GLA Land and Property Ltd

Environmental Sustainability Framework

Requirements, implementation and reporting

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Levitt Bernstein People.Design

Etude

Currie & Brown

Contents

GLAP Environmental Sustainability metrics and reporting

GLA Land and Property Limited (GLAP) is a wholly owned subsidiary of the Greater London Authority (GLA). Its purpose is the purchase, sale and development of land or property, and the holding of assets for rental income or capital growth.

As the Mayor's directly owned landowner and developer, GLAP is committed to supporting the Mayor to deliver his climate emergency response and London being a net zero carbon city by 2030 and climate resilient city.

In support of GLAP's Climate Action Strategy and commitment to deliver developments fit for the future, this document outlines the specific environmental sustainability metrics and KPIs it intends to deliver against.

Context on the environmental sustainability requirements

As an organisation primarily tasked with development, the majority of GLAP's emissions are from its development activity. GLAP is in a position of influence and support to show how Mayoral ambitions can be achieved, through a flexible, streamlined approach, encouraging best practice whilst responding to the economic conditions of the time.

This guidance document intends to provide a framework that assists with decisions and outcomes that deliver against Mayoral commitments. Through a streamlined approach with a focus on key sustainability themes, encouraging best practice and the use of metrics which take into account site context, wider considerations providing opportunities for flexible outcomes.

The document also seeks to align GLAP's requirements with those across the GLA Group and the reporting requirements of the Homes for Londoners (HfL) Collaboration Programme. Therefore, this document references and overlaps with the HfL Collaboration Programme Environmental Sustainability Reporting guide and proforma.

GLA Group:

The GLA's four development organisations: GLA Land and Property Ltd (GLAP); London Legacy Development Corporation (LLDC); Transport for London - Places for London; and Old Oak and Park Royal Development Corporation (OPDC), form the 'GLA Group'.

Requirements, implementation and reporting

This guidance sets out GLAP's environmental sustainability requirements across four themes and twelve metrics and key performance indicators. It provides guidance on implementation for project teams and explains and delivers a mechanism for reporting and tracking progress.

Who is this guidance for?

This document is intended for:

- **GLAP project teams:** to establish an understanding of the key environmental sustainability requirements, ensuring consistent reporting across projects, learning and enhancing the sustainability performance of the GLAP new development projects.
- **Developer and design teams:** to communicate the sustainability requirements which will form part of the development brief. Whilst also providing guidance on how to implement them successfully through their delivery processes.

What the guidance covers

The guidance is split into three parts:

1. **Environmental sustainability requirements:** Requirements have been set out across four environmental sustainability themes; ***operational energy***, ***embodied carbon***, ***climate resilience*** *and* ***water***. Within these themes there are twelve environmental sustainability metrics with a mix of numerical targets or reporting requirements.
2. **Implementation guidance:** To effectively deliver the requirements, guidance on implementation has been provided which sets out the roles and responsibilities across the project team for use on new development projects.
3. **Reporting:** To demonstrate how the requirements are being met on developments, reporting through a proforma has been explained. Using the proforma this information can be collected on a project by project basis and then reported into the Homes for Londoners Collaboration Programme as part of the wider GLA Group reporting.

Informing future iterations of this guidance

This is the first version of the GLAP environmental sustainability requirements and reporting framework. It looks to provide a framework for encouraging best practice environmental sustainability outcomes on projects whilst providing flexibility and collecting and analysing data from developments. An evidence-based approach has been taken to develop the metrics and KPIs however, in some areas such as embodied carbon the evidence currently isn't as robust. Therefore, a key part of collecting and analysing data from projects whilst striving to achieve the metrics and KPIs is to enhance the evidence base connecting policy and delivery.

By striving to meet the GLAP requirements this will inform future iterations of the targets included and allow meaningful on- project discussions.

Existing projects

Existing projects are actively encouraged to make use of the checklists within the implementation section and to report against the metrics and key performance indicators within the guidance. This aims to support the development of an accurate picture of the environmental sustainability achievements across GLAP projects and to enhance the data being collected from projects.

1

Environmental sustainability requirements

Consistent environmental sustainability reporting

This page sets out GLAP's environmental sustainability requirements. These requirements should be reported against on all new development projects including those with an outline planning permission. They consist of key metrics and Key Performance Indicators (KPIs) that encourage best practice, while providing flexibility of outcomes by taking into account site context and viability.

The requirements are evidence based and were formed by taking learnings from the minimum requirements outlined in the London Plan 2021; a review of GLA development family standards and framework; the best practice standards across industry; and existing draft and emerging policies in local plans. This thorough research and evaluation distilled the reporting into 12 key environmental sustainability metrics and stakeholder engagement, across the GLA Group and industry, contributed to finalising them.

The GLAP metrics and KPIs cover four key environmental sustainability themes:

- Operational energy
- Embodied carbon
- Climate resilience
- Water

Hierarchy of requirements

The table opposite outlines the environmental sustainability requirements in order of importance. The highest ranking requirement is to reduce operational energy, and then minimising embodied carbon. Next the focus is on designing buildings for climate resilience, with the final key priority of improving levels of water consumption. It should however, be noted that the theme areas are interconnected and when developments are being designed the metrics should be considered collectively rather than individually.

Requirements for reporting across the four sustainability themes and their wider benefits:

Operational Energy

Requirements:

- Space heating demand
- Energy use intensity
- No on-site fossil fuels
- On-site renewable energy
- Energy balance

Wider benefits:

- Reducing fuel poverty
- Improving thermal comfort
- Health and well being
- Reducing performance gap

Embodied carbon

Requirements:

- Upfront embodied carbon
- Life cycle carbon

Wider benefits:

- Minimise resources
- Minimise construction waste & cost
- Health and well being

Climate resilience

Requirements:

- Overheating assessment
- Urban tree canopy cover
- Biodiversity net gain
- Urban greening factor

Wider benefits:

- Resilience to climate change
- Access to nature and biodiversity
- Improving thermal comfort and air quality
- Health and well being

Water

Requirements:

- Water consumption

Wider benefits:

- Conserving essential resource
- Economic savings
- Resilience to drought conditions

Metrics and Key Performance Indicators (KPIs) in more detail

Limits and targets

Six of the metrics introduced are underpinned and assessed through meeting numerical KPIs. These include:

Limits - the limits on performance must be met by all new developments, as a means to raise the floor and ensure that GLAP projects achieve a consistent level of minimum performance.

Targets - the targets signal an expectation to be achieved, encouraging best practice and improved performance. Targets are expected to be worked to unless there is an unavoidable reason, for which a derogation will need to be agreed to lower performance expectations.

Reporting – in some instances no limit or target has been set. This is either because the limit has already been set nationally or locally (e.g. BNG and UGF), or because there is not sufficient consensus/evidence to set a meaningful/robust target at this point (energy balance, life-cycle carbon and tree canopy cover). In these cases developments are to demonstrate they achieve the requirement by reporting against it.

Overall, the requirements should be implemented and reported across all new development projects, including those with an outline planning permission.

Metrics and KPIs in more detail

The following pages set out the metrics and KPIs across the four themes in more detail. Under each theme there are two pages: Metric explanation, and Metrics and key performance indicators.

Building typologies

Metrics and KPIs have been set for three building typologies – mid - high-rise residential, schools and offices. Where non-domestic building uses proposed on a development do not fit into these categories the targets should be agreed on a project by project basis.

Wider benefits

Supported by the implementation guidance (section 2) and the reporting (section 3) the key environmental sustainability metrics and KPIs aim to contribute to delivering the wider Mayoral priorities and ambitions for a net zero carbon city by 2030 and align to a 1.5 degree future, while also providing a mechanism for reporting on progress and learning. Beyond the environmental benefits, the requirements have wider benefits summarised on the table on the previous page, including tackling fuel poverty and improving thermal comfort for the residents.

Metrics and KPIs for reporting across the four sustainability areas:

		Reporting currently required by **London Plan/ regulation**	**GLAP reporting**		
			Target	Limit	Reporting
Operational energy	Space heating demand	✓	✓	✓	✓
	Energy use intensity	✓	✓		✓
	No on-site fossil fuels				✓
	On-site renewable energy	*	✓		✓
	Energy balance				✓
Embodied carbon	Upfront embodied carbon	✓	✓		✓
	Life cycle carbon	✓			✓
Climate resilience	Overheating assessment	✓		✓	✓
	Tree canopy cover				✓
	Biodiversity Net Gain	✓			✓
	Urban Greening Factor	✓			✓
Water	Water consumption	✓		✓	✓

* *Requirement to maximise PV area in London Plan 2021, but metric differs from GLAP proposal*

Operational energy explained

What is operational energy?

Operational energy is the energy consumed at the building meters for daily operations. It includes energy used for heating, cooling, lighting, ventilation, hot water and plug loads (such as operating appliances or systems such us laptops and elevators).

The importance of minimising operational energy

Buildings account for a significant portion of the national energy consumption. Therefore, reducing the amount of energy a building needs to operate is crucial to achieving the Mayor's commitments and aspirations for London. Beyond the wider environmental benefits, occupants benefit from reduced utility bills, improved indoor air quality and thermal comfort.

Predictive modelling

Net zero carbon is only truly achieved when the predictions of energy consumption in buildings more closely match the delivered outcomes. To achieve this, Passive House Planning Package (PHPP) for residential buildings and CIBSE TM54 dynamic modelling or PHPP for non-residential buildings is required to accurately assess operational energy during design stage and to better influence early design decisions to ensure the thermal envelope and systems are better designed. More information on the importance of using predictive modelling can be found in the appendix (pages 39-41).

Operational metrics

The operational energy metrics to be assessed and reported have been explained opposite.

Operational energy metrics for reporting:

1. Space heating demand - kWh/m^{2}GIA/yr

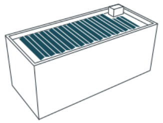
The amount of energy needed to heat a building over a year (per sqm of the building's gross internal area). Design and specification decisions affect space heating demand, such as: orientation, form and exposure, insulation, windows and doors, air-tightness and ventilation systems.

2. Energy use intensity - kWh/m^{2}GIA/yr

The amount of total energy needed to run a building over a year (per sqm of the building's gross internal area), including space heating demand and the efficiency of the ventilation, heating, hot water and cooling systems, lighting, cooking and appliances.

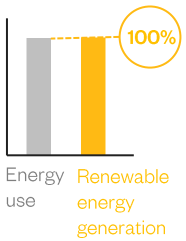
3. No on-site fossil fuels

This is a requirement to ensure that buildings do not require the use of on-site fossil fuels to run them.



4. On-site renewable energy generation - kWh/m^{2}fp.yr

The amount of on-site renewable energy generated in a year per sqm footprint of the building. This is influenced by the PV density, roof design, orientation, mounting and power output.



5. Energy balance - %

The percentage of on-site renewable energy generated in a year (kWh/yr) compared to the energy use/consumption (kWh/yr) of the building.

Operational energy - metrics and key performance indicators

The metrics and key performance indicators on operational energy are set out in the table below, including modelling expectation and definitions.

