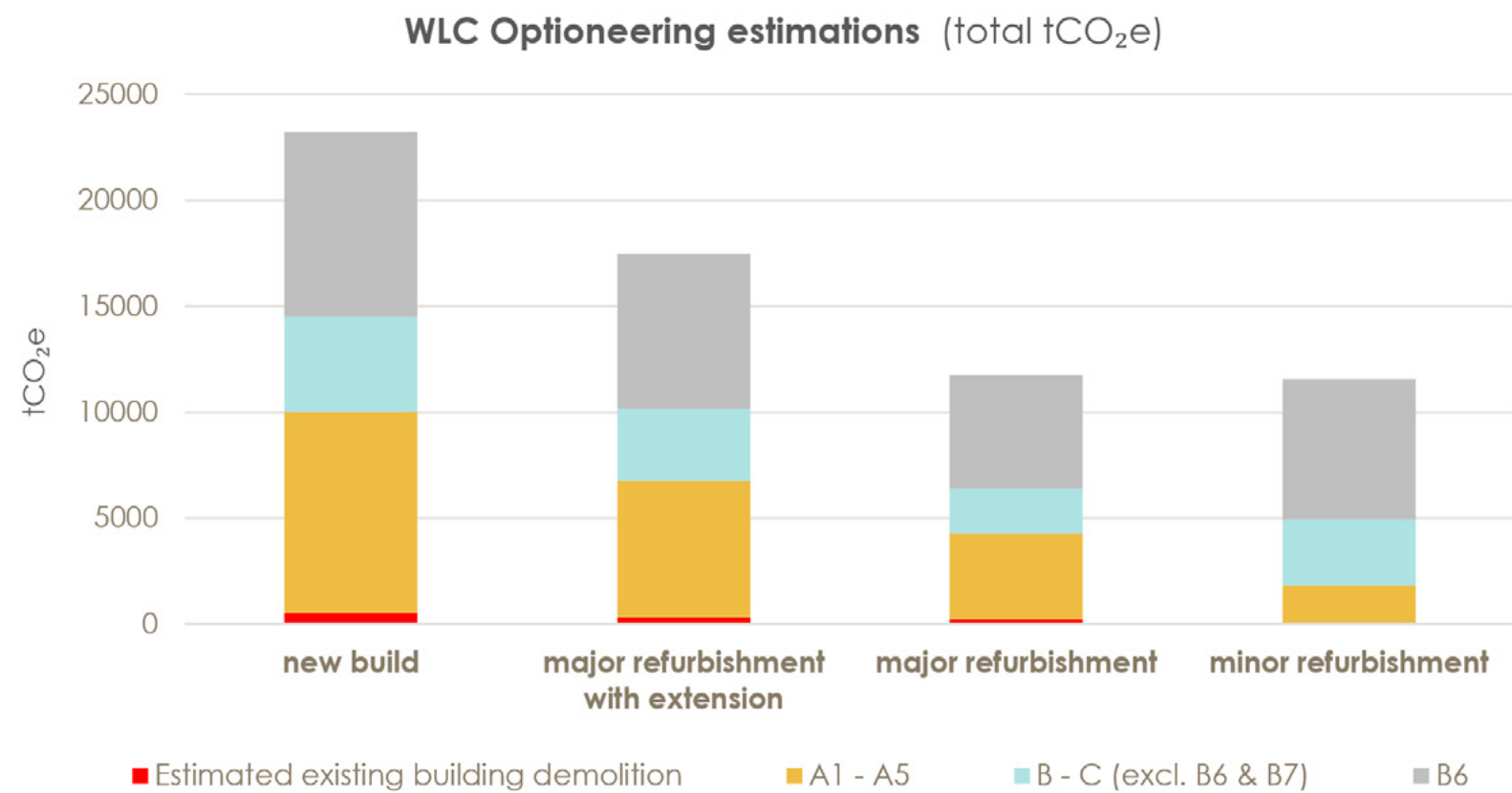


Figure C: Whole Life Carbon Options comparison in total tonnes of CO₂ for each option. Note: the difference in floor area of options will affect the total tonnage of CO₂e for each option

Dashboard 2:
Application WLCA Preferred Option

Life-cycle stage scope

Scope (Modules based on EN 15978)	Proposed development
Product and construction process stage	
A1-A3	✓
A4-A5	✓
Use Stage	✓
B1-B5	✓
B6	✓ SAP <input type="checkbox"/> TM54 <input type="checkbox"/> NABERS UK <input type="checkbox"/>
B7	✓
End of life stage	✓
C1-C4	✓
Beyond project Life-cycle	✓
D	✓

Table B: Example of completed scoring template tables for whole life-cycle carbon

Completion of Dashboard 2 is required to provide reporting consistency, improved transparency and standardisation across applications. Applicants are to complete and include it in the executive summary of the WLCA report that forms part of the planning application. The GLA WLCA reporting template should also be used for submitting the final results.

Applicant to identify reasons where benchmarks are exceeded for life-cycle stages and building elements, using evidence of explored improvements where possible.

Additional opportunities for improvements should also be identified in the application report.

Building elements scope

Building part/Element group	Proposed development
Demolition prior to construction	✓
Facilitating works	✓
Substructure	✓
Superstructure (Frame, upper floors, roof, stairs, ramps)	✓
Superstructure (External walls, windows, doors)	✓
Superstructure (Internal walls, partitions, doors)	✓
Finishes	✓
Fittings, furnishings, and equipment (FF and E)	✓
Building services / MEP	✓
Prefabricated Buildings and Building Units	✓
Work to Existing Building	✓
External Works	✓

Comments
Justification
Exclusions
Assumptions
Certainty

TABLES C: Information in relation to the preferred option providing justification for preference, and clarity on assumptions, exclusions and level of certainty of the data used in the assessment

Whole Lifecycle Carbon__kgCO2/ m2 GIA (modules A1-A5, B1-B7, C1-C4, D)

FIGURE D: Example of completed template table comparing the WLC modules A1-A5, B1-B5, C1-C4 to the published GLA standard and aspirational benchmarks

