THE UNIVERSITY *of* EDINBURGH

Estates Department



Estates Guideline No. 11

Environmental Sustainability for Construction Projects

Important Comment on Estates Design Guidelines, Assets & Standards

These Design Guidelines, Assets and Standards, and the associated suite of documents, have been produced in order to provide external design consultants and contractors with guidance on the required University standards for inclusion within their proposed project design.

These guidelines are to be used as supplementary information during the project design and construction stages, and as such, detail the minimum standards expected from the University's Estates Department.

Please note that these guidelines do not absolve the project Design Team -including sub-consultants and sub-contractors-, of their legal and contractual obligations under design liability, statutory regulations and health and safety legislation.

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Estates Guideline No.11 - Environmental Sustainability - Approval Procedure	
Estates Design Guidelines (Assets & Standards) No. 11 Environmental Sustainability for Construction Projects Check and Approval: Head of Energy & Utilities Management	Name: Dean Drobot Date: September 2026
Estates Design Guidelines (Assets & Standards) No. 11 Environmental Sustainability for Construction Projects Approval (Major Policy Changes Only) - Director of Estates Net Zero and Carbon Leadership	Name: Grant Ferguson Date: September 2026
Estates Design Guidelines (Assets & Standards) No. 11 Environmental Sustainability for Construction Projects Approval (Major Policy Changes Only) - Estates Leadership Team	Name: ELT Date: September 2026

Version Control for Estates Guidelines (Assets & Standards) No. 11 - Environmental Sustainability for Construction Projects

Version	Date	Nature of Revision	Author	Approved by
V Pilot	September 2026	New Guideline - Pilot	CB	DD
V 1.0				
V 2.0				

CONTENTS

Executive Summary

1.0 Introduction

1.1 Introduction 10
1.2 Purpose 10
1.3 Scope 11
1.4 Guiding Principles 12
1.5 Structure of the Guide 13
1.6 How the Guide sits within the University's Estates Project Management processes 14
1.7 Language 15
1.8 Version Control and updates 15

2.0 Background and Context

2.1 Introduction 18
2.2 Background and Context 18
2.3 The University's Sustainability Vision 19
2.4 The University's Estates Sustainability Vision and current practice 19

3.0 High-level Implementation

3.1 Objectives 24
3.2 Methodology 27
3.3 The ESTS Tool 27
3.4 Roles and Responsibilities 30

4.0 Project Management Process

4.1 Stage 0 - Strategic Definition 34
4.2 Stage 1 - Preparation and Briefing 38
4.3 Stage 2 - Concept Design 42
4.4 Stage 3 - Spatial Coordination 46
4.5 Stage 4 - Technical Design 50
4.6 Stage 5 - Manufacturing and Construction TBD
4.7 Stage 6 - Handover TBD
4.8 Stage 7 - Use TBD

5.0 Key Sustainability Themes

5.1 Whole-life Carbon 60
5.1.1 Net Zero Embodied Carbon 62
5.1.2 Net Zero Operational Carbon 68
5.1.3 LZC's and Renewables 76

5.2 Health and Well-being 82
5.2.1 Indoor Air Quality 82
5.2.2 Daylight and Visual Comfort 88
5.2.3 Thermal Comfort 92
5.2.4 Acoustic Performance 98
5.2.5 Sustainable and Healthy Materials 104

5.3	Sustainable land-use and ecology		108
	5.3.1	Biodiversity	108
	5.3.2	Waste Management and Circular Economy	114
5.4	Sustainable Water Use and Management		118
5.5	Sustainable Connectivity and Transport		122
5.6	Sustainable Management		
	5.6.1	Sustainable Life Cycle Cost	126
	5.6.2	Commissioning and Handover	TBD
	5.6.3	Soft Landings	TBD
	5.6.4	POE	TBD
5.7	Pollution		TBD
5.8	Resilience and Adaptability		TBD
6.0	**Terms and Definitions**		131
References			137
Abbreviations			141

Note: The content displayed in grey is under development, and will be included in Version 2 of the document.

Foreword

The UoE Estates Environmental Sustainability Guide ('the Guide') constitutes the framework governing the planning, design, and delivery of environmentally sustainable construction projects across the University of Edinburgh's Estate. Its remit extends to the design, construction, and operational phases of all buildings developed by the University of Edinburgh Estates Department, encompassing new builds, major and minor refurbishments, and fit-out programmes.

Developed in response to the escalating environmental polycrisis, this document operationalises the University's strategic commitment to achieving Net Zero Carbon by 2040 and Zero Waste by 2030. It aligns rigorously with the University's Strategy 2030, its Social and Civic Responsibility Plan, and its Regenerative Sustainability Strategy, while fulfilling legal obligations under the Climate Change (Scotland) Act 2009.

The Guide is governed by four strategic objectives: (1) mitigating the Estate's environmental footprint through biodiversity conservation, circular economy principles, sustainable water management, and low-carbon travel; (2) achieving Net Zero Carbon by 2040 via the reduction of embodied and operational emissions and the deployment of Low and Zero Carbon Technologies (LZCTs); (3) optimising occupant well-being and productivity through supportive, healthy environments; and (4) ensuring financial sustainability through rigorous whole-life costing.

These objectives are delivered through six key focus areas: Net Zero Carbon; Health and Well-being; Sustainable Land Use and Ecology; Sustainable Water Management; Sustainable Connectivity and Transport; and Sustainable Management.

Central to the Guide's methodology is the integration of sustainability across the entire project lifecycle, aligned with the RIBA Plan of Work 2020 and the University's internal Project Delivery Process Maps. This ensures environmental considerations are embedded from inception through to operational handover, rather than being treated as retrospective additions.

The document is structured as an intuitive, adaptable, and progressive modular framework comprising five interconnected sections. This modular format distils complex sustainability themes into manageable, focused concepts, facilitating ease of navigation. Consequently, users can access specific information as required whilst maintaining a cohesive understanding across the entire framework:

1. The 'Introduction' provides a comprehensive overview, detailing the Guide's context, purpose, and scope.
2. The 'Context' delves into the background of the Guide, exploring the broader University Sustainability Vision and illustrating how the Estates Vision aligns with this overarching strategy.
3. The 'High-level Implementation' provides a comprehensive overview of the Guide's implementation strategy, articulated through a clear roadmap. It's primary objective is to equip all stakeholders with a clear understanding of their roles and the sequence of actions required.
4. The 'Project Management Process' establishes a comprehensive framework, designed to integrate sustainability objectives throughout all RIBA Work Stages. This process-oriented approach aims to promote consistency, streamline decision-making, improve coordination among different teams, and optimise resource management across all projects.
5. The 'Key Sustainability Themes' provides detailed guidance on the design principles, requirements and deliverables for each sustainability theme that shall be incorporated.

Furthermore, to address the complexity and diversity of the University's portfolio, the Guide introduces the Environmental Sustainability Target Selection (ESTS) Tool. This instrument enables project teams to select appropriate performance targets, stadards, and accreditation routes tailored to specific project constraints.

The document delineates clear roles and responsibilities for all stakeholders, including the Estates Planning and Delivery Team, the Net Zero Team, and external Design and Construction teams. It specifically assesses the requirement to appoint key sustainability specialists, such as Sustainability Champions, Whole Life Carbon Assessors and Energy Modellers.

To distinguish between mandatory requirements and recommendations, the document employs precise linguistic conventions, underpinned by a formal protocol for managing deviations.

Finally, the Guide functions as a live document, subject to periodic reviews to ensure continued relevance amidst evolving technologies, modern methods of construction, and environmental policies and regulations.



1.0 INTRODUCTION

1.1 Introduction

Since its founding in 1583, the University of Edinburgh has been a globally influential centre of technological innovation and scientific enquiry, leading to significant sociological, medical, and scientific advances. These contributions have had a profound influence on shaping the world we live in today.

Guided by its vision to make the world a better place, the University is dedicated to creating a positive impact at local, regional, and global levels. It is focused on addressing humanity's most pressing current and future challenges through a values-led approach to teaching, research, and innovation, bolstered by the strength of our local, national and international relationships.

One of the greatest challenges that humanity faces is the Environmental Polycrisis, which is already causing profound disruptions that threaten biodiversity, planetary health, human well-being, ecosystem productivity, and economic stability worldwide. In response, the University is determined to play an active role in tackling this polycrisis. Its efforts can accelerate progress in environmental research, education, community involvement, policy shaping and international cooperation.

According to the Intergovernmental Panel on Climate Change (IPCC), to mitigate the most severe consequences of Climate Change it is essential to cap the rise in global average temperature at 1.5°C above the levels of the pre-industrial era. Achieving this requires a significant reduction in global carbon emissions, in order to reach a Net Zero Carbon world by 2050.

To fulfil this goal, every sector across all nations needs to drastically cut their emissions while counterbalancing any residual emissions. The University of Edinburgh has a legal duty (Climate Change (Scotland) Act 2009) to help deliver Scotland's national emissions reduction target, adapt to the impacts of climate change, and to act sustainably. In answer to this, the University has committed to becoming Net Zero Carbon by 2040 and Zero Waste by 2030.

As defined by the World Green Building Council (WorldGBC), a Net Zero Whole-life Carbon Building is a highly efficient one that has reduced all sources of carbon emissions across its whole life cycle, to a level that is consistent with reaching 'net zero' at the global or sector level, in line with achieving a global '1.5ºC pathway'. Any residual emissions that remain unfeasible to eliminate should be neutralised through carbon offset.

Consequently, every construction project undertaken by the University of Edinburgh's Estate must adhere to clear, specific goals aimed at reducing their operational energy demand and minimising their embodied carbon emissions, while ensuring that the spaces offer optimal conditions that enhance the health, well-being and performance of their occupants.

1.2 Purpose

The Estates 'Environmental Sustainability Guide for Construction Projects' (referred to as "the Guide"), has been developed for use by stakeholders involved in the planning and delivery of the University of Edinburgh's construction projects. This includes employees from the University's Estates Department, Architects, Engineers, Project Managers, Cost Consultants, external Consultants, Contractors and Sub-Contractors.

The document has been designed to achieve the following four key goals:



Goal 1 - Minimising Environmental Impact

This Guide lays out the following strategies, to minimise the environmental impact of the University's Estate by:

- Conserving and enhancing biodiversity, and actively contributing to local, regional, and national conservation efforts through its long-term environmental strategy.
- Targeting to become a Zero Waste University by 2030, and embracing Circular Economy principles. By shifting from traditional, linear methods to a more sustainable approach where resources are reused, recycled, and optimised, the University will minimise its waste, reduce the demand for

new raw materials, achieve cost savings, and reduce its environmental impact.
- Implementing sustainable water use and management processes, focusing on water conservation, while enhancing the resilience of our buildings to future extreme weather events.
- Supporting the University's 'Climate Conscious Travel' approach, by promoting and understanding the environmental impacts of travel, and encouraging the use of lower-carbon methods of transport whenever possible.

Goal 2 - Achieving Net Zero Carbon by 2040

In alignment with the University's Strategy 2030, its Social and Civic Responsibility Delivery Plan, and Regenerative Sustainability Strategy, the Guide provides clear instruction to Project Teams for the delivery of a sustainable Estate that shall become Net Zero Carbon by 2040.

The document outlines the principles, objectives, and processes aimed at minimising the Estate's embodied carbon emissions, enhancing operational efficiency, reducing operational energy demand, and implementing Low or Zero Carbon Technologies (LZCT's) to support this process.

Goal 3 - Health and Well-being

The Guide is intended to enhance the health, well-being, and productivity of its buildings' occupants, by focusing on the creation of supportive, engaging, and healthy spaces. This goal will contribute to the delivery of an optimal environment conducive to achieving excellence in education and research.

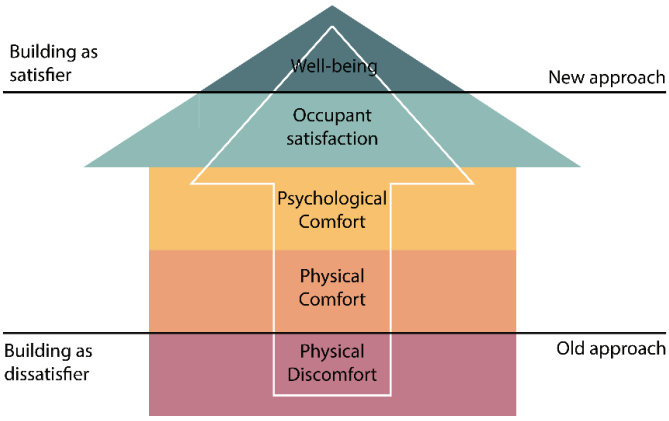


Figure 1.1 Vischer's adaptation of Maslow's hierarchy of needs.

Goal 4 - Sustainable Cost Management

The Guide requires that all projects take into account not just the initial capital costs, but also the long-term financial implications, including expenses associated with their operation, maintenance, refurbishment, and eventual decommissioning. Understanding whole-life cost impact is crucial for informed decision making, with respect to resource-efficient and cost-effective building strategies, especially in light of the increasing operational costs and uncertainties about durability under future extreme climate conditions.

1.3 Scope

The Guide applies to the design, construction and usage of every building developed by the University of Edinburgh Estates Department, encompassing new-builds, major and minor refurbishments, and fit-out projects.

By acknowledging the size, complexity and diversity of the University's Estate, it is recognised that not all projects should follow a uniform approach. In response, the Guide provides a clear and flexible set of processes and methods for the establishment of the most suitable performance and verification requirements, based on the unique aspects of each project. Therefore, the extent and scope of the guidance will be based upon project-specific requirements and in agreement with the University's Net Zero and Project Management Teams.

The use of this Guide will not take the place of, or remove, any professional responsibility from external Design Teams, Consultants and Contractors. Their liabilities to the University are not diminished or otherwise reduced by the approval process. Consultants and Contractors will remain fully and totally responsible for the design and/or works carried out by them or on their behalf by their staff, agents, sub-consultants or sub-contractors.

The Design Teams, Consultants and Contractors will comply with all relevant legislation and regulation relating to the design and construction of the project. Where superseded standards and regulatory documents are referred to in the text, the reader shall apply current versions. It is the responsibility of readers/duty holders to ensure subsequent designs are complete, compliant and able to meet the final approved Project Brief when measured in-use. Where derogations or exceptions from this Guideline are being considered, they are subject to approval by the respective Net Zero and Project Management Teams.

Should any projects deviate from this Guide, a technical submittal outlining the deviation, reason why,

and impact to the Estates Net Zero strategy, should be prepared and forwarded to the nominated University project representative for liaison with the Estates Net Zero Team. A review of this deviation shall be carried out by the Estates Net Zero Team, and a final decision on the deviation shall be communicated to the appropriate Design/Construction Team.

1.4 Guiding Principles

The Guide is governed by the following key principles, that ensure the document remains a progressive, flexible and practical tool in delivering sustainable buildings across the University's Estate:

- **Live Document:** The Guide has been developed as a live document, designed to be annually updated and refined. This approach will allow the document to evolve in response to new scientific discoveries, advances in technology and construction methodologies, and changes in environmental policy or regulations. Continuous improvement processes are integrated to capture lessons learned from previous projects, facilitating ongoing enhancements that will keep the Guide relevant and effective.

- **Focus on Processes:** This guide adopts a process-oriented approach, establishing a standardised framework that ensures consistency, quality, and efficiency across all projects. Such a framework will help streamline decision-making, improve coordination among different teams, and optimise resource management. Additionally, adherence to this approach facilitates compliance with regulatory requirements and industry standards, minimising the likelihood of errors and subsequent rework.

  This principle not only aids in meeting project objectives and deadlines, but also supports continuous improvement and learning, ensuring that University Estates projects are delivered successfully, while adapting to changing conditions and technologies.

- **Modular and Interlinked:** By adopting a modular format, the Guide breaks down complex sustainability themes into manageable, focused concepts that are easy to navigate. In addition, specific sustainability themes -such as carbon emissions, biodiversity or sustainable water management- are interlinked to provide a holistic understanding of how various aspects of sustainability interact and support one another. This approach ensures clarity, and allows for targeted updates without disrupting the coherence of the document as a whole.

- **Flexibility and Adaptability:** Recognising the unique challenges and opportunities presented by different projects, the Guide is designed to be flexible and adaptable. It provides a framework for customising approaches -to accommodate a wide range of project scales, types, locations, and specific stakeholder requirements- without compromising the broader sustainability objectives. This adaptability ensures that the document promotes sustainability in a manner that is both practical and attainable across diverse contexts.

- **Continuous Improvement and Innovation:** The document is committed to increasing its sustainability requirements and ambitions progressively,

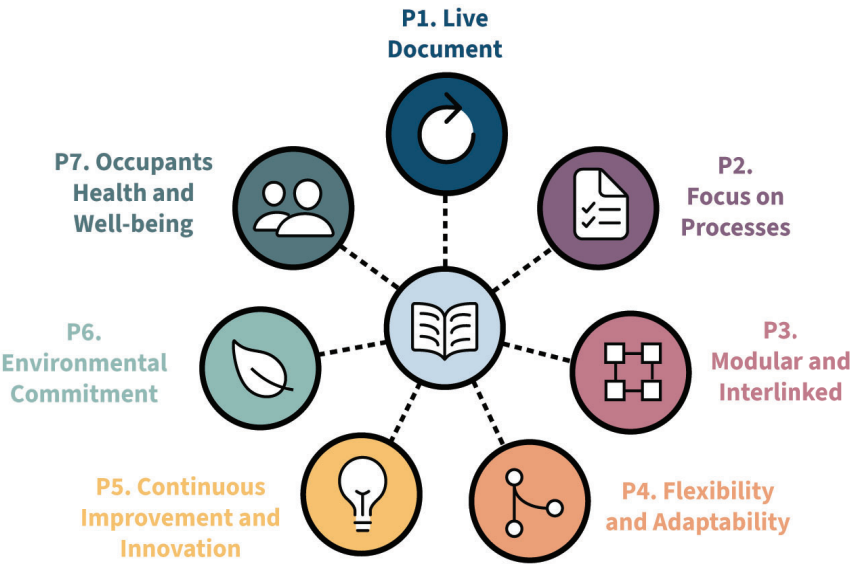


Figure 1.2 Environmental Sustainability Guide Guiding Principles

to balance the urgent action needed on climate change with the current knowledge, experience and data available in the construction industry. This principle ensures that the University's construction projects not only meet the current sustainability criteria, but are also geared towards future-proofing its Estate.

- **Environmental Commitment:** This principle reflects the University's commitment to reduce its environmental impact, from cutting down its carbon emissions to protecting and enhancing biodiversity within its Estate. Universities hold a distinctive position to shape societal norms and practices. By pursuing these objectives, the University of Edinburgh not only acts responsibly and sustainably, but also establishes a benchmark that extends its influence beyond its Estate, impacting broader community practices and standards.

- **Enhancement of Occupants Health and Well-being:** The Guide prioritises the physical, mental, and social well-being of those who live, work, and study within the University buildings. This is accomplished by carefully designing spaces that maximise natural light and ensure good indoor air quality levels, thermal comfort, and acoustic performance. Further, the Guide promotes the use of healthy materials, while also incorporating elements of nature and biophilic design to create stimulating and restorative environments.

1.5 Structure of the Guide

The document is structured to be intuitive, adaptable, and progressive. It consists of five main sections -designed to be modular yet interconnected- and allowing users to access specific information as needed while maintaining a cohesive understanding across all parts.

1. **Introduction:** The introduction to the Guide provides a comprehensive overview, detailing the Guide's context, purpose, and scope. It elaborates on the underlying principles governing the document, and explains how it integrates into the larger framework of the University of Edinburgh's Estates documentation. Additionally, its structure is clearly outlined to facilitate easy navigation and application of its contents.

2. **Context:** This chapter delves into the background of the Guide, exploring the broader University Sustainability Vision and illustrating how the Estates Vision aligns with this overarching strategy. It discusses current best-practices within the industry and how these will be encouraged, and the specific challenges and opportunities that emerge from the existing environmental sustainability landscape. This section aims to provide a good understanding of the University's Estate context, enabling stakeholders to appreciate the Guide's relevance and necessity in fostering sustainable construction practices.

3. **High-level Implementation:** This segment provides a comprehensive overview of the Guide's implementation strategy, articulated through a clear roadmap. It starts by presenting the objectives and the methodology that will govern its application, ensuring a robust and systematic approach. The section then introduces the Environmental Sustainability Target Selection Tool (ESTS Tool), detailing its functionality and guidelines for effective usage. Subsequently, roles and responsibilities are assigned to project team members, underscoring the necessity of collaboration at all levels. The primary objective of this section is to equip all stakeholders with a clear understanding of their roles and the sequence of actions required, thus ensuring a unified and successful implementation of the Guide across the University's Estates construction projects.

4. **Process Guide:** The "Project Management Process" section of the document presents a comprehensive Project Management framework, designed to integrate sustainability objectives throughout all RIBA Work Stages. This process-oriented approach aims to promote consistency, streamline decision-making, improve coordination among different teams, and optimise resource management across all projects. For each RIBA Stage, the guide specifies core objectives and anticipated outcomes, critical end-of-stage checkpoints, mandatory information exchanges, and detailed tasks checklists. These tasks are appropriately assigned to responsible parties, which may refer to the Client, Design, or Construction Teams, while enhancing clarity in their roles and responsibilities. Additionally, the tasks have been coordinated and linked to the corresponding Activity References defined in the University's internal Project Delivery Process Maps (PDPMs).

   This alignment ensures that all activities are consistent with established University procedures, promoting a harmonised process that enhances quality and efficiency.