Sustainability categories	Metric	Key performance indicators			Modelling/ methodology expectations	Definition/ explanation of metric
		Residential (mid and high-rise)	School	Office		
Operational energy	**Space heating demand** - kWh/m²GIA.yr	*0 — **15 Target** — 30 Limit*			*Predictive energy modelling expected (PHPP for resi and TM54/PHPP for non-resi)*	*The amount of heat energy needed to heat a building over a year (per sqm)*
	Energy use intensity - kWh/m²GIA.yr	*0 — **35 Target***	*0 — **65 Target***	*0 — **75 Target***	*Predictive energy modelling expected (PHPP for resi and TM54/PHPP for non-resi)*	*The amount of total energy needed to run a building over a year (per sqm)*
	No on-site fossil fuels	*Confirmation of no on-site fossil fuels – through reporting*			*N/A*	*No use of on-site fossil fuels should be used to deliver the total energy needed to run the building*
	On-site renewable energy generation - kWh/m²fp .yr	*0 — **60 Target***	*0 — **100 Target***	*0 — **45 Target***	*Predictive energy modelling expected*	*The amount of renewable energy generated over a year (per footprint)*
	Energy balance - %	*Reporting of on-site energy balance*			*N/A*	*The on-site renewable energy generation compared against the energy use*

KEY

Limit: Developments must meet the limits of performance.

Target: Developments are expected to achieve the target, unless there is an unavoidable reason, for which a derogation will need to be agreed.

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Embodied carbon explained

What is embodied carbon?

The embodied carbon emissions of a building are the total greenhouse gas emissions associated with materials, construction processes, maintenance and demolition. Embodied carbon is assessed through the use of different boundaries. This framework focuses on the assessment of the two key boundaries:

- Upfront embodied carbon – modules A1-A5
- Life cycle embodied carbon – modules A1-A5, B1-B5, C1-C4

The importance of minimising embodied carbon

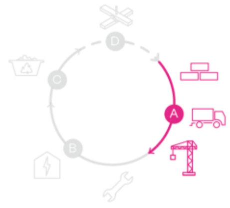
Reducing operational carbon emissions has traditionally been the focus of regulation and planning policy. However, as buildings become more energy efficient, embodied carbon associated with materials is becoming a greater portion of the total building emissions. Addressing embodied carbon is vital to meet climate targets.

In addition, creating buildings that are efficient in material use, form and design from the outset can result in significant embodied carbon and cost reductions. Decisions taken to reduce embodied carbon should be considered in tandem with decisions taken to reduce operational energy consumption. The focus should be on reducing embodied carbon alongside and in support of operational energy, as opposed to trading one off against the other.

Evidence base for setting embodied carbon targets

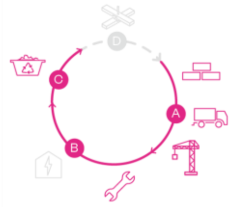
The evidence base for embodied carbon is a growing area. When comparing developments against the upfront embodied carbon targets, it is important to retain ambition to attain the lowest possible level of upfront embodied carbon, especially in residential developments. It is often possible to achieve less than 600kgCO_2e/m^2 (down to 500kgCO_2e/m^2 and below) for residential developments, so this should be strived for through design and material selection. However, flexibility up to 600kgCO_2e/m^2 has been initially allowed in the target to account for industry learning and continued understanding in this field. This target was also informed by stakeholder engagement.

Embodied carbon metrics for reporting:



1. Upfront embodied carbon - kgCO_2e/m^{2}GIA

The amount of greenhouse gas emissions associated with material and construction stages: raw material supply, manufacture, transport and construction of all building elements (modules A1-A5). Factors contributing to upfront embodied carbon include: building's form and exposure, non-typical features (e.g. basement), lean structural, architectural and building services design and the choice of materials.



2. Life cycle carbon reporting - kgCO_2e/m^{2}GIA

The sum of upfront embodied carbon and the embodied carbon associated with:

- In-use - maintenance, replacement and refrigerant leakage (modules B1-B5) and
- End of life - waste processing of demolition/deconstruction and disposal of any products (modules C1-C4).

Methodology

The quality of embodied carbon reporting and the data used during the an embodied carbon assessment is constantly being improved in the industry. RICS Professional Statement (2023) second edition (RICS PS v2) aims to improve the quality and granularity of the assessments, producing more accurate results that can be compared from one building to another. The RICS PS v2 assessment methodology should be used when calculating upfront and lifecycle embodied carbon. PV should be calculated and reported separately because carbon consumed in making the PV would directly compete with the operational energy generated in-use. Results should be reported using the RICS reporting forms.

Embodied carbon - metrics and key performance indicators

The metrics and key performance indicators on embodied carbon are set out in the table below, including the modelling expectation and the definition of each metric.

Sustainability categories	Metric	Key performance indicators			Modelling/ methodology expectations	Definition/ explanation of metric
		Residential (mid and high-rise)	School	Office		
Embodied carbon	**Upfront embodied carbon** – $kgCO_2e/m^2GIA$	*0 **600 Target***	*0 **600 Target***	*0 **700 Target***	*RICS Whole life carbon assessment for the built environment Professional Statement 2023 **	*The emissions associated with raw materials supply, manufacture, transport and construction of all building elements (per sqm)*
	Life cycle embodied carbon - $kgCO_2e/m^2GIA$	*Reporting of the life cycle carbon emissions*			*RICS Whole life carbon assessment for the built environment Professional Statement 2023 **	*The upfront embodied carbon emissions plus the emissions associated with maintenance, replacement, and waste processing of the building elements*

* RICS Whole life carbon for the built environment Professional Statement 2023 requires that the embodied carbon figures are reported on a building by building basis, as opposed to at a whole site or development level.

KEY

Target: Developments are expected to achieve the target, unless there is an unavoidable reason, for which a derogation will need to be agreed.

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Climate resilience explained

What is climate resilience?

Climate resilience in the construction industry refers to the ability of buildings, infrastructure and urban developments to withstand, adapt to and recover from the impacts of climate change, such as the significant rising temperatures in the urban context of London. This guidance addresses the overheating risk in buildings and the need for softscape and particularly large mature trees as two key climate resilience strategies.

The importance of designing for climate resilience

As the climate changes there is a greater risk of overheating in buildings, which can be particularly acute for heavily glazed buildings and homes with vulnerable residents who spend significant proportion of their time at home (e.g. elderly residents or young children). Overheating in buildings is not a stand-alone issue, it crosses paths with energy efficiency, daylight, acoustics, air quality, security and safety making it a complex and important design issue. It is important that overheating is first tackled and reduced through good building design, through the review of window areas, inclusion of shading, and designing for generous openable window areas coupled with cross ventilation.

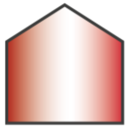
Mature and large species trees are not often seen as part of the landscape design strategy for new developments in London. This is due to smaller species having less space constraints, cost less and are less likely to interfere with the underground utilities. However, the planting of large species trees should be encouraged as they have the ability to cool down the temperature of urban areas, improve air quality by breaking down pollutants in the air, support urban biodiversity by becoming habitats for a wide range of wildlife and act as a flood mitigation strategy by reducing surface water runoff. The Mayor of London is supportive of an increase tree canopy cover in London to assist with climate resilience.

Climate resilience metrics

The climate resilience metrics to be assessed and reported have been explained opposite.

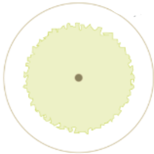
No limit or target has been set in this document for BNG and UGF this is because the limit has already been set nationally or locally as part of the London Plan. Therefore, these metrics are just to be reported as part of this process.

Climate resilience metrics for reporting:



1. Overheating assessment (Part O, CIBSE TM59/ TM52) – pass/ fail

London Plan 2021 requires compliance with CIBSE TM59 for residential buildings and CIBSE TM52 for non-residential buildings (using DSY1). Part O compliance for residential buildings is also required to meet building regulations. This requirement therefore follows suit in assessing and reducing the overheating risk. To supplement implementation of this metric a checklist of actions, including design decisions has been provided in section 2.



2. Urban tree canopy cover - %

The tree canopy cover is a two-dimensional representation of the area that will be covered by the branches and foliage of the tree(s) around 20 years after they are planted. It is expressed as a percentage of the total site area in m^2. Factors contributing to tree canopy cover are: density of development, tree species, volume and quality of soil and maintenance plan.

BNG

3. Biodiversity Net Gain (BNG)- %

Biodiversity net gain (BNG) is a measurement that requires more habitat to be replaced/enhanced than is lost on a development site. A 10% increase in BNG is a mandatory national requirement under the Environment Act 2021 and applies to all developments.

UGF

4. Urban Greening Factor (UGF)

Urban Greening Factor (UGF) is used to evaluate the quantity and quality of urban greening. The London Plan 2021 requires all major developments to include urban greening as a fundamental element of site and building design.

Climate resilience - metrics and key performance indicators

The metrics and key performance indicators on climate resilience are set out in the table below, including the modelling expectation and the definition of each metric.

Sustainability categories	Metric	Key performance indicators			Modelling/ methodology expectations	Definition/ explanation of metric
		Residential (mid and high-rise)	School	Office		
Climate resilience	Overheating assessment (Part O, CIBSE TM59/ TM52) – pass/ fail	**Pass** *Fail* *All sample homes/buildings tested are expected to pass*			*Dynamic Thermal Modelling using the CIBSE TM59/ TM52 methodology (e.g. IES)*	*Assessing and minimising the risk of overheating through on-site opportunities, massing, windows design and shading strategies*
	Urban tree canopy cover - %	*Reporting of tree canopy cover percentage*			*N/A*	*The tree canopy cover is a two-dimensional representation of the area that will be covered by the branches and foliage of the tree(s) around 20 years after they are planted.*
	Biodiversity Net Gain - %	*Reporting of Biodiversity Net Gain*			*N/A*	*Net gain impact on biodiversity, compared to what was there before*
	Urban Greening Factor	*Reporting of Urban Greening Factor*			*N/A*	*Factor score to each surface cover type, weighted based on their potential for rainwater infiltration*

Water explained

What is water consumption?

The water consumption in buildings refers to the total amount of potable water used through various fixtures and fittings in a building. In this instance the water consumption is focused on the internal water use.

The importance of minimising the consumption of water?

With the rapid growth of London's population, and natural water resources becoming more limited, managing water consumption in buildings is essential for resource efficiency, while residents benefit from cost savings.

Water metrics

The water metrics to be assessed and reported have been explained opposite.

Tips for following good practice water consumption (summarised from AECB)

The Association for Environment Conscious Building (AECB) Water Standard is designed to promote water efficiency for new (and existing) residential buildings, considering the following measures:

- Flow rate limits on water fixtures to reduce water wastage, e.g. showers 6-8 l/min.
- Hot water pipework design guidance to reduce distribution heat losses, e.g. limit dead legs.
- Guidance on water metering, pressure regulation and leak detection.

Water consumption metric for reporting:

1. Water consumption efficiency – litres/person/day

The amount of water in litres consumed in a building per person per day, from bathing, hand washing and kitchen taps, WC flush, washing machine, dishwasher, plant watering, etc. Factors affecting water consumption consists of: efficiency of water systems, their flow rates and the installation of additional water efficiency systems (e.g. rainwater harvesting and greywater recycling).

Making informed decisions and following good practice water standards (e.g. AECB) will improve efficiency of water usage in our buildings.

Water - metrics and key performance indicators

The metrics and key performance indicators on water are set out in the table below, including the modelling expectation and the definition of each metric.

Sustainability categories	Metric	Key performance indicators			Modelling/ methodology expectations	Definition/ explanation of metric
		Residential (mid and high-rise)	School	Office		
Water	**Water consumption efficiency** – litres/ person/ day - BREEAM	**litres/ person/ day** *0* *105** ***Limit*** *(as per London Plan 2021)*	**BREEAM Wat 01** *Outstanding* ***Excellent*** ***Limit*** *(as per London Plan 2021)*		*N/A*	*The amount of water in litres consumed in a building per person per day, from showering, hand wash and kitchen taps, WC flush, washing machine, dishwasher etc.*

** A separate allowance for external water use of 5 litres/person/day can be assumed in addition to the target value*

KEY

Limit: Developments must meet the limits of performance.