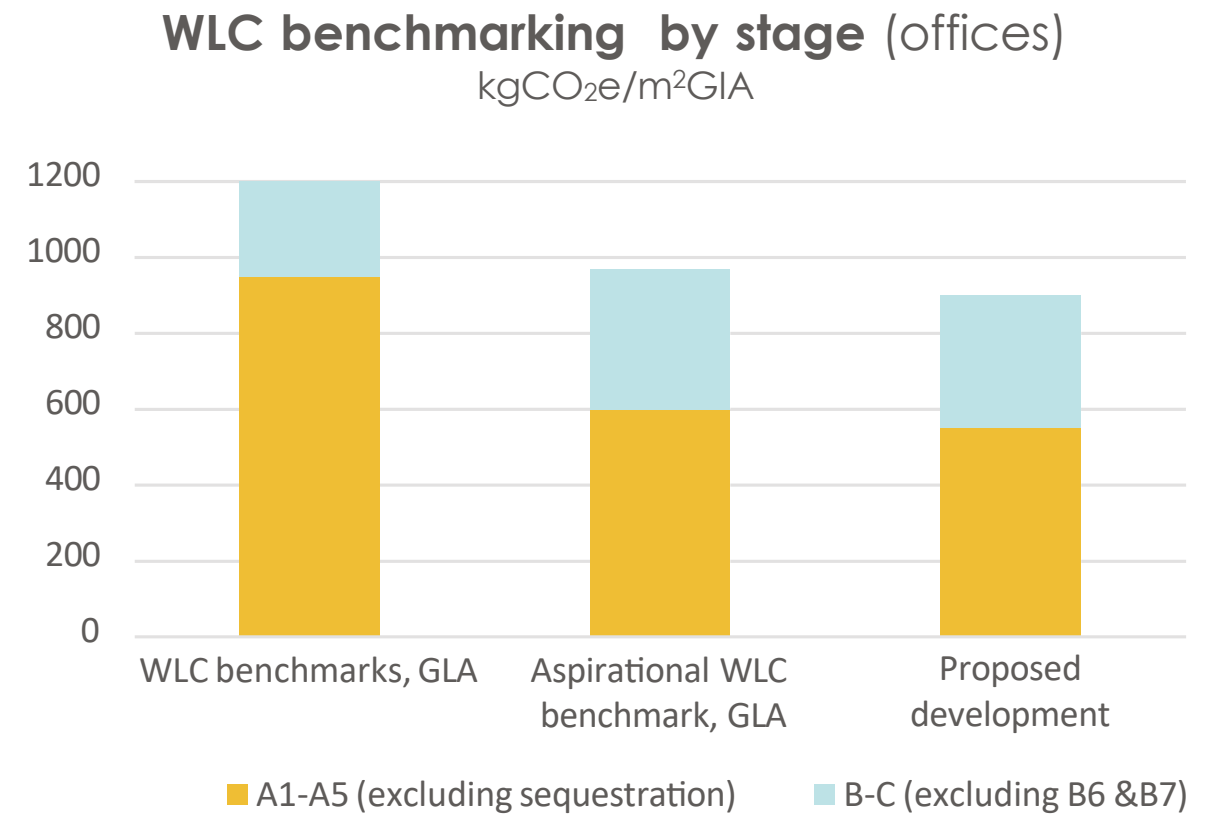
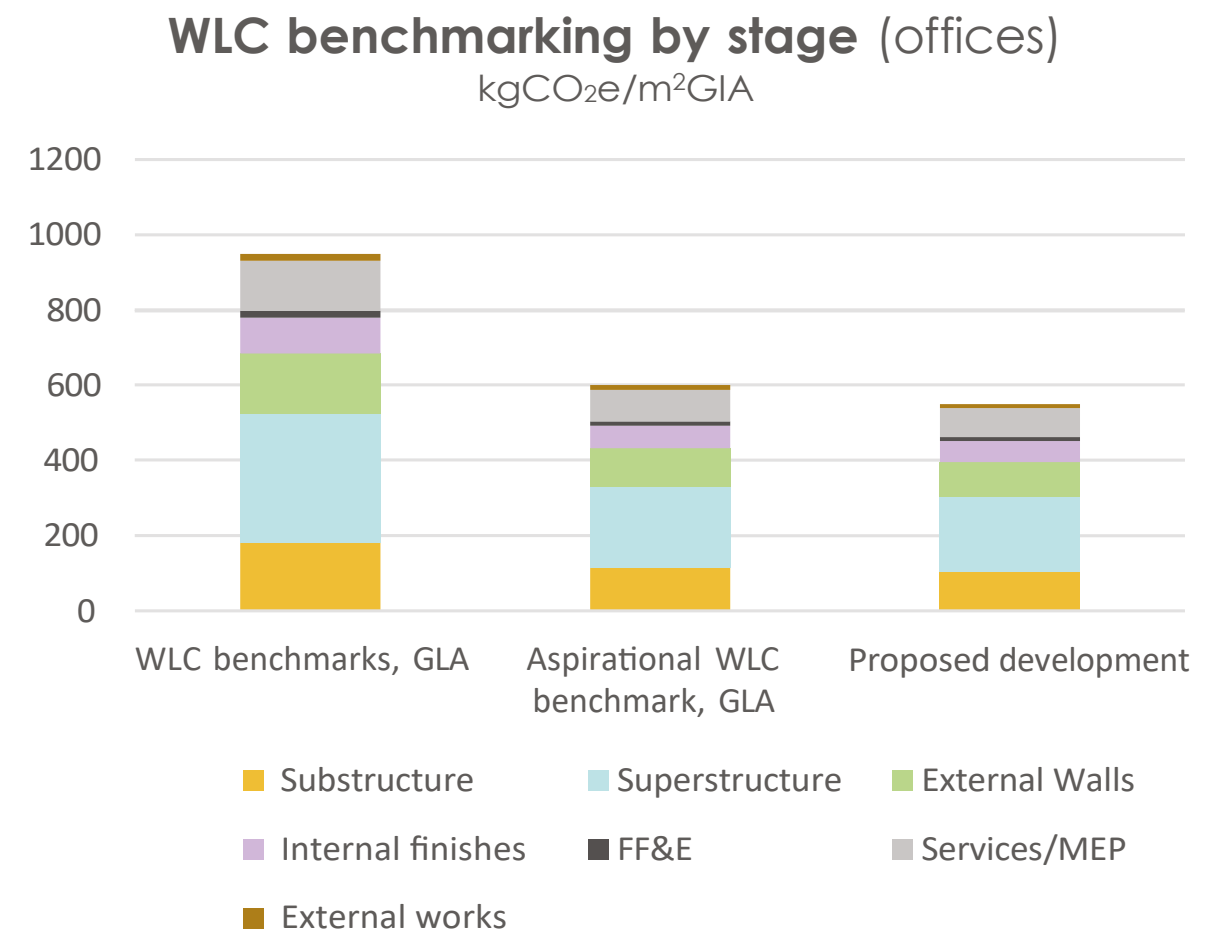


FIGURE E: Example of completed template table comparing the embodied carbon (Modules A1-A5) to published GLA standard and aspirational benchmarks for elemental carbon emissions



8. The Consideration of Options in the Planning Application Process

Planning applications received by the CoLC are expected to provide a narrative of how optioneering considerations about reducing carbon emissions have informed the design of an application scheme. The optioneering results include high level data about whole life-cycle carbon emissions and an analysis of the opportunities and constraints of each option against the vision and deliverables of a site. The optioneering exercise is designed as a tool in the discussion and negotiation of a proposal in the early pre-application stage between applicants and planning officers to help optimise the design of the application scheme.

This methodology is not designed to link the optioneering designs and results to the details of the planning application scheme as the latter is based on more, and perhaps different, design detail compared with the options. The chosen option should follow the GLA WLC assessment guidance for the application and achieve the current benchmark guidance.

Once a planning application scheme has been given planning permission, the Energy, Whole Life-Cycle Carbon and Circular Economy strategies of the approved scheme will be further detailed and approved during the planning conditions stages. The CoLC will monitor post-completion results that are required to be submitted by condition.

The methodology set out in the previous chapters will be updated as frequently as necessary to reflect the latest scientific advances, technologies, policies and regulations.



Appendix 1 Climate Action Strategy 2020-2027

Headlines

Through this strategy the City Corporation commits to achieving:

- Net zero by 2027 in the City Corporation's operations
- Net zero by 2040 across the City Corporation's full value chain
- Net zero by 2040 in the Square Mile
- Climate resilience in our buildings, public spaces and infrastructure

Across the Square Mile we will:

- Work with all stakeholder groups to accelerate the transition to net zero
- Support SMEs to reach net zero
- Invest in making the Square Mile more resilient to extreme weather and flooding

At the City Corporation we will do this through major investments in:

- Improving energy efficiency at our investment and corporate properties
- Aligning our investment portfolio with the Paris Agreement
- Enhancing carbon removal in our open spaces
- Protecting our shared natural resources
- Driving net zero through our supply chain
- Integrating climate considerations into all our decisions

Our climate vision, aims and goals

Our vision

- The City of London is Responsible, Sustainable and Competitive

Our aims

- To support the achievement of net zero
- To build climate resilience
- To champion sustainable growth

Our goals

For the City of London Corporation:

- City of London Corporation **scope 1 and 2 emissions are net zero by 2027** and **scope 3 emissions are net zero by 2040**.
- The City of London Corporation and its assets **are resilient to climate change**.
- The City of London Corporation supports UK and overseas organisations to **become climate responsible**.

For the Square Mile's fabric and function

- The Square Mile's scope 1, 2 and 3 emissions (BASIC+ definition) are net zero by 2040.
- The Square Mile's buildings, public spaces and infrastructure are **resilient to climate change**.

For society

- People in the Square Mile and beyond **benefit from a clean, green and safe environment and job creation**.





The first six years

Actions to support the achievement of net zero

The City of London Corporation

- Transform the energy efficiency of our operational buildings through the adoption of best available technologies
- Maximise the use of renewable energy sources across our operational buildings
- Introduce new land management practices across our open spaces aiming to maximise their ability to remove carbon, and optimise their biodiversity and resilience value
- Align our financial investment portfolio with the goals of the Paris Agreement on climate change
- Embed circular economy principles into our capital projects and reduce carbon intensity by using life cycle carbon and cost assessment techniques and design specifications
- Accelerate the move to net zero carbon and energy efficient tenanted buildings, working closely with tenants to achieve shared goals
- Strengthen our requirements and supplier engagement to drive performance and innovation in delivering sustainable products and solutions
- Upskill our workforce on net zero

The Square Mile

- Work with other organisations to develop a Climate Action Fund to invest in effective zero carbon technologies and accelerate decarbonisation
- Develop a Square Mile renewable energy strategy Use our planning role to influence others to embed carbon analysis and circular economy principles in capital projects
- Advocate the importance of green spaces and urban greening as natural carbon sinks, and their contribution to biodiversity and overall wellbeing
- Support organisations in the Square Mile to build circular, low carbon and resilient supply chains
- Provide tailored support to SMEs on their decarbonisation journeys
- Increase engagement and communications about sustainability with residents, businesses, visitors and other stakeholders

Actions to build climate resilience

The City of London Corporation

- Build on our existing work to develop an early warning system, and clear resilience strategies for pests and diseases across our ports and markets, driving down the climate related food security risks
- Embed resilience measures into our upgrade plans for our owned and operated buildings
- Upskill our workforce on climate resilience
- Embed a climate resilience lens into all our decision-making