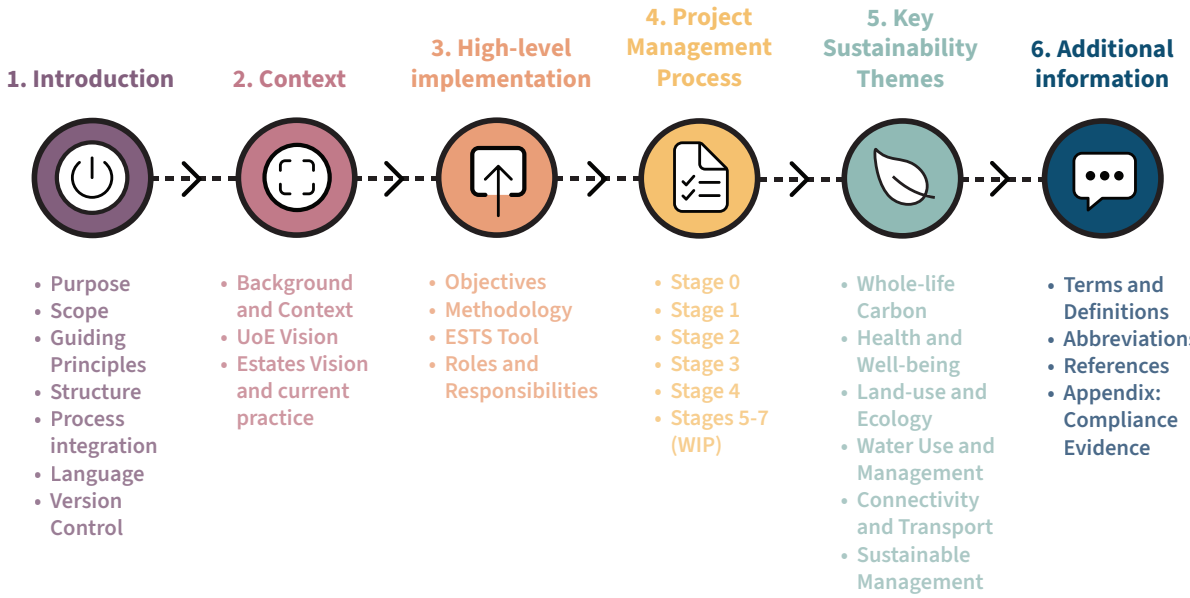


Figure 1.3 Structure and content of the Environmental Sustainability Guide.

5. **Sustainability Themes:** The "Key Sustainability Themes" section, provides detailed guidance on the design principles, requirements and deliverables for each sustainability theme that shall be incorporated withing the proposed project design. Each theme is clearly presented with a with a rationale on why it is important to the University, a list of reference documents, an indication of which University representative is responsible for its consultation, and a set of key design principles. These shall be understood as a generic guide on what good looks like, and the Design and Construction teams will have to assess which ones are applicable on a project-by-project basis. Additionally, there are two sections on key requirements and the evidence that will have to be provided, and a summary of the critical steps to consider at each RIBA Stage.

   By adopting this modular format, the Guide breaks down complex sustainability themes into manageable, focused concepts that are more easy to navigate.

Should you have any questions, concerns, or require further clarification regarding the Environmental Sustainability of the University's Estate, or the application of this Guide, please contact the University's Estates Net Zero Team.

1.6 How the Guide sits within the University's Estates Project Management processes

This Guide has been developed as part of a suite of documents called 'The University of Edinburgh Estates Design Guidelines (Assets and Standards)'. These documents underpin the University's Estates Vision -which is updated approximately every 4 years- and identifies the core aims and strategic objectives of the built environment that supports its world-class academic activity.

The Estates Guides (as a whole), have been developed for employees of the University's Estate Department, Architects, Engineers, Project Managers, external Consultants and Contractors. The aim of this documentation is to enable Project Teams to have a correct understanding of the principles and standards that the University will require to be adopted for any future developments within its Estate. Consequently, it is essential for readers of this document to first refer to the Design Guide No.1, entitled 'Estates Design Guidelines - Introduction and Application', which serves to provide the principles and overview with vital information and context that apply to all construction projects.

The Guide is primarily designed to be used in conjunction with the RIBA Plan of Work 2020 -a framework for construction projects in the UK- which offers a structured staged-approach that improves project management, enhances communication, and aids in risk management. This alignment ensures a holistic incorporation of sustainability objectives, standardises processes and enhances communication among stakeholders, establishing that sustainability targets have been tailored to each phase of the project life cycle. By addressing sustainability from project inception to operational life, the University can avoid costly late-stage modifications, enhance its resource and energy efficiency, and maintain long-term sustainability goals.

This approach supports the creation of a smarter, more sustainable Estate, by ensuring that sustainable development is a core objective from the outset.

Additionally, the Estates Department has developed its own PDPMs, to improve the effectiveness of project delivery. The PDPM tool outlines specific and clear activities and tasks required for the successful completion of each RIBA Stage, while maintaining flexibility to adapt to the unique aspects of each project. To maintain consistency on its implementation, the tasks and requirements laid out in this Guide have been coordinated with the University's PDPMs. As a result, links to corresponding PDPMs Activity References have been incorporated into the text for each Work Stage, denoted with the formula PDPM-XX.

1.7 Language

This Guide contains requirements, recommendations and permissions. The following describes the implications and use of these modal verbs in the document:

- The use of the word(s) 'shall', 'must' or 'will', denotes a requirement that is non-negotiable and shall be fulfilled. If such a statement conflicts with a statutory obligation, then a technical report must be issued for liaison with the corresponding University Estates representative, for their final decision regarding compliance with the documentation.
- The word 'should' is used to indicate something that is recommended or preferred, although it is not required for conformity.
- The word 'may' is used to indicate that something is permitted, within the limits of the associated requirement or recommendation.

1.8 Version Control and Updates

The Guide will remain as a "live" document, and will be periodically revised and updated to ensure it remains relevant as technology, modern methods of construction, and environmental policies and regulations evolve.

The version number will, using 2025 as an example, move from 2025 V1.0 to 2026 V2.0 for the following year. Any new items or amended content will be highlighted in yellow to enable identification of changes from previous versions.

Following any update or change, the Estates Project Management Team will send email notifications to the directory of currently appointed Design and Construction Teams. Any updates to the Guide which cause significant change to a project shall be discussed with the respective Project Management Team, and application of the Change Control Process will be required.

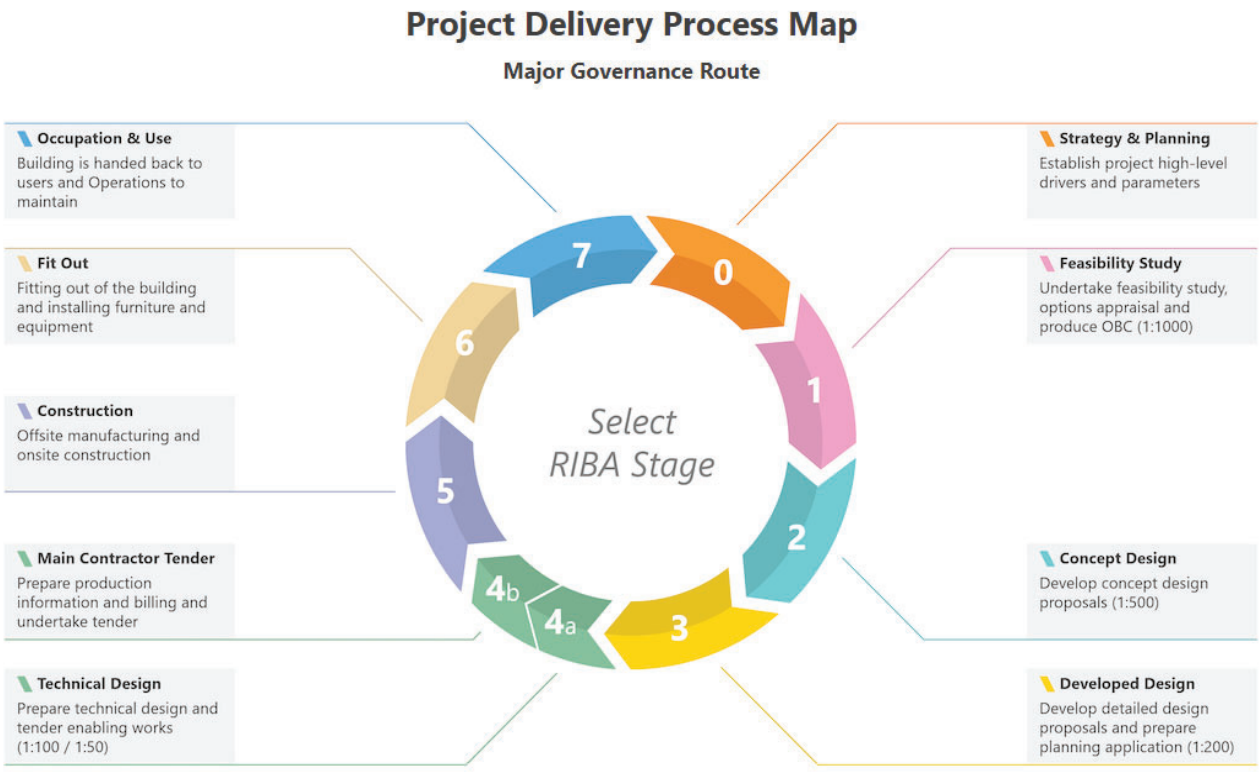


Figure 1.4 University of Edinburgh Project Delivery Process Map for Major Projects.



2.0 BACKGROUND AND CONTEXT

2.1 Introduction

The University of Edinburgh is committed to making the world a better place, as outlined in its 'Strategy 2030.' This strategic plan establishes ambitious targets to address critical challenges ahead -through pioneering research, cutting-edge innovation, and exceptional teaching- in order to make a positive impact on society. In alignment with these objectives the University is dedicated to addressing Climate Change, a phenomenon which is already endangering biodiversity, human health, economic stability, and the productivity of ecosystems worldwide.

This Guide draws on the University of Edinburgh's strong track record of leadership, using the knowledge and insights gained from past efforts to shape our future sustainability strategies. It aligns with the University's 'Strategy 2030', its 'Social and Civic Responsibility Plan (2020-2030)', and its 'Regenerative Sustainability Strategy'. Together, these documents guide the University's actions towards creating environments that reflect its commitment to environmental and social sustainability.

In pursuing these goals, the University of Edinburgh is not just aiming to meet current standards for environmental and social sustainability. Instead, it is actively expanding these boundaries, to establish what it means for an academic institution to show responsible leadership and contribute to global improvement in the 21st century.

This chapter of the Environmental Sustainability Guide seeks to establish a robust foundation for understanding the University's whole-institution approach to sustainability, its background, challenges, and goals, as explained in subsequent sections.

2.2 Background and Context

Over the past two decades, the UK construction industry has undergone a profound transformation in its approach to sustainable construction, influenced by evolving market demands, regulatory changes, technological innovations, and growing environmental awareness.

Guided by leading institutions such as LETI, UKGBC, BRE, RIBA, CIBSE, RICS, and national and local governments, the construction industry has developed and implemented numerous guidelines and frameworks that establish ambitious sustainability goals and targets. These efforts have significantly raised awareness about the importance of sustainable practices in the sector, and have shaped policy-making and construction-related regulations.

Since 2008, the University's Estates capital portfolio has actively incorporated various sustainability frameworks -from BREEAM to the T46 and the ESME- aligning its projects with principles of environmental sustainability and social responsibility. This strategic direction led to numerous projects -such as the Scottish Centre for Regenerative Medicine (SCRM) and



Figure 2.1 University of Edinburgh students at the EFI roof terrace. Whitedog Photography.

the Edinburgh Climate Change Institute (ECCI)- receiving widespread recognition for their sustainability achievements. However, challenges emerged, including difficulty in adapting to specific intitutional needs, and unresolved performance gap issues in buildings.

All of this, together with the industry's enhanced skills and commitment, have offered the University a pivotal moment to rethink and redefine its approach to environmental sustainability in construction projects. This Guide is a product of this re-evaluation, embodying an evolutionary rather than revolutionary change in strategy. It aims to create an accessible and adaptable framework that incorporates cutting-edge technical knowledge, while emphasising alignment of processes and evidence-based outcomes. Additionally, it is carefully structured to integrate sustainability throughout the whole life cycle of building projects effectively, while being integrated in the existing Project Management processes within the Estates Department.

In driving its environmental sustainability performance forward, the University of Edinburgh seeks to be regarded as a responsible leader within the Higher Education sector.

2.3 The University's Sustainability Vision

The University of Edinburgh's Sustainability Vision is deeply integrated with its commitment to Social and Civic Responsibility, as highlighted in the University's forward-thinking 'Strategy 2030'.

This strategic direction is firmly rooted in the United Nations '2030 Agenda for Sustainable Development', a comprehensive plan for achieving a better future globally. Central to this plan are the 17 Sustainable Development Goals (SDGs) which serve as a call to action and a guiding framework for the University's policies and initiatives.

Recognising its potential to contribute to the UN SDGs, the University of Edinburgh has engaged in extensive consultations with staff, students, and the wider community. This process has been instrumental in shaping the University's approach to Civic and Social Responsibility, leading to the identification of three pivotal Strategic Objectives:

- Achieving environmental milestones: Becoming Net Zero Carbon by 2040, and Zero Waste by 2030.
- Increasing educational outreach and inclusivity: Expanding participation in Higher Education and fostering greater inclusivity.
- Strengthening community ties: Collaborating with local communities to enhance the quality of life throughout the Edinburgh City Region.

To achieve these objectives, the University's 'Regenerative Sustainability Strategy' outlines three key impact areas through which it seeks to address the environmental polycrisis of climate change, biodiversity loss and resource use and pollution. Driven by its people and the culture that supports them, the University will increase climate and nature-related learning and teaching, boost environmentally focused research and innovation and embed regenerative sustainability across its operations. To this end, the Strategy sets out the following Operations goals:

- A 1.5°C aligned decarbonitasion pathway will enable the University to achieve Net Zero Carbon by 2040, and Net Negative Carbon. These targets apply to Scopes 1, 2 and all scope 3 emissions.
- The University intends to regenerate ecological systems across a land footprint at least five times the size of its own campuses, whilst ecologically regenerating its campus, by 2040.
- The University is committed to driving a step-change in chemical pollution, water impacts and resource use beyond its operations, engaging its suppliers, investment managers and partners.
- The University will ensure it is resilient and ready for the impacts of the polycrisis, ranging from flooding to supply chain disruptions.

Through these strategic initiatives, the University of Edinburgh is actively going beyond the traditional roles of an academic institution. It not only meets established environmental and social sustainability standards, but also pushes boundaries to redefine what responsible academic leadership looks like in the 21st century.

This vision is not merely aspirational, but serves as the cornerstone for future actions, and further affirms the University's ongoing commitment to creating a sustainable, inclusive, and responsive educational environment.

2.4 The University Estates Sustainability Vision and current practice

The University of Edinburgh Estates Vision is focused on creating and maintaining a world-class, sustainable, and inclusive physical environment, that supports the University's aspirations in teaching, research, and contribution to society. The Estates Department strives to ensure that the University's infrastructure is flexible, resilient, and efficiently managed, to facilitate cutting-edge research and a high-quality student experience, while also engaging with the wider community.

The Estates Vision also includes commitments to sustainability, aiming to minimise its environmental

impact, and adapting to changing technologies and societal needs. This presents an enormous challenge, given that the University's Estate encompassess 482 buildings and supports over 41,000 students and 17,000 staff.

In 2017, the RIBA published the 'UN Sustainable Development Goals in Practice', a guide that elucidates how the field of architecture can support the 17 UN SDGs. In this publication, the RIBA pinpointed eight sustainable outcomes to which all buildings can contribute. These are defined by clarity, measurability, realism, and transparency regarding expectations and results, and they embrace the three pillars of sustainable development: social, environmental, and economic. It is important to note that not all the UN SDGs are addressed by these RIBA outcomes -since some of these are oriented towards Government policy level- and consequently, are outside the scope of individual architectural projects.

The University -through the strategic mapping of the UN SDGs, the RIBA Sustainable Outcomes and its own Regenerative Strategy- has identified 6 Areas of Focus, which must be addressed by all future developments within its Estate, to fulfil the University's environmental, social and economic sustainability commitments.

- **Net Zero Carbon**: As part of its Net Zero Carbon by 2040 roadmap, the University is working towards reducing the direct emissions from its Estate to zero -or very near zero- without relying on offsets for this part of its operations. Offsets are planned through the University's Forests and Peatland program, but only to compensate for carbon emissions associated with unavoidable international student flights. Additionally, the University is enhancing the use of renewable energy, and exploring new ways to cut both its direct and indirect emissions.

- **Good Health and Well-being:** The University is committed to enhancing the health, well-being, and productivity of its buildings' occupants, by focusing on the creation of supportive, engaging, and healthy spaces. This will be done by incorporating requirements on Indoor Air Quality, Thermal Comfort, Acoustic Performance, Daylight and Visual Comfort and Healthy Materials.

- **Sustainable Land Use and Ecology:** The University is working towards becoming a Zero Waste University by embracing Circular Economy principles. Additionally and as a signatory of the Nature Positive Universities Alliance, the University aims to protect and restore biodiversity within its Estate through its operations, teaching and research activities. In new developments, this will be achieved by targeting a minimum of 10% Biodiversity Net Gain and minimum Urban Greening Factors appropriate to the location of the project.

- **Sustainable Water Use and Management:** The University is dedicated to adopting sustainable water use and management strategies within its daily operations. This commitment will be achieved through the implementation of measures aimed at water efficiency and conservation, while increasing the resilience of our buildings against future extreme weather events.

- **Sustainable Connectivity and Transport:** . To support the Net Zero Carbon by 2040 commitment, the University developed its Sustainable Travel Policy. This document supports a 'Climate Conscious Travel' approach of understanding the environmental impacts of travel, while using lower-carbon methods of transport where possible, minimising the overall number of journeys to reduce carbon emissions and offsetting the carbon emissions from unavoidable travel.

- **Sustainable Management:** All projects within the University Estate are required to account for long-term financial considerations, including operational, maintenance, refurbishment, and decommissioning expenses, which extend beyond the initial capital outlays. This comprehensive evaluation is increasingly crucial given the rising operational costs and potential durability challenges posed by extreme climate conditions in the future. Furthermore, the integration of Soft Landings and Post-Occupancy Evaluations is critical. These practices ensure that University buildings achieve their performance objectives and provide insights into user satisfaction, thereby helping to refine future projects and operational strategies.

To fulfil the goals of these Areas of Focus, sustainability needs to be standard practice across the University's Estate, it is not merely optional. In a time of financial and climate challenges, the University's Estate must be an exemplar living lab of design innovation, collaborative thinking and minimal environmental impact.

The Guide is a 'live' document that will undergo periodic reviews and updates to reflect industry developments and lessons learned. This will ensure that the document remains relevant and effective in guiding sustainable development across the University's Estate. As a result, the Areas of Focus and their associated Key Sustainable Themes will be regularly reviewed and revised to reflect these ongoing changes and improvements.

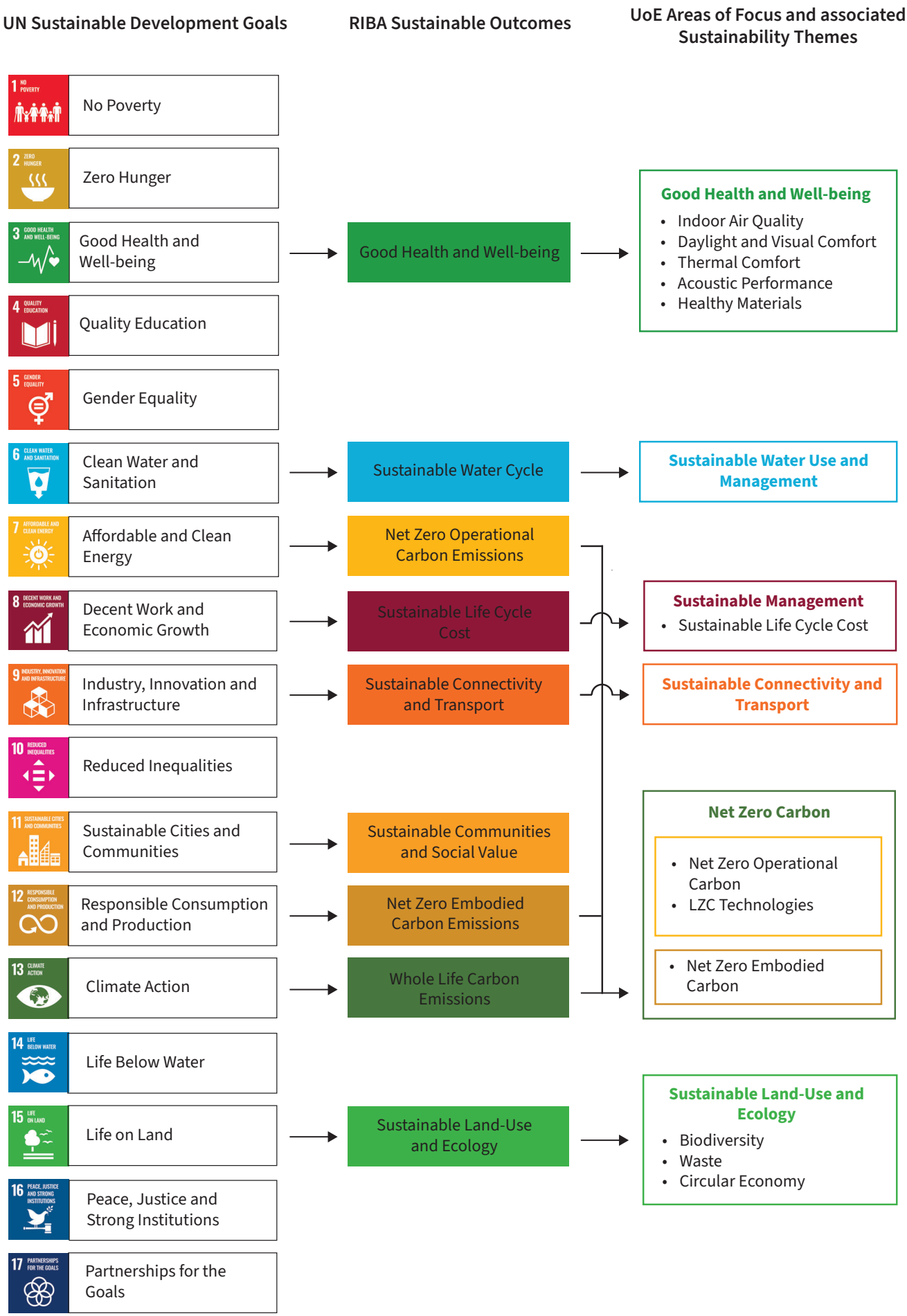


Figure 2.2 UN SDGs, RIBA Sustainable Outcomes, and UoE Environmental Sustainability Areas of Focus. Partially Ref: RIBA Sustainable Outcomes Guide (2019).