Summary of environmental sustainability metrics and KPIs

Operational energy

1 Space heating demand
kWh/m²GIA/yr

All developments
0 — 15 Target — 30 Limit

2 Energy Use Intensity
kWh/m²GIA/yr

	Residential	School	Office
Scale	0 — 35 Target	0 — 65 Target	0 — 75 Target

3 No on-site fossill fuels

All developments
Confirmation of no on-site fossil fuels through reporting

4 On-site renewable energy generation
kWh/m²fp/yr

	Residential	School	Office
Scale	0 — 60 Target	0 — 100 Target	0 — 45 Target

5 Energy balance
%

All developments
Reporting of on-site energy balance

Embodied carbon

6 Upfront embodied carbon
$kgCO_2e/m^2GIA$

	Residential	School	Office
Scale	0 — 600 Target	0 — 600 Target	0 — 700 Target

7 Life cycle embodied carbon
$kgCO_2e/m^2GIA$

All developments
Reporting of life cycle carbon emissions

Climate resilience

8 Overheating assessment
-pass/ fail

All sample homes/buildings tested are expected to pass

All developments
Pass | Fail

9 Urban tree canopy cover %

10 Biodiversity Net Gain %

11 Urban Greening Factor

All developments
Reporting of metrics

Water

12 Water consumption

Residential
0 — 105 l/pp/day Limit

Non-residential
Outstanding — Excellent Limit — BREEAM Wat 01

2

Implementation

2.1

The project team's role in implementing the environmental sustainability requirements under the Homes for Londoners Collaboration Programme

The project team's role in implementing the requirements

Each member of the project team has a significant role to play in the successful implementation and delivery of the environmental sustainability objectives and key performance indicators (KPIs) throughout the project development. The role of the development manager, project team and sustainability lead in promoting this and working together to avoid derogations can be split up into five key responsibilities:

- **Briefing:** ensuring that the project's environmental sustainability objectives are clearly articulated, communicated to the project team and understood by them (developer and design team initially, contractor later). Embed objectives and requirements from the outset including in any early feasibility or design work, procurement of a development partner and then into design and delivery teams.
- **Scopes and responsibilities:** ensuring that all key tasks necessary to assess and deliver the KPIs are in the project team and contractor's scope and identifying who is responsible/accountable for them. Setting out the objectives clearly in procurement documents and considering them in the selection process.
- **Advocating**: championing the sustainability objectives and checking that any detrimental impacts of design or specification choices are considered.
- **Management/derogation:** ensuring that the project team reports against the KPIs at each relevant RIBA stage, managing any derogation and/or tension with capital costs. Checking that responsibilities are communicated/transferred to the contractor team at the appropriate stage.
- **Reporting to GLAP and HfL Collaboration programme**: keeping clear records of performance of the development against KPIs and report to GLAP and HfL Collaboration Programme at key stages, including any post occupancy data and useful lessons learned. A **proforma** has been developed to assist with data collection on projects at various stages and to assist in reporting back to GLAP and HfL Collaboration Programme.

The below table illustrates the typical process during design. Consideration will need to be given to contractual arrangements on projects and this should be followed in conjunction with the development partner.

Stage 1	Stages 2-3	Stage 4	Stage 5-6	Stage 7
Write the project brief *Include environmental sustainability requirements in the brief* **Write the consultant scopes.** *Include consultant activities required to assess and deliver the KPI's in the brief.* **Appoint the design team** *that have the skills and enthusiasm with a track record to develop the design to meet the sustainability requirements.*	**Champion sustainability requirements** **Review the emerging and developing design** **Understand the impact of sustainability requirements on design and costs.** *Keep the objectives high on the agenda as the design develops and ensure the team are reviewing and reporting impacts of design decisions on achieving the KPIs as well as capital costs.* *Include meeting sustainability requirements in the contract if D&B (see Stage 4)*	**Include all sustainability requirements in the contract** *Ensure all tender information and contracts include details of the sustainability KPIs, requirements and objectives. Consider these when making procurement decisions.* **Ensure continuity.** *Check that the contractor team scope meshes with the design team responsibilities and that accountability for meeting the objectives is clear and, where appropriate, handed over effectively from design to delivery teams.*	**Report** *on sustainability requirements. Keep the objectives under review and report to GLAP any critical issues that either support or impede the delivery of the KPIs.* **At handover** *ensure the information necessary for the successful operation of the buildings is presented in a suitable format for the intended users.*	**Update** *with any POE data or information collected on the performance in use compared to the objectives that were set. Seek to understand any unexpected variances and feedback and lessons learned to GLAP and to the project team.*

Report on sustainability requirements to the Home for Londoners (HfL) Collaboration Programme

Environmental ambition, cost and viability

A clear and articulated environmental ambition

The environmental ambition of the GLAP is clear: deliver high quality Net Zero carbon buildings with low energy bills which are safe, comfortable in all seasons and climate resilient. Each project should therefore start and be developed during design and construction with the objective of delivering all environmental sustainability requirements covered in this guidance document.

A system which can react pragmatically to viability challenges

During design development and procurement, it is normal for projects to encounter challenges. It may be technically challenging to achieve a specific KPI or the project may have viability issues. The system proposed in this document caters for these situations.

In order to be pragmatic and constructive in these situations while mitigating the risk of the environmental sustainability ambition being eroded to the point that a scheme is merely compliant with minimum planning policy requirements, a simple derogation system is proposed. It has been informed by similar practices across the industry also trying to deliver high environmental ambition in a challenging environment for viability.

Avoiding unevidenced degradation of environmental performance

It is also possible that a project team member may have reservations about some of the requirements due to pre-conceptions and request a derogation from these. This is not a sufficient basis for a derogation. Instead discussions should be open in order to resolve perceived challenges. It is only when a derogation is fully evidenced that it should be considered by the Development Manager and other team members.

Different contractual arrangements with developers can change the level of control on a project. Regardless of contractual arrangements, development partners and design teams should present proposed degradation against the required target in an evidence based way to allow informed decisions to be made and for the information to be recorded.

1 The 'twin-track' approach seeks to deliver a high environmental ambition (e.g. Passivhaus) which is referred to as 'Track A'. Design decisions which are cost effective (e.g. more efficient building form) or cost neutral are 'locked in'. However, to avoid locking in additional costs, design decisions with a cost premium (e.g. high quality MVHR) are identified and the cost difference compared to a minimum planning compliant design (e.g. average quality MHVR) is quantified. The alternative design for these elements is referred to as 'Track B'.

Considering environmental ambition cost and viability throughout the RIBA Stages

RIBA Stages 1-2

1. Designing the scheme at RIBA Stages 1-2 in order to achieve these KPIs is a no-regret decision. Most concept design decisions are likely to be cost-effective, e.g. a building with a more efficient form factor costs less to build.
2. A cost plan should be developed on the basis of meeting the requirements.
3. Decisions associated with a significant additional cost should be identified and discussed. If they can be changed to a cheaper alternative later in the process they just need to be recorded. If they represent a risk of 'locking in' additional cost, an alternative design option should be developed.

RIBA Stage 2+/3

1. When achieving a KPI relies on a better specification than a 'minimum London Plan compliant' alternative, both specifications should be recorded. The design should progress on the basis of the better specification and costed accordingly.
2. If the scheme is not viable, the cost consultant should compare the potential cost savings associated with reducing the specification down to a 'minimum London Plan compliant'. The energy consultant should also quantify the impact in terms of energy bills for residents and carbon emissions. On the basis of both sets of information, the design team can submit a derogation to the Development Manager. The derogation should be accompanied by robust evidence.
3. The Development Manager discusses the derogation internally and then makes an informed decision whether to accept it or not based on the information submitted.

RIBA Stages 4-5 (assumed to be led by Contractor)

1. During procurement, detailed design and construction, the contractor can suggest a derogation to a KPI if it is thought to reduce costs and if it is necessary. The derogation should be accompanied by evidence: (a) current vs alternative solution and associated cost difference, (b) estimate of impact on energy bills and carbon emissions, and (c) confirmation that the alternative solution is still compliant with all planning commitments.
2. The Development Manager discusses the derogation internally and then makes an informed decision whether to accept it or not based on the information submitted.

2.2

Communicating sustainability requirements to the external project team

Communicating sustainability requirements to the external project team

This section gives guidance on how to communicate the environmental sustainability requirements under GLAP to the external project team, embed them in scope of works and contracts, and ensure they are carried throughout the RIBA stages all the way to handover.

Responsibility for achieving the requirements will vary on different projects depending on contractual arrangements. However, most commonly a development partner is procured, with the responsibility to procure a design team and deliver against the requirements. Therefore, it is essential that the requirements are included within the project briefs for the developer partner. The GLAP's sustainability lead/ support will need to be involved in confirming the right approach and level of detail for procurements based on the procurement approach i.e. agreement for lease vs development agreement vs joint venture.

It is also critical to establish the environmental sustainability requirements for the design team, the contractor and any novated designers and sub-contractors. They should form part of the contract between all parties involved in making design and delivery decisions for the building.

Project briefs

A detailed, thorough and well thought out client brief is important for all parties involved in the design and deliver of any building. The environmental sustainability KPIs should form part of this project brief. See page 21 for more detailed information.

Preliminaries, Employer's Requirements and Tender Documentation

Preliminaries, Employer's Requirements and Tender Documentation need to contain clear and sufficient detail on sustainability KPIs and requirements. They should be developed at the right stage with input from the design team. See pages 22 for more detailed information.

Roles and skills needed to address sustainability requirements and KPIs

In order to successfully deliver the environmental sustainability KPIs and requirements, it will be necessary to:

- clearly define roles and responsibilities
- appoint appropriate specialised studies and reports
- ensure effective collaboration.

Roles and specialisms have been expanded opposite which can cover the four main sustainability requirement and KPI themes: operational energy; embodied carbon; climate resilience and water.

Roles and specialisms

Typical minimum **design team** roles are listed below, together with additional specialisms required to meet the sustainability KPIs and requirements set out in this report which may be beyond the regulatory or London policy minimum.

This list is typical, rather than exhaustive, but will need to be reviewed on a project by project basis

The specialist roles do not necessarily need to be additional appointments, it may be possible for them to be undertaken by existing members of a typical design team, provided their scope is expanded to include the studies required.

Typical design phase appointments

1) Architect
2) MEP engineer
3) Structural engineer
4) Landscape architect, arboriculturist or ecologist

Additional skills / specialisms required pre-planning

1) Energy consultant[1]
2) Embodied carbon specialist[2]
3) Overheating specialist[1]

Useful roles at construction phase to maintain quality and encourage outcomes:

1) Air-tightness and Thermographic survey specialist
2) Design guardian
3) Clerk of Works/site supervisor[3]

1 - May be able to be undertaken by MEP role or energy specialist role.

2 - May be able to be undertaken by structural engineer and/or architect role or energy specialist role.

3 - General description of clerk of works role on Designing Buildings WiKi . In this instance the role should cover the oversight of meeting the environmental sustainability requirements.

Project brief - setting the requirements for the project

The requirements

The environmental sustainability KPIs and requirements are applicable to all new GLAP projects. Existing projects are encouraged to implement the guidance and reporting on projects. To ensure successful delivery of the metrics they must be included in the project briefs and environmental sustainability requirements for projects.

The requirements are intended to provide an initial consistent starting point that projects should be able to meet, over and above the minimum planning requirements.