The Square Mile

- Make the Square Mile public realm more climate change ready through adding in more green spaces, urban greening, flood resistant road surfaces, adaptable planting regimes and heat resistant materials
- Reduce the risk of flooding through developing sustainable rain and surface water management policies, resulting in a connected system of water recycling, sustainable urban draining and rainwater management measures
- Strengthen our planning guidance on climate resilience measures for new developments
- Work with our partners to create a more climate resilient and diversified energy network across the Square Mile
- Develop a strong, data-led approach to deepen our understanding of climate related risks and mitigations across the Square Mile
- Ensure that we continue to protect the residents, critical assets, infrastructure and heritage of the Square Mile

Actions to champion sustainable growth

The City of London Corporation

- Mobilise capital into sustainable finance
- Secure the UK's place as a leader for investment in sustainable finance products
- Help faster development and adoption of sustainable finance products and services
- Share best practice on standards, tools, platforms and expertise to facilitate green and sustainable investment and growth
- Encourage global movement towards disclosure and production of credible transition plans as the norm
- Foster an ambition to achieve net zero emissions by 2050 or sooner for UK-based financial and professional services firms
- Join other investors working through development and implementation of net zero transition action plans
- Support financial institutions committing to net zero in the 2040s at the latest, covering all emissions, including scope 3 and where data allows reliable measurement
- Support charities and SMEs to consider, prepare for and lead the response to climate change
- Promote responsible procurement and investment practices
- Enhance the UK/London's capacity to finance sustainable investment opportunities globally, including emerging markets
- Work with the financial services sector and UK Government to promote and scale sustainable finance products and services that countries and corporates need to help them transition to net zero
- Influence and support the delivery of technical solutions to increase comparability of data and ease of reporting
- Share learning and best practice about the challenges and opportunities of our net zero journey
- Address existing inequalities and ensure no one is left behind
- Prepare people for skills needed in a net zero economy
- Facilitate collaborative action on air pollution in London
- Reduce pollution and increase the resilience of the Square Mile
- Reduce air pollution through implementing our ambitious air quality and transport strategies
- Embrace circular economy principles across our strategies and work
- Work with our creative and educational sector partners to deliver sustainable initiatives
- Enhance greening and biodiversity across our public realm and open spaces

Appendix 2 Related Reporting Requirements

Non-policy related reporting for net zero carbon

Over the past three years, the UK property industry has done more to advance the environmental agenda than ever before. Developers, consultants and professional bodies have come together to declare a climate and biodiversity emergency and have taken concrete action. Together we have developed much needed clarity and guidance on how to truly achieve zero carbon by 2030.

Property lenders, investors, asset managers and occupiers are all driving this shift by demanding a very high standard of environmental, social and governance policy as a prerequisite to any transaction. This trend is

increasing rapidly across all workplace environments, both for new and existing assets.

A number of businesses have declared that they have become net zero carbon in operation across portfolio assets

and activity within their control. These declarations in the London market tend to align with the World Green

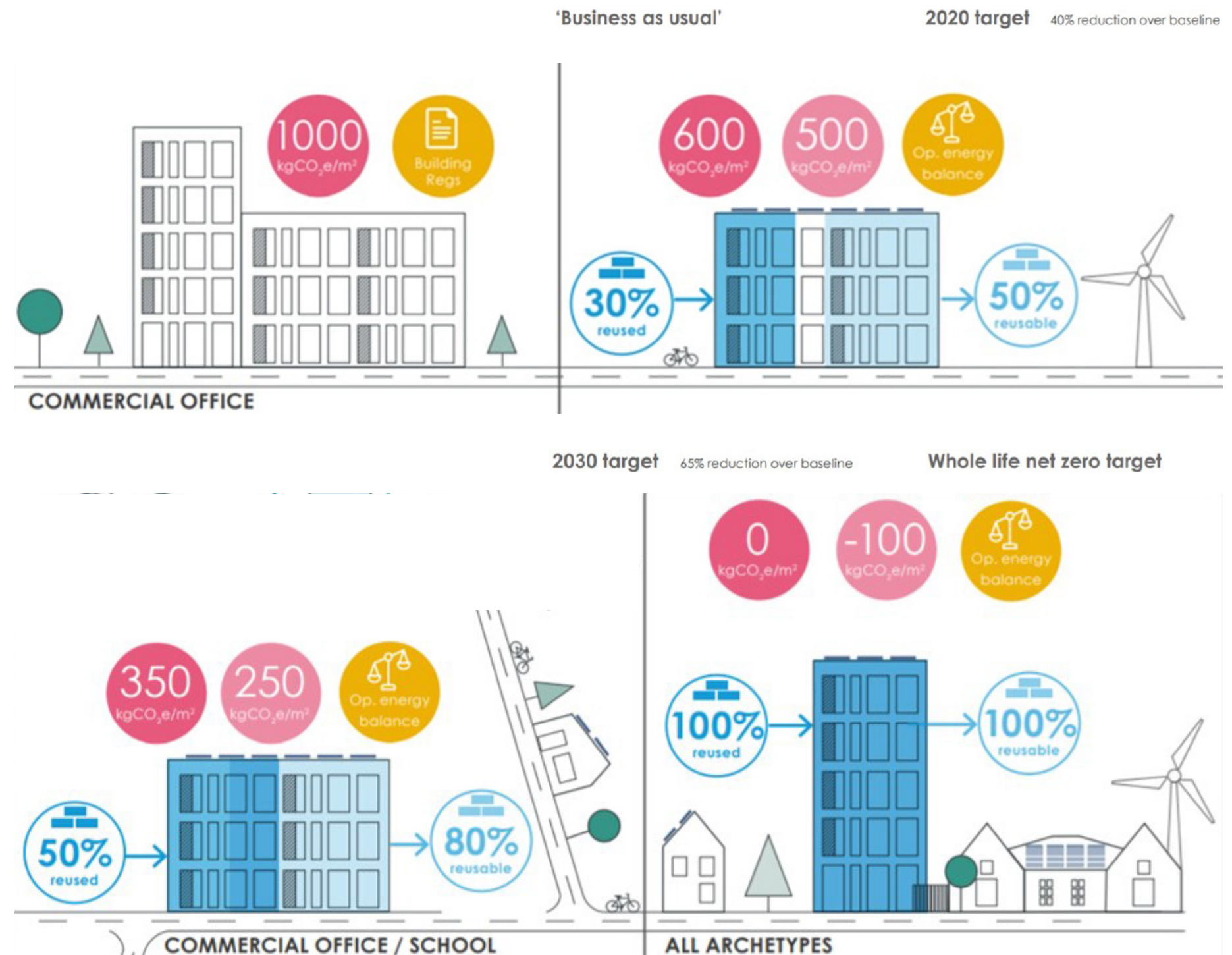
Building Council or UK Green Building Council Definition Framework and consists of accounting for and reducing carbon emissions, investing in renewable energy, offsetting residual carbon through accepted credit frameworks and publicly disclosing their pathway.

Other approaches adopted by applicants that vary in scope to planning policy requirements include:

- The Low Energy Transformation Initiative (LETI) targets and scope
- The UKGBC Net Zero Carbon Definition Framework and benchmarks
- The forthcoming Net Zero Carbon Buildings Standard. Note: this initiative is currently in the early stages of development. Once requirements become available, they should be a valuable point of reference for planners and project teams to assess proposals.

Low Energy Transformation Initiative (LETI)

LETI has recently published several design guidance documents that set out a trajectory of embodied carbon and operational energy targets required to address the climate emergency. The WLCA scope associated with their targets is limited to stages A1-A5 to practical completion.



UKGBC Net Zero Carbon Buildings Framework Definition

The UKGBC sets out guidance in consultation with the industry to define net zero carbon. At time of writing this planning guidance, a building can claim to be net zero carbon in construction or in operation or in both. UKGBC has published benchmarks for operational energy with a trajectory to net zero carbon, but none for embodied carbon at this time.

The framework requires third party verification of whole life-cycle assessments and operational energy assessments, including a minimum carbon reporting template and information that needs to be publicly disclosed. Notably, key differences between the UKGBC Net Zero Carbon definition and the London Plan definition are shown in the following table.