THE UNIVERSITY OF EDINBURGH

3.0 HIGH-LEVEL IMPLEMENTATION

3.1 Objectives

In accordance with its Regenerative Sustainability Strategy, the University of Edinburgh is committed to pursuing a 1.5°C aligned decarbonisation pathway for all three scope emissions, with the objective of achieving Net Zero Carbon by 2040.

Building on this commitment, the University has adopted the UK Net Zero Carbon Building Standard (UKNZCBS). This Standard establishes requirements for 'Net Zero Carbon Aligned Buildings,' which, if adopted collectively by the UK building stock, would enable the UK's built environment sector to remain within its national carbon and energy budgets.

As explained in the Standard's document, the development of this standard was led by a coalition that included prominent Professional Institutions and industry bodies, including LETI, RIBA, RICS, CIBSE, BBP, BRE, IStructE, and the UKGBC. This collaboration recognised the necessity for consistent guidelines to enhance the credibility of net zero carbon claims, and to accelerate the design, construction, and operation of buildings in compliance with the UK's legally binding carbon budgets and targets.

This initiative builds upon prior advancements in the net zero carbon field, incorporating insights and recommendations from these expert groups and professional bodies. Furthermore, the carbon accounting methodology utilised in the Standard is in line with the second edition of the RICS Professional Statement on Whole Life Carbon Assessment for the Built Environment.

The evidence-based unified methodology presented is applicable to new, existing and retrofitted buildings. Its requirements aim to reduce upfront carbon emissions and operational energy consumption, eliminate onsite fossil fuel use, enhance the integration of renewables, and guide the selection of refrigerants. The proposed limits are based on an analysis that combines measured performance data with expert professional insights into future performance trends and buildability. This analysis has been benchmarked against a model encompassing the entire existing stock and projected UK build-out rates.

The University acknowledges, however, certain limitations in applying the UK Net Zero Carbon Standard across all its construction projects, namely:

1. Due to the complexity and diversity of the Estate, which includes around 30% heritage and listed buildings, it is acknowledged that the Standard requirements may not be directly applicable in some University buildings. Although the Standard applies to all building types, heritage buildings often necessitate customised approaches to align them with suitable net zero carbon trajectories. While the current Standard Version 1 does not offer a bespoke method for these scenarios, the accompanying heritage project decarbonisation journey flowcharts provide a preliminary framework.
2. Beyond the scope of the Standard, there are broader Environmental Sustainability areas not covered, including Biodiversity, Health and Well-being, Waste and Circular Economy, and Sustainable Management, among others. These aspects, which extend beyond net zero carbon, are crucial for meeting the University's environmental, social, and economic sustainability commitments.

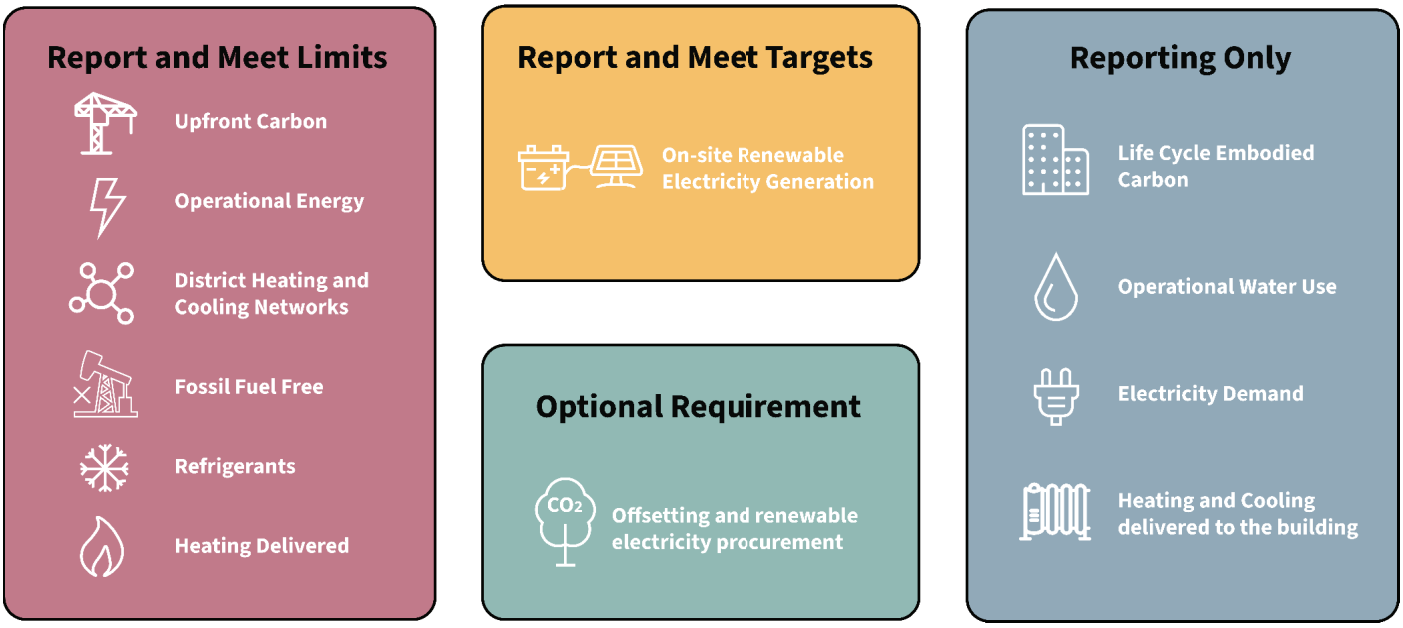


Figure 3.1 The UK Net Zero Carbon Building Standard Requirements (Version 1). Adapted from UKNZCBS V1 Launch Webinar slides.

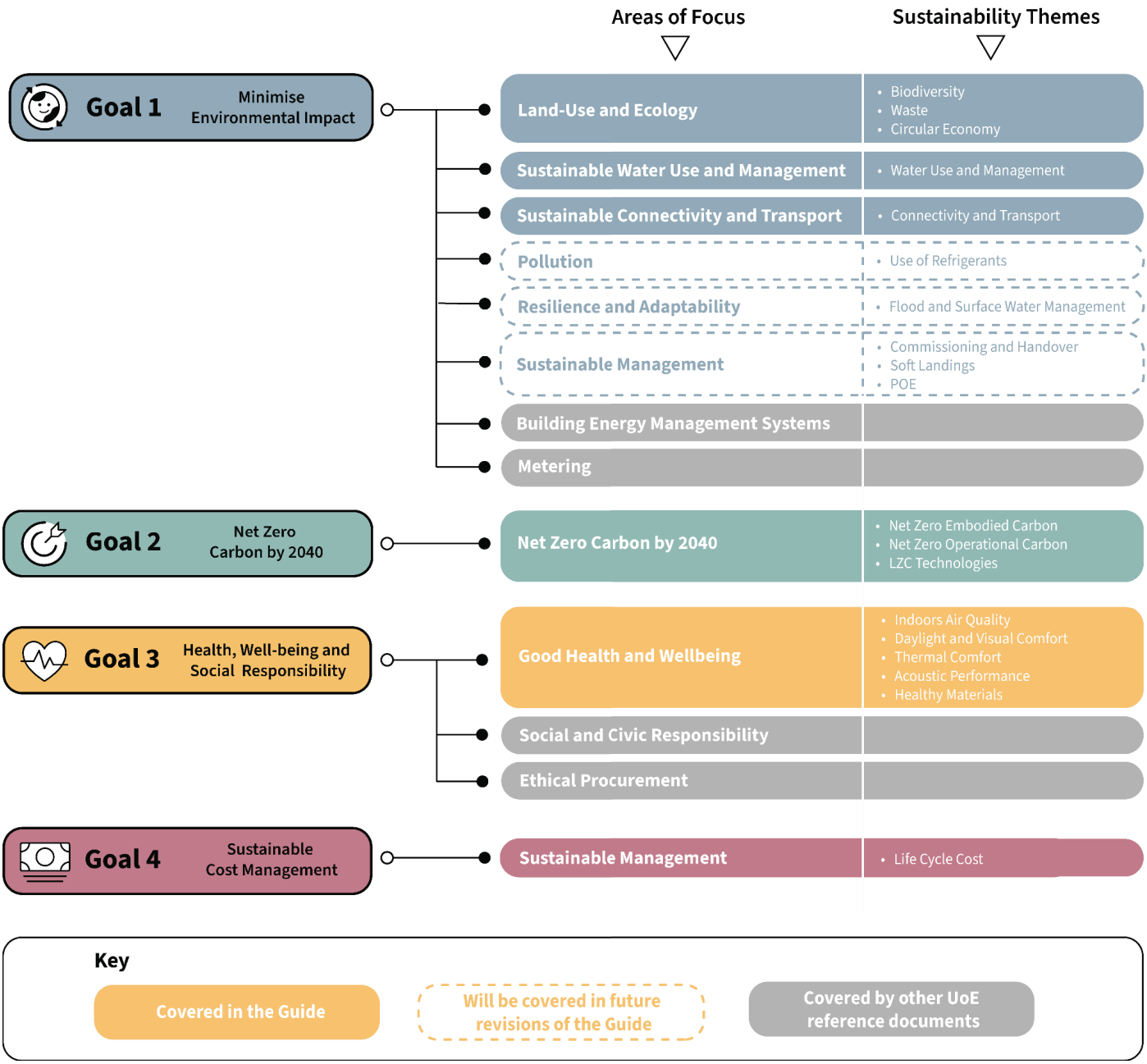


Figure 3.2 Environmental Sustainability Guide Key Goals, Areas of Focus and Sustainability Themes.

To bridge these gaps, the University stablished Six Areas of Focus that were obtained from strategically mapping the UN SDGs, the RIBA Sustainable Outcomes, and the University's own Regenerative Sustainability Strategy.

Within each Focus Area, specific Sustainability Themes have been identified, to guide Project Teams towards achieving the Guide's four main goals: minimising the environmental impact of the University's Estate, becoming Net Zero Carbon by 2040, enhancing the health, well-being, and productivity of its occupants, and promoting sustainable cost management. These six Areas of Focus and corresponding key Sustainability Themes are detailed in Figure 3.2 above.

Considering the complexity of the University's Estate as previously described, it is recognised that not all projects can pursue identical objectives and targets within those Sustainability Themes. To address this variability, the University has developed its own Environmental Sustainability Target Selection Tool (ESTS Tool). This tool provides a straightforward and accessible method for selecting the most suitable performance standards and environmental accreditations/certifications, tailored to the specific characteristics of each individual project.

The Guide's Areas of Focus and their associated Key Sustainability Themes will be regularly re-evaluated and updated, to incorporate the latest advancements and requirements in sustainable development, and ensure that it remains relevant and effective.

Process flowchart for conformance with Estates ESG

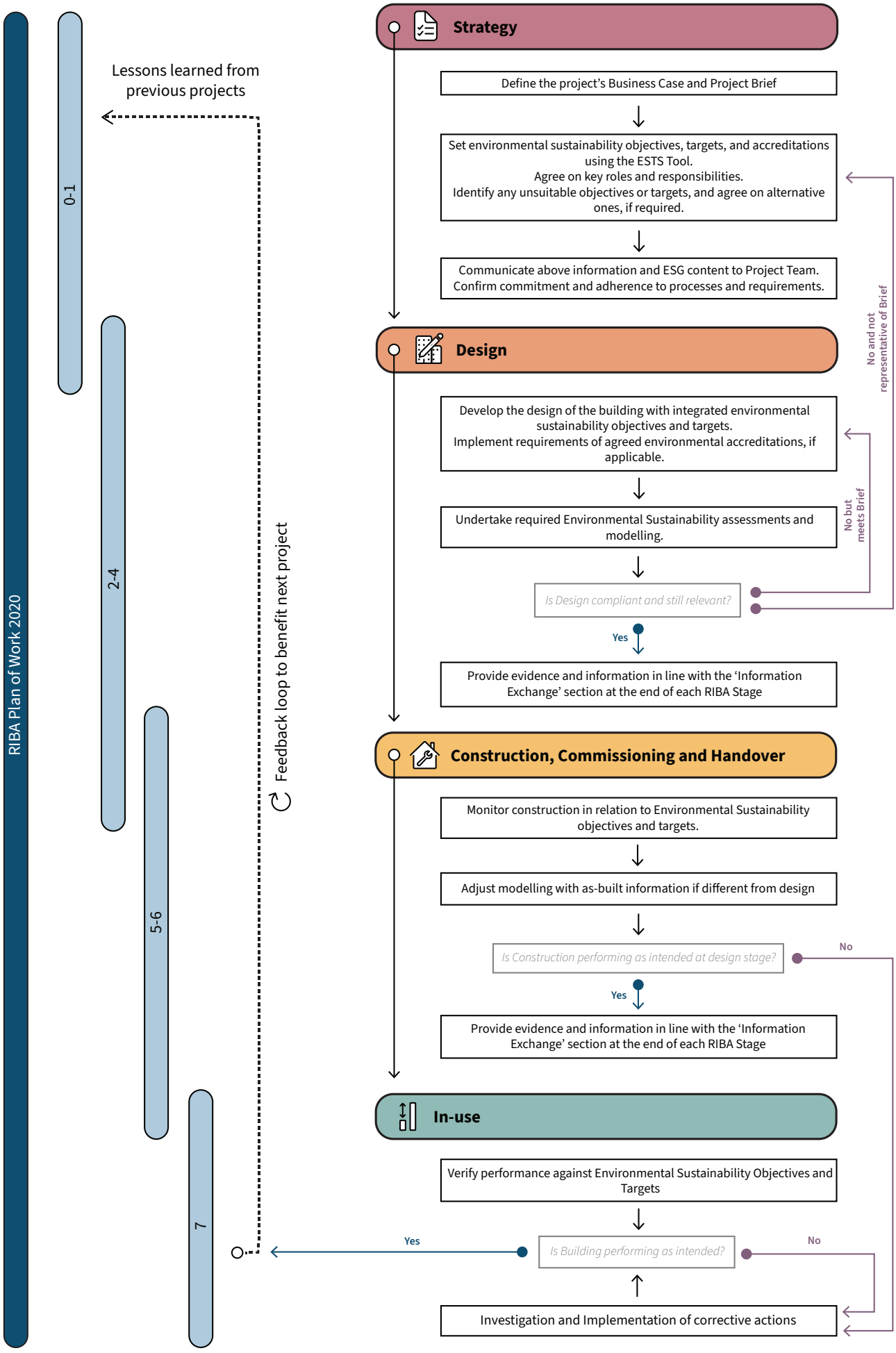


Figure 3.3 Process Flowchart for compliance with the 'Estates Environmental Sustainability Guide'.

3.2 Methodology

The methodology integral to ensuring conformance with the Estates 'Environmental Sustainability Guide' is detailed in the accompanying Process Flowchart.

This flowchart is designed to support Project Teams by providing a clear roadmap through the various conformance stages across the entire lifecycle of a building. This strategy acknowledges the cyclical nature of a building's lifecycle, underscoring the necessity of continually integrating environmental sustainability practices from the project's inception, through its operational life, and beyond. This sustained focus is essential for achieving long-term sustainability goals and is a fundamental component of the Guide.

While the Guide addresses the full life cycle of construction projects, decisions made during the early stages are particularly crucial. Early commitments to sustainability can significantly influence the feasibility, performance, and conformance of the project with the sustainability objectives and targets set forth.

A structured Project Management process is essential for effective conformance. Consequently, the Project Team is required to engage with the content outlined in the two main chapters of the Guide: the Project Management Process (Chapter 4) and the Key Sustainability Themes (Chapter 5).

The Project Management Process ensures that sustainability is consistently integrated as a core element of the project from initiation to completion, preventing it from being an afterthought. This holistic approach facilitates proactive identification and management of potential sustainability issues before they become problematic, thereby enhancing overall project efficiency and success. In parallel, the detailed technical information provides specific insights and actionable guidance on implementing sustainability practices effectively within the unique operational and environmental context of the University. This combination not only helps in meeting regulatory requirements and achieving sustainability targets, but also in fostering innovation and continuous improvement in the environmental performance across the University's Estate.

The methodology requires continuous monitoring and review mechanisms throughout the project's life cycle. This constant vigilance ensures that any deviations from the Project Brief, Business Case, or Environmental Sustainability Objectives are promptly identified and rectified. At every stage of the project, performance verification measures must be implemented to ensure alignment with the predefined Environmental Sustainability Targets and conformance with the Guide's requirements.

Should compliance with certain requirements prove unfeasible, Design and/or Construction Teams must immediately report such deviations to the Estates Net Zero, Planning and Delivery Teams. This early communication allows for the identification and implementation of alternative strategies, ensuring that sustainability objectives are still achieved through revised targets and methods, thus maintaining the project's overall integrity in line with the University's environmental goals.

Overall, this methodology seeks to enhance consistency, promote coordination among teams, streamline decision-making, and optimise resource management across all University Estates projects.

3.3 The ESTS Tool

The Environmental Sustainability Target Selection Tool (ESTS Tool) is a quick and easy-to-use flowchart developed by the University Estates Net Zero Team. Its aim is to guide Project Teams in the selection of the most suitable performance standards and environmental accreditation/certifications, based on the unique aspects of each project.

To ensure that the ESTS Tool is used correctly, the project category and corresponding assessment method must be specified in the consultant's Invitation to Tender. Should any uncertainties arise, these should be discussed, clarified, and agreed with the University's Estates Net Zero Team.

The University of Edinburgh is committed to using robust and verifiable environmental assessment methods for all its building projects. We support the use of recognised and ascertainable industry standards to ensure that environmental and sustainability objectives and targets are met.

Additionally, we remain open to alternative or innovative approaches, such as Passivhaus, the WELL International Building Standard or NABERS UK, provided they deliver comparable or superior results to the ones established in this Guide.

If any of the standards/accreditations stated by the ESTS Tool are unsuitable for a specific project, the Design Team must report the reasons for this to the Estates Net Zero Team, and will explore, report and agree with them which should be the alternative targets and methods for measuring performance. This shall occur as early as possible in the design process.

ESTS Tool (Major Projects >£2m)

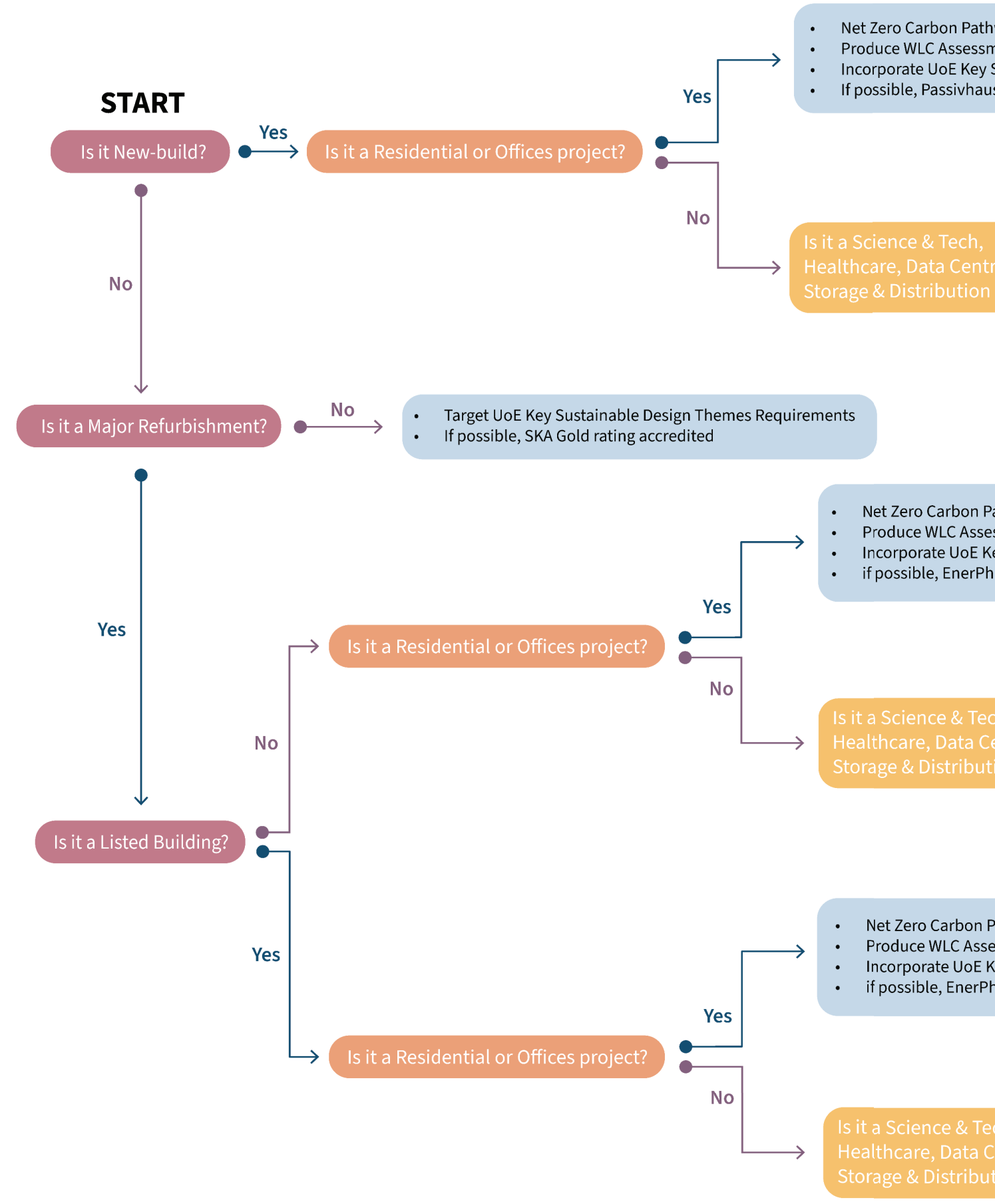


Figure 3.4 University of Edinburgh's Environmental Sustainability Target Selection Tool (ESTS Tool).

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ent - in alignment with RICS PS WLCA (version 2)
Sustainable Design Themes Requirements
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e or
project?