Including requirements in the project brief

To support implementation and provide clarity to project teams the project brief should be explicit about the environmental sustainability requirements of GLAP. The box on the right contains draft example text that could be used.

Further details on the information that should be included in contractor tender documents and project contracts is provided on the next page.

GLAP as a subsidiary of the GLA is committed to supporting the Mayor of London's ambition of a net zero carbon and climate resilience London.

GLAP has set the following environmental sustainability metrics and KPIs for its projects: (*replace with design or project specific KPIs if appropriate)*

Metric		KPI
Operational energy	Space heating demand (kWh/m^2/yr)	Target of 15 and limit of 30 (all developments)
	Energy use intensity (kWh/m^2/yr)	Targets of 35 / 65 / 75 (residential / school / office)
	No on-site fossil fuels	Reporting only (all developments)
	On-site renewable energy (kWh/m^{2}fp/yr)	Targets of 60/ 100/ 45 (residential / school / office)
	Energy balance (%)	Reporting only (all developments)
Embodied carbon	Upfront embodied carbon (kgCO$_2$e/m^{2}GIA)	Targets of 600/ 600/ 700 (residential/ school / office)
	Life cycle carbon (kgCO$_2$e/m^{2}GIA)	Reporting only (all developments)
Climate resilience	Overheating assessment (pass/ fail)	Pass Part O, TM59/ TM52 (all developments)
	Urban tree canopy cover (%)	Reporting only (all developments)
Water	Water consumption	Limit of 105 litres/person/day (residential) and meet BREEAM excellent in Wat 01 (non-residential)

The team should report the project status to the development manager against each metric and KPI at the end of each RIBA stage of work. The reporting is also provided to the Homes for Londoners collaboration programme.

The project is expected to deliver all requirements and KPIs but a standard derogation process is possible (through the Development Manager) provided that robust and satisfactory evidence is provided that a KPI cannot be achieved for technical or cost reasons.

Tender information - Setting the requirements for the construction contractor

Including requirements in the tender documents

The box on the right contains draft example text that can be used in the project tender and contract documents to summarise the requirements for contractors and subcontractors.

Adapting to the procurement routes

Different procurement routes will be preferred for different projects. Whichever procurement route is selected, it is important that the environmental sustainability metrics and KPIs are clearly set out and monitored throughout the different stages of design, construction and handover.

The Development Manager will be responsible for writing tender and contract documents for prospective contractors. Depending on whether the procurement route this will take place between RIBA Stage 2 and 4. In all cases, it is important to make that:

- ❑ Preliminaries, Employer's Requirements and Tender documentation contain sufficient detail on environmental sustainability KPIs and requirements for the contractor to price and successfully deliver the outcomes.

- ❑ Any value engineering options proposed by the contractor is checked against impact on environmental sustainability KPIs and requirements.

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GLAP has set the following environmental sustainability metrics and KPIs for its projects: (*replace with design or project specific KPIs if appropriate)*

	Metric	KPI
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	Energy use intensity (kWh/m^2/yr)	Targets of 35 / 65 / 75 (residential / school / office)
	No on-site fossil fuels	Reporting only (all developments)
	On-site renewable energy (kWh/m^{2}fp/yr)	Targets of 60/ 100/ 45 (residential / school / office)
	Energy balance (%)	Reporting only (all developments)
Embodied carbon	Upfront embodied carbon (kgCO_2e/m^{2}GIA)	Targets of 600/ 600/ 700 (residential/ school / office)
	Life cycle carbon (kgCO_2e/m^{2}GIA)	Reporting only (all developments)
Climate resilience	Overheating assessment (pass/ fail)	Pass Part O, TM59/ TM52 (all developments)
	Urban tree canopy cover (%)	Reporting only (all developments)
Water	Water consumption	Limit of 105 litres/person/day (residential) and meet BREEAM excellent in Wat 01 (non-residential)

The Contractor will report the project status against each KPI every 3 months as a minimum.

There must be a nominated champion in the contractor team who is responsible for: monitoring and delivering each KPI ; ensuring that all subcontractors and suppliers are aware of and are compliant with these requirements; site workforce are trained in the appropriate skills for delivering the KPIs; clear accessible information is given to building occupants upon completion.

The project is expected to deliver all requirements and KPIs but a standard derogation process is possible (through the Development Manager) provided that robust and satisfactory evidence is provided that a KPI cannot be achieved for technical or cost reasons.

2.3

Implementation per RIBA stage

Introduction to the RIBA stages checklists

This section outlines the activities that should be undertaken by project team members at each RIBA stage, so the project has the best opportunity to meet the environmental sustainability objectives.

Each of the following pages is dedicated to a particular RIBA stage. They contain information for the project team. The checklists detail the key actions that should be undertaken at each RIBA stage to ensure the project achieves its environmental sustainability objectives and KPIs.

Checklists

The checklists should be consulted at the beginning of each RIBA stage in order that the actions can be planned in for the appropriate time in the project stage. It is important to note that some actions should be undertaken at the beginning of the stage or halfway through it, rather than just at the end of it.

At RIBA Stage 2 / 3 the checklist pages offer two routes: the traditional route where a planning application is submitted after Stage 3, and a 'fast track to planning' route, where the planning application is submitted after Stage 2+.

Roles and responsibilities

The roles and responsibilities indicated in the checklists are consistent with common practice. However, each project will be procured and delivered in a different way and therefore lead roles and responsibilities may need to be adjusted accordingly. The development manager could be internal or within the developer's team depending on project set up. The checklist can also be used to provide guidance to developers on the expected reporting at end of a stage.

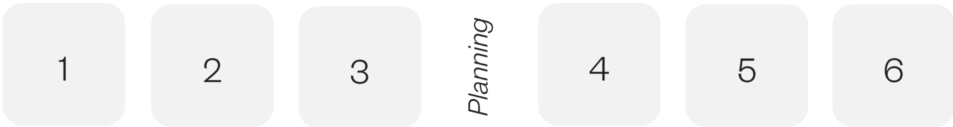
Responsibilities for the Project Lead

At each stage the Development Manager with the sustainability lead should ensure that:

- ❑ Roles and responsibilities are appropriately assigned within the project team
- ❑ Each RIBA Stage Checklist is reviewed at the beginning of the RIBA stage and activities planned accordingly by the project team.
- ❑ The RIBA Stage Checklists are used to guide sustainability updates during progress meetings.
- ❑ All sustainability KPIs are reported at the end of each RIBA Stage through the KPIs proforma.

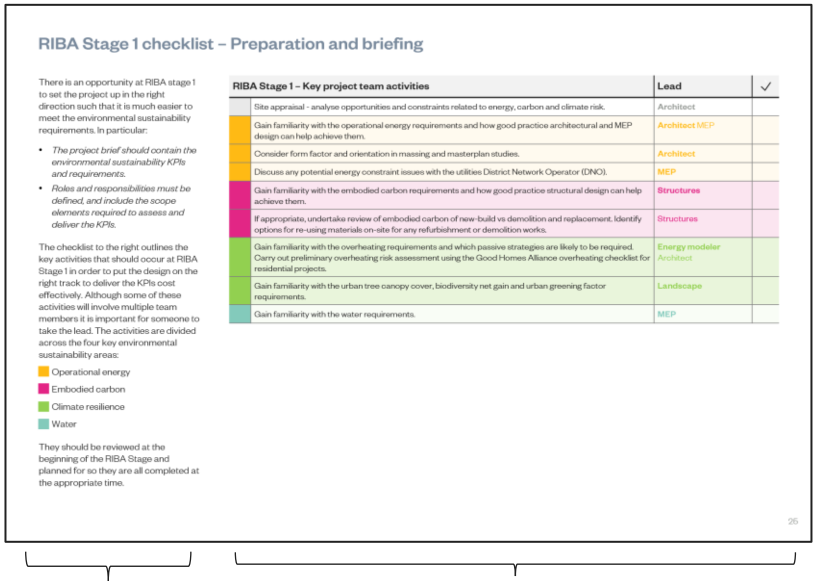
Projects traditionally apply for planning permission after RIBA Stage 3 where there is more certainty in the design, however, some developments opt for a faster route to planning:

Traditional route to planning



>>> Fast track route to planning and procurement

How to read the **checklist pages:**



RIBA Stage 1 checklist – Preparation and briefing

There is an opportunity at RIBA stage 1 to set the project up in the right direction such that it is much easier to meet the environmental sustainability requirements. In particular:

- *The project brief should contain the environmental sustainability KPIs and requirements.*
- *Roles and responsibilities must be defined, and include the scope elements required to assess and deliver the KPIs.*

The checklist to the right outlines the key activities that should occur at RIBA Stage 1 in order to put the design on the right track to deliver the KPIs cost effectively. Although some of these activities will involve multiple team members it is important for someone to take the lead. The activities are divided across the four key environmental sustainability areas:

- Operational energy
- Embodied carbon
- Climate resilience
- Water

They should be reviewed at the beginning of the RIBA Stage and planned for so they are all completed at the appropriate time.

RIBA Stage 1 – Key project team activities	Lead	✓
Site appraisal - analyse opportunities and constraints related to energy, carbon and climate risk.	Architect	
Gain familiarity with the operational energy requirements and how good practice architectural and MEP design can help achieve them.	Architect MEP	
Consider form factor and orientation in massing and masterplan studies.	Architect	
Discuss any potential energy constraint issues with the utilities District Network Operator (DNO).	MEP	
Gain familiarity with the embodied carbon requirements and how good practice structural design can help achieve them.	Structures	
If appropriate, undertake review of embodied carbon of new-build vs demolition and replacement. Identify options for re-using materials on-site for any refurbishment or demolition works.	Structures	
Gain familiarity with the overheating requirements and which passive strategies are likely to be required. Carry out preliminary overheating risk assessment using the Good Homes Alliance overheating checklist for residential projects.	Energy modeler Architect	
Gain familiarity with the urban tree canopy cover, biodiversity net gain and urban greening factor requirements.	Landscape	
Gain familiarity with the water requirements.	MEP	

Information for Project Lead　　*Checklist for project team*

RIBA Stage 1 checklist – Preparation and briefing

There is an opportunity at RIBA stage 1 to set the project up in the right direction such that it is much easier to meet the environmental sustainability requirements. In particular:

- *The project brief should contain the environmental sustainability KPIs and requirements.*
- *Roles and responsibilities must be defined, and include the scope elements required to assess and deliver the KPIs.*

The checklist to the right outlines the key activities that should occur at RIBA Stage 1 in order to put the design on the right track to deliver the KPIs cost effectively. Although some of these activities will involve multiple team members it is important for someone to take the lead. The activities are divided across the four key environmental sustainability areas:

- Operational energy
- Embodied carbon
- Climate resilience
- Water

They should be reviewed at the beginning of the RIBA Stage and planned for so they are all completed at the appropriate time.