Scope	Metric	Interim Targets 2020-2025	Interim Targets 2025-2030	Interim Targets 2030-2035	Paris Proof Target 2035-2050
Whole building energy	kWhe/m2(NLA)/Year	160	115	90	70
	kWhe/m2(GIA)/Year	130	90	70	55
	DEC rating	D90	C65	B50	B40
Base building energy	kWhe/m2(NLA)/Year	90	70	55	35
	kWhe/m2(GIA)/Year	70	55	45	30
	NABERS UK star rating	4.5	5	5.5	6
Tenant energy	kWhe/m2(NLA)/Year	70	45	35	35

Comparison of Net Zero Carbon Definitions

	UKGBC Net Zero Carbon	London Plan Net Zero Carbon
Whole Life-Cycle carbon	Minimum reporting Stages A1-A5, B4 for superstructure ext. walls and windows/external doors, B6 operation energy. Full Assessment Modules A-C	Modules A-D (B6, B7, and D not included in benchmarks).
Regulated operational carbon emissions from energy use	Includes all energy use within declarant's control	Part L2 regulated carbon assessment used to determine net zero carbon target TM54 required for 'be seen' (non-residential)
Unregulated operational carbon emissions from energy use	Includes all energy use within declarant's control	Unregulated energy to be estimated and infrastructure in place to monitor, verify and report all annual energy consumption. NABERS UK Design for Performance (see below) encouraged for commercial office buildings 5,000m2 TM54 requires for 'be seen' (non-residential)
Renewable energy generation	Onsite and off-site renewables	Priority for on-site renewables, but offsite renewables are acceptable alternative to carbon offset (conditional)
Carbon offsetting	Offset all residual carbon using an approved international or domestic carbon offset standard, applying standard market rates. UKGBC recommend also using higher rate from HMT Green Book at the time of offset to create Transition Fund for further decarbonisation	Offset residual carbon relative to 100% regulated carbon savings only, determined by Part L2 target. Carbon offset is recommended as £95/tonnes CO2 paid in advance and for a 30-year life-cycle

Appendix 3

Detailed Building Element Scope

Table 3 compares the UKGBC, GLA, LETI and BREEAM reporting scopes for building elements in more detail (refer to Table 1 in section X).^{*} Building-related items are building-integrated technical systems and furniture, fittings and fixtures built into the fabric or included in the shell and core specification. Building-related MEP and FFE typically include the items classified under shell and core and Category A fit-outs.



Table 3: Detailed comparison of scopes per building part element /group

Building part/Element group	Building Element	UKGBC Full Assessment	UKGBC Minimum Reporting	GLA WLC Guide	RIBA 2030 CC Ver.2	LETI EC Primer	BREEAM NC 2018 and RFO 2014***
Demolition prior to construction	0.1 Toxic/Hazardous/Contaminated Material Treatment			YES Reported separately. Benchmarks do not include these building elements			
	0.2 Major Demolition Works			A 'fabric first' approach should be prioritised to minimise energy demand and reduce carbon and in-use costs.			
Facilitating works	0.3, 0.4, 0.5 Temporary/Specialist ground/Enabling Works	✓		"			
	0.4 Specialist groundworks	✓		"			
Substructure	1 Substructure	✓	✓	✓	✓	✓	NC credit option, RFO if in scope
Superstructure	2.1 Frame 2.2 Upper Floors 2.3 Roof 2.4 Stairs and Ramps	✓	✓	✓	✓	✓	NC mandatory, RFO if in scope (excludes ramps)
Superstructure	2.5 External Walls 2.6 Windows and External Doors	✓	✓	✓	✓	✓	NC mandatory, RFO if in scope
Superstructure	2.7 Internal Walls and Partitions 2.8 Internal Doors	✓		✓	✓	✓	NC mandatory education only, RFO if in scope
Finishes	3.1 Wall finishes 3.2 Floor finishes 3.3 Ceiling finishes	✓		✓	✓	✓	RFO if in scope
Fittings, furnishings and equipment (FF&E)	4.1 Fittings, Furnishings and Equipment incl. Building-related* and non- building related**	✓		✓	✓		RFO if in scope to CN7 limited furniture/ shop fitting
Building services/MEP	5.1–5.14 Services incl. Building-related* and non-building related**	✓		✓	✓	✓	NC credit option, RFO if in scope
Prefabricated Buildings and Building Units	6.1 Prefabricated Buildings and Building Units	✓		✓	✓	✓	
Work to Existing Building	7.1 Minor Demolition and Alteration Works	✓		✓	✓		
External Works	8.1 Site preparation works 8.2 Roads, paths, paving and sur- facing 8.3 Soft landscaping, planting and irrigation systems 8.4 Fencing, railings and walls 8.5 External fixtures 8.6 External drainage 8.7 External services 8.8 Minor building works and ancillary buildings	✓		✓			NC credit option RFO if in scope: hard landscaping and boundary protection only

** Non-building-related items are loose furniture, fittings and other technical equipment like desks, chairs, computers, refrigerators, etc. Such items are usually part of Category B fit-out. Therefore, for shell and core construction this is not part of the assessment scope.

***BREEAM NC = BREEAM New Construction 2018; BREEAM RFO = BREEAM Refurbishment and Fit-out 2014

Appendix 4
GLA WLCA Pre-App Reduction
Principles Proforma

	WLC reduction principles	Key benefits
1	Reuse and retrofit of existing buildings	Significant retention and reuse of structures is likely to be carbon efficient and reduces construction costs.
2	Use re-purposed or recycled materials	Reduces waste and carbon emissions.
3	Material selection	Appropriate material choices are key to carbon reduction. Ensuring that materials are selected with consideration of the planned life expectancy of the building reduces waste, the need for replacements and the in-use costs.
4	Minimise operational energy use	A 'fabric first' approach should be prioritised to minimise energy demand and reduce carbon and in-use costs.
5	Minimise the carbon emissions associated with operational water use	Choice of materials and durability of systems, which help to avoid leakage and subsequent building damage, contribute to reducing the carbon emissions of water use.
6	Disassembly and reuse	Designing for future disassembly ensures that products do not become future waste and that they maintain their environmental and economic value.
7	Building shape and form	Compact efficient shapes help minimise both operational and embodied carbon emissions from repair and replacement for a given floor area. This leads to a more efficient building overall resulting in lower construction and in use costs.
8	Regenerative design	Removing carbon emissions from the atmosphere through materials and systems absorbing it makes a direct contribution to carbon reduction.
9	Designing for durability and flexibility	Durability means that repair and replacement is reduced which in turn helps reduce life-time building costs. A building designed for flexibility can respond with minimum environmental impact to future changing requirements and a changing climate, thus avoiding obsolescence which also underwrites future building value.
10	Optimisation of the relationship between operational and embodied carbon	Optimising the relationship between operational and embodied carbon con- tributes directly to resource efficiency and overall cost reduction.
11	Building life expectancy	Defining building life expectancy gives guidance to project teams as to the most efficient choices for materials and products. This aids overall resource efficiency, including cost efficiency and helps future proof asset value.
12	Local sourcing	Sourcing local materials reduces transport distances and supply chain lengths and has associated local social and economic benefits.
13	Minimising waste	Waste represents unnecessary and avoidable carbon emissions. Buildings should be designed to minimise construction waste, and to ease repair and replacement with minimum waste, which helps reduce initial and in-use costs.
14	Efficient construction	Efficient construction methods (e.g. modular systems, precision manufacturing and modern methods of construction) can contribute to better build quality, reduce construction phase waste and reduce the need for repairs in the post completion and the defects period (snagging).
15	Lightweight construction	Lightweight construction uses less material which reduces the carbon emissions of the building as there is less material to source, fabricate and deliver to site.
16	Circular economy	The circular economy principle focusses on a more efficient use of materials which in turn leads to carbon and financial efficiencies.

Appendix 5 Indicative Example of Completed Table A

To be updated once dashboards are completed

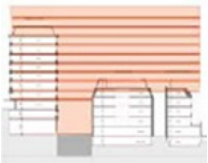

Example of Applicable Option	Minor refurbishment	Major refurbishment	Major refurbishment with extension	New build, reclaim and recycle
		N/A		
Scope of works summary	e.g. Change of plant /minor alterations to windows	e.g. Major interior modifications, change to façade, upgrade services	e.g. Major interior modifications, change to façade, upgrade services plus 2 storey extension	New build
Gross Internal area (GIA)	17,309m²	___m²	29,860m²	35,948m²
Net Internal area (NIA)	___m²	___m²	___m²	___m²
Change in NIA (compared to existing)	___m²	___m²	___m²	___m²
Substructure % Retained by mass	%	%	%	%
Superstructure % Retained by mass	%	%	%	%
Façade % Retained by area	%	%	%	%
Estimated existing building demolition	kgCO ₂ e/m² GIA	kgCO ₂ e/m² GIA	kgCO ₂ e/m² GIA	kgCO ₂ e/m² GIA
Embodied Carbon (A1-A5)	kgCO ₂ e/m² GIA	kgCO ₂ e/m² GIA	kgCO ₂ e/m² GIA	kgCO ₂ e/m² GIA
Embodied Carbon (A1-A5, B1-B5, C1-C4)	___kgCO ₂ e/m² GIA	___kgCO ₂ e/m² GIA	___kgCO ₂ e/m² GIA	___kgCO ₂ e/m² GIA
Estimated Whole building Operational Energy	Kwhe/m²/yr	Kwhe/m²/yr	Kwhe/m²/yr	Kwhe/m²/yr
Fuel source	<input type="checkbox"/> Gas <input type="checkbox"/> Electricity <input type="checkbox"/> Other (state)	<input type="checkbox"/> Gas <input type="checkbox"/> Electricity <input type="checkbox"/> Other (state)	<input type="checkbox"/> Gas <input type="checkbox"/> Electricity <input type="checkbox"/> Other (state)	<input type="checkbox"/> Gas <input type="checkbox"/> Electricity <input type="checkbox"/> Other (state)