Yes

- Net Zero Carbon Pathway: Aim for UKNZCB Standard Requirements (version 1)
- Produce WLC Assessment - in alignment with RICS PS WLCA (version 2)
- Incorporate UoE Key Sustainable Design Themes Requirements

No

- Net Zero Carbon Pathway: Aim for UKNZCB Standard Requirements (version 1)
- Produce WLC Assessment - in alignment with RICS PS WLCA (version 2)
- Incorporate UoE Key Sustainable Design Themes Requirements
- if possible, Passivhaus Low Energy Standard accredited

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No

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No

- Net Zero Carbon Pathway: If possible, aim for UKNZCB Standard Requirements (version 1)
- Produce WLC Assessment - in alignment with RICS PS WLCA (version 2)
- Incorporate UoE Key Sustainable Design Themes Requirements
- if possible, Passivhaus Low Energy Standard accredited

3.4 Roles and Responsibilities

The Guide has identified the following roles and their associated responsibilities as key in the delivery of the University's sustainable Estate:

Estates Leadership Team

- Develop and refine the long-term vision for a sustainable Estate that anticipates future challenges and trends in Environmental Sustainability.
- Approve Environmental Sustainability strategies and policies that align with the University's Environmental Sustainability Vision.
- Evaluate and adjust Environmental Sustainability strategies to better meet the evolving needs of the University and its community.
- Ensure that Environmental Sustainability is a core consideration in all aspects of Estates Management.
- Allocate financial resources effectively to support Environmental Sustainability initiatives.

Estates Planning and Delivery Team

- Align the design and development of the University Estates capital projects with the University's sustainability vision.
- Champion the principles set forth in the ''Environmental Sustainability Guide for Construction Projects' during the development of Business Cases.
- Oversee the implementation of Environmental Sustainability Strategies through the planning, design, construction, and delivery phases of Estates projects.
- Maintain transparency in sharing how projects align with Sustainability Goals.
- Collaborate closely with Design and Construction Teams to ensure that Estates construction projects not only meet but aim to exceed both regulatory sustainability standards and internal sustainability objectives
- Support the integration of innovative solutions and research findings into construction projects.

Estates Net Zero Team

- Develop long-term Environmental Sustainability objectives, strategies and policies for the University Estates construction projects that align with the University's 'Strategy 2030', its 'Social and Civic Responsibility Plan (2020-2030)', and its 'Regenerative Sustainability Strategy'.
- Support the development and implementation of the 'Estates Environmental Sustainability Guide for construction projects'.
- Provide input for Environmental Sustainability criteria in Project Briefs and Business Cases, to ensure all projects adhere to established environmental standards.
- Actively participating in the selection and brief-

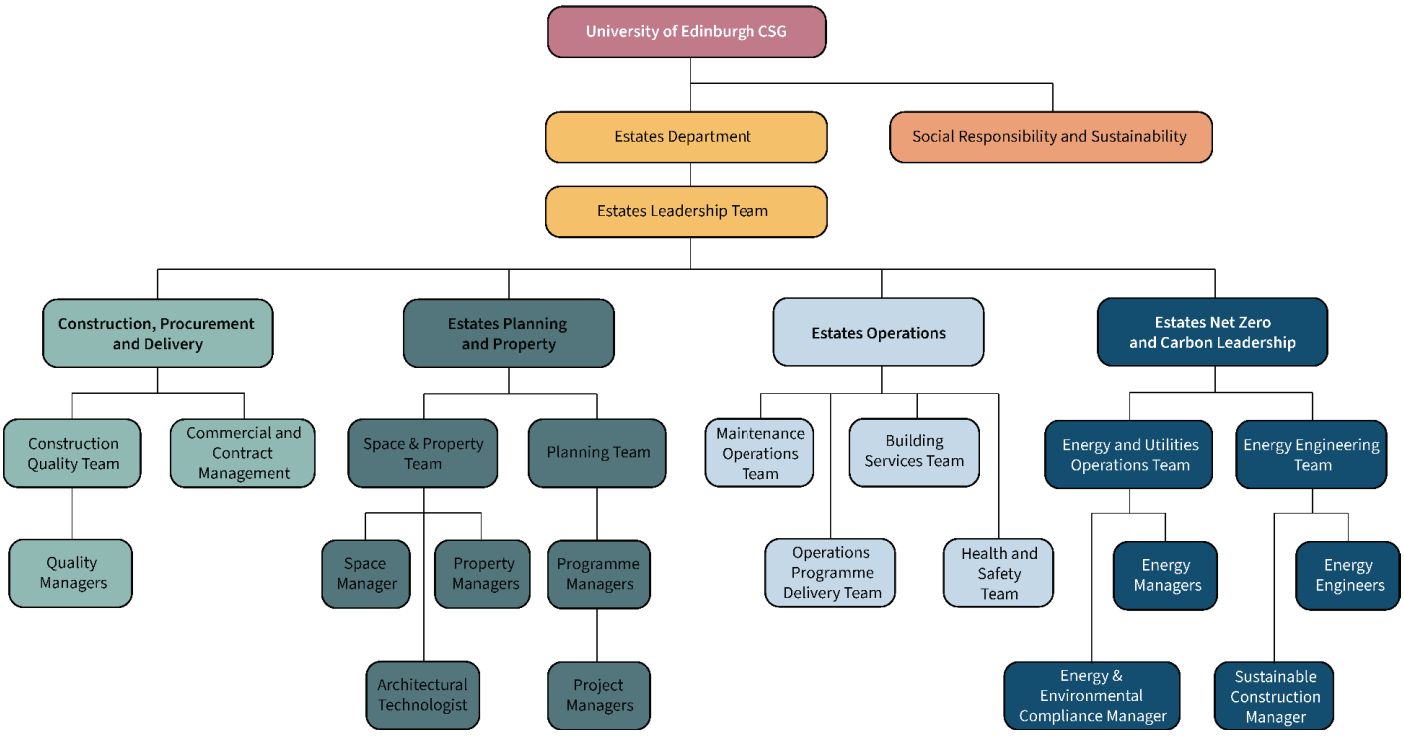


Figure 3.5 Client Team Organigram - Key Roles on the delivery of the University of Edinburgh Sustainability Vision.

ing process of Design and Construction Teams to ensure that environmental sustainability is prioritised from the outset of every project.
- Establish overaching requirements and agree any derogations from the current Guide, where appropriate.
- Review design proposals to ensure they meet the required environmental sustainability criteria.
- Actively monitor the Design, Construction and Handover Stages to ensure compliance with environmental regulations and the Sustainability Objectives outlined in the Project Brief, Business Case and the 'Estates Environmental Sustainability Guide for construction projects'.
- Collect feedback from building users to evaluate the effectiveness of the environmental sustainability strategies, and identify any areas for improvement in future projects.
- Monitor the sustainability performance of projects once in use through systematic POEs, to ensure they perform as intended, and promote ongoing enhancement.

Social Responsibility and Sustainability (SRS)

- Provide guidance on integrating sustainability, climate change mitigation, and circular economy practices in line with the UN Sustainable Development Goals (SDGs), across all university activities, including operations, learning and teaching, research, and enterprise and business commercialisation.
- Drive the inclusion of sustainable practices in the University's operations, teaching, research, and commercial activities.
- Ensure Social Responsibility and Sustainability issues are fully embedded across operations including building design and public realm, energy, waste, biodiversity, water use, land, transport, IT and purchasing, international travel and aviation.
- Develop, assess, and report on the University's Climate Strategy, Waste and Resources Strategy, and Biodiversity Strategy.
- Assist the University Leadership Team in the delivery of the Social & Civic Responsibility Plan, including its Net Zero Carbon and Zero Waste Strategic Objectives.
- Oversee the progress in the implementation of the Social & Civic Responsibility Plan, and monitor, review and evaluate the Plan.
- Support the development and implementation of the 'Estates Environmental Sustainability Guide for construction projects'.
- Advocate for sustainable practices and ensure that stakeholder values are incorporated into Estates development plans.
- Engage with the local and wider community on sustainability initiatives.

Sustainable Construction Manager

- Guide the integration of Sustainable Design and Construction principles and Whole Life Impact Assessments into all University construction and refurbishment projects, ensuring alignment with the University's Vision and Climate Strategy.
- Actively support the implementation of the University's Estates Strategic Plan and Vision to 2030, Capital Plan, Energy and Utilities Masterplan, and Climate Strategy.
- Develop and maintain the University's 'Estates Environmental Sustainability Guide for Construction Projects', alongside other sustainable design quality standards, ensuring they remain relevant, realistic, and incorporate the latest technical knowledge.
- Support the development of a wide range of construction and operational guidelines, contributing to University Estates Design Guidelines, Estates Delivery Process Maps, Delivery Procedure templates, Technical Specifications, and Project Briefs.
- Provide expert technical advice to Project Management teams, on low impact (energy, carbon, environmentl) architecture and MEP design, enhancing sustainability outcomes across projects.
- Enable evidence-based decision-making, particularly in the early stages of the RIBA plan of work, contributing to effective design and specification decisions.
- Provide ongoing support to Project Management teams and key stakeholders, with design team feedback, effective communication, negotiation, problem solving, impact assessment and remedial action.
- Support the effective communication of design and performance requirements.
- Communicate the implications of design and specification changes, ensuring that all parties are informed and aligned.
- Engage in negotiation and collaboration with both internal and external stakeholders to foster partnerships that enhance project outcomes.
- Develop and maintain monitoring of project delivery and project performance objectives-

throughout the lifecycle of Estates projects.
- Contribute to the development and delivery of projects led by the Net Zero Team. This includes identifying, developing and implementing energy infrastructure and energy efficiency projects in collaboration with the Energy Project Engineers.
- Actively engage with university stakeholders, industry, and academia to promote and embed a culture of sustainable design, innovation, and effective performance in use.

Project Manager

- Ensure that Environmental Sustainability is incorporated from the outset of the project.
- Clearly communicate Environmental Sustainability Goals and Objectives to the Design and Construction Teams, in line with the University's Sustainability Vision and the 'Estates Environmental Design Guide for Construction Projects'.
- Implement Environmental Sustainability criteria in the Design Team/Contractor Team selection, and contractual documents.
- Engage with Stakeholders to gather insights and consensus on Environmental Sustainability objectives.
- Encourage opportunities to promote the implementation of Sustainable strategies to enhance the project's sustainability profile.
- Identify and assess risks related to the project's Environmental Sustainability, developing contingency plans to address potential issues.
- Seek guidance from the Sustainable Construction Manager -as required- to ensure construction projects correctly adhere to the UoE Estates Environmental Sustainability Guide.

Cost Consultant

- Provide initial advice on the viability of Environmental Sustainability objectives, based on the project's budget and funding.
- Contribute to feasibility studies by advising on the potential costs of different scenarios.
- Develop initial cost models at early stages, considering different materials, constructive systems, and project strategies based on the project's sustainability requirements. Refine cost plan at later design stages, ensuring alignment with project Brief.
- Carry out Life Cycle Costing analysis -with input from Sustainability Champion- to consider long-term financial impact of the project, and make informed decisions.
- Ensure that Budgeting and Value Engineering exercises account for the entire life cycle impact of investing in Environmental Sustainability initiatives.
- If necessary, offer Value Engineering options to align with budget constraints, without compromising the Environmental Sustainability objectives and goals.

Project Design Team

- Review the 'Estates Environmental Sustainability Guide' to confirm the clarity and applicability of its requirements. If necessary, suggest any required deviations.
- From the early design stages, integrate the environmental sustainability requirements clearly into the project designs and documentation, to ensure that the building's design and construction align with the objectives outlined in the 'Estates Environmental Sustainability Guide'.
- Produce and present documents and required evidence as specified in the 'Information Exchange' section for each RIBA stage.
- Work collaboratively with Stakeholders and Contractor Team, to ensure that all parties involved in the project are committed to and understand the sustainability objectives and goals.
- Confirm the Design Team's Scope of Services for tasks and responsibilities associated with Environmental Sustainability.
- Ensure that the building design complies with relevant environmental legislation and building regulations, and meets the requirements set in the 'Estates Environmental Sustainability Guide'.
- Evaluate discipline-specific requirements of the sustainability assessment -such as Passivhaus- to identify compliance risks, and explore additional opportunities.
- Conduct site inspections to confirm that construction is consistent with design specifications, ensuring that he building achieves the intended Environmental Sustainability objectives and goals.

Project Construction Team

- Evaluate targeted Environmental Sustainability requirements along with specifications and contractual documents, to verify practical feasibility.
- Manufacture, construct and commission the

building to meet the objectives and goals outlined in the 'Estates Environmental Sustainability Guide'.
- Commission all the equipment required for monitoring the Environmental Sustainability objectives.
- Compile construction stage information required for certification and submit evidence to ensure that the building complies with relevant environmental legislation and building regulations, and meets the requirements set in the 'Estates Environmental Sustainability Guide'.
- Identify and communicate risks, and propose alternative opportunities. Any deviations from the Environmental Sustainability objectives must be reported and mitigated.
- Ensure that environmental sustainability goals and objectives are maintained in the case of product substitutions or design modifications.
- Develop and deliver a Commissioning Plan & Programme. Engage a Specialist Commissioning Manager early in the design process to manage complex building services and systems.
- Create a Building Manual prior to Handover, setting out the Sustainability Strategies.

Sustainability Champion

- Should be appointed by the Client no later than RIBA Stage 2 for new build/major refurbishment projects.
- Monitor and report on the project's progress towards achieving the predetermined Environmental Sustainability goals, objectives, and targets across all RIBA Stages.
- Provide advice to ensure that the project adheres to the University's Sustainability requirements and any applicable statutory regulations.
- Actively identify risks and opportunities that could impact the achievement of the agreed objectives and targets.
- Seek additional opportunities for exemplary practice or innovation.
- Encourage the Project Team to enhance environmental sustainability in both design and construction phases.
- Provide feedback and guidance to support the Project Team in implementing corrective actions and reaching the environmental sustainability targets.
- Organise Sustainability Workshops and provide regular written updates.
- Monitor, evaluate, and coordinate the creation of documentary evidence to confirm the implementation of sustainable design strategies.
- Gather and submit data for verification, when necessary.
- Manage the formal certification process, if required.

Whole Life Carbon Assessor

- Should be appointed at Stage 2 for new build/major refurbishment projects.
- Conduct a Whole Life Carbon Assessment (WLCA) following the RICS PS vs2 Standard.

Energy Assessor

- Should be appointed at the same time/ alongside the MEP Consultant for new build/major refurbishment projects.
- Calculate predicted in-use performance to ensure that Operational Targets can be met, and advise on any necessary design modifications to meet these thresholds.
- Conduct Energy Modelling as part of the Operational Energy Strategy of the project, in alignment with the recommendations in this document.
- Review MEP specifications and highlight any potential risks.
- Perform additional modelling tasks, such as daylighting and overheating analysis, as required.
- Provide energy consumption data to the cost consultant for Life Cycle Cost (LCC) analysis, where relevant.
- Offer recommendations to the Project Team on sustainable energy practices, and identify innovative solutions to reduce operational carbon emissions.
- Explore further opportunities for exemplary practices or innovation in energy use and sustainability.

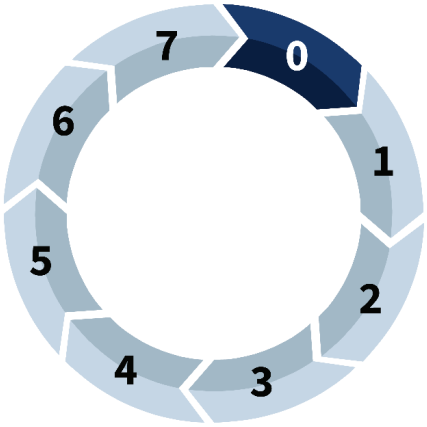
Further Specialists

- Depending on its scope, the project might require the incorporation of additional specialist consultants to achieve the Environmental Sustainability objectives and compliance with any relevant statutory requirements.
- Potential specialists might include an ecologist, transport consultant, acoustician, etc.



4.0 PROJECT MANAGEMENT PROCESS

4.1 Stage 0 - Strategic Definition



0 Strategic Definition

Core Objectives

To define the University's Sustainability Vision and core Sustainability Goals of the project, and capture them in the Business Case and Strategic Brief (PDPM-0K).

Overview of Stage 0

As explained in the RIBA Job Book, Stage 0 marks the initial phase in which the Client initiates a project by transforming an initial idea or problem into a defined concept with a Strategic Brief and a Business Case (PDPM-0K).

This stage primarily focuses on analytical and exploratory activities aimed at making strategic decisions and capturing them in the Business Case, rather than delving into design or practical details. Key tasks in this stage involve defining the project purpose and key required outcomes, considering alternative pathways to meeting those objectives, their pros and cons, project risks and project budget for a range of options (PDPM-0B/0C/0D). Where necessary, carrying out site appraisals, before undertaking a comparative analysis and recommending and ratifying the best option to deliver the University's Requirements. To do this, it is essential that lessons are learnt from previous projects.

As described in the 'RIBA Stage Guides: Briefing', the Stage 0 analysis process will almost always include four main tasks, which may vary in scope, duration and significance, depending on the specifics of the project. These activities listed in their usual sequence of execution are: forming a Vision, developing a Business Case, appraising the Site, and drafting a Strategic Brief. It is important to acknowledge that these tasks may not proceed linearly, and could require multiple iterations to reach the optimal solution.

Therefore, Stage 0 is the time to ensure that the Client Team understands the nature of sustainable approach, and its implications for the Business Case and the Strategic Brief (PDPM-0H). If a shared understanding of a sustainable approach is not adopted at this stage, then it will be difficult and expensive to introduce it later, and much less likely to succeed. Too little ambition may have a negative impact, as lost opportunities to protect against rising operating costs will become increasingly apparent over time.

At this initial stage only the Client Team is involved. All decisions that impact the building's Environmental Sustainability or Net Zero strategy shall be made in consultation with the University's Estates Net Zero Team.

Stage 0 Core Tasks Checklist

Learning from previous projects (CT)

- ☐ Evaluate lessons learnt from at least 5 exemplar projects from the Higher Education sector or similar use (within the UK or international).
- ☐ Undertake a workshop -or other consultative assessment process- to evaluate these exemplar projects and brainstorm the University's requirements. This will help identify the strategic outcome required to formulate the project's sustainability goals and define the critical success factors.
- ☐ Revisit previous University of Edinburgh projects to understand success/failure factors and performance gaps.

- ☐ Review information related not only to building performance, but also any other knowledge acquired in relation to costs, programme, and risks, that had an impact on sustainability outcomes during their design and construction processes.

Sustainability Vision (CT)

- ☐ Ensure that the University's sustainability vision is integrated within the project's Business Case, and develop the Strategic Brief.

- ☐ The sustainability vision will consider aspects such as future-proofing, occupant's health and well-being, reputation, low maintenance, etc…

Business Case (CT)

- ☐ Develop and test the Business Case for different scenarios against the sustainability requirements, including a review of the project risks and project budget (PDPM-0E/0K).

- ☐ Consider Life Cycle Costs to identify the long-term financial impact of delivering the sustainability goals and objectives. Include how much it would cost to design, construct and operate, how it would be funded, what return it might produce once complete and over its useful life, the cost of disposal at the end of its life and any other factors that might influence the size, scope and affordability (PDPM-0B/0C/0D).

Strategic Brief (CT)

- ☐ Set a thoughtful and thorough Strategic Brief that includes long-term planning and future flexibility. This document must bring together the vision, options appraisal and Business Case into a concise document. It is both a report and a summary of the conclusions of Stage 0. It must summarise where the University is, where it would like to be and the routes to get there (PDPM-1A).

- ☐ Define the University's sustainability goals to establish what the University is seeking to achieve. These goals must be ambitious, unambiguous and measurable.

- ☐ Define initial sustainability objectives, targets and required accreditations using the guidance provided by the University's ESTS Tool, based on the unique aspects of each project (PDPM-0B/0C/0H). These will be confirmed by the Estates Net Zero Team, and will be included in the Initial Project Brief.

- ☐ Be explicit in the Strategic Brief on the reasons behind the sustainability goals, objectives and targets, and the corporate value these are anticipated to deliver, so that this value can be protected.

- ☐ Appoint a Specialist Consultant to assist in the formation of the sustainability requirements, if required (PDPM-0H/0I).

- ☐ Identify in the Brief the requirement for an external Sustainability Champion embedded within the integrated Design Team. Its role and responsibilities will be clearly defined in the Matrix of Responsibilities and Scope of Services (PDPM-0I).

Outcome

By the end of Stage 0 the University requirements must be clearly identified, the subsequent resolution of these explored, and potential options defined (PDPM-0B/0C).

Therefore, at the end of this stage the sustainability strategies relevant to the University's sustainability vision and goals will be defined into the Business Case and the Strategic Brief, including ambitious and unambiguous targets. This must be signed off by the University, and fully committed to by the Project Team (PDPM-0K).

The requirement for a Sustainability Champion must be considered (PDPM-0I).

Site Appraisals (CT)

- ☐ Undertake Site Appraisals and identify sustainability opportunities and constraints of potential sites and building assets (PDPM-1F/1H).
- ☐ Define any opportunities and limitations that may influence the sustainability goals and objectives. This might include recognising contractual incentives and/or technology grants, or funding to increase the inclusion of technologies that will benefit the project sustainability objectives.
- ☐ Contemplate the calculation of costs and whole-life carbon emissions for both new-build and refurbishment options, to acknowledge whether it is recommended to reuse or refurbish buildings instead of new-builds.
- ☐ Examine any opportunities to recover materials and products on site (or from another site) for reuse. Similarly, the possibility to share materials or products for onward reuse, where they cannot be used on this site, shall be taken into consideration.
- ☐ Follow the Net Zero Carbon & Sustainability Site Appraisal Checklist (Appendix 3, LETI Client Guide for NZC Buildings) to support this task.

Existing Estate and Infrastructure (CT)

- ☐ Identify opportunities and risks associated to the existing energy infrastructure and new technologies. The Energy Masterplan, together with the Building Services Condition/Compliance Registers will be analysed for this purpose (PDPM-0J).