Area	RIBA Stage 1 – Key project team activities	Lead	✓
	If a site already has outline planning permission: Check planning conditions, S106 requirements, parameter plans and design codes for existing obligations.	**Architect**	
	If a site already has outline planning permission: Review where the design may need to be improved to meet current building regulations, planning requirements and the Hfl Collaboration Programme's environmental sustainability requirements.	**Architect**	
	Site appraisal - analyse opportunities and constraints related to energy, carbon and climate risk.	**Architect**	
Operational energy	Gain familiarity with the operational energy requirements and how good practice architectural and MEP design can help achieve them.	**Architect** MEP	
Operational energy	Consider form factor and orientation and opportunity for dual aspect in massing and masterplan studies.	**Architect**	
Operational energy	Discuss any potential energy constraint issues with the utilities District Network Operator (DNO) and any requirements to connect to a District Heating Network.	**MEP**	
Embodied carbon	Gain familiarity with the embodied carbon requirements and how good practice structural design can help achieve them.	**Structures**	
Embodied carbon	If appropriate, undertake review of embodied carbon of new-build vs demolition and replacement. Identify options for re-using materials on-site for any refurbishment or demolition works.	Structures	
Climate resilience	Gain familiarity with the overheating requirements and which passive strategies are likely to be required. Carry out preliminary overheating risk assessment using the Good Homes Alliance overheating checklist for residential projects.	**Energy modeler** Architect	
Climate resilience	Gain familiarity with the urban tree canopy cover, biodiversity net gain and urban greening factor requirements.	**Landscape architect/ ecologist**	
Water	Gain familiarity with the water requirements.	**MEP**	

RIBA Stage 2 checklist – Standard route to planning

Design decisions made at RIBA stage 2 have a very significant impact on how feasible and cost effective it will be to deliver the environmental sustainability KPIs. In particular, the following design decisions are critical:

- *The building position and orientation in relation to constraints (e.g. sources of noise and/or pollution) and opportunities (e.g. winter solar gains).*
- *Efficient building form to reduce heat loss area, construction complexity and embodied carbon.*
- *Window proportions to balance daylight, energy efficiency and overheating.*
- *Opening of windows to mitigate the risk of overheating.*
- *Approach to shading of glazed areas.*
- *Lean structural design*

The checklist to the right outlines the key activities that should occur as part of RIBA Stage 2 in order to deliver the KPIs cost effectively. Although some of these activities will involve multiple team members, it is important for someone to take the lead. Activities should be reviewed at the beginning of the RIBA Stage and planned for so they are all completed at the appropriate time and can be reported on at the end.

All sustainability KPIs should be reported at the end of Stage 2 via the proforma.

	RIBA Stage 2 – Key project team activities	Lead	✓
Operational energy	Refine and smooth the massing of the building as the design develops to ensure a low form factor. Group cold/unheated spaces together and identify unheated areas on plans. Calculate and report the building form factor for design options.	**Architect**	
Operational energy	Mark-up insulation line and airtightness line on all plans and sections.	**Architect**	
Operational energy	Ensure window areas respond to orientation and use of room. Note window to wall ratios per façade.	**Architect**	
Operational energy	Mark window opening areas and types on elevations for providing natural ventilation for summer comfort. Design for and note % of dual aspect dwellings.	**Architect**	
Operational energy	Develop target U-values to be met and ensure wall/floor/roof thicknesses are drawn reflect this.	**Architect /** Energy modeler	
Operational energy	Design roof to accommodate and maximise the area of roof available for PV.	**Architect**	
Operational energy	Identify the type of ventilation systems and the location of AHU/MVHR.	**MEP**	
Operational energy	Carry out low carbon heating options appraisal, considering energy use, running cost, capital cost and carbon emissions in sufficient detail to make an informed choice of system.	**MEP**	
Operational energy	Develop an initial predictive energy model to estimate energy use for an example building, run iterations to understand the fabric and system specifications such that the space heating demand and energy use intensity of various design options is understood. Use PHPP to model residential developments and PHPP or TM54 for non-residential developments.	**Energy modeler**	
Operational energy	Prepare an initial PV layout and calculate on-site renewable energy generation, testing a range of roof type options and reviewing against KPI.	**Energy modeler**	
Operational energy	Using the predictive energy model, calculate the energy balance of various deign options.	**Energy modeler**	
Embodied carbon	Carry out an embodied carbon workshop with the design team, highlighting common areas of high embodied carbon for typology of building, agreeing strategies that the Architect, Structures, Landscape and MEP teams will do to reduce embodied carbon.	**Embodied specialist** Architect, Structures, MEP, landscape	
Embodied carbon	Develop qualitative analysis on the embodied carbon of structural options.	**Structures**	
Embodied carbon	Undertake a façade study to review upfront embodied carbon of façade options.	**Embodied specialist** Architect	
Climate resilience	Carry out iterative overheating assessments to guide the design using passive strategies where possible and report towards compliance with Part O, CIBSE TM59/52. Determine the scope and extent of any mechanical cooling systems required.	**Energy modeler** Architect	
Climate resilience	Calculate urban tree canopy cover, biodiversity net gain and urban greening factor for design options. Note the number and type of trees proposed to be planted.	**Landscape architect/ ecologist**	

KEY
- Operational energy
- Climate resilience
- Embodied carbon
- Water

RIBA Stage 2+ checklist – Fast track route to planning and procurement

Activities at RIBA stage 2+ are focused on developing the stage 2 design sufficiently and ensuring that it has been tested before planning. In particular, the following design outcomes are critical:

- *Final window proportions to balance daylight, energy efficiency and overheating.*
- *Final approach to shading of glazed areas.*
- *Low carbon materials for façade.*

The checklist to the right outlines the key activities that should occur at RIBA Stage 2+ **in addition to those highlighted on the Stage 2 checklist.** Although some of these activities will involve multiple team members it is important for someone to take the lead.

Activities should be reviewed at the beginning of the RIBA Stage and planned for so they are all completed at the appropriate time and can be reported on at the end.

All sustainability KPIs should be reported at the end of Stage 2+ via the proforma.

	RIBA Stage 2+ - Key project team activities	Lead	✓
Operational energy	Refine final design to ensure the building massing, window areas per façade orientation and window opening areas are balanced and optimised.	**Architect**	
Operational energy	Define airtightness strategy and identify airtightness and insulation lines on plans and sections.	**Architect**	
Operational energy	Provide ventilation layout including location of AHU/MVHR, duct distribution and measurement of intake and exhaust duct lengths to external walls for sample dwellings/ sample non-residential floor plates. (required for predicted energy model)	**MEP**	
Operational energy	Update the predictive energy model as per the planning stage design such that the space heating demand an energy use intensity of the final design option can be reported.	**Energy modeller**	
Operational energy	Calculate on-site renewable energy generation from PV arrays of the planning stage design and review against KPI.	**Energy modeller**	
Operational energy	Update the predicted energy balance for the planning stage design	**Energy modeller**	
Embodied carbon	Carry out upfront and lifecycle embodied carbon analysis using RICS second edition method. Review result against KPI, suggest reductions if possible.	**Embodied specialist** Architect, Structures, MEP, landscape	
Climate resilience	Update the Part O and CIBSE TM59/52 overheating analysis, so that it represents the planning stage design. Carry out analysis for future weather files.	**Energy modeler** Architect	
Climate resilience	Update urban tree canopy cover, biodiversity net gain and urban greening factor so that they represents the planning stage design.	**Landscape architect / ecologist**	
Water	Ensure any fixtures and fittings specified meet the water consumption target.	**MEP**	

KEY
- Operational energy
- Climate resilience
- Embodied carbon
- Water

RIBA Stage 3 checklist – Standard route to planning

Design decisions made at RIBA stage 3 begin to lock in how feasible and cost effective it will be to meet the environmental sustainability KPIs. In particular, the following design outcomes are critical:

- *Final window proportions to balance daylight, energy efficiency and overheating.*
- *Final approach to shading of glazed areas.*
- *Low carbon materials for façade.*

The checklist to the right outlines the key activities that should occur at RIBA Stage 3 to put the design on the right track to deliver the KPIs cost effectively. Although some of these activities will involve multiple team members it is important for someone to take the lead.

Activities should be reviewed at the beginning of the RIBA Stage and planned for so they are all completed at the appropriate time and can be reported on at the end.

All sustainability KPIs should be reported at the end of Stage 3 via the proforma

	RIBA Stage 3 – Key project team activities	Lead	✓
Operational energy	Draft indicative build-ups of all external elements including overall thicknesses	**Architect**	
Operational energy	Review mark-up of insulation line on all plans and sections and carry out initial U-value calculations.	**Architect**	
Operational energy	Define airtightness strategy and identify airtightness line on plans and sections.	**Architect**	
Operational energy	Identify key thermal bridge junction types.	**Architect/** Structures	
Operational energy	Provide ventilation layout including location of AHU/MVHR, duct distribution and measurement of intake and exhaust duct lengths to external walls for sample dwellings/ sample non residential floor plates.	**MEP**	
Operational energy	Provide heating and hot water systems layout out including location of main plant, pipe distribution routes and measurement of heating and hot water pipe lengths for sample dwellings / sample non-residential floor plates.	**MEP**	
Operational energy	Develop a detailed predictive energy model that estimates energy consumption for all buildings/ blocks and review against KPI. Use PHPP to model residential developments and PHPP or TM54 for non-residential developments.	**Energy modeler**	
Operational energy	Prepare PV layout and calculate on-site renewable energy generation from PV arrays of the Stage 3 design and review against KPI.	**Energy modeler**	
Operational energy	Develop a metering and monitoring strategy to enable effective post occupancy evaluation	**MEP**	
Operational energy	Calculate predictive energy balance of Stage 3 design.	**Energy modeler**	
Embodied carbon	Carry out upfront and lifecycle embodied carbon analysis using RICS second edition methodology. Review result against KPI.	**Embodied specialist** Architect, Structures, MEP, landscape	
Embodied carbon	Carry out qualitative analysis on the embodied carbon of structural options. Highlight big ticket items such as basements.	**Structures**	
Embodied carbon	Develop embodied carbon façade study to minimise upfront embodied carbon emissions	**Embodied specialist** Architect	
Climate resilience	Update the Part O, CIBSE TM59/52 overheating analysis, so that it represents the planning stage design. Carry out analysis for future weather files.	**Energy modeler** Architect	
Climate resilience	Update urban tree canopy cover, biodiversity net gain and urban greening factor so that it represents the Stage 3 design.	**Landscape architect / ecologist**	
Water	Specify flow rates of water outlets and thus predicted water consumption.	**MEP**	

KEY

- Operational energy
- Climate resilience
- Embodied carbon
- Water

RIBA Stage 4 checklist – Technical design

Detailed decisions and how these are communicated to the contractor through the tender process at RIBA stage 4 (if using a traditional procurement route) have a significant impact on whether the environmental sustainability KPIs will be delivered in practice.

This stage is about finalising designs, details and systems.

- *Calculations should be updated to reflect Stage 4 design.*
- *Drawings and specifications should clearly define and describe all design features and performance data relating to KPIs.*

The checklist to the right outlines the key activities that should occur at RIBA Stage 4 in order to ensure the contractor can deliver a building that meets the KPIs.

All sustainability KPIs should be reported at the end of Stage 4 via the proforma.