TABLE A: continued

Example of Applicable Option	Minor refurbishment	Major refurbishment	Major refurbishment with extension	New build, reclaim and recycle
Estimated Whole Building Operational Carbon for building life time (B6)	___kgCO ₂ e/m ² GIA	___kgCO ₂ e/m ² GIA	___kgCO ₂ e/m ² GIA	___kgCO ₂ e/m ² GIA
Carbon Factor used for B6	___kgCO ₂ e/Kwh	___kgCO ₂ e/Kwh	___kgCO ₂ e/Kwh	___kgCO ₂ e/Kwh
District heating carbon factor	kgCO ₂ e/Kwh	kgCO ₂ e/Kwh	kgCO ₂ e/Kwh	kgCO ₂ e/Kwh
District cooling carbon factor	kgCO ₂ e/Kwh	kgCO ₂ e/Kwh	kgCO ₂ e/Kwh	kgCO ₂ e/Kwh
EPC rating	D		B	A
Total WLCA	___kgCO ₂ e/m ² GIA	___kgCO ₂ e/m ² GIA	___kgCO ₂ e/m ² GIA	___kgCO ₂ e/m ² GIA
Total WLCA	68,102 tCO ₂ e	___tCO ₂ e	54,137 tCO ₂ e	64,757 tCO ₂ e
	<ul style="list-style-type: none">Retention of existing 3 buildingsExtends building lifeEmbodied carbon lowest for immediate future	N/A	<ul style="list-style-type: none">Retains most of substructure and some structural elements with new build extension	<ul style="list-style-type: none">Better operational energy opportunitiesWider social benefitsMore opportunities for roof space/greening (UGF)Greater adaptabilitySome foundations retainedSome stonework to be repurposed
	<ul style="list-style-type: none">Retention and intervention relies on gas due to roof space.Poor floor area does not maximise space, risk of poorer EPC performanceServices upgrades restricted due to existing space constraints.Assumes like for like plant changes if upgrades	N/A	<ul style="list-style-type: none">Structurally challenging. Existing structure would need considerable new structure to support building which add to the complexity of the constructionSubstantial temporary works required.Quality of existing steel unknown.Services challengingRestricted Floor to floor heights and level changes add to complexityNot maximising land useLess roof space for plantingDid not meet tenant space requirements.	<ul style="list-style-type: none">Embodied carbon is highest but there is a trade of for other wider benefits.
	Assumes no fabric interventions. Pro rata carbon data estimates based on new build for building element categories, internal works 2.7 - 8. Does not include future façade intervention which is likely to be required. Making embodied carbon worse over life—cycle	N/A	<ul style="list-style-type: none">Structure recalculation: for 1 Substructure, 2.1 Superstructure - frame, 2.2 Superstructure - upper floors.2.3 - 8 estimated pro rata	<ul style="list-style-type: none">Increase in GIA vs existing building(s) GIABased on new build cost plan so good data set for GLA reporting.
Notes and assumptions made in calculations Please state detail here				

Appendix 6 Planning Application Trends

An evaluation of planning applications and types has been undertaken based on the City of London Development Schedule 'Development Schedules March 2021 -Updated Jan' issued to Hilson Moran by CoLC.

This review was undertaken to establish trends and to provide the evidence base to support this guidance document.

The majority of applications, 76% (of which 40% where GLA referable), fall under the City's definition of major development (>1,000m²) and/ or require an environment impact assessment. This demonstrates that the greatest proportion of projects are likely to have the largest carbon impact and therefore should be required to mitigate it.

Project type	Year(s)	Number of applications	FULMAJ	FULEIA	FULL	GLA referable
Office	2014-March 2021	37	15	11	11	4
Office	March 2021-2022	9	4	5		8
Total		46	19	16	11	12
Percentage		100%	76%		24%	41%
Hotel/Student accommodation	2012-2021	9	5	0	4	2
Percentage		100%	56%		44%	22%
Other (law court, police + commercial)	2021	1		1		1
Percentage			100%			100%

Table 4: Number and types of commercial development applications in the City of London.

The remaining applications are varied full applications covering change of use and extensions (24%). These are broken down as follows:

Project type	Full	Change of Use - Partial Building	Extension only	New Buildings with Change of Use	Refurbishment with Change of Use	Refurbishment without Change of Use
Office	11	1	4	2	2	2
Percentage by type	100	9	36	18	18	18

Table 5: Number of full planning applications, excluding major application, by development type.

Conclusion

Based on the above, it is reasonable and recommended to follow the GLA approach for a WLCA to provide a consistent approach across the City of London.

Advantages:

- Leads to consistent and more transparent results;
- Will create a uniform and well-understood approach across the industry;
- Will build consistency around the metrics used over time;
- Can be compared to GLA benchmarks for benchmarking;
- Future-proofs policy updates across London;
- Greater awareness of impacts could lead to better design decisions and to greater carbon savings.

Disadvantages:

- Will require additional time and detail from the design team for evaluation and assessment. However, the assessment will contribute to the justification for the application proposal and may help with achieving a successful outcome.

The review of data concludes that there is a need for emissions to be accounted for and for options to be considered in the City of London for all major applications. Full major applications are to consider development options and carbon impacts, applying the methodology presented in this document.

Following the optioneering CoLC expects that all major developments undertake a whole life-cycle carbon assessment (WLCA) for the final application for the chosen option.

Within this is a requirement to review building options accounting for carbon in a more consistent way, to ensure the best choices are made. There will always be some carbon emissions associated with developments. However, there is a duty to try and limit them wherever possible and for the CoLC to be able to make informed decisions in line with the CoLC's Climate Action Strategy.

The following is a breakdown of office applications by size. The majority have an area above 10,000m² (76%). This also confirms the trend for larger scale applications with potentially bigger impacts.

Project type	Total	1,000-5,000 sqm	5,001-10,000 sqm	10,001-15,000 sqm	15,000 sqm +
Office	46	9	2	5	30
Percentage	100	20	4	11	65

Table 6: Size of office development applications in the City of London.

				Circular Economy	Whole Life-Cycle Carbon Assessment			Operational Energy	
Project	Size (GIA m ²)	Land use class/es	Referable/major	Options	Life-cycle scope	Building elements scope	Value kgCO ₂ e/m ² GIA	Scope	Value kgCO ₂ e/m ² GIA
14-21 Holborn Viaduct	35,948	Class E	FULMaj Referable	Demolish and rebuild Mitigate impacts	GLA (draft guidance) A1-A5, B1-B5, C1-C4, D	GLA (draft guidance) WLC spreadsheet submitted	670 (Stage 2)	Estimated	925** (Stage 2)
115 – 123 Houndsditch	66,867	Class E (Sui Generis)	FULMaj Not Referable	Demolish and rebuild Mitigate impacts	GLA (draft guidance) A1-A5, B1-B5, C1-C4,	State followed GLA (draft guidance)	768 (+25% factor used) (Excludes module D)	Estimated	844* (Stage 2)
120 Fleet Street**	61,135	Class E	FULEIA Referable	Demolish and rebuild Mitigate impacts	GLA (draft guidance) A1-A5, B1-B5, C1-C4, D	GLA (draft guidance) WLC spreadsheet submitted	753	Estimated	1,321

Table 7: WLC sample from recent projects submitted for planning to the City of London.

*TM54 not provided, source of operational energy use unclear

** Project is using early NABERS DfP model for operational energy use rather than the CIBSE TM54 approach

*** Multiple buildings indicated but only 1 WLCA sheet submitted for main development

Appendix 7 Related Reporting Requirements

There are other carbon-related planning reports that should be taken into consideration. They include Greenhouse Gas impact assessments, the Circular Economy Statement, operational energy and operational water assessments. Where relevant, these should be referenced in WLCA reporting, in particular to highlight discrepancies and overlaps in design considerations and decisions.

Greenhouse Gas Reporting in Environmental Impact Assessments

A greenhouse gas (GHG) is a gas that absorbs and emits radiant energy within the thermal infrared range, essentially, they trap heat causing the greenhouse effect. Very large developments, such as infrastructure projects and high-rise buildings, usually require a GHG chapter within the Environmental Impact Assessment scoping for a planning application.

In February 2022 the Institute of Environmental Management and Assessments (IEMA) published an update to their guide 'Assessing Greenhouse Gas Emissions and Evaluating their Significance' (2nd ed.) to align with government and industry agendas. The methodology for writing this environmental impact assessment chapter includes a full life-cycle scope, aligning with parts of the GLA WLCA method referred to above. The approach covers similar themes but may not be as detailed as a full WLCA due to the timing of the assessment.