Leadership Responsibilities (CT)

- ☐ Ensure that the professionals with the appropriate experience and skills are put in place to help deliver and understand the University's sustainability vision, supported by the necessary and appropriate financial, legal, technical and design-related advice.
- ☐ The University leadership has a role in ensuring that the work is moving in the right direction, and that the University is clear in terms of its evolving vision.

Policies and legislation (CT)

- ☐ Identify relevant, current, and emerging global, European, national and local sustainability-related policy and legislation.
- ☐ Contextualise the project within the relevant and current University of Edinburgh's policies and strategies, such as its Strategic Plan 2030, Regenerative Sustainability Strategy, Estates Strategy, Social and Civic Responsibility Plan, Energy Masterplan, Sustainable Travel Plan, Zero Waste Policy, etc. (PDPM-0J).

Information Exchange at the end of Stage 0

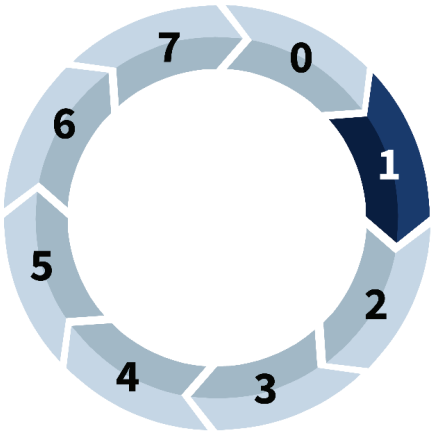
☐ **Business Case**	Based on well-defined and solid **sustainability vision, goals and objectives**, and **Site Appraisal.**
☐ **Strategic Brief**	Based on high-level, ambitious, unambiguous and measurable **environmental sustainability targets** and a clear **Business Case**.

Important note: Information/documents highlighted in **Red** *will be provided by the Design Team, external consultants, etc... Information/documents pointed out in* **Blue** *will be developed by the Client Team.*

End-of-Stage 0 Checkpoints

1. Ensure that a strategic review of the University's needs and potential sites has been carried out, including reuse of existing facilities, building components and materials, Energy Masterplan requirements, and that these have been considered in relation to the project programme and project budget. This will enable the stage to result in a well-defined Strategic Brief incorporating both qualitative and quantitative aspects.
2. Make sure that the Project Team has been adequately briefed about the University's environmental sustainability vision, goals, and requirements.
3. Identify the need for an external Sustainability Champion.
4. Explore sustainable public and private finance options.
5. Explore initial environmental sustainability targets and any sustainability accreditation aspirations using the ESTS Tool.

4.2 Stage 1 - Preparation and Briefing



1 Preparation and Brief

Core Objectives

1. To develop well-defined, ambitious and measurable sustainability objectives and targets, and incorporate these into the Initial Project Brief (PDPM-1A/1I).

2. The project budget, programme, procurement route and design process capable of delivering the sustainability objectives need to be established, and a Project Team with the appropriate resources, skills and commitment assembled (PDPM-1Q).

Overview of Stage 1

During Stage 0, the sustainability vision and strategies should have been defined, and it will be in Stage 1 when the sustainability objectives will be developed and incorporated into the Initial Project Brief, along with methods for measurement.

It is important to recognise that Stage 1 is not a design stage. Instead, its purpose is to add depth and specific requirements to the Brief in preparation for the design phase, which commences in Stage 2. Stage 1 provides a critical opportunity to assess the implications of the Sustainability Objectives concerning the overall project process, timeline, and budget (PDPM-1I).

A multidisciplinary Project Team, equipped with the appropriate skills and mindset, will be necessary to address the sustainability goals effectively (PDPM-1F).

At this stage, involvement is generally limited to the Client Team. Decision-making regarding the building's environmental sustainability strategy will be conducted in collaboration with the University's Estates Net Zero Team, BSG, SRS, and any other required Stakeholders, to ensure comprehensive alignment with the wider University's sustainability vision.

Stage 1 Core Tasks Checklist

Stage 1 Sustainability Consultation (CT)

☐ The Project Manager shall arrange a Sustainability Consultation as soon as possible in Stage 1. From this, a report will be produced that will, as a minimum:

1. Identify the sustainability related roles and responsibilities within the Project Team for each RIBA stage.
2. Confirm sustainability objectives and targets.
3. Discuss potential for low carbon and/or renewable energy systems.
4. Discuss which grants/funds might be available for energy/carbon saving technologies.
5. Agree on requirement for Environmental Sustainability/Health and Well-being accreditations.

Initial Project Brief (CT)

☐ Re-evaluate the sustainability goals, objectives and targets inherited from Stage 0, using any new information available. Ensure these are clearly articulated, ambitious and quantifiable, and integrate them into the Initial Project Brief.

☐ Develop a site-specific sustainability strategy, and include it in the Initial Project Brief.

- ☐ Evaluate current assets, analyse space usage data, and employ flexible design strategies through scenario planning to optimise space efficiency. Engage stakeholders to refine space utilisation strategies as necessary.

- ☐ Document all decisions and justifications to maintain transparency, and conduct reviews at each stage to adjust to evolving requirements.

Sustainability, Project Budget and Programme (CT)

- ☐ Ensure that, where there are any increases in capital costs due to environmental sustainability considerations, these should offer quality and/or long-term cost benefits. Alternatively, there may be longer term drivers for high sustainability objectives resulting from a University commitment to ethical standards, an early identification of local issues, or because they are necessary to meet the conditions of a specific certification scheme (PDPM-1I/1L).

- ☐ If properly understood and managed, sustainable design and construction need not have adverse implications for the project programme or project budget. However, failure to fully assess options at an early stage may require iteration in later stages to fully address the sustainability objectives and prevent opportunities being missed, with time and cost implications.

- ☐ The Project Team must take into account factors such as: the schedule for acquiring specialist materials, any physical, operational, or planning limitations, identifying stakeholders needs, addressing natural habitats and breeding cycles during construction, the necessity for formal sustainability evaluations, and any planning conditions or commitments associated with the site.

- ☐ Agree the building lifespan with attention to future-proofing and preferably with a commitment to design for deconstruction at the end of its useful life (PDPM-1C).

Environmental Accreditation (CT)

- ☐ Discuss and agree with the University's Estates Net Zero Team any sustainability accreditation or assessment method to be used. Early input from a Specialist Consultant might be required.

- ☐ Consider and agree the appointment of relevant and nessesary external assessors (PDPM-1E).

- ☐ Contemplate the impact of information exchange requirements and additional scopes of work (e.g. community consultation), the need for specialist surveys (e.g. biodiversity, airtightness, thermal imaging, transport etc), and any required third party validation. The timing of these may be critical.

Stakeholder Consultation (CT)

- ☐ Arrange effective consultations with relevant stakeholders and building users -as per the University's T18- to inform and influence the Initial Project Brief, and reduce risks (PDPM-1B/1G).

Outcome

By the end of Stage 1, a site-specific sustainability strategy must be included in the Initial Project Brief (PDPM-1A). It must be verified that the sustainability strategy can be accommodated on the site, along with methods for measurement, and the Brief will be signed-off by the University.

The sustainability targets should be well-defined, ambitious and measurable, and should have been shared across the Project Team and agreed (PDPM-1I).

Requirements for Post Occupancy Evaluations, Handover, Commissioning and Aftercare must have been defined by the University. All parties shall have these services included in their Schedule of Services and Matrix of Responsibilities.

Statutory Processes

Pre-Planning

Local authority planning requirements for energy targets must be checked.

The impact on the local environment must be adequately assessed and considered in the project objectives. This may take the form of a statutory Environmental Impact Assessment (EIA) or be undertaken voluntarily to address best practice aspirations.

Consultation at this early stage with local, statutory and utility authorities and non-departmental environmental and community organisations and public bodies can highlight issues such as environmental standards, local environmental initiatives and collaborations that might provide valuable information and prevent abortive work.

LHEES shall be reviewed to understand any zoning applicable and any local heat or energy sources.

Existing Estate and Infrastructure (CT)

- ☐ Identify potential opportunities and risks for synergies within existing and future buildings and infrastructure (PDPM-1H).

Procurement Checklist (CT)

- ☐ Determine which procurement route to use, taking into consideration aspects such as quality and as-built performance. How these will affect the ability to manage the sustainability objectives, and how the design and tender procedures could affect the delivery of the sustainability targets must be acknowledged (PDPM-0I).
- ☐ Appoint a Design Team with the necessary multidisciplinary design skills as required by each specific project. Evidence of skills in required areas and design experience to demonstrate this shall be provided in the tendering process (PDPM-1E).
- ☐ Specify the project category and required sustainability assessment method -as indicated in the ESTS Tool- in the consultant's Invitation to Tender.
- ☐ Include quality checking on-site and post-construction testing in the chosen procurement route and appointment documents.
- ☐ Include in the Schedule of Services of the Design and Construction Teams the handover strategy, commissioning check, post-completion services and POE requirements.
- ☐ Embed within relevant contractual documents -and not treated as optional- the Design and Contractor Teams sustainability obligations.
- ☐ Produce in Stage 1 the Schedule of Services and Responsibility Matrix. These core project documents must be fine-tuned in later stages, to ensure that there are no design responsibility ambiguities or omissions in later stages. Their purpose is to bring clarity and ensure that everyone is aware of what they must do and at which stage.
- ☐ Clearly state sustainability targets, including the process required to scrutinise progress and achievement at each RIBA stage.
- ☐ Commission relevant specialists to support the delivery and evidencing of the sustainability strategies. These may include, depending on the project requirement: sustainability champion, whole life carbon assessor, energy assessor, airtightness champion, registered ecologist, transport engineer, life cycle costing assessor, acoustician, etc.

Information Exchange at the end of Stage 1

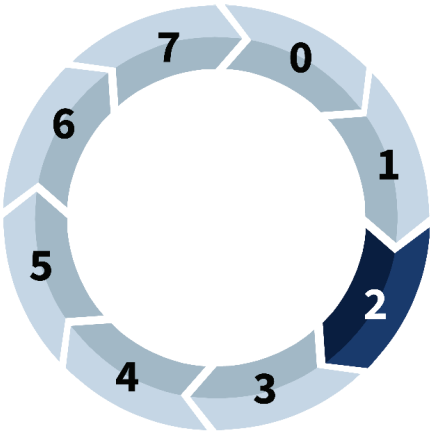
☐ **Initial Project Brief**	Well-defined, ambitious and unambiguous **Initial Project Brief** describing sustainability goals, objectives and targets.
☐ **Feasibility Studies**	Any required **Feasibility Study** to test sustainability objectives in a specific site.
☐ **Site information**	Any **Site Information**, including **Site Surveys** to meet sustainability objectives or assessment procedures, such as ecological surveys, building services survey, or existing building energy data.
☐ **Cost Plan**	**Project Budget** that includes the impact on cost of sustainability goals and objectives.
☐ **Project Programme**	**Project Programme** that takes into consideration the implications of the sustainability goals and objectives.
☐ **Procurement Documents**	Well-defined and unambigious **Scope of Services** and **Matrix of Responsibilities**, establishing sustainability responsibilities for each Design Team member. Incorporate clear responsibilities of Sustainability Champion/ Advisor.
☐ **Preliminary WLC Plans**	Stage 1 **Preliminary Energy Modelling Roadmap**. Stage 1 **Preliminary Embodied Carbon Management Plan.**
☐ **Minutes**	Stage 1 **Sustainability Consultation Minutes.**
☐ **Other/ If applicable**	Any further Sustainability material related to Information Requirements.

Important note: Information/documents highlighted in **Red** *will be provided by the Design Team, external consultants, etc... Information/documents pointed out in* **Blue** *will be developed by the Client Team.*

End-of-Stage 1 Checkpoints

1. Confirm that formal sustainability goals, objectives and targets are stated in the Initial Project Brief.
2. Confirm that environmental sustainability and health and well-being requirements, building lifespan and future climate parameters are stated in the Initial Project Brief.
3. Early-stage consultations, surveys and/or monitoring should have been undertaken as necessary to meet sustainability criteria and assessment procedures.
4. Check that the principles of the handover and commissioning strategies, post-completion services and POE requirements are included in each party's Schedule of Services and Responsibility Matrix.
5. The appointment of required Sustainability Specialist roles should be agreed at the end of Stage 1.
6. Establish environmental sustainability targets and identify if there will be sustainability accreditation aspirations using the ESTS Tool.

4.3 Stage 2 - Concept Design



2 Concept Design

Core Objectives

1. To develop a Concept Design that fulfils the University sustainability vision and goals, with sufficient detail and analysis to ensure its feasibility (PDPM-20).

2. The sustainability goals and objectives outlined in the Initial Brief must be re-examined, and any deviations from the Initial Brief must be agreed upon and documented in the Final Brief (PDPM-2G).

Overview of Stage 2

Stage 2 establishes the Architectural Concept for a project. The location and nature of the project is known at the beginning of this stage, and through an iterative process, the Design Team will develop one or more early stage proposals that meet the Initial Brief and the sustainability goals.

The sustainability strategy of those proposals must be tested against all aspects of the Initial Brief to determine if they will deliver the project goals, by considering factors such as operational energy, embodied carbon, thermal comfort, daylight and visual comfort and the use of healthy materials. They will also pay attention to the local environment, alongside seasonal usability, long-term management and maintenance, cost, programme, and buildability.

A fully integrated approach that implements the sustainability strategy as an integral part of the design is critical. The Project Team should be open to innovative solutions that could enhance the University's sustainability vision.

The composition of the Project Team may vary due to different procurement and contractual choices (PDPM-2A/2B). At the beginning of this stage the Design Team must have been appointed (PDPM-2C).

Stage 2 Core Tasks Checklist

Concept Design Proposal (DT)

- ☐ Develop the Concept Design proposal with integrated sustainability goals and objectives, incorporating strategic engineering requirements and aligned to cost plan, programme, project strategies and outline specifications (PDPM-2F/2G). This process requires iteration and constant evaluation and exchange within the wider Project Team. The different disciplines will also need to operate in a multidisciplinary manner to ensure a fully integrated approach in the delivery of the Sustainability Strategy.

- ☐ Agree the route to Building Regulations compliance, especially with regards to Sections 3, 6 and 7 of the latest versions of Building Standards Technical Handbook.

- ☐ Undertake environmental sustainability consultations with the Client Team and Stakeholders (PDPM-2D).

Project Brief (DT + CT)

- ☐ Test and review the Sustainability goals and objectives defined in the Initial Brief. The conclusions will be used to produce the Final Brief (PDPM-20).

- ☐ Explore, report and agree any deviation from the sustainability objectives and targets. All deviations will be included in the Project Brief Derogations section.

Information Management (CT)

- ☐ Ensure that the Design Team is provided with the information and requirements concerning occupancy, room layouts, equipment, processes, plant and other installations, etc. (PDPM-2E).

- ☐ Properly record all this information in the Final Brief and review it with the Design Team.

Stage 2 Sustainability Consultation (CT)

- ☐ The Project Manager will schedule a Sustainability Consultation to take place early in Stage 2. From this a report will be produced, which will include as a minimum:

    1. Revision of sustainability related roles and responsibilities within the Project Team for each RIBA stage.
    2. Confirmation of sustainability objectives and targets.
    3. Overview of discussions regarding methods for measuring and verifying sustainability objectives and targets.
    4. Summary on discussion on proposed sustainability strategies, and any challenges identified and potential solutions proposed.
    5. Summary of discussion on results from initial sustainability assessments or audits.
    6. Information on funding opportunities for energy/carbon saving technologies.
    7. Agreement on requirements for environmental sustainability/ health and well-being accreditations, if applicable.

Procurement Checklist (CT)

- ☐ Embed the Design and Contractor Teams sustainability obligations within relevant contractual documents. These must not treated as optional (PDPM-2A).

- ☐ Review the roles and responsibilities within the Project Team, and identify any modifications to the Schedule of Services that might be required (PDPM-2A).

- ☐ Review and fine-tune the Responsibility Matrix and its sustainability related content at the end of Stage 2, to ensure that there are no design responsibility ambiguities or omissions at later Stages (PDPM-2C).

- ☐ Consider the appointment of further environmental sustainability consultants and specialists, if required, (PDPM-2C).

- ☐ Undertake consultations with relevant University representatives and Stakeholders, to inform and influence the Concept Design (PDPM-2D). Specifically consult with Stakeholder teams on future maintenance roles and responsibilities.

Outcome

By the end of this stage, the University will sign-off the Project Concept Design, which integrates the sustainability strategy to meet the sustainability objectives, and the Final Brief (PDPM-2M). The Sustainability Targets will be incorporated into the Outline Specification, Cost Plan and Programme.

Statutory Processes

Pre-Planning

Pre-planning application advice will be pursued from a planning advisor, if applicable (PDPM-3G).

Sustainability targets that align with the local area must be identified, to enable easier consultation and planning.

If appropriate, an Outline Planning Application should be submitted. Local Planning Authorities may have sustainability requirements, such as enhanced regulatory requirements or assessment methods (PDPM-2F).

The Pre-Planning Application Report/ Outline Planning Application will be produced by the Design Team.

Information Exchange at the end of Stage 2

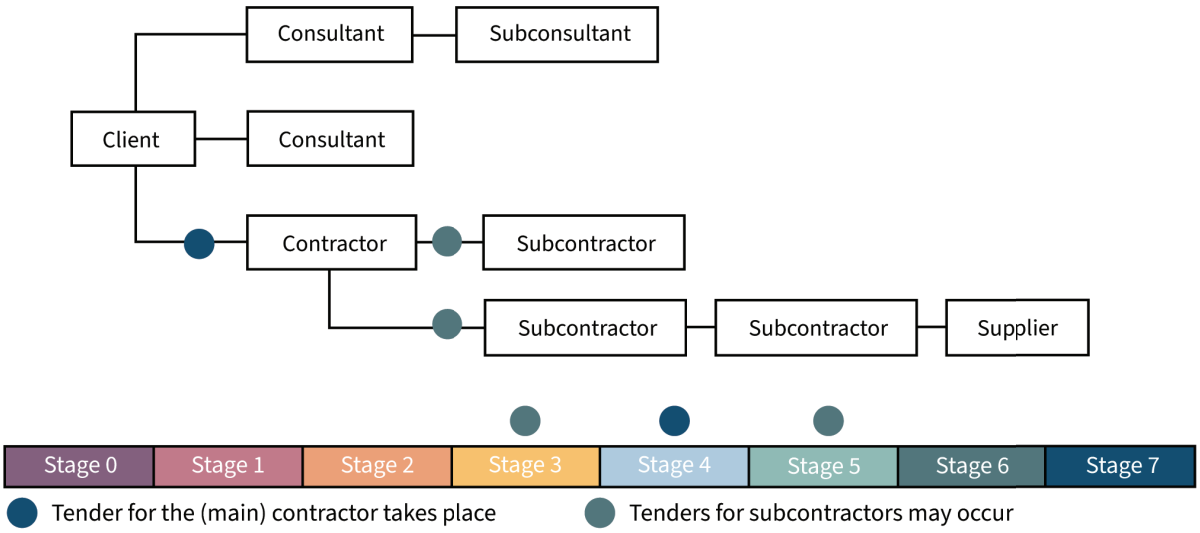
☐ **Stage 2 Sustainability Report**	Covering all aspects of the sustainability strategy within the Concept Design proposal. It must include: 1. The **Stage 2 Concept Design Phase Whole-life Carbon Assessment**. 2. Reviewed and updated **Embodied Carbon Management Plan** must be provided. 3. An **Operational Energy Report** that clearly describes how the preliminary model was carried out, all the input data and confidence levels, plus results from all the sensitivity tests and scenarios run with comparison against targets. The revised **Energy Modelling Roadmap, CIBSE TM54 Implementation Matrix** and **Risk Assessment** must be included. 4. Preliminary **CIBSE TM52/TM59 assessment**. 5. Preliminary **Daylight Analysis Report**. 6. Project-specific **LZCT's Feasibility Study** to understand benefits and constrains associated to the implementation of different LZCT's systems.
☐ **Final Project Brief**	Fully developed, with well-defined **sustainability objectives and targets** and agreed **derogations** from the Initial Project Brief.
☐ **Site information**	Including **site surveys** to meet targets or assessment procedures such as ecological surveys, building services survey, existing building energy data.
☐ **Outline Specification**	With corresponding sustainability related information.
☐ **Cost Plan**	Revised, with **Initial LCC Plan Report** and necessary information to ensure that the budget accounts for the sustainability strategies to be implemented.
☐ **Procurement Documents**	If required, review and fine-tune **Matrix of Responsibility** and **Scope of Services** regarding Sustainability related information.
☐ **Minutes**	Stage 2 **Sustainability Consultation Minutes.**
☐ **If applicable**	**Pre-Demolition Audit** and **Resource Management Plan**.