Category	RIBA Stage 4 – Key project team activities	Lead	✓
Operational energy	Develop junction details for windows, doors and all key areas of the building fabric.	Contractor / Architect	
Operational energy	Develop airtightness details at key junctions and a method for ensuring airtightness across the whole building fabric.	Contractor / Architect/ Structures	
Operational energy	Update detailed U-value calculations.	Contractor / Architect	
Operational energy	Undertake thermal bridge calculations.	Contractor / Architect	
Operational energy	Review and provide detailed drawing of MVHR layout including duct distribution and measurement of intake and exhaust duct lengths to external walls for sample dwellings. Provide specification for heat recovery efficiency of MVHR unit and design.	Contractor / MEP	
Operational energy	Review and provide detailed drawing of heating/cooling system and layout. Provide specification for heating and cooling efficiencies of the system.	Contractor / MEP	
Operational energy	Measure heating and hot water pipe lengths and calculate distribution and standing losses for all buildings.	Contractor / MEP	
Operational energy	Update predictive energy model to reflect Stage 4 design parameters. List all model inputs and assumptions including U-values, thermal bridges and system specifications. Check against Space heating demand and energy use intensity KPIs.	Contractor / Energy modeller	
Operational energy	Specify high performing PV panels and check projected output against KPI.	Contractor / MEP	
Operational energy	Specify meters, sub-meters and other appropriate monitors as per metering strategy.	MEP	
Operational energy	Update predicted energy balance calculation for Stage 4 design.	Contractor / Energy modeller	
Embodied carbon	Continue to refine and specify materials with low upfront embodied carbon, maintenance and replacement cycles.	Contractor / Embodied specialist	
Embodied carbon	Carry out an updated upfront embodied assessment post-tender to include any material updates and product specific data.	Contractor / Embodied specialist	
Climate resilience	Calculate urban tree canopy cover, biodiversity net gain and urban greening factor.	Contractor / Landscape / ecologist	
Climate resilience	Review and provide detailed drawing with the number and type of trees.	Contractor / Landscape	
Climate resilience	Update Part O, CIBSE TM59/52 overheating assessment.	Contractor / Energy modeller	
Water	Update sanitaryware schedule with maximum flow rates for all fittings.	Contractor / MEP	

KEY
Operational energy
Climate resilience
Embodied carbon
Water

RIBA stages checklist – Stage 5 – Construction

RIBA Stage 5 – Construction – is a critical stage for minimising the performance gap between what the building is supposed to deliver and what it actually delivers in terms of sustainability performance.

Actions in the RIBA Stage 5 checklist on the right therefore focus on two main areas:

- Communicating to everyone on site *how to deliver construction quality on site.*
- *Quality checking to ensure key building elements are being installed correctly.*

Depending on the procurement route the responsibilities for these activities will be different. It is the contractor's responsibility to deliver the sustainability and KPI requirements.

Construction quality checks are required and may necessitate a client appointed Clerk of Works and design guardians in Design and Build contracts.

The responsibility for the provision of specialist reports (e.g. operational energy and embodied carbon) should be agreed at project contract stage.

All sustainability KPIs should be reported at the end of Stage 5 via the proforma to reflect the building as-built.

Category	RIBA Stage 5 – Key contractor activities	Lead	✓
	Review planning conditions and ensure appropriate actions and activities are planned for and undertaken to meet them.	Contractor	
Operational energy	Run an introduction to ultra-low energy construction workshop on-site. Encourage site manager and team training on construction quality requirements covering insulation and airtightness.	**Contractor / Energy specialist**	
Operational energy	Prepare toolbox talk information for site team inductions on low energy construction quality.	**Contractor / Energy specialist**	
Operational energy	Carry out regular construction quality assurance site visits and reports (depending on the size of the scheme – at least six) in tandem with regular visits.	**Clerk of Works**	
Operational energy	Regular construction QA checks on: • Continuity and quality of insulation installation • Continuity of air-tightness barrier. • Continuity of thermal bridging junctions. • Quality of ductwork insulation to MVHR. • Quality of heating and hot water pipe insulation.	**Clerk of Works** Architect / MEP	
Operational energy	Develop site quality tracker, assess against KPIs and update regularly.	**Contractor / Energy specialist / Clerk of Works**	
Operational energy	Require leak finding airtightness tests at first fix and second airtightness test pre-completion.	**Contractor / Clerk of Works / MEP**	
Operational energy	Witness commissioning of MVHR systems and heating system.	**Contractor / Clerk of Works / MEP**	
Operational energy	Deliver final as-built predicted in-use energy model (Use PHPP to model residential developments and PHPP or TM54 for non-residential developments) and models required for building control.	**Contractor / Energy modeller**	
Embodied carbon	Carry out an updated upfront embodied and life cycle carbon assessment post-tender to include any material updates.	**Contractor / Embodied specialist**	
Embodied carbon	Post-construction, re-calculate the upfront embodied and life cycle carbon assessment to include all materials used on-site using product specific data. Report KPI.	**Contractor / Structures / Embodied specialist**	
Climate resilience	Construction QA check on installation of trees and soft landscaping.	**Clerk of works / Landscape architect**	
Climate resilience	Update Part O, CIBSE TM59/52 overheating assessment to reflect as-built building.	**Contractor / Energy modeller**	
Water	Report flow rates of water outlets and thus predicted water consumption.		

KEY Operational energy, Climate resilience, Embodied carbon, Water

RIBA stages checklist – Stage 6 and 7 – Handover and use

How a building is operated and maintained in use is key for ensuring a building delivers its full potential and meets its sustainability KPIs.

RIBA Stage 6 and 7 are critical to achieving this aim and are interlinked. Actions in the RIBA Stage 6 and 7 checklist on the right therefore focuses on three main areas:

- *Providing building occupants and residents with sufficient and clear documents and instructions on how to use the building and its services effectively for optimum performance.*
- *Measuring the buildings performance during occupancy, comparing it with design intent and identifying any improvements that can be made in how the building is operated.*
- *Developing maintenance and replacement plans that ensure sustainability KPIs continue to be met throughout a building's lifetime.*

Futureproof to allow a post occupancy evaluation to be carried out to measure and report the performance of all sustainability KPIs. This is also in line with the London Plan 'Be Seen' requirement.

Category	RIBA Stage 6 and 7 – Key contractor and occupier activities	Lead	✓
Operational energy	Lessons learnt project review with project team.	**Project lead**	
Operational energy	Contractor to give thorough induction and training on all systems to building operators.	Contractor	
Operational energy	Contractor to provide a clear Building User Guide, aimed at a non-technical audience, containing operational, maintenance and replacement information on the key aspects of the building design including: building fabric; air-tightness; MVHR; maintaining indoor air quality; heating/cooling systems; renewable energy systems and metering systems and how the systems all work together.	Contractor	
Operational energy	Provide building users with clear MVHR maintenance and filter replacement information.	Contractor	
Operational energy	Provide guidance on air-tightness strategy and how to maintain air-tightness throughout the life of the building (e.g. how to create penetrations or add fixtures and fittings without compromising the air-tightness barrier).	**Energy specialist**	
Operational energy	Follow London Plan 'Be Seen' energy monitoring requirements for new major developments. Where possible carry out a post-occupancy evaluation to verify KPIs have been met.	**Energy specialist**	
Operational energy	Compare in-use energy consumption and renewable energy generation with final predicted 'as-built' energy model.	Building owner	
Operational energy	Publicly report KPIs where possible.	Building owner	
Embodied carbon	Post completion, carry out a third party verified RICS compliant WLCA.	**Embodied specialist**	
Embodied carbon	Develop maintenance and replacement strategy and schedule that considers embodied carbon and include in the O&M manual.	**Contractor**	
Climate resilience	Develop and utilise a habitat, tree and plant maintenance plan. Ensure appropriate watering strategy is in place (especially in the first year as plants stabilise).	**Landscape architect**	
Water	Measure water consumption in-use and compare to the KPI targets and 'as-built' predictions	**Building owner**	

KEY Operational energy · Climate resilience · Embodied carbon · Water

3

Reporting

Homes for Londoners Collaboration Programme environmental sustainability reporting

Why reporting is important

Standardising the reporting process ensures consistency across GLAP projects, making it easier to track, compare and evaluate performance over time.

HfL Collaboration programme environmental sustainability proforma has been developed to act as a performance dashboard, allowing GLAP and the rest of the GLA group members to access, review and compare projects efficiently. The aim is to build a valuable database of projects which will aid refining the environmental sustainability metrics and KPIs in future while tracking current performance.

What is the HfL Collaboration Programme environmental sustainability proforma?

The proforma is a useful tool for ensuring clear and effective communication initially between the GLAP's project lead and sustainability lead, and then with the HfL Collaboration Programme. It helps determine if the full potential of a project from an environmental KPIs perspective has been reached. If it has not, the proforma helps to easily identify where the development could be improved and an opportunity to learn lessons.

The proforma is a tool to summarise and report the environmental performance of projects per RIBA Design Stage. It is an Excel tool for both residential (mid to high-rise) and non-residential developments. It requires reporting against the key metrics and key performance indicators from the four main sustainability themes. Additionally, it includes the reporting of supplementary contextual information to provide a more complete overview of the achieved performance.

Content of the environmental sustainability proforma

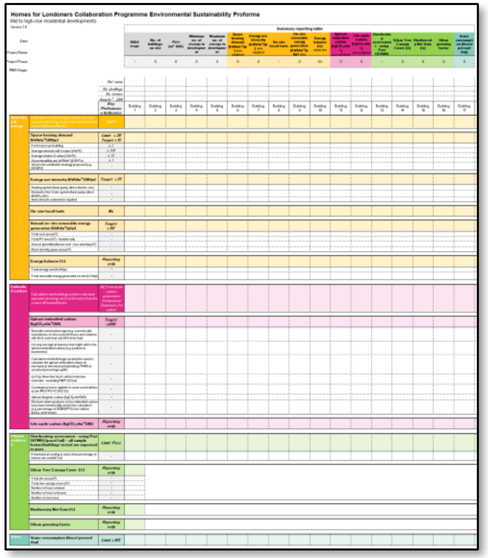
There are two environmental sustainability proformas: one for residential developments (mid to high-rise buildings) and one for non-residential developments which focused primarily on requirements for schools and offices with the potential to be adjusted to more non-residential types. The overall structure in both proformas remain the same to ensure consistency in reporting, but the KPIs are tailored from one typology to the other. However, the residential proforma includes a summary table at the top which auto calculates a summary for all buildings combined.

Reporting should take place throughout all RIBA stages (RIBA Stage 2-7) to ensure the evolution of performance is continuously tracked.

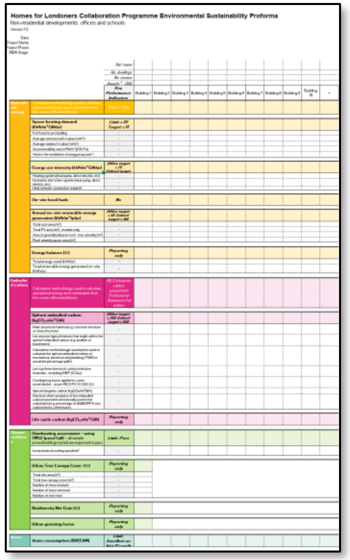
The proforma requires reporting across the following 12 metrics:

1. Space heating demand
2. Energy use intensity
3. No on-site fossil fuels
4. On site renewable energy generation
5. Energy balance
6. Upfront embodied carbon
7. Life cycle carbon
8. Overheating assessment
9. Urban tree canopy cover
10. Biodiversity net gain
11. Urban greening factor
12. Water consumption

Residential developments	Non-residential developments
Mid and high-rise residential developments	Primarily schools and offices, potential to be adjusted to more non-residential types



Homes for Londoners Collaboration Programme Environmental Sustainability Proforma



Homes for Londoners Collaboration Programme Environmental Sustainability Proforma

Environmental sustainability reporting proforma

This page explains how the environmental sustainability proforma is set out and is to be used.

The proforma should be completed per development and per typology (residential mid or high rise/ non-residential), per building and per RIBA design stage.