The differences in the approach include:

1. The range of gases is broader than carbon (carbon dioxide CO₂) and includes methane (CH₄), nitrous oxide (N₂O), and ozone (O₃);
2. The scope of emitters is broader, including for example emissions from operational transport and leaking F-gases (refrigerants). Note, the GLA requires separate calculation of refrigerant emissions in the reporting WLCA template;
3. The proposal is compared to a current baseline;
4. Exclusions, metrics, data quality, degree of uncertainty and mitigation measures need to be clearly defined; and
5. GHG assessments can be carried out a lot earlier than a detailed application WLCA (to GLA standards), for example for an Outline Planning Application, and therefore the data tends to be based on industry averages/benchmarks.

The process and content of a GHG assessment is structured by the IEMA guidance and should not preclude the need for a WLCA. In many cases, the information in relation to carbon in a GHG assessment may differ from that of a WLCA due to timing and the accuracy of information available at the time of assessment.

IEMA Greenhouse Gas Management Hierarchy (updated 2020)	
Eliminate	<ul style="list-style-type: none">• Influence business decisions/use to prevent GHG emissions across the lifecycle• Potential exists when organisations change, expand, rationalise or move business• Transition to new business model, alternative operation or new product/service
Reduce	<ul style="list-style-type: none">• Real and relative (per unit) reductions in carbon and energy• Efficiency in operations, processes, fleet and energy management• Optimise approaches (eg technology) and digital as enablers
Substitute	<ul style="list-style-type: none">• Adopt renewables/low-carbon technologies (on site, transport etc)• Reduce carbon (GHG) intensity of energy use and of energy purchased• Purchase inputs and services with lower embodied/embedded emissions
Compensate	<ul style="list-style-type: none">• Compensate 'unavoidable' residual emissions (removals, offsets etc)• Investigate land management, value chain, asset sharing, carbon credits• Support climate action and developing markets (beyond carbon neutral)

Table 1: GHG Management Hierarchy, 2020 (Source: EIMA, Assessing Greenhouse Gas Emissions and Evaluating their Significance' (2nd ed.)

GLA Pre-application Optioneering

The London Plan Guidance 'Whole Life-Cycle Carbon Assessments' (March 2022) explains how to calculate WLC emissions and the information to be submitted to comply with the policy, including the scope required. It also includes information on design principles and WLC benchmarks (by life-cycle stage) to aid planning applicants in designing buildings that have low operational carbon and low embodied carbon.

A WLC assessment template needs to be completed in four parts, namely, at pre-application, planning submission (outline and details) and post construction (prior to occupation).

The GLA encourages WLC assessments on major applications that are not referable to the Mayor. The CoLCis supportive of this approach and requires that they are provided as part of the planning application in line with the GLA requirements. In addition to the above, planning officers request, by condition, a more detailed update of

the WLCA following the detailed design phase (RIBA Stage 4) prior to construction when more design and procurement information is available to the project team. This is to ensure that the CoLC is aware of and understands opportunities and constraints through changes of and improvements to developments.

The GLA's pre-application section includes a hierarchy of WLC reduction principles (see Appendix 4 for full list). Principle 1 relates to options for 'significant retention and reuse of structures' as shown in Table 2 below, requiring examples to demonstrate that:

- Options for retaining existing buildings and structures have been fully explored before proposing substantial demolition, including incorporating the fabric of existing buildings into the new development (aligned with London Plan Guidance for Circular Economy Statements, March 2022);
- Carbon emissions associated with pre-construction demolition are currently reported separately;
- An estimate of the percentage of the new build development which will be made up of existing façades, structures and other key components is reported;
- An optional requirement to report on the effects of future grid decarbonisation on the development's embodied carbon emissions.
- The WLC principles are informing the proposed development of the site.

If substantial demolition is proposed, applicants will need to demonstrate that the benefits of demolition would clearly outweigh the benefits of retaining the existing building or parts of the structure.

Further considerations and options in relation to the retention of building elements and material are required by the circular economy principles (see following page).

Note, the GLA (and optionally BREEAM) requires the reporting of refrigerant Global Warming Potential emissions in kgCO₂e/m² GIA. This is important to include in the WLCA. The GLA requires reporting of refrigerant impact in the Whole Life-Cycle Carbon Assessment template spreadsheet. Measures can be installed to prevent and manage refrigerant leakage to the atmosphere. The requirement for leak detection and containment of refrigerants as part of the commissioning process could be secured through a condition.

WLC reduction principle: 1. Reuse and retrofit of existing buildings

Key benefit: Significant retention and reuse of structures is carbon efficient and reduces construction costs

Provide examples of how the reduction principle has been used, or give reasons why it cannot be used.

Confirmation that options for retaining existing buildings and structures have been fully explored before considering substantial demolition	[Outline the options that have been considered - plus an explanation of opportunities and limitations, and why demolition outweighs the benefits of retaining existing buildings/structures where applicable]
Carbon emissions associated with pre-construction demolition (kgCO ₂ e)	[If estimates are not possible, please apply standard assumption of 50kgCO ₂ e/ m ² of the existing building/s]
Estimate of the percentage of the new build development which will be made up of existing elements	[e.g. X% existing facades; Y% existing foundations; Z% superstructures etc.]

Table 2: Retention of existing building and structures from the GLA WLCA assessment template, March 2022

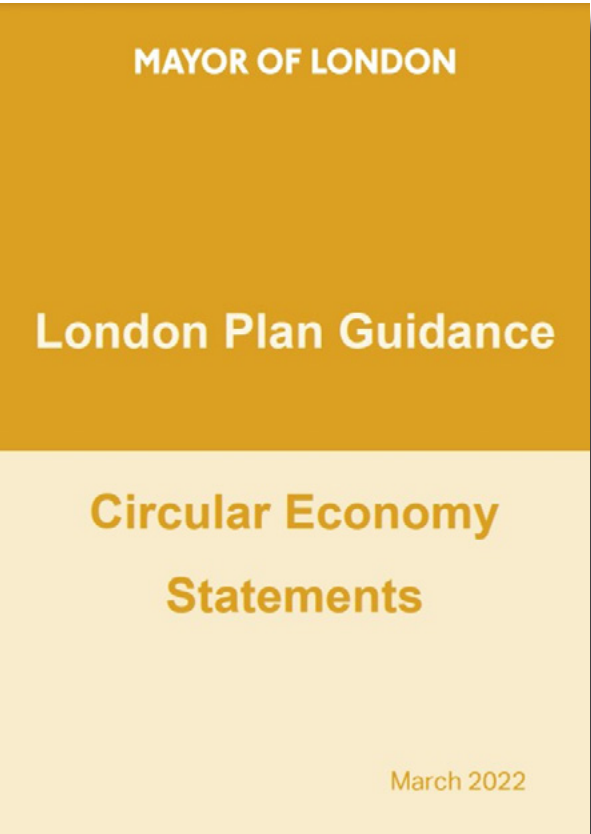


Figure 9: The new London Plan Guidance ‘Circular Economy Statements’ sets out the principles to be adopted to demonstrate the adoption of circularity in design and construction

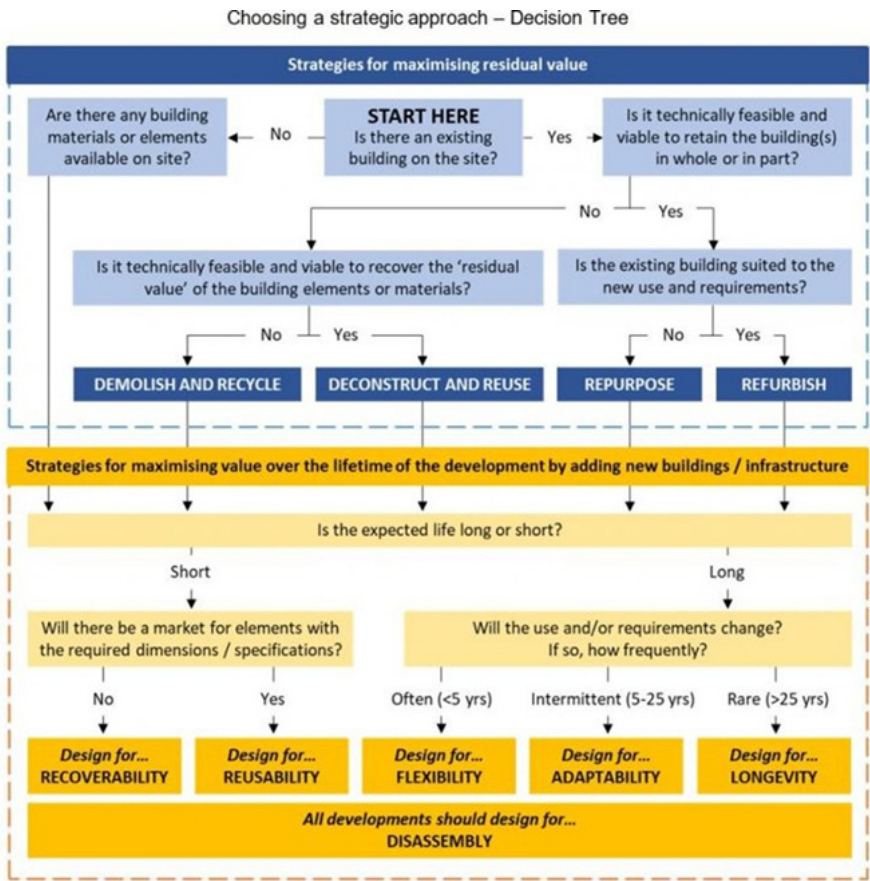


Figure 10: Decision tree for design approaches to existing structures/buildings -GLA Circular Economy Guidance March 2022

Circular Economy Statement

The Mayor of London’s London Plan 2021 requires proposals referable to the Mayor to calculate a development’s impacts and solutions to meet circular economy principles. It sets out the aim of retaining material at their highest value for as long as possible, to increase reuse and recycling, leaving minimal residual waste.