Important note: Information/documents highlighted in **Red** *will be provided by the Design Team, external consultants, etc... Information/documents pointed out in* **Blue** *will be developed by the Client Team.*

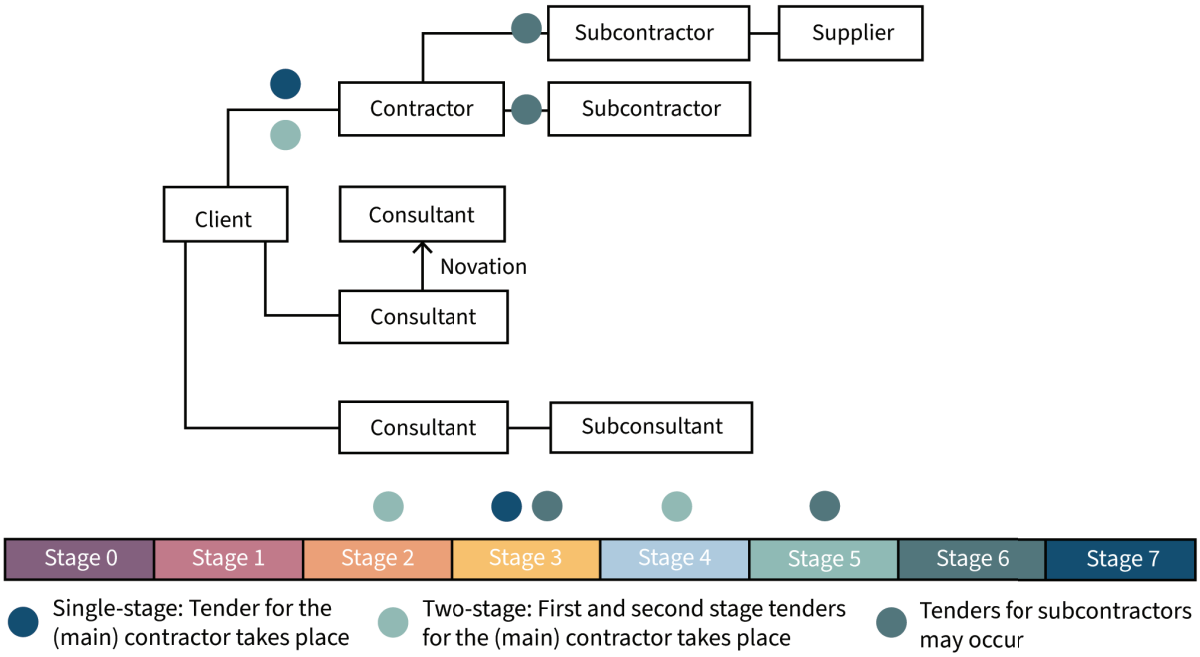
End-of-Stage 2 Checkpoints

1. Formal sustainability pre-assessment and identification of key areas of design focus should have been undertaken, and any deviation from the sustainability objectives must have been reported and agreed.
2. Preliminary Section 6 Assessment for the Concept Design Proposal must have been carried out.
3. Clear descriptions of internal environmental conditions and seasonal control strategies and systems shall be provided.
4. Environmental impact of key materials must have been checked.
5. Critical aspects of integrated design shall be captured in the Change Control Procedures.
6. Resilience to future extreme weather events as a result of climate change must have been considered.
7. Consult with stakeholder teams on future maintenance roles and responsibilities.

Traditional Procurement Method



Design-Build Procurement Method



Management Procurement Method: Management Contracting variant

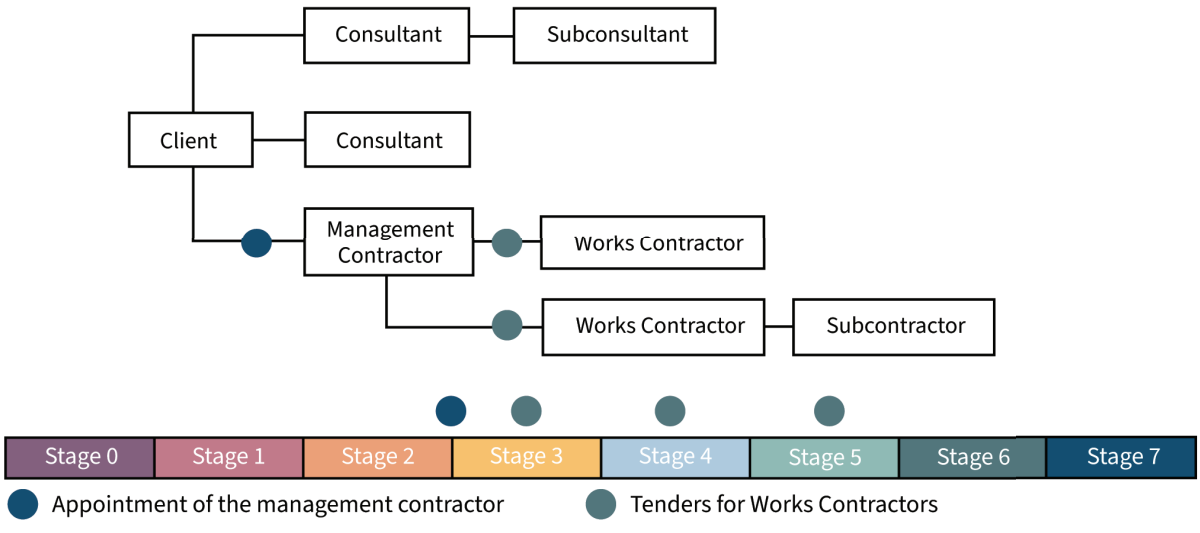
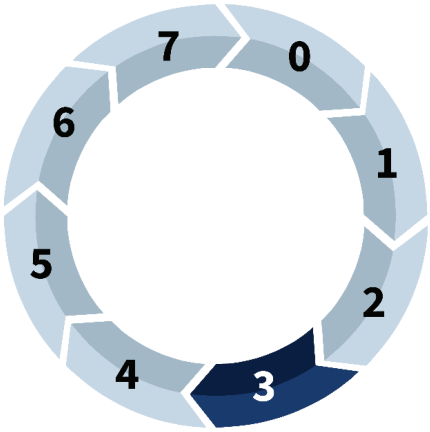


Figure 3.7 Traditional, Design-Build and Management Procurement Methods. Contractual relationships, tendering and RIBA Plan of Work 2020 stages. Adapted from Which Contract?, 6th edition, Sarah Lupton and Manos Stellakis, RIBA Publishing (2019).

4.4 Stage 3 - Spatial Coordination



3 Spatial Coordination

Core Objectives

To produce the Spatially Coordinated Design proposal that incorporates the sustainability objectives and targets aimed to achieve the agreed sustainability goals (PDPM-3P).

This entails a further developed and coordinated proposal, with the sustainability strategies embedded within the architectural and structural design, building services systems, outline specifications, and aligned with the project's cost and programme (PDPM-3C/3D).

Outcome

At the end of this stage, the Spatially Coordinated Design with integrated sustainability goals and objectives will be signed off by the University (PDPM-3P). The project shall be ready for submission to the local planning authority, and the key support tasks must be reviewed to ensure that any changes are addressed.

Overview of Stage 3

Stage 3 is fundamentally about testing and validating the Concept Design inherited from Stage 2, and to make sure that the proposal is spatially coordinated before the detailed information is produced at Stage 4.

The Final Project Brief is a fundamental document for the development of the proposal at this stage. The design must be regularly tested against the sustainability goals and objectives stated on the Brief, and both need to be considered a priority on the agenda of all Project Progress Meetings.

During Stage 3 the interdependence of the sustainability strategies should be fully understood by all Project Team members. Alterations in one aspect of the design can diminish the performance of the overall proposal. Therefore, it is essential that everyone involved collaborates in the delivery of the sustainability objectives.

The role of the Design Team is key at this stage, as will be explained in the Sustainability Themes described in Chapter 5. The University will be involved where client decisions are required for the development of the project.

If the selected procurement route requires early contractor or specialist subcontractor input, the Construction Team may also get involved.

Stage 3 Core Tasks Checklist

Spatially Coordinated Design Proposal (DT)

- ☐ Develop the Spatially Coordinated Design proposal with reviewed and integrated sustainability goals and objectives (PDPM-3F).
- ☐ Ensure that the proposal is aligned to cost plan, programme, project strategies and outline specifications. Iteration and constant evaluation and exchange within the Project Team will be critical (PDPM-3C/3E).
- ☐ The different disciplines will cooperate to ensure a fully integrated approach in the delivery of the sustainability strategies. An integrated design is vital since it will contribute to preventing overdesign, which increases capital and running costs.
- ☐ Undertake the design studies, engineering analysis and cost exercises required to test the proposal and enable evidence-based decision making (PDPM-3F).
- ☐ Address any requirement or consultation as part of any environmental/ health and well-being accreditation process, if applicable.
- ☐ Review the design proposal to ensure it is cost, energy, carbon and wellness optimised (PDPM-3K).

- ☐ Undertake sustainable design peer reviews with University and required stakeholders (PDPM-3A/3B).

- ☐ Check particular requirements concerning the life expectancy and maintenance of components, if required.

Final Brief (DT + CT)

- ☐ Review the Spatially Coordinated Design against the sustainability goals and objectives established in the Final Brief, to ensure that they have been met or exceeded (PDPM-3L).

- ☐ The Design Team shall raise as early as possible any risks that can impact the sustainability objectives and targets (PDPM-3D).

- ☐ Thoroughly explore, report and agree any deviations. These should be presented in the Project Brief Derogations section.

Information Management (CT)

- ☐ Ensure that the Design Team has the information and requirements concerning occupancy, room layouts, equipment, processes, plant and other installations, etc. This information should be properly recorded in the Final Project Brief and reviewed with the Design Team, if required (PDPM-3B).

Procurement Checklist (CT)

- ☐ Review roles and responsibilities within the Project Team, and identify any modifications to the Schedule of Services that might be required.

- ☐ Review the Responsibility Matrix and its sustainability related information to ensure that all areas of responsibility are clearly identified, removing ambiguity over who is leading each element and that no omissions take place.

- ☐ Ensure that Tender documents align with environmental sustainability, and health and well-being objectives and targets. Identify and communicate any risks to bidding Contractors.

- ☐ Establish the Contractor's required environmental sustainability skills/ability/approach as part of their selection criteria, if they haven't been appointed yet.

- ☐ Consider the need to appoint further sustainability consultants and specialists, if required.

- ☐ Embed the requirements for Soft Landings and Post Occupancy Evaluations (POEs) in the project's procurement strategy.

- ☐ Discuss with the Design Team and Cost Consultant the effect of major design decisions on the allocations within the Cost Plan before they are taken.

- ☐ Outline responsibilities under the building contract to ensure the required level of construction quality is achieved.

Statutory Processes

Planning

Following the University's approval of the Stage 3 Spatially Coordinated Design, prepare and submit detailed Planning Application, accompanied by supporting information such as Specialists Reports and Design, Access and Sustainability Statements (PDPM-4a3).

Positive environmental and sustainability attributes must be highlighted as key drivers in the Design Statement.

Depending on the Planning Authority requirements, the Sustainability Statement could include:

1. Audit of the Spatially Coordinated design against the sustainability strategy and project outcomes
2. Opportunities to reduce resource and waste use
3. Section 6 assessment and design stage carbon/energy declaration
4. Description of internal environmental conditions, seasonal control strategy and systems
5. A copy of the Stage Report, and more supplementary detailed reports if appropriate

Building Regulations

Review proposal against Building Regulations, especially in regard to Sections 3, 6 and 7 of the Building Standards Technical Handbook, and give special consideration to buildability.

Prepare preliminary Building Control Tracker to monitor and report updates on the Building Control application process.

Information Exchange at the end of Stage 3

☐ **Stage 3 Sustainability Report**	The **Stage 3 Sustainability Report**, which covers all aspects of the sustainability strategy within the Spatially Coordinated proposal. It must include: 1. Updated **Whole life Carbon Assessment** using the latest material/product choices and quantities in the Cost Plan, and the anticipated energy use over the building's life. 2. Reviewed and updated **Embodied Carbon Management Plan**. 3. The updated **Operational Energy Report** that clearly describes how the Operational Energy Model has been produced, all the input data and confidence levels, plus results from all the sensitivity tests and scenarios run with comparison against targets. The revised **Energy Modelling Roadmap**, and updated **CIBSE TM54 Implementation Matrix** and **Risk Assessments** must be included. 4. Updated **CIBSE TM52/TM59 assessment.** 5. Preliminary **Building Control Tracker** to monitor and report updates on the Building Control application process. 6. Preliminary **report to assure compliance with Section 6** of the Building Standards Technical Handbook. 7. Reviewed **Solar Exposure and Shading Analysis**. 8. Further developed **Daylight Analysis Report** with daylight simulation calculations. 9. Reviewed **LZCT's Feasibility Study**. 10. Preliminary **Report on Maintenance, Operational and Handover Strategies**.
☐ **Final Project Brief**	Fully developed **Final Project Brief** with well-defined sustainability objectives and targets, and agreed derogations.
☐ **Feasibility Studies**	Any required **Feasibility Study** to test sustainability objectives and targets in a specific site.
☐ **Site information**	Any **site information**, including **site surveys** to meet sustainability targets or assessment procedures, such as ecological surveys, building services survey, or existing building energy data.
☐ **Specifications**	**Outline specifications** with corresponding sustainability related information.
☐ **Cost Plan**	Revised **Cost Plan** and updated **Initial LCC Plan Report**, with necessary information to ensure that the budget accounts for the sustainability strategies to be implemented.
☐ **Procurement Documents**	If required, review and fine-tune the sustainability related information in the **Scope of Services** and **Matrix of Responsibilities**.
☐ **Minutes**	Stage 3 **Sustainability Consultations Minutes.**
☐ **Statutory Compliance**	Following Stage 3 approval, submit detailed **Planning Application** with supporting information, including Specialists Reports, Design, Access and Sustainability Statements.
☐ **Other/If applicable**	Latest version of the **Operational Energy Model**. Any further Sustainability material related to Information Requirements.

*Important note: Information/documents highlighted in **Red** will be provided by the Design Team, external consultants, etc... Information/documents pointed out in **Blue** will be developed by the Client Team.*

End-of-Stage 3 Checkpoints

1. Spatially Coordinated Design proposal with integrated sustainability goals and objectives has been produced and aligned to cost plan, programme, project strategies and outline specifications. Any deviation from the sustainability objectives and targets must have been reported and agreed.

2. Proposal has been reviewed against Building Regulations, especially with regard to Sections 3, 6 and 7 of the Technical Handbook.

3. The Whole-life Carbon Assessment must have been further developed and updated with the latest information available.

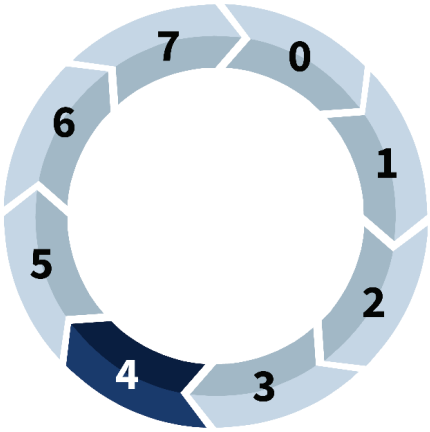
4. The design should have been reviewed to identify opportunities to reduce energy usage and waste.

5. Resilience to extreme weather events as a result of climate change should have been considered.

6. Planning application must have been submitted following the University's Stage 3 approval.

7. Requirements for Soft Landings and Post Occupancy Evaluations must have been embedded in the Procurement Strategy.

4.5 Stage 4 - Technical Design



4 Technical Design

Core Objectives

The core objectives for Stage 4 are:

- To complete the Technical Design information that is required to manufacture and construct the building, allowing for any overlap between Stages 4 and 5. The information must integrate the sustainability strategies aimed to meet the agreed sustainability objectives (PDPM-4a5/4a8/4b1), and will align with the project's cost and programme (PDPM-4a14/4b12).
- To clarify who is responsible for each and every item of the Technical Design.
- To develop a new Design Programme in order to ensure that the stage is completed in a timely manner.

Overview of Stage 4

Stage 4 involves the preparation of all Technical Design information that is required to manufacture and construct the building. This phase is crucial to ensure that the Spatially Coordinated Design and embedded sustainability strategies align with, or surpass, the sustainability objectives and targets established in the Final Project Brief. It is also the point when all statutory requirements are verified.

During Stage 4 technical details are produced, and effective communication, consolidation, and review processes among Project Team members are essential. Attention must be paid to key elements such as airtightness and thermal performance, as well as material specifications, to ensure that they have been thoroughly addressed and align with the sustainability objectives.

Looking forward to the completion of the project, it is important to outline the building handover, commissioning and post-occupancy strategies. This includes defining the roles and contractual responsibilities of all parties involved, and identifying any necessary technologies to be incorporated.

The consequences of any modifications to the design or specification must be thoroughly discussed and agreed. Change Control Procedures shall be in place to ensure a clear line of enquiry and information, to prevent disruptions to the project programme and stay within the project budget.

It is also critical to revisit the initial sustainability goals at this stage (PDPM-4a14). This helps remind the Project Team—and inform any new members—about the foundational reasons behind the agreed sustainability objectives and tagets, and the expected outcomes. Additionally, clear responsibility allocation for managing the sustainability strategy is critical.

Stage 4 Core Tasks Checklist

Technical Design Proposal (DT)

- ☐ Develop the Technical Design proposal with integrated sustainability strategies and objectives. The package will include all architectural, structural, civil, building services, further specialist consultants information, specialist sub-contractors design and final specifications (PDPM-4a8/4b1/4b2), allowing for any overlap between Stages 4 and 5. The level of detail to be included in the Information Exchange needs to be carefully considered.
- ☐ Ensure that the proposal aligns with cost plan, programme, project strategies and final specifications. Iteration, evaluation and exchange within the Project Team will be required (PDPM-4a14/4b1).
- ☐ Review all Design Stage sustainability related documents, to ensure that the latest information is complete and has been submitted.

- ☐ Revisit earlier stages of the project at Stage 4, to ensure everyone involved understands the rationale behind the sustainability strategies and objectives, and the implications of any changes to the design or specification (PDPM-4a14).

- ☐ Careful consideration must be given to key elements of the design, since these may be fulfilling multiple purposes. Consequently, Value Engineering based modifications at this stage -or later- need very careful consideration (PDPM-4a2).

- ☐ Ensure that the different disciplines cooperate to guarantee a fully integrated approach in the delivery of the sustainability strategy. An integrated design is vital, since it will contribute to preventing the overdesign and waste that increases capital and running costs.

- ☐ Address any requirement for consultation to be undertaken as part of any sustainability accreditation process, if applicable.

- ☐ Review the Technical Design proposal to ensure it is cost, energy and wellness optimised (PDPM-4a8).

- ☐ Undertake Sustainable Design peer reviews with Client and Stakeholders (PDPM-4a4).

- ☐ Update the Health and Safety Strategy, and organise any training required in the use of innovative materials or components with which the Project Team may be unfamiliar (PDPM-4a6).

- ☐ Include specific reference to the handover strategy, building management, controls and commissioning strategies, and to future monitoring. Identify and consult with the stakeholders responsible for all of these aspects.

Final Brief (DT + CT)

- ☐ Review the Technical design against the sustainability goals and objectives established in the Final Brief, to ensure that they have been met or exceeded (PDPM-4a14).

- ☐ The Design Team shall raise as early as possible any risks that can impact the sustainability goals (PDPM-4a15).

- ☐ Any deviation must have been thoroughly explored, reported and agreed. This should be presented in the Project Brief Derogations section.

Information Management (CT)

- ☐ Ensure that the Design Team has the latest information and requirements concerning occupancy, room layouts, equipment, processes, plant and other installations, etc. This information should be properly recorded in the Final Project Brief and reviewed with the Design and Construction Teams, if required.

Value Engineering (DT+CT)

- ☐ Evaluate the impact of different procurement routes on the outcomes

Outcome

By the end of Stage 4, sufficient information will have been produced to issue the Tender (PDPM-4b5), and demonstrate compliance with the various Building Regulation requirements (depending on the chosen procurement route).

The sustainability strategy and verified sustainability objectives shall be included in the Manufacturing and Construction Information, including final specifications, drawings and sustainability targets.

Statutory Processes

Planning

Develop any required additional design information to confirm specifics before implementing planning permission.

Submit an application to discharge any precommencement Planning Conditions (PDPM-4a3).

If necessary, produce and submit any applications for non-material or minor material amendments. A new Planning Application might be required if material amendments are implemented (PDPM-4a3).

Incorporate, as part of the Employer's Requirements package, a Planning Conditions Tracker.

Review Tender responses or Contractor's Proposals. Pay special attention to any suggested alternatives proposed to reduce costs that could go against Planning Conditions.

Building Regulations

Review and update Building Control Tracker to monitor and report updates on the Building Control application process.

Submit Building Regulations Application before work commences on site (PDPM-4a9).

Any carbon/energy declarations initiated at Stage 3 must be updated as part of a Building Regulations submission.

of value engineering. Ensure that the objective of Value Engineering -to achieve optimal value for the University while preserving the quality of the approved design- is maintained. (PDPM-4b7).

- ☐ Robust Change Control Procedures must be implemented at Stage 4 (PDPM-4a2), to systematically manage any changes in design or specifications. This approach is essential for minimising risks to the sustainable goals and objectives, and for effectively managing time and costs.

Maintenance and Operational Strategy (DT+CT)

- ☐ Plan for handover, commissioning, and post-occupancy building management to guarantee that the building functions as designed (PDPM-4b1).
- ☐ Agree all technical requirements necessary to support the monitoring strategy, including the data collection and analysis technologies. This includes ensuring compatibility with the project budget and clearly defining responsibilities and roles involved.
- ☐ The University Net Zero Team, BSG, building users, and facility managers, shall participate in consultations concerning building maintenance and operation. These sessions aim to ensure that procedures are thoroughly planned, cost-effective, and sufficient, while minimising environmental impact.
- ☐ Review the control systems to verify that they are suitable, user-friendly, and not excessively complicated. Where feasible, include facility managers and users in the evaluation of environmental control systems, both manual and automatic, to confirm their effectiveness for the intended purpose. Additionally, engage the eventual users or their representative in a discussion about the required contents of a simple, appropriate user guide.

Procurement Checklist (CT)

- ☐ The Procurement activities during this stage will depend on the procurement route determined. Different procurement routes will use differing approaches to producing and issuing tender information and communicating University requirements. Therefore, it is important to discuss the best route with the project management team to ensure that the sustainability requirements are understood and clearly set out (PDPM-4a13).
- ☐ Review roles and responsibilities within the Project Team in charge of delivering the sustainability objectives, and any modifications to the Schedule of Services that need to be implemented.
- ☐ Review the Responsibility Matrix and its sustainability related information, to ensure that all roles and responsibilities are clearly defined. It is essential to determine who is responsible for developing the Manufacturing and Construction Information and, whether the Design Team will produce Prescriptive or Descriptive Information (PDPM-4b3).
- ☐ The Cost Consultant will complete an provide an updated construction cost estimate, that is fully integrated with the Technical Design information (PDPM-4b10).

- ☐ Discuss with the Design Team and Cost Consultant the impact of major design decisions on the allocations within the Cost Plan before they are taken (PDPM-4b10).

- ☐ Ensure that the Tender package clearly communicates the sustainability targets, objectives and goals. Sustainability related risks shall be identified and communicated to bidding Contractors (PDPM-4b1).

- ☐ Embed the requirements for Soft Landings and Post Occupancy Evaluation in the project's procurement strategy.

- ☐ Define and clearly communicate the Contractor's required Environmental Sustainability skills and expertise, as part of their selection criteria.