Automatic summary table

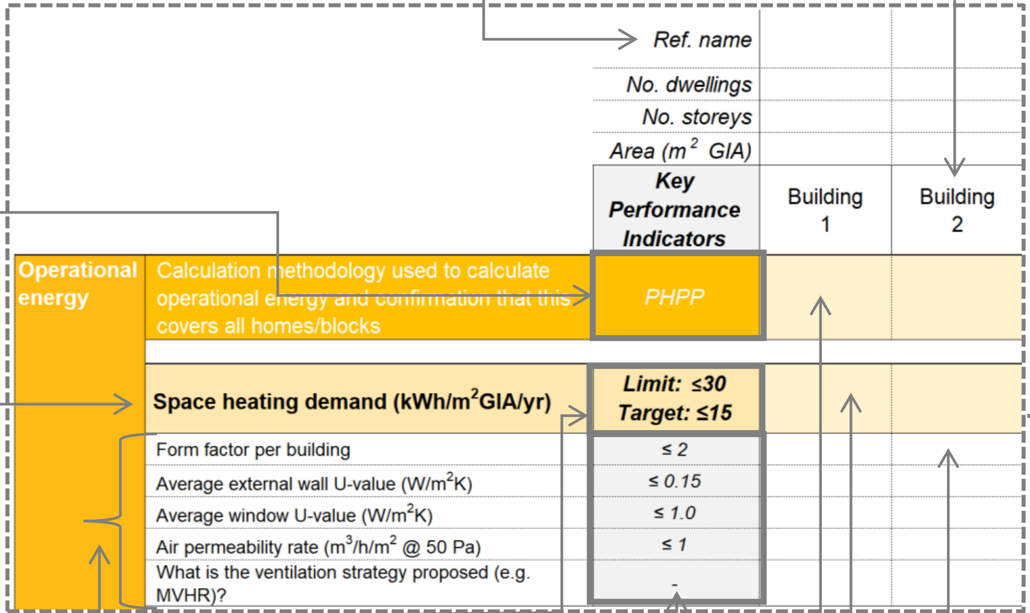
GLAP sustainability themes

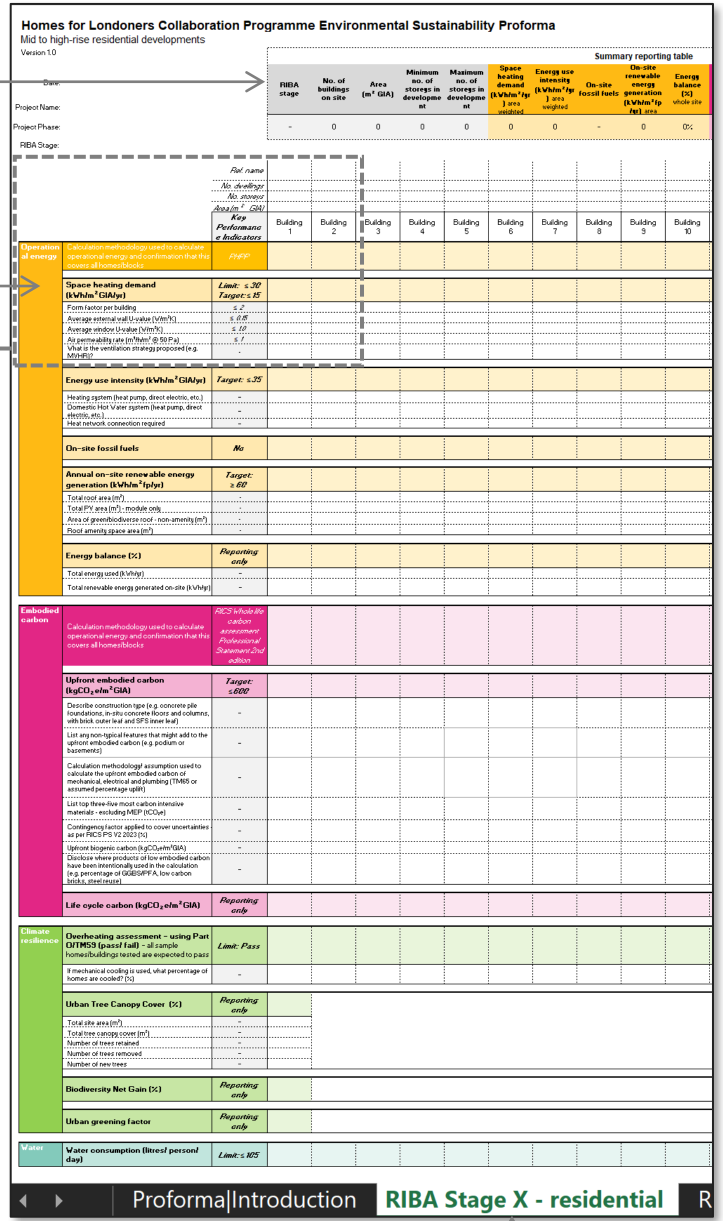
Reference name of building for design team's use

Add columns to the right to add more buildings

Calculation method expected to be used

Metric with a key performance indicator (in colour)





Supporting information that backs up the key performance indicator

Key performance indicator values to be achieved (limits and targets) or where reporting only is required

Suggested good practice values shown as supporting information

Results/data column from each building in the development. Every building with a distinct/complete thermal envelope/insulation line should have its own column.

A new tab within the same Excel file should be created for every RIBA Stage

The importance of using the appropriate reporting areas

When evaluating the energy performance of buildings, development managers rely on key performance indicators (KPIs) and supplementary data to ensure projects meet the environmental sustainability requirements. Therefore, the accuracy of these data is important. Specifically, one critical aspect for energy metrics is whether final results have been reported against the Gross Internal Area (GIA) and NOT the Treated Floor Area (TFA). The HfL Collaboration Programme environmental sustainability proforma requires the reporting of space heating demand and energy use intensity **per square meter of GIA**. Misreporting them can lead to incorrect conclusions, potentially forcing unnecessary costly and time consuming design interventions. Ensuring a standardized reporting method is key to maintain consistency and comparability between projects.

Difference between GIA and TFA

- GIA is the total internal floor area of a building, measured to the inside face of external walls. It includes all usable space within the thermal line, such as circulation areas, storage, or plant rooms. Cold spaces outside the thermal line, such as bin stores or cycle storage should not be included in the calculation.
- TFA is based on a German standard and it is used to calculate the metrics that define if a building meets the Passivhaus standard. It includes some areas at 100% of their area, others at a lesser percentage and some areas cannot be included at all, even if they are within the thermal envelope.

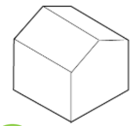
Therefore, GIA would always be a higher number than the TFA of the same building. If accidentally the wrong area is used (either use TFA or miscalculate GIA) to report the energy KPI or their supplementary figures directly affected, the results would be skewed, making a building appear less or more efficient than it actually is.

To avoid confusion and inefficiencies development managers should:

1. Communicate this potential issue with the design teams from an early design stage and ensure its avoidance throughout the project development.
2. Ensure that if PHPP is used as the energy tool, and if the project is not aiming for a Passivhaus certification then the energy modeller should replace TFA with GIA withing the model.
3. If the project is heading for a Passivhaus certification then ensure than KPIs have been converted per GIA before reporting them and making any informed design decisions.

What difference does it make?

The example below demonstrates that using TFA to calculate space heating demand results in overestimating it. This is also the case with the form factor of the building. If the mistake was overlooked, design teams would have probably made unnecessary design changes, such as make the building more compact or decrease the U-value of walls, to compensate the excess SHD. This would have results in the increase of capital cost and loss of valuable time. In reality, as shown below the SHD of the same building reported per GIA meets the GLAP environmental sustainability target and no further actions should be needed at this stage.



	Key Performance Indicators	✓ GIA route	✕ TFA route
Calculation methodology used to calculate operational energy and confirmation that this covers all homes/blocks	*PHPP*	PHPP	PHPP
Space heating demand (kWh/m²GIA/yr)	***Target: 15***	(3000/200)= 15	(3000/170)= 18
Form factor per building	*≤ 2*	(400/200) = 2.00	(400/170)= 2.35
Average external wall U-value (W/m²K)	*≤ 0.15*	0.15	0.15
Average window U-value (W/m²K)	*≤ 1.0*	0.9	0.9
Air permeability rate (m³/h/m² @ 50 Pa)	*≤ 1*	1	1
What is the ventilation strategy proposed (e.g. MVHR)?	-	MVHR	MVHR

LLDC requirement | Supporting information

Meets target listed in proforma

Does not meet target

4

Appendix

4.1

Guidance on predictive energy modelling

Predicting energy and carbon and delivering outcomes through improved modelling

The Climate Change Committee's UK Housing: Fit for the Future? advises that urgent changes are needed to close the performance gap between predicted and as built energy performance. Recognising that net zero carbon will only truly be achieved when the predictions of energy consumption in buildings more closely match the delivered outcomes.

In 2021, the Mayor of London committed to making the city net zero carbon by 2030 - a commitment embedded in the activity of the GLAP and the rest of the GLA Group. To achieve this, developments must show ambition through design and construction and become more accurate and transparent in calculating and reporting expected energy performance. The current way of achieving this (by use of building regulation models) has so far failed to deliver.

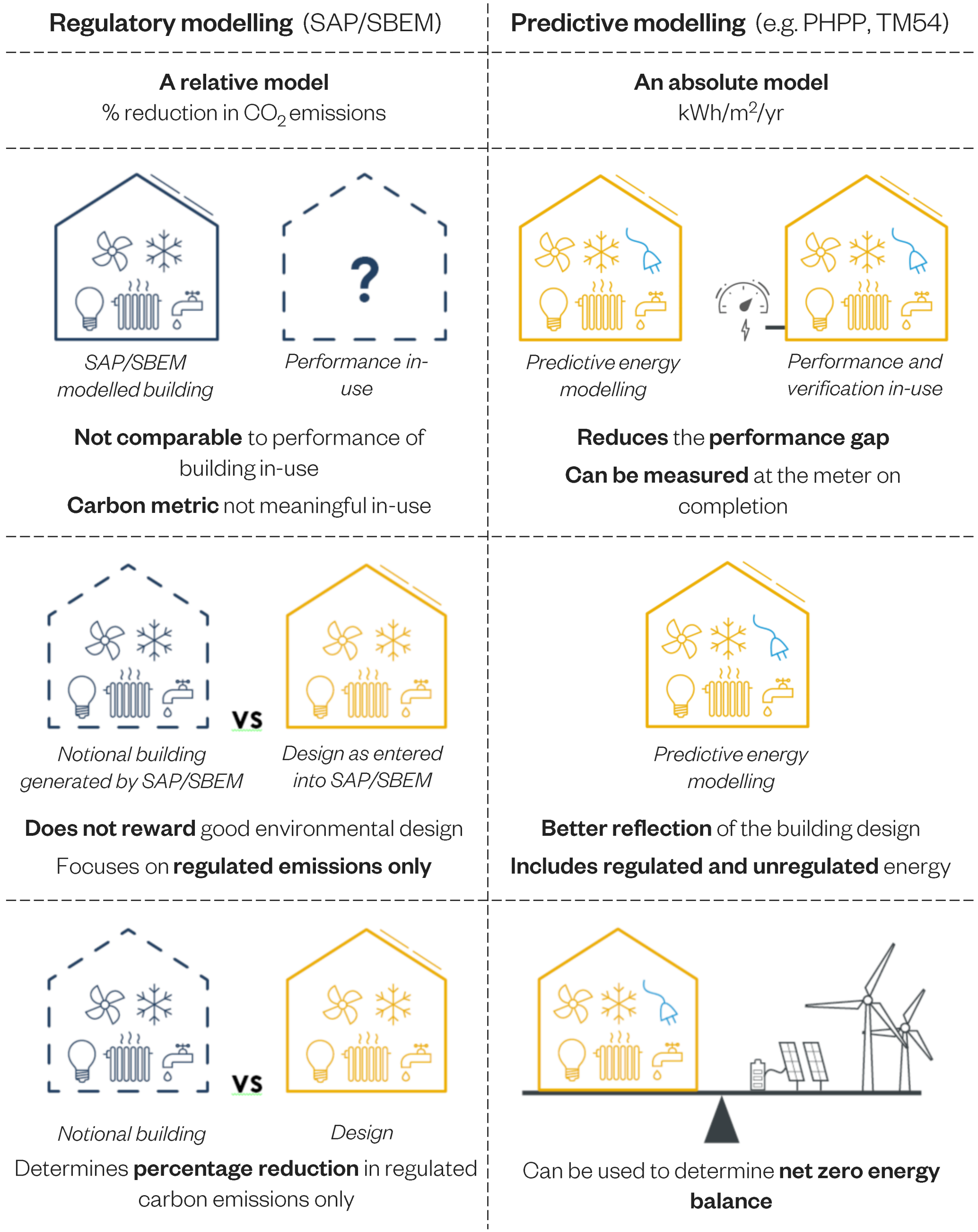
Predictive modelling is needed to better predict energy use

Building regulation tools such as the Standard Assessment Procedure (SAP) and Simplified Building Energy Model (SBEM) are frequently used to determine carbon reductions for building regulations compliance purposes and as a demonstration of performance for planning applications. However, it has been historically understood by industry that SAP and SBEM were not designed to be accurate predictions of energy use and therefore, are not fit for use in designing net zero buildings.