The reporting requirements and scope of the assessment are described in a London Plan Guidance ‘Circular Economy Statements’ (adopted 25th March 2022), which structures a reporting framework and principles to be considered by all referable applications. This needs to be considered alongside the WLCA.

The guidance includes requirements for a decision pathway to be outlined and for pre-redevelopment and pre- demolition audits, which need to be communicated at the earliest stages possible. The aim is for projects to incorporate these into their brief at procurement stage.

The guidance sets out six principles which are seen as critical to the design process:

1. Building in layers, ensuring that different parts of the building are accessible and can be maintained and replaced where necessary
2. Designing out waste, ensuring that waste reduction is planned in from project inception to completion, including consideration of standardised components, modular build, and reuse of secondary products and materials
3. Designing for longevity
4. Designing for adaptability or flexibility
5. Designing for disassembly
6. Using systems, elements or materials that can be reused and recycled.

The principles apply to the waste hierarchy to reduce or avoid waste wherever possible and to try and ensure that materials are applied and used at their highest value. The concept for building in layers attributes design life to different aspects of the building in terms of skin, shell, structure/frame, building services, Space/space plan/interior/ interior space, stuff and contents.

Carbon Emissions from Operational Energy and Water

The WLCA includes life-cycle stages B6 (Operational Energy) and (B7 Operational Water). GLA planning policy currently requires separate energy and water consumption reporting. This section clarifies the requirements and overlaps between reporting requirements. GLA benchmarks exclude stages B6 and B7.

Operational Energy Modelling

NABERS UK 'Design for Performance' (DfP) and CIBSE TM54 'Evaluating operational energy use at the design stage' (2022) are increasingly being used by applicants to more accurately estimate and reduce operational energy during design, and to inform metering, commissioning and management requirements to maintain low energy consumption throughout a building's life-cycle.

BREEAM New Construction's (optional) operational energy modelling requirements are similar. NABERS UK is the most onerous approach of the three because of independent design reviews required during design, post completion and post occupancy seasonal monitoring, and tuning, metering infrastructure criteria to facilitate annual rating and annual energy rating updates. Note that the UK Government is proposing to introduce a new obligatory energy rating disclosure, that aligns with NABERS UK, starting with all offices greater than 1,000m², from 2022/23, indicatively. In addition, CIBSE TM54 has recently aligned with NABERS UK Design for Performance (DfP), and BREEAM is set to do the same at the next update (estimated 2023).

The GLA requires referable schemes to evaluate operational energy as part of the 'be seen' stage of the Energy Hierarchy. The associated guidance sets out parameters for evaluating performance at the planning, post-completion and in use stages of a development.

The planning stage requires an estimation of the regulated and unregulated energy. The recommendation is for the use of analysis guided by CIBSE TM54 'Evaluating operational energy use at the design stage'. NABERS UK DfP is encouraged for office buildings greater than 5,000m².

CIBSE, TM54 and NABERS UK give a far more accurate and complete estimate of operational carbon emissions than Building Regulations Part L as they allow for detailed prediction of regulated and unregulated energy using more detail and realistic parameters to evaluate energy performance, rather than a uniform set of standardised regulated energy parameters. Part L modelling is used to

ensure that buildings meet the minimum energy efficiency standards set by building regulations, while TM54 operational energy modelling is used to identify areas where energy consumption can be reduced and to inform decisions on building design and operation.

Both the TM54 and NABERS UK (currently for commercial offices only, other schemes are being developed) approaches align with the reporting requirements of Stage B6 'Operational Energy Use' under the GLA's WLCA Guidance (March 2022) and the GLA's 'Be seen' guidance.

The GLA also requires in use monitoring and Energy Use Intensity (EUI) reporting of actual energy use for the first 3 years of a building's operation.

Operational water use

Operational water consumption in planning applications is currently reported in 2 ways:

1. Part of the WLCA (module B7), in line with the RICS method, which requires all carbon emissions related to water supply and wastewater treatment to be reported, using BSRIA benchmarks initially, then estimated values once known. Carbon conversion factors for water use and treatment as published by the local water supplier should be used.
2. Part of the BREEAM Assessment, which aims to reduce and benchmark the consumption of potable water for sanitary use (credit Wat 01) in new and refurbished buildings through the use of water efficient components and water recycling systems. CoLC's current policy refers to requiring all BREEAM water credits to be achieved.

The latter consumption evaluation is therefore limited to potable water only, while the former looks at all water consumption and treatment and associated carbon emissions. BREEAM does review non potable water but in a qualitative way (credit Wat 04).

The UK Government is proposing to introduce a new obligatory water rating disclosure (in a similar way to energy, above) and to regulate all water consumption for different land uses. Currently only potable water in residential uses is regulated.

Evaluating operational energy use at the design stage



Figure 11: The new revised CIBSE Technical Manual for evaluating operational use at the design stage provides a framework for more accurate prediction of regulated and unregulated energy consumption

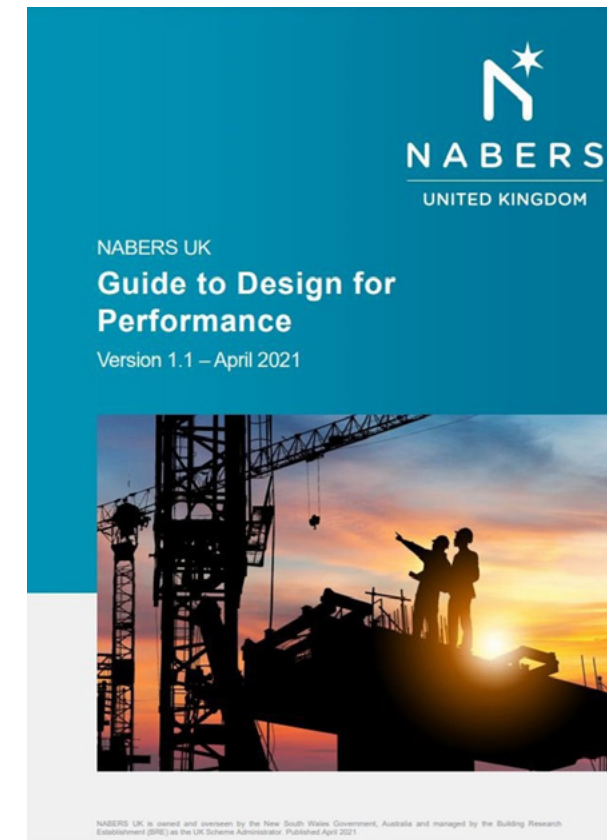


Figure 12: The NABERS UK Design for Performance guidance manual

Glossary

The below included a series of definition for terms used in the document. A number of these terms are aligned with industry standards including the document *Improving Consistency in Whole Life Carbon Reporting Assessment and report – Carbon definitions for the Built Environment Buildings and Infrastructure, January 2023*. (<https://www.leti.uk/carbondefinitions>). 'This document was put together initially by a working group within the Whole Life Carbon Network (WLCN, a group of some 90 built environment professionals) and includes detailed discussions between WLCN, LETI, CIBSE, RIBA, RICS, IStructE, ICE, and UKGBC. The 'Definitions' are structured around CEN TC 350 life-cycle modules, (e.g. BS EN 15978:2011 for buildings, BS EN 17472: 2022, PAS 2080:2016 for Infrastructure, BS EN 15643 2021.)'

Absolute Zero Carbon: Eliminating all carbon emissions without the use of offsets.

Approved Document Part L conservation of fuel and power: Part L is a building regulation that covers both new and changes to existing dwellings and non-dwellings. Part L sets minimum requirements and targets for energy performance and carbon emissions. It also defines the carbon intensity of fuel and power.

Beyond Life-cycle (Beyond – LC): Carbon emissions arising from any benefits or burdens of materials and components beyond the life-cycle (Module D).

Biogenic Carbon: 'Biogenic Carbon' refers to the carbon removals associated with carbon sequestration into biomass as well as any emissions associated with this sequestered carbon. Biogenic carbon must be reported separately if reporting only upfront carbon but should be included in the total if reporting embodied carbon or whole life carbon.