- ☐ If required -and under some forms of procurement- appoint a monitoring team representing the University, to review the Tender information that has been produced.

- ☐ Consider the need to appoint any further sustainability consultants and specialists, if required.

Information Exchange at the end of Stage 4

☐ **Stage 4 Sustainability Report**	The **Stage 4 Sustainability Report**, which covers all aspects of the sustainability strategy within the Technical Design proposal. It must contain: 1. Updated **Technical Design Phase - Whole life Carbon Assessment** using the latest material/product choices and quantities used in the Cost Plan, and the anticipated energy use over the building's life. 2. Reviewed and updated **Embodied Carbon Management Plan**. 3. The updated **Operational Energy Report** that clearly describes how the Operational Energy Model has been produced, all the input data and confidence levels, plus results from all the sensitivity tests and scenarios run with comparison against targets. The revised **Stage 4 Energy Modelling Roadmap**, and updated **CIBSE TM54 Implementation Matrix** and **Risk Assessments** must be included. 4. Updated **CIBSE TM52/TM59 assessment.** 5. Updated **Building Control Tracker** to monitor and report updates on the Building Control application process. 6. Updated **report to assure compliance with Section 6** of the Building Standards Technical Handbook. 7. Reviewed **Solar Exposure and Shading Analysis**. 8. Reviewed **Daylight Analysis Report.** 9. Reviewed **LZCT's Feasibility Study**. 10. Stage 4 **Biodiversity Management Plan**. 11. Updated **Report on Maintenance, Operational and Handover Strategies**.
☐ **Final Project Brief**	Fully developed **Final Project Brief** with well-defined sustainability objectives and targets, and agreed derogations.
☐ **Feasibility Studies**	Any required **Feasibility Study** to test sustainability objectives in a specific site.
☐ **Site information**	Any **site information**, including **site surveys** to meet sustainability targets or assessment procedures, such as ecological surveys, building services survey, or existing building energy data.
☐ **Final Specifications**	**Final specifications** with corresponding sustainability related information.
☐ **Cost Plan**	Revised **Cost Plan** and reviewed **LCC Plan Report**, with necessary information to ensure that the budget accounts for the sustainability strategies to be implemented.
☐ **Procurement Documents**	If required, review and fine-tune the sustainability related information in the **Scope of Services** and **Matrix of Responsibilities**.
☐ **Minutes**	Stage 4 **Sustainability Consultation Minutes.**
☐ **Statutory Compliance**	Following **Planning Application** submission, discharge any precommencement Planning Conditions and submit any applications for non-material or minor material amendments, if required. Produce **Planning Conditions Tracker**.
☐ **Other/If applicable**	Latest version of the **Operational Energy Model**. Any further sustainability material related to Information Requirements.

*Important note: Information/documents highlighted in **Red** will be provided by the Design Team, external consultants, etc... Information/documents pointed out in **Blue** will be developed by the Client Team.*

End-of-Stage 4 Checkpoints

1. Produce Technical Design information with integrated sustainability goals, objectives, and targets, aligned to cost plan, programme, project strategies and final specifications. Any deviation from the sustainability objectives and targets must have been reported and agreed.

2. Building Regulations Application will be submitted, and any pre-commencement planning conditions will be discharged.

3. All outstanding Design Stage Sustainability assessment documents must have been further developed and updated with the latest information available.

4. Demonstrate compliance with the agreed sustainability strategy, objectives and targets for contributions by specialist subcontractors.

5. Review the implications of changes to the building design or specifications against the agreed sustainability objectives and targets. These must be captured in the Change Control Procedures.

6. Specify the building's handover, commissioning, and post-completion strategies.

7. Requirements for Soft Landings and Post Occupancy Evaluations must have been embedded in the Procurement Strategy.



5.0 KEY SUSTAINABILITY THEMES

5.1 Whole-Life Carbon Emissions

Rationale

Climate Change is recognised as one of the most significant global challenges of the 21st century, with GHG emissions from human activities being the dominant cause of global warming since the mid-20th century, as highlighted by the Intergovernmental Panel on Climate Change (IPCC).

Guided by its vision to make the world a better place, the University of Edinburgh is dedicated to playing an active role in tackling Climate Change, which is already causing profound disruptions that threaten biodiversity, human health, ecosystem productivity, and economic stability worldwide. To address this, the University's Regenerative Sustainability Strategy sets a clear path to achieve Net Zero Carbon by 2040, with the ultimate ambition of becoming Net Negative. This goal requires reducing direct emissions from the University's Estate to zero, or as close to zero as technically feasible.

The University acknowledges that transitioning to a Net Zero Carbon Estate delivers benefits far beyond climate mitigation. These advantages include reduced energy costs, enhanced energy security, regulatory compliance, increased asset value, improved public perception, future resilience, job creation, and better health and well-being for building occupants.

Achieving a Net Zero Carbon Estate requires minimising its Whole-life Carbon emissions, encompassing both the Operational and Embodied Carbon emissions associated with its buildings. As these two categories demand distinct considerations during the design and construction phases, they will be examined in detail in subsequent sections. Project teams are required to ensure that their approach to managing whole-life carbon aligns rigorously with both the University's Regenerative Sustainability Strategy and the Energy Masterplan to 2040.

To facilitate informed decision-making and enable the early identification of carbon reduction opportunities, the University recognises the critical importance of measuring carbon impacts across all life cycle stages of its buildings. Consequently, all major projects must undertake a Whole-life Carbon Assessment using the RICS PS Whole-life Carbon Assessment for the Built Environment (v2, 2023) methodology. This assessment must be integrated into project and cost planning from the outset, developed collaboratively by the entire Project Team, and maintained as a living document throughout the project life cycle.

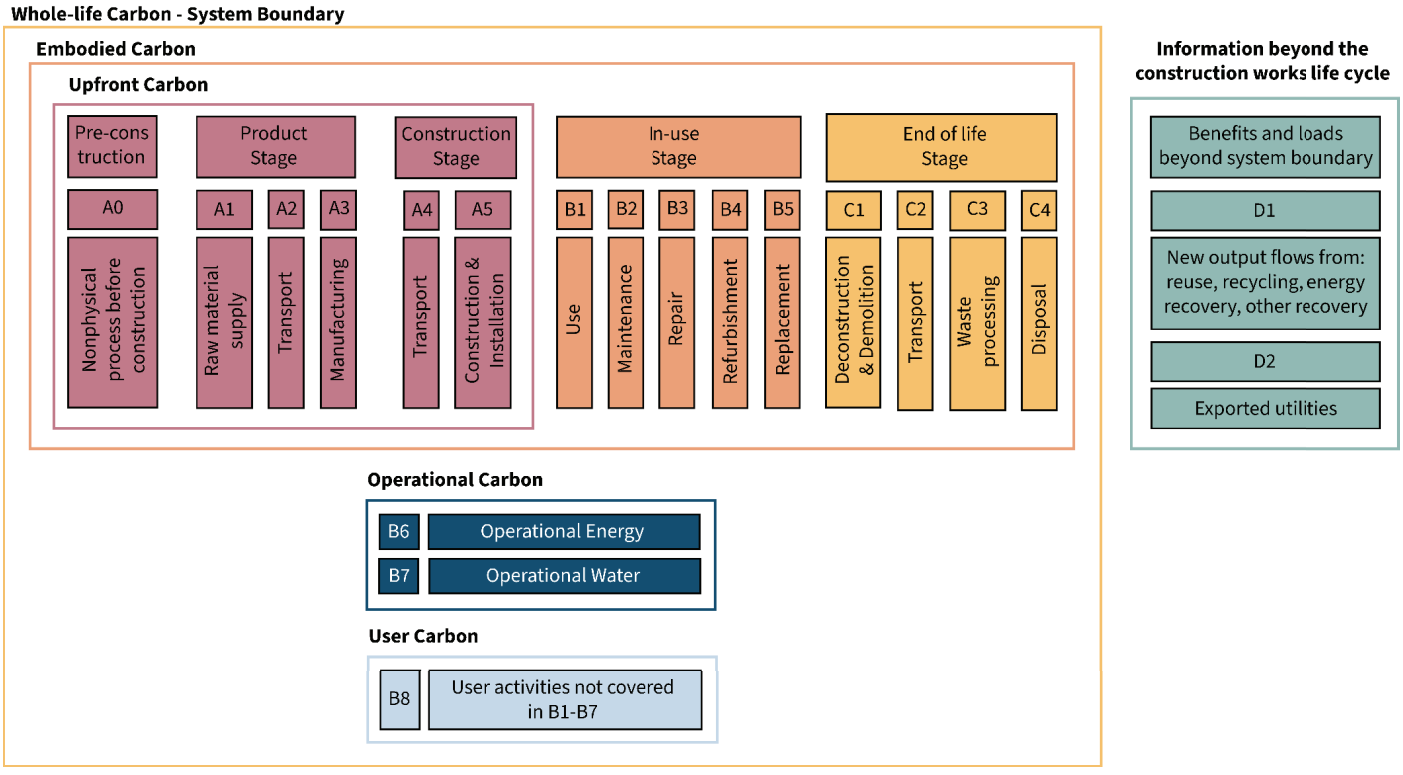
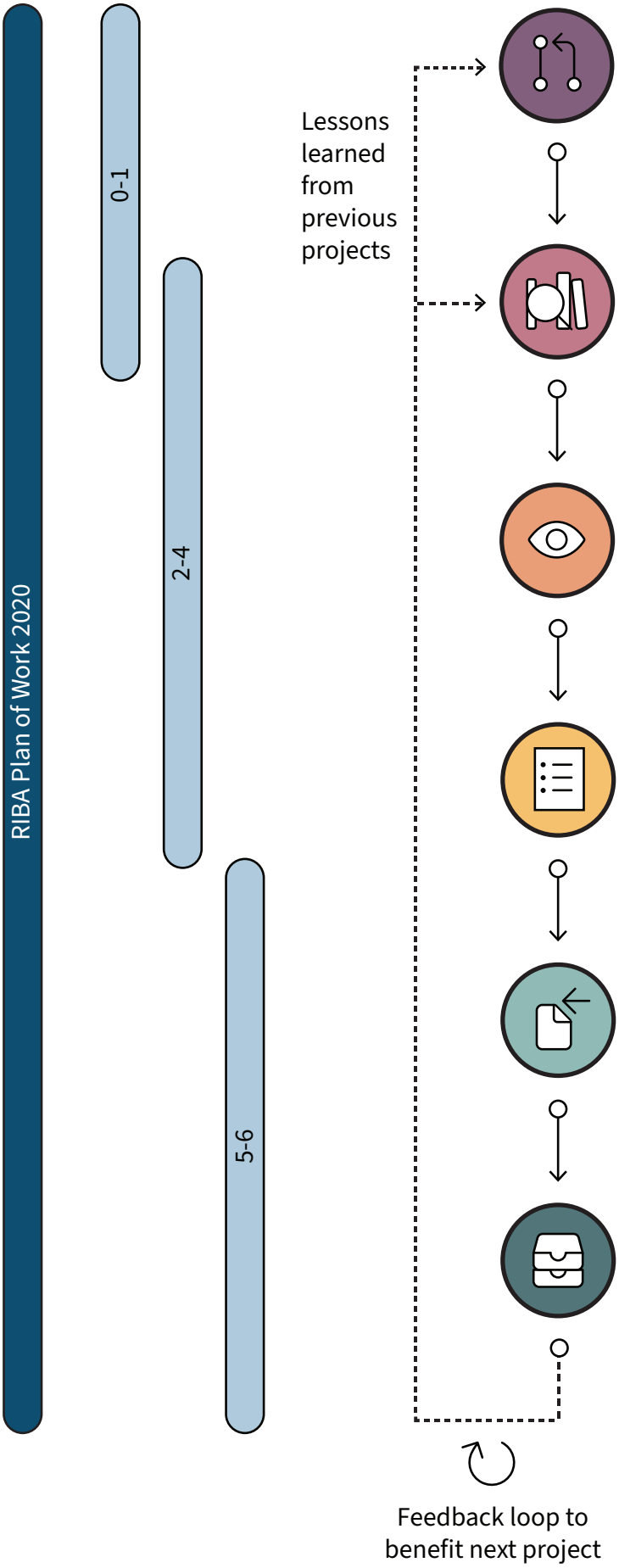


Figure 5.1 The life cycle stages. Source: adapted from RICS PS - WLC Assessment for the Built Environment, 2nd edition (in turn, adapted from EN 15978).

Successful Carbon Reduction Roadmap



Strategy

Client and Design Teams
Prepare whole life carbon reduction strategies at the earliest stage of the project to set project targets, key project dates for delivery of information and identify appropriate opportunities.

Research + Design

Client and Design Teams
Engage with manufacturers, contractors and relevant authorities to determine appropriate material, product and component selection based on performance and design requirements, whole life carbon impact and procurement implications.

Transparency

Design and Contractor Team and Manufacturers
Specify products and materials from manufacturers who can supply verified product declarations.

Requirements

Client, Design and Contractor Teams
Expand information to capture contractual criteria and targets relevant to reducing whole-life carbon such as GWP data provided in EPD, waste rate reduction, transportation and responsible sourcing. Include requirement to record procured and as-built carbon data.

Submittals

Contractor Team
Engage with contractors to ensure that relevant GWP data and whole-life carbon related information are included in the contractor's submittals.

Record

Client,Design and Contractor Teams
Obtain final as-built data to update whole-life carbon assessment of project. Project teams should identify at an early stage which party will be responsible for assembling this information. Record information for the O+M Manual. The collection of record information on carbon will benefit the Project Team as part of a feedback loop for future projects. In addition, any gaps that have occurred between design data and record data should be identified.

Figure 5.2 Successful carbon reduction roadmap. Source: adapted from the 'Low Embodied Carbon Specification and Procurement Guide', LETI (2023)

5.1 Whole-Life Carbon Emissions

5.1.1 Net Zero Embodied Carbon

Rationale

As described in the RICS PS 'Whole life carbon assessment for the built environment', the Embodied Carbon emissions of an asset are the 'total GHG emissions and removals associated with materials and construction processes, throughout the whole life cycle of an asset'. This is typically associated with any processes, materials or products used to construct, maintain, repair, refurbish and demolish a building.

Traditionally, the construction sector has prioritised Operational Carbon due to its more significant impact compared to Embodied Carbon. As a result of this, efforts to reduce emissions have historically focused on enhancing operational efficiencies and decreasing energy consumption, with less attention given to assessing Embodied Carbon. However, as building efficiencies improve and carbon factors reduce, the importance of addressing Embodied Carbon has become increasingly acknowledged.

The University of Edinburgh is committed to minimising its Embodied Carbon emissions, recognising prevention as the primary method for reduction. As illustrated in figure 5.3, the most effective strategies for reducing Embodied Carbon emissions include limiting new builds, promoting building retrofits, optimising material use, and enhancing efficiency. Thus, the University generally prioritises retention, refurbishment and repurposing over new builds, and will only consider new constructions once it has been shown that these options do not satisfy the necessary functional requirements, or if it is proven through the appropriate methods that a new built is more beneficial from a carbon impact standpoint.

Consequently, the University recognises the importance of measuring Embodied Carbon throughout the design and construction process of its capital projects, to enable informed decision-making and facilitate the early identification and implementation of carbon reduction opportunities. Therefore, all major projects are required to conduct a Whole-Life Carbon Assessment, following the latest version of the 'RICS PS WLCA for the Built Environment' methodology.

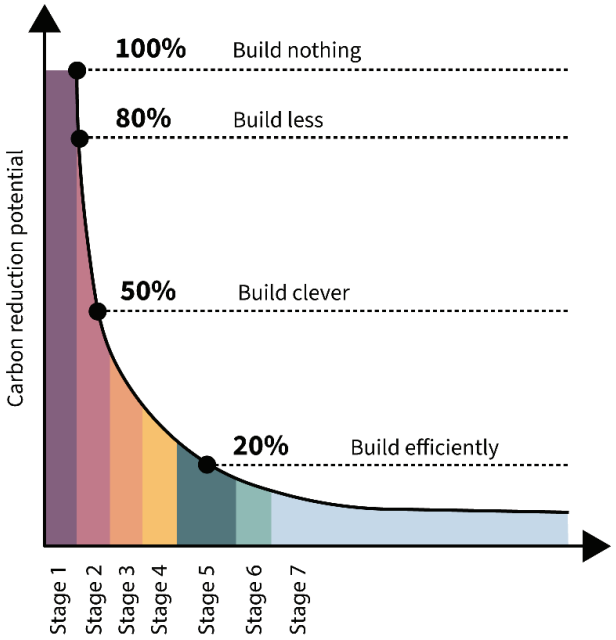


Fig 5.3 Carbon reduction potential. Adapted from HM Treasury, 2013. Infrastructure Carbon Review. Source: adapted from Green Construction Board.

Given the diverse and complex nature of the University's Estate, a uniform approach to all projects is not feasible. The University's ESTS Tool will therefore be employed to determine the most appropriate Embodied Carbon targets tailored to the specific characteristics of each project.

Finally, it is important to recognise that Embodied

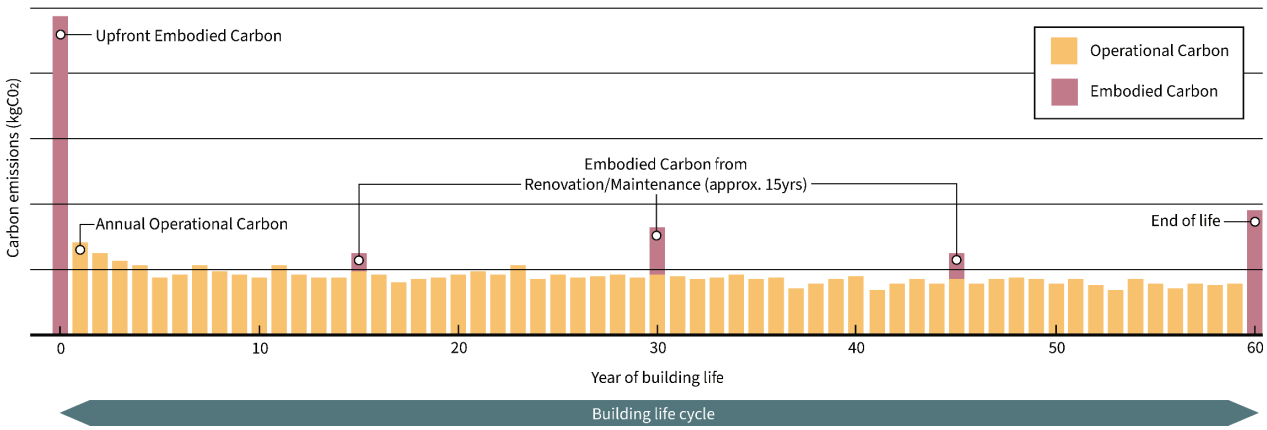


Figure 5.4 Operational and Embodied Carbon thoughout building life cycle. Source: adapted from an image produced by Carbon Leadership Forum (2020).

Carbon benchmarks are a developing field. As methodologies for calculating Embodied Carbon evolve and new low-carbon materials are developed, the University will progressively heighten its requirements. This approach aims to align the urgent need for climate action, with the evolving capabilities and knowledge within the construction industry.

Reference documents

- UoE Regenerative Sustainability Strategy
- UK Net Zero Carbon Buildings Standard (v1,2026)
- WLC Assessment for the Built Environment, 2nd edition, RICS (2023)
- Embodied Carbon: Developing a Client Brief, UKGBC (2017)
- Low Embodied Carbon Specification and Procurement, LETI (2023)
- Climate Emergency Design Guide, LETI (2020)
- Client Guide for Net Zero Carbon Buildings, LETI (2021)
- Bringing Embodied Carbon Upfront, World Green Building Council (2019)

Consultation

The University Estates Net Zero Team must be consulted at every stage for decisions impacting the project's Embodied Carbon and its management.

Design Principles

These are defined in accordance with the RIBA 'Sustainable Outcomes' and the LETI 'Low Embodied Carbon Specification' Guides:

1. Prioritise reuse whenever possible.
2. Promote the use of low embodied carbon and recycled materials. Minimise high embodied carbon materials, paying particular attention to the structure and envelope. Focus must be put on major wins, where the greatest reductions can be made.
3. Prioritise design efficiency before exploring alternative low-carbon materials.
4. Optimise the use of materials during all stages, especially in structural designs.
5. Promote the use of local natural materials.
6. Minimise materials transport and construction demand. Avoid/reduce use of fossil fuels for materials transport and construction activities.
7. Prioritise the use of materials that are supplied with an ISO 14025 compliant EPD.
8. Encourage the use of ethical and responsibly sourced materials with appropriate certifications (i.e. FSC/PEFC for timber) and recognised environmental rating systems (i.e. A/A+ Green Guide,…).
9. Target zero construction waste diverted to landfill.
10. Consider modular off-site construction systems to improve construction efficiency and reduce site waste.
11. Detailing to be long-life and robust. Design for durability and protection from degradation.
12. Consider designing building for disassembly and using circular economy principles.



Figure 5.14 Construction Material Pyramid. This tool helps visualise different kinds of environmental impacts, such as CO_2 footprints, between different categories, of materials or between materials within the same category. Source: CINARK at the Royal Danish Academy.

Key Requirements

1. Undertake Whole-Life Carbon Assessment following the methodology described in RICS PS Whole Life Carbon Assessment for the Built Environment (v2, 2023).
2. Target Upfront Carbon limit ($kgCO_2e/m^2$ GIA). Limit selection in accordance with the University's ESTS Tool.
3. Report Life Cycle Embodied Carbon metric ($kgCO_2e/m^2$ GIA), in accordance with University's ESTS Tool requirements.

Evidence/Deliverables

1. RIBA Stage Sustainability Report
2. Embodied Carbon Management Plan
3. WLC Assessment Report in accordance with RICS PS Whole Life Carbon Assessment (v2, 2023) requirements
4. Final Brief and ER's
5. Workshops/Consultations with Stakeholders
6. Minutes

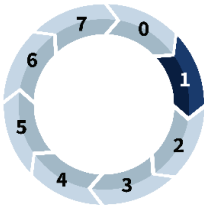
Requirements per RIBA Stage



STAGE 0 - Strategic Definition

Client Team

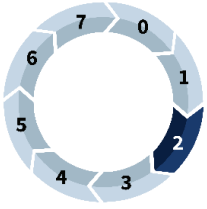
- Examine lessons learnt from previous projects, related not only to building performance but also in relation to costs, programme and risks.
- Identify the positive contribution that the building will make to the University's Net Zero Carbon commitment. It should align with the University's Regenerative Sustainability Strategy and Energy Masterplan to 2040.
- Project-specific Embodied Carbon objectives and targets must be clearly identified in the Business Case and will inform the Strategic Brief.
- Identify Embodied Carbon opportunities and limitations of potential sites/locations.