For this reason their use is best kept for building regulation compliance only. To achieve net zero carbon now and in the future, the built environment industry must move to the use of predictive energy modelling (e.g. Passivhaus Planning Package (PHPP) for residential/ non-residential typologies and dynamic modelling using CIBSE TM54 methodology only for non-residential typologies) that can assist in influencing the design and performance outcomes. Predictive modelling not only gives more accurate predictions of performance, but it can also better influence early design decisions to ensure the thermal envelope and systems are better designed.

The future of regulatory calculations

The Future Homes Standard is set to be introduced alongside a new energy model for homes (i.e. the Home Energy Model (HEM)) to replace SAP. However, until its development is complete there remains a gap that only predictive modelling can fill for residential developments. There is no planned update for the energy modelling tool used for non-residential buildings, therefore only predictive modelling can fill this gap.



Source: LETI

Residential - Energy modelling

Part L modelling – residential buildings

Standard Assessment Procedure (SAP 10.2) is the calculation methodology used on new residential buildings to demonstrate compliance with Part L of the Building Regulations. Until now, these Part L energy assessment methodologies were developed only to check compliance with Building Regulations. However, SAP was not developed to perform the key functions that are required to assess Net Zero carbon buildings, and most importantly they were not meant to predict future energy use accurately. This is a widely accepted fact in the industry, hence why the Government is currently developing a new energy modelling methodology for residential buildings: the Home Energy Model (HEM) and its Future Homes Standard (FHS) wrapper. However, HEM:FHS is not yet validated or available for use*.

Predictive energy modelling for residential buildings

For residential buildings, the Passivhaus Planning Package (PHPP) methodology and excel based tool have been shown to predict energy use much more accurately than the SAP 10.2.

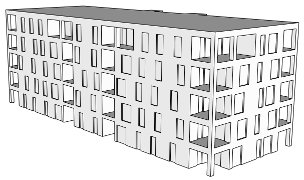
Benefits of using PHPP on new residential developments include:

- Greater accuracy (e.g. specific weather file, more accurate shading assessment, ventilation duct heat losses taken into account)
- Inclusion of unregulated energy (e.g. cooking and appliances)
- Ability to assess the benefit of a better form early during the design.

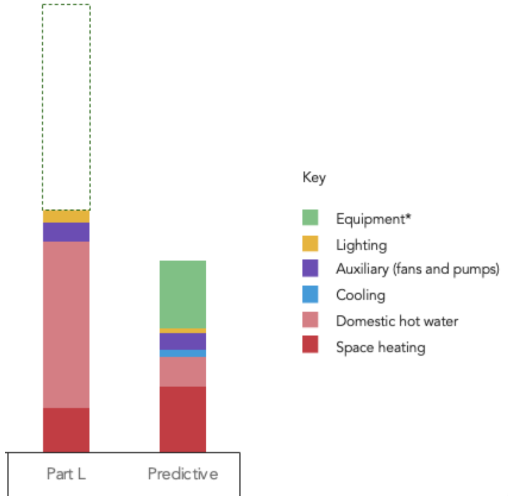
The use of PHPP is independent of meeting Passivhaus standards and certification.

** Note: it is possible that HEM: FHS can be used for predictive energy modelling purposes in the future but that can only be confirmed when the first 'official' version for use will be released.*

Part L modelling	Predictive modelling	HEM
SAP 10.2	PHPP	HEM:FHS
Used to check compliance with Part L 2021	Used to predict space heating demand and energy use	Will be used to check compliance with Future Home Standard
Active to be replaced by HEM in 2025 (tbc)	**Active**	**From 2025** (tbc)
Least accurate • UK standard weather file • Underestimates space heating and overestimates domestic hot water and appliances	**Most accurate** • Specific weather conditions and location used • As-built performance predicted more accurately	**To be determined** Strengths and weaknesses of HEM:FHS are not confirmed yet



There is a significant difference between Part L modelling currently used to demonstrate compliance with building regulations and predictive energy use modelling which should be used to calculate and report GLAP energy metrics and KPIs.
(Source: Delivering Net Zero Study, 2023)



Non-residential - Energy modelling

Part L modelling – residential buildings

The NCM (National Calculation Methodology) is the calculation methodology used on new non-residential buildings and is used through the Simplified Building Energy Model (SBEM) and Dynamic Simulation Modelling (DSM) tools in order to demonstrate compliance with Part L of the Building Regulations. However, this methodology was never meant to perform key functions that are required to assess Net Zero carbon buildings, and most importantly they were not meant to predict future energy use accurately. This is a widely accepted fact in the industry. This is why the use of predictive energy modelling should be required to demonstrate compliance with Net Zero requirements.

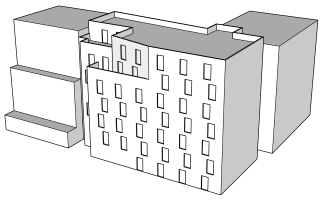
Predictive energy modelling for non-residential buildings

For non-residential buildings, the same Dynamic Simulation Modelling (DSM) tool can be used but the methodology set out in CIBSE Technical Memorandum 54 (TM54) should be followed. The PHPP methodology and excel based tool have also been shown to predict energy use reasonably accurately.

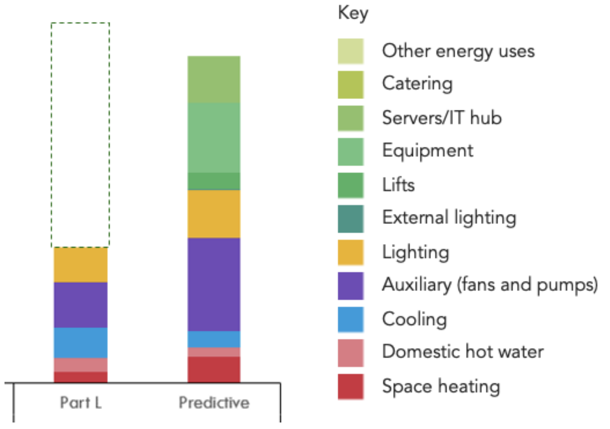
Benefits of using TM54 on new non-residential developments include:

- Ability to model opening/working hours and occupancy specifically.
- Inclusion of unregulated energy (e.g. IT and equipment).
- Possibility to compare predictive performance against benchmarks for similar buildings.

Part L modelling	Predictive modelling
SBEM and DSM for Part L (e.g. IES , TAS)	DSM for CIBSE TM 54 (e.g. IES , TAS), PHPP
Used to check compliance with Part L 2021	Used to predict space heating demand and energy use
Active to be updated in 2025 (tbc)	**Active**
Least accurate • High level of standardisation • Underestimates space heating and overestimates domestic hot water and equipment (incl. IT)	**Most accurate** • As-built performance predicted more accurately



There is a significant difference between Part L modelling currently used to demonstrate compliance with building regulations and predictive energy use modelling which should be used to calculate and report the GLAP energy metrics and KPIs.
(Source: Delivering Net Zero Study, 2023)



4.2

Case studies

Ultra-low energy fabric case studies – space heating demand

Ultra-low energy buildings have been delivered in London for a while now. The London-based cases studies below achieve less than the 30 kWh/m²GIA/yr space heating demand limit required to be met by GLAP developments, while all of them meet or perform better that the 15 kWh/m²GIA target. The HfL Collaboration Programme environmental sustainability proforma requires SHD to be reported per GIA and as discussed on page 37, the SHD of the below developments reported per TFA is overestimated and in reality if their SHD was reported per GIA, it would be even lower than the target.

Providing case studies for the rest of the environmental sustainability KPIs can be challenging as often the as-build data is either not collected/calculated, or is not available in the public domain, or it is often hard to underpin the calculation methodology used which can have a great effect on the results. This would be tackled through the HfL Collaboration Programme reporting system, forming a database where KPIs are comparable across developments.

Plashet Road, Newham, London

Image source: Levitt Bernstein

Low to mid-rise block of apartments
4-5 storeys
Total number of dwellings on site: 65
Completion: 2024

Agar Grove, Camden, London

Image source: Architype

Mid to high-rise block of apartments
2-7 storeys
Total number of dwellings on site: ~400
Completion Phase 1: 2018

Ashley Road, Haringey, London

Image source: Levitt Bernstein

Low to high-rise block of apartments
4-13 storeys
Total number of dwellings on site: 271
Completion: 2026

Hackbridge, Sutton, London

Image source: Architype

Primary school
Completion: 2020

Stebon , Tower Hamlets, London

Image source: Rivington Street Studio

Primary school
Completion: 2015

Mulberry academy, London

Image source: Architype

Secondary school
Completion: 2024

4.3

Useful links

Useful links

- CWCT– How to calculate embodied carbon of facades
- Easi Guide Passivhaus Design
- GLA Energy Assessment Guidance
- GLA London Plan
- GLA Urban Greening Factor Guidance
- GLA Whole Life-cycle Carbon Assessments Guidance
- IStructE How to calculate embodied carbon 2nd edition
- IStructE Lean design: 10 things to do now
- LETI Climate emergency design guide
- LETI Embodied Carbon Primer
- LETI opinion piece – operational carbon in whole life carbon assessments
- LETI The Whole Life Carbon Alignment paper
- LLDC Preparing for a 1.5C Future
- Net Zero Carbon Toolkit
- Net Zero Carbon Building Standard Pilot
- Part Z proposed amendment to building regulations
- Policy paper by Part Z group of experts , January 2024
- RICS Whole Life Cycle Assessment 2023, 2nd edition
- Services Guide - Zero Carbon Hub
- Shading for housing - Design guide for a changing climate
- TDAG First Steps in Urban Tree Canopy Cover
- TfL Sustainable Development Framework Handbook
- The concrete centre– Sustainable concrete
- The construction material pyramid
- Thermal Bridging Guide - Zero Carbon Hub
- TM52 - The limits of thermal comfort: avoiding overheating
- TM54 - Evaluating operation energy use at the design stage
- TM59 - Design methodology for the assessment of overheating risk in homes
- TM65 - Embodied carbon in building services
- UK Net Zero Carbon Building Standard - Pilot
- Understanding overheating - where to start - NHBC