BREEAM – Building Research Establishment Environmental Assessment Method: A leading and well-established scheme for the evaluation, rating and certification of the sustainability of buildings developed by the BRE. It is the main sustainability certification standard in the UK but also is used internationally. The main schemes apply to new buildings and both non-domestic refurbishment and fit-outs and domestic refurbishments.

Carbon Dioxide equivalent (CO₂e): A metric expressing the impact of all greenhouse gases on a carbon dioxide basis. A measure used to compare the emissions from various greenhouse gases based upon their global warming potential in a common unit over a 100 year period. E.g. 1 kg of methane is converted into the amount of CO₂

needed to cause the same effect, in this case 23 kg. Therefore 1 Kg methane has a CO₂ equivalent of 23.

Carbon Sequestration: 'Carbon sequestration' is the process by which carbon dioxide is removed from the atmosphere and stored within a material – e.g. stored as 'biogenic carbon' in 'biomass' by plants/trees through photosynthesis and other processes.

Climate Change: Climate change refers to long-term shifts in temperatures and weather patterns. These shifts may be natural, such as through variations in the solar cycle. However, since the 1800s, human activities have been the main driver of climate change, primarily due to burning fossil fuels like coal, oil and gas.

Densification: Is a term used by planners, designers, developers and theorists to describe the increasing density of people living in/using urban areas. There are a number of metrics attributing to densification on is total building floor area divided by the area of land the buildings are built on.

Embodied Carbon or Life-Cycle Embodied Carbon: Embodied carbon emissions of an asset are the total GHG emissions and removals associated with materials and construction processes throughout the whole life-cycle of an asset (Modules A0-A5, B1-B5, C1-C4, with A02 assumed to be zero for buildings).

Upfront Carbon Embodied Carbon at Practical Completion:

'Upfront carbon' emissions are the GHG emissions associated with materials and construction processes up to practical completion (Modules A0-A5). Upfront carbon excludes the biogenic carbon sequestered in the installed products at practical completion. A1-A3 covering materials product, A4 transport of materials and A5 construction and installation processes.

Energy use intensity (EUI): An indicator of the energy efficiency of a building's design and/or operations. It is the total amount of energy used in a building in a year divided by its floor area (kwh/m²/yr). It can be expressed in terms of GIA or NLA, and this should be clearly stated when reporting.

Environmental Aspect: An aspect of construction works, part of works, processes or services related to their

Life-cycle that can cause change to the environment.

Environmental Impact: A change to the environment, whether adverse or beneficial, wholly or partially, resulting from environmental aspects.

Environmental Performance Declaration (EPD): A transparent, objective report that communicates what a product or material is made of and how it impacts the environment across its entire life-cycle. An EPD is usually valid for five years, and is generated according to a number of relevant standards.

Global Warming: Is the long-term heating of Earth's climate system observed since the pre-industrial period (between 1850 and 1900) due to human activities, primarily fossil fuel burning, which increases heat-trapping greenhouse gas levels in Earth's atmosphere.

Global Warming Potential (GWP): The standard metric used to calculate CO₂-equivalent emissions of different greenhouse gases in carbon budgets and the Kyoto Protocol. GWP measures the total radiative forcing over a given period (usually 100 years) after a pulse emission, relative to that from the same mass of CO₂.

Greenhouse Effect: A process that occurs when gases in Earth's atmosphere trap the Sun's heat. This process makes the Earth much warmer than it would be without an atmosphere.

Greenhouse Gases (GHG): 'Greenhouse Gases' are constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere, and clouds: For these 'carbon definitions', we are only addressing the GHGs with Global Warming Potential assigned by the Intergovernmental Panel on Climate Change (IPCC), e.g. carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFC's), perfluorocarbons (PFC's), and sulphur hexafluoride (SF₆).

Grid Decarbonisation: The gradual reduction of the carbon intensity of electricity production.

Gross Internal Area (GIA): The area of a building measured to the internal face of the perimeter walls at each floor level. In the UK this is determined according to Royal Institute of Chartered Surveyors (RICS) property measurement standards.

IMPACT (Integrated Material Profile and Costing Tool): A specification and database for software developers to incorporate into their tools to enable consistent Life-cycle Assessment (LCA) and Life-cycle Costing (LCC). IMPACT compliant tools work by allowing the user to attribute environmental and cost information to drawn or scheduled items in the BIM. Put simply, IMPACT takes quantity information from the BIM and multiplies this by environmental impact and/or cost 'rates' to produce an overall impact and cost for the whole (or a selected part) of the design.

Life-cycle: consecutive and interlinked stages in the life of the object under consideration.

Life-cycle Assessment (LCA): is a process to evaluate the environmental burdens associated with a product, process or activity:

- By identifying and quantifying energy and materials used and wastes released to the environment;
- To access the impact of those energy and materials used and releases to the environment; and
- To identify and evaluate opportunities to affect environmental improvements.

The assessment includes the entire life-cycle (from cradle to grave) of the product, process or activity encompassing extracting and processing of raw materials, manufacturing, transportation and distribution; use and re-use; maintenances; recycling and final disposal.

Minimum Energy Efficiency Standards (MEES): The Energy Efficiency (Private Rented Property)(England and Wales) Regulations 2015 established the new Minimum Energy Efficiency Standards in the residential and commercial private rented sector in 2016.

NABERS UK ‘Design for Performance’ (DfP): A building rating scheme (currently for offices only) designed to help projects deliver against their design intent and overcome the well-evidenced performance gap between design and operation. It requires a developer or owner to commission a new office to a defined rating. It is a more detailed way of undertaking an energy model with the aim of enabling better design decisions to help reduce carbon emissions once the building is operating.

Net Zero Carbon: A ‘net zero (whole life) carbon asset is one where the total sum of all assets related to GHG emissions, both operational and embodied, over an asset’s life-cycle (Modules A0-A5, B1- B8, C1-C4) are minimised, which meets local carbon, energy and water targets or limits, and with residual ‘offsets’, equals zero.

NABERS Energy: NABERS Energy measures the efficiency of an office building and rates its performance (0-6 Stars). The energy rating works by comparing the energy consumption of a building against a set of benchmarks that have been developed using actual data. It is based on in-use data.

Operational Energy (modelling): A detailed energy model that attempts to reflect real world energy consumption of a building during the design and construction stages of a development. This would include more detail than a standard model used for building regulations, and would include unregulated energy.

Operational Carbon Energy building (use): ‘Operational Carbon – Energy’ (Module B6) are the GHG emissions arising from all energy consumed by an asset in-use, over its life-cycle.

Operational Carbon Water (use): ‘Operational Carbon – Water’ (Module B7) are those GHG emissions arising from water supply and wastewater treatment for an asset in-use, over its life-cycle.

Recycling: Recycling is the process of converting waste materials into new materials and objects. A recovery operation by which waste materials are reprocessed into products, materials or substances either for the original purpose or other purposes.

Refurbishment: Modification and improvements to an existing building in order to bring it up to an acceptable condition. The refurbishment of something is the act or process of cleaning it, decorating it, and providing it with new equipment or facilities.

Regulated Energy Consumption: The building energy consumption resulting from the specification of controlled, fixed building services and fittings, including space heating and cooling, hot water, ventilation, fans, pumps and lighting.

Retrofit: The act of providing something with a feature not fitted in the original construction or a replacement of a component. Often this refers to building systems upgrades, however it can refer to improving fabric and or glazing. This work generally improves amenities for the building’s occupants and the overall building performance.

TM 54: A CIBSE Technical Memorandum that covers all types of building energy modelling with the aim of more accurately estimating a building’s energy consumption in the design process and allowing more meaningful comparison with actual in-use consumption once operational.

Unregulated energy: Energy consumption that is not ‘controlled’, it does not fall under Part L of the Building regulations. This would include consumption from elements such as IT equipment, lifts and other plug-in equipment such as white goods, laboratory equipment, external lighting and audio visual equipment.

Whole life-cycle Carbon (WLC) or Whole Life Carbon over Life-Cycle: Whole life carbon emissions are the total sum of all asset related GHG emissions and removals, both operational and embodied over the life-cycle of an asset including its disposal (Modules: A0-A5; B1-B7; B8 optional; C1-C4, all including biogenic carbon, with A0* assumed to be zero for buildings). Overall whole life carbon asset performance includes separately reporting the potential benefits or loads from future energy or material recovery, reuse, and recycling and from exported utilities (Modules D1, D2). * A0 is generally assumed to be zero for buildings, however for infrastructure projects A0 can

include ground investigations and activities associated with designing the asset.

Demolition of existing structures or buildings must be separately identified and included within Module A5.

Application types:

FULLEIA: any application requiring EIA in support

FULMAJ: – Any application over 1,000m² - Major applications may include schemes for redevelopment, substantial refurbishments and extensions. Residential development of 10 or more dwellings or on a site of 0.5 hectares or more, and all other development of 1,000 square metres gross or more floorspace, or on a site of 1 hectare or more.

FULL: All other full applications

This page is intentionally left blank