STAGE 1 - Preparation and Brief

Client Team

- Initial Embodied Carbon benchmarks shall be established based on relevant limits and targets in $kgCO_2e/m^2$. These must be decided using the guidance provided by the University's ESTS Tool, and will be based on the unique aspects of each project. The benchmarks will be agreed with the UoE Estates Net Zero Team, and will be included in the Initial Project Brief.
- Prepare a project-specific Stage 1 Preliminary Embodied Carbon Management Plan to set project Targets, clarify roles and responsibilities, illustrate methodology for implementation, monitoring and reporting, and provide key project dates for delivery of information.
- Determine whether a WLC Assessment following the methodology described in RICS PS Whole Life Carbon Assessment (v2, 2023) will be required on the project.
- Consider how Embodied Carbon objectives and requirements are to be communicated to the Design and Construction teams. These can be embedded in a range of documents such as ER's, Scope of Services, Specifications, Construction Contracts, etc.
- Arrange dedicated sustainability consultation/workshop with Embodied Carbon objectives and targets as a key agenda item. Integrate the outcomes of this meeting directly into the Initial Project Brief.
- Arrange consultations with stakeholders and incorporate feedback in the Initial Brief.
- The appointment of sustainability specialists, such as a Whole-life Carbon Assessor, may be required, necessitating careful consideration of both programme and fees. The University must raise this requirement at the earliest possible opportunity upon project commencement.
- Assess the risks that the chosen form of contract has on the project's Net Zero Carbon ambition, and develop a procurement strategy that mitigates this risk.
- Any costs associated with Embodied Carbon strategies must be clearly allocated in the Cost Plan.



STAGE 2 - Concept Design

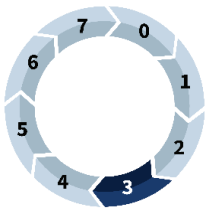
Client Team

- Discuss the best procurement route with the Project Management Team to ensure that the Embodied Carbon requirements will be understood and clearly set out.
- Appoint a Design Team with the skills to develop the strategy to achieve the Embodied Carbon objectives and targets.
- Clear Contractual Upfront Carbon Limit targets (in $kgCO_2e/m^2GIA$) and objectives must be communicated, discussed and agreed with the Design Team. Clarify with the Design Team that Life Cycle Embodied Carbon figures shall be reported.
- Embodied Carbon Limit selection in accordance with the University's ESTS Tool.
- If required, the WLC Assessor shall be appointed.

- Review the Embodied Carbon of materials and construction processes in the context of the building's lifespan and operational strategy.
- Review costs. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop the Concept Design Proposal with integrated Embodied Carbon strategies to achieve agreed objectives and targets. Follow the Design Principles described in this section when producing the Concept Design Proposal.
- Include in the Sustainability Report the updated 'Embodied Carbon Management Plan'. As described in LETI 'Low Embodied Carbon Specification and Procurement Guide', this is an independent document which should: refer to agreed Embodied Carbon limits, clarify roles and responsibilities, illustrate methodology for implementation, monitoring, and reporting of achievements. It should be incorporated into the programme together with all other project deliverables. From RIBA Stage 2 is updated by the Whole-life Carbon Assessor throughout the project when significant changes occur, or as new information becomes available.
- Carry out a Stage 2 Concept Design Whole Life Carbon Assessment (WLCA) to test and refine the architectural concept and sustainability strategy. Unless otherwise agreed with the Net Zero Team, it must follow the standard set out in the RICS PS 'Whole Life Carbon Assessment for the built environment (2023)'.
- Embodied carbon reduction is best tackled by measuring as early as possible during design so that reduction opportunities can be highlighted and acted upon.
- Identify opportunities to reduce Embodied Carbon emissions and implement a tracking system to assess the effectiveness of each option.
- Future flexibility, intended design life and durability, material optimisation, deconstruction and disposal must all be taken into consideration as part of the design process. How these concepts have been approached will be described in the Sustainability Report.
- Any deviation must be explored, reported and agreed with the Net Zero Team.
- Arrange Sustainability Consultation/Workshop. Include in the agenda tracking and review of Embodied Carbon objectives and targets. Incorporare conclusions in Final Project Brief.
- Outline Specifications will be provided at the end of this stage, to describe the main components of the construction project in a sufficient level of detail to indicate the design intent and some information on performance and preliminaries. Any Embodied Carbon ambitions or requirements shall be included.



STAGE 3 - Spatial Coordination

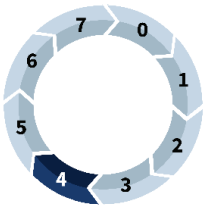
Client Team

- Review critical design information and decisions made regarding Embodied Carbon.
- Assess any Guide derogations, their justification, and their impact, using information submitted by the Design Team.
- Reassess design decisions and approach to local Authority Planning advice against criteria.
- Review costs associated with Embodied Carbon. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop the Spatially Coordinated Proposal with integrated Embodied Carbon strategies. Follow the Design Principles described in this section when producing the Spatially Coordinated Proposal. Different structural, construction, building services, cladding and fit out approaches, and their impact towards Embodied Carbon targets should be explored.
- Update and continue developing the WLC Assessment inherited from Stage 2.
- The Embodied Carbon Management Plan will be reviewed and updated to reflect any

significant changes that might have occurred within the project, or new information that might have become available.
- For a likely future climate, the proposal should consider resilience of the building and the development of appropriate adaptation strategies.
- The specification of verified products and materials declarations should be prioritised to promote transparency of the information.
- For MEP products when no generic EPDs are available, generic datapoints with the highest confidence level possible should be created using the 'CIBSE TM65-Generic embodied carbon' methodology.
- At the end of this stage, updated Outline Specifications will be delivered. Any Embodied Carbon ambitions or requirements shall be included. Clarity on the tolerance levels accepted for any deviation from specification must be provided.
- Arrange Sustainability Consultation/ Workshop to track and review Embodied Carbon objectives and targets. Any risks must be raised as early as possible by the Design Team.



STAGE 4 - Technical Design

Client Team

- Review critical design information and decisions made regarding Embodied Carbon.
- Review and understand any derogations from the Design Guideline as well as the reasoning and impact of that decision, using information presented by the Design Team.
- Ensure requirements and targets for Embodied Carbon are clear and prescriptive in the project specifications and Tender documentation, at the start of procurement process.
- Ensure that questions related to Embodied Carbon will be included in the Contractor's tendering process on how the objectives will be achieved, monitored and reported.
- Process needs to be tailored to engage with, but not burden, the supply chain.
- Review costs associated with this theme. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop and coordinate the Technical Design information with integrated Embodied Carbon strategies.
- The Tender package will be produced to ensure that the competing contractors understand the Embodied Carbon requirements, objectives and process of delivering, monitoring and reporting carbon reductions during construction and post-occupancy stages.
- Update and submit the Technical Design Phase - WLC Assessment and corresponding Embodied Carbon Management Plan, with any new information available or changes agreed to the proposals's design or specifications.
- Record, discuss and agree with the Estates Net Zero Team any design changes that can influence the project's embodied carbon.
- If necessary, produce and submit any applications for non-material or minor material amendments. A new Planning Application might be required if material amendments are implemented.
- Arrange a Sustainability Consultation/ Workshop to track and review Embodied Carbon objectives and targets. Any risks must be raised as early as possible by the Design Team.

5.1 Whole-Life Carbon Emissions

5.1.2 Net Zero Operational Carbon

Rationale

As described in the LETI 'Climate Emergency Design Guide', Operational carbon is 'the CO_2 and equivalent global warming potential (GWP) of other gases associated with the in-use operation of the building. This usually includes carbon emissions associated with heating, hot water, cooling, ventilation, and lighting systems, as well as those associated with IT, computing equipment, cooking and lifts (i.e. both regulated and unregulated energy uses)'. Operational emissions can vary over the lifetime of the building and are governed by several factors, including building fabric efficiency, HVAC system efficiency, fuel type, carbon factors and the way the building is used.

A building achieving net zero operational carbon utilises no fossil fuels, operates entirely on renewable energy sources, and meets a level of energy performance in-use that aligns with our national climate change targets.

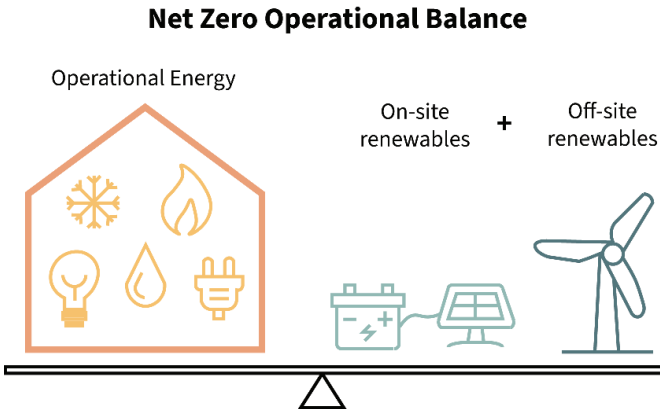


Figure 5.4 Net zero operational balance at building scale. Source: adapted from the 'Climate Emergency Design Guide', LETI, (2020)

In the context of sustainable construction, LETI outlines a critical relationship between operational carbon and operational energy, underscoring their interdependent nature. Operational energy encompasses all energy consumed by a building during its usage phase, affecting the level of operational carbon emitted based on the energy's source and carbon intensity. The University strategies for sustainable construction, therefore, aim to focus on reducing energy consumption and transitioning to renewable and low-carbon energy sources, to minimise operational carbon emissions.

In 2021, the University conducted pilot studies to evaluate the performance of a group of its key buildings, and determine if these had deviated from their original design intent. The results revealed a 'persistent performance gap' between the projected energy demand at design stage and the real operational performance in practice.

Reducing this 'performance gap' is crucial for achieving net zero operational targets effectively. This gap can be attributed to several factors, including inadequate modeling tools, overly optimistic models, poorly informed value engineering decisions or commissioning, and how buildings are managed and used by occupants. Accurate and transparent energy performance modeling plays an essential role in addressing this gap. It requires the use of appropriate tools and adherence to a rigorous methodology.

Given the diversity and complexity of the University's Estate, a standardised approach to all projects is not feasible. To address this, the University's ESTS Tool will be utilised to identify the most appropriate Operational Energy targets for each project, taking into account their unique features. As the field of operational energy benchmarks is continually evolving, updates to these may be incorporated in future revisions of this document.

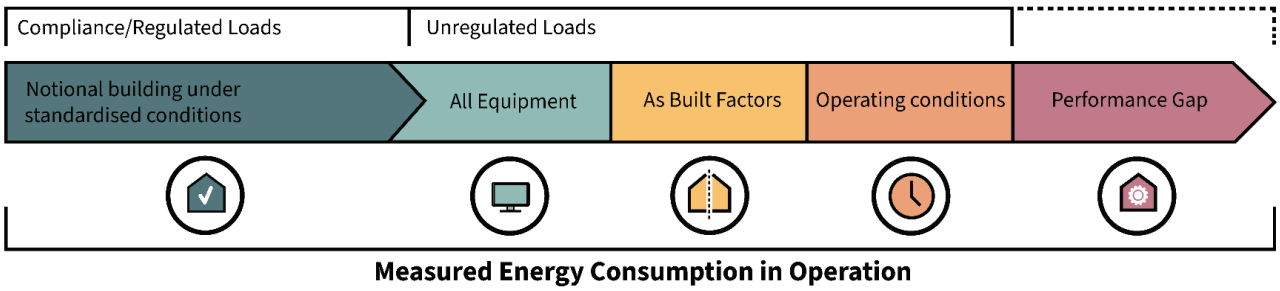


Figure 5.5 Measured Energy Consumption showing that it typically includes Regulated, Unregulated Loads and Performance Gap.

Reference documents

- UoE Regenerative Sustainability Strategy
- UoE Energy Masterplan
- UK Net Zero Carbon Buildings Standard (v1, 2026)
- WLC Assessment for the Built Environment, 2nd edition, RICS (2023)
- TM54 - Evaluating operational energy use at the design stage, 2nd edition, CIBSE (2022)
- Climate Emergency Design Guide, LETI (2020)
- Client Guide for NZ Carbon Buildings, LETI (2021)
- Operational Modelling Guide, LETI (2023)

Consultation

The University's Net Zero Team, BSG and Controls Team must be consulted at every stage for decisions impacting Operational Carbon and its management.

Design Principles

Principles extracted from the RIBA 'Sustainable Outcomes' Guide should direct the design process:

1. Use of Passive First Design Principles:
   - Orientation and Position: Design the building layout to optimise solar exposure, increasing solar gain in the winter and minimising it in summer to prevent overheating.
   - Form Factor: Employ a compact building shape to minimise surface area relative to volume, which reduces heat loss. In colder climates, this aids in temperature retention and reduces construction and insulation costs.
   - Thermal Mass: Use materials that absorb and retain heat to stabilise interior temperature fluctuations and lower energy use.
   - Insulation and U-values: Apply insulation to minimise thermal bridging and manage moisture, enhancing overall energy efficiency.
   - Airtightness: Seal the envelope to prevent uncontrolled air leaks, maintaining consistent indoor temperatures and reducing energy demand.
   - Adequate Ventilation: Maintain high indoor air quality, crucial for occupant health.
   - Facade/Glazing Ratio: Optimise window placement, size and opening style to balance daylight entry, solar heat gains, heat loss and natural ventilation, adjusting for seasonal variations.
   - Shading Strategy: Building orientation, along with strategic use of shading elements like overhangs or shades, can block excessive summer sun, allowing for passive cooling and reducing reliance on mechanical systems.
   - Occupancy and Use Analysis: Consider likely usage patterns and operational scenarios to tailor the building design appropriately.
   - Daylight Optimisation: Promote natural light to reduce reliance on artificial lighting, saving energy and enhancing indoor conditions.
2. Integrated Building Services: Use efficient and well-integrated mechanical and electrical systems.
3. Renewable Energy Integration: Maximise the use of on-site renewable energy sources, tailored to the specific site conditions.
4. User-friendly Systems: Design building systems that are easy to operate and manage, ensuring they are accessible. Avoid overly complex systems and plan for commissioning.
5. Minimise the 'performance gap':
   - Use proven energy performance modelling tools that adhere to a rigorous methodology.
   - Avoid overly simplistic assumptions by implementing methodologies like TM54, which incorporates margins of error and caution.
   - Prioritise high quality of construction and commissioning processes. Actively monitor and manage risks, specially those arising from value engineering decisions.
   - Consider a range of occupancy scenarios and report on their impact on energy performance.

Key Requirements

1. Undertake Whole-Life Carbon Assessment following the methodology described in RICS PS Whole Life Carbon Assessment for the Built Environment (v2, 2023).
2. Target Operational Energy Limits (EUI (kWh/m^2GIA/year) and Annual Space Heating Demand (kWh/m^2GIA/year)). Limit selection in accordance with University's ESTS Tool.
3. Report Annual Operational Carbon Emissions Intensity ($kgCO_2e/m^2$GIA/year), in accordance with University's ESTS Tool requirements.

Evidence/Deliverables

1. RIBA Stage Sustainability Report
2. Energy Modelling Roadmap
3. WLC Assessment Report in accordance with RICS PS whole Life Carbon Assessment (v2, 2023) requirements.
4. TM54 Implementation Matrix and Risk Assessment
5. Dynamic Operational Energy Model
6. Final Brief and ER's
7. Workshop/Consultation with Stakeholders
8. Minutes

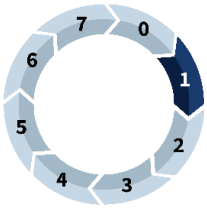
Requirements per RIBA Stage



STAGE 0 - Strategic Definition

Client Team

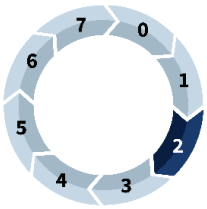
- Assess the lessons learnt from past exemplary projects, related not only to building performance but also in relation to costs, programme and risks.
- Identify the positive contribution that the building will make to the University's Net Zero Carbon commitment. It should align with the University's Regenerative Sustainability Strategy and Energy Masterplan.
- Project-specific Net Zero Operational Carbon objectives must be clearly identified in the Business Case and will inform the Strategic Brief.
- Identify Operational Carbon opportunities and limitations of potential sites/locations.



STAGE 1 - Preparation and Brief

Client Team

- Prepare the preliminary Stage 1 Energy Modelling Roadmap to set project Targets for Operational Carbon, key project dates for delivery of information and identify appropriate opportunities.
- Initial EUI and Annual Space Heating Demand Limits shall be established. These must be decided using the guidance provided by the University's ESTS Tool, and will be based on the unique aspects of each project. The benchmarks will be agreed with the Estates Net Zero Team, and will be included in the Initial Project Brief.
- Undertake a Carbon Appraisal to evaluate options to drive carbon reductions.
- Consider how Operational Carbon objectives and requirements are to be communicated to the Design and Construction teams. These can be embedded in a range of documents such as ER's, Scopes of Services, Specifications, Construction Contracts, etc.
- Arrange consultation with stakeholders. Include information in Initial Project Brief.
- Arrange a Sustainability Workshop. Include in the agenda Operational Carbon objectives and targets. Incorporate conclusions in the Initial Project Brief.
- Determine which specialist energy/sustainability consultant -such as Passivhaus, Energy Modeller or WLC Assessor- are required to deliver the project. Depending on the expertise of the Project Team, additional programme and fees may be required. This must be raised at the earliest opportunity on commencement of the project by the University.
- Assess the risks that the chosen form of contract has on the project's Net Zero Carbon ambition and develop a procurement strategy that mitigates this risk.
- Any costs associated must be clearly allocated in the Cost Plan.



STAGE 2 - Concept Design

Client Team

- Discuss the best procurement route with the project management team to ensure that the Operational Carbon requirements will be clearly captured.
- Appoint a Design Team with the appropriate skills to develop the strategy to achieve the Net Zero Operational Carbon objectives and targets.
- Clear Contractual EUI (in kWh/m^2GIA/year) and Annual Heating Demand (in kWh/m^2GIA/year) Limits and Operational Carbon Objectives must be communicated, discussed and agreed with the Design Team.
- Operational Energy and its implications must be clearly understood by all members of the Project Team.
- If applicable, preliminary surveys on existing building fabric and building services will be carried out to identify risks and opportunities.
- If required, a WLC Assessor shall be appointed.
- Review the Operational Carbon strategies in the context of the building's lifespan.

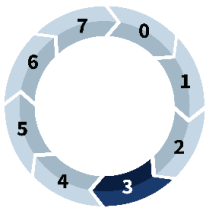
- Review costs. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop the Concept Design Proposal with integrated Operational Carbon strategies to achieve agreed objectives and targets. The reduction of energy demand must be a priority in the development of the proposal to reduce the environmental impact of the day-to-day operation of the building. To achieve this, the Design Principles described in this section shall be followed.
- A Sensitivity Analysis on passive design strategies -such as airtightness, insulation, natural ventilation, etc.- will be developed to inform decisions.
- Any Brief deviation should be explored, reported and agreed with Estates Net Zero Team.
- A preliminary Dynamic Operational Energy Model aligned to the EUI Targets must be produced to guide the Concept Design throughout Stage 2. Sufficient energy modelling to test and refine the Concept Design shall be carried out.
- Dynamic Operational Energy Model:
    1. The Design Team will further develop the Modelling Roadmap initiated in Stage 1, as described in the 'UoE Energy Modelling Guideline'. The Modelling Roadmap should include: modelling software and weather files to be used, information gathering, how the predicted occupancy, unregulated loads and management practices have been determined, scenarios modelled, all requirements set out in the Modelling Specification, client consultation, peer review and client reporting, aligned to the milestone set for the delivery of the RIBA Stage 2 Project Report.
    2. A preliminary Dynamic Operational Energy Model of the proposal must be developed to question and inform the design. The Design Team shall demonstrate how the model has optimised the Concept Design proposal, covering aspects such as orientation, U-values, shading, glazing, ventilation, etc… The proposal will be supported by a Solar Exposure and Shading analysis that test the decisions made and how the design has been optimised.
    3. At Stage 2, the priorities of the Operational Energy Model are:
        - Design optimisation: using orientation, massing, glazing ratio, envelope thermal performance, shading, natural ventilation strategy, etc.
        - Identification of possible thermal bridges
        - Influence Final Project Brief
        - Identification of heating and cooling requirements for different spaces
    4. Models estimating performance against Operational Energy targets must be as accurate as possible but should also include allowances and margins that represent the real-world construction industry and operation of buildings. Accurate outcomes rely on good quality modelling and good information sharing between the Project team and the modeller.
    5. Sensitivity analysis shall be undertaken to determine the factors that can significantly impact building energy consumption. Based on the results and in discussion with the Project Team, different scenarios to explore how high impact factors might influence the building energy consumption must be tested.
    6. Special attention must be paid to design changes since these add risk to the modelling. These can occur through client change, value engineering, design development and late determination of the control strategy.
    7. CIBSE TM54 shall be followed as the central methodology for all energy performance assessments. The TM54 analysis should be updated for each design stage review.
    8. The CIBSE TM54 Implementation Matrix must be used as a tool for monitoring the confidence and possible variance within the input data. The confidence levels should gradually improve to reach 'high' as the project progresses, with most steps reaching a high level of confidence by detailed design. By using the implementation matrix, the model should test the impact of less certain inputs by running sensitivity analysis to inform the high, mid-range and low EUI scenarios.

9. A Risk Assessment shall be done using a systematic approach of sensitivity and scenario analysis, as presented in TM54.
10. A detailed Operational Energy Modelling Report will be prepared, presented to the Client Team and checked by the Project Team to reduce the risk of any design elements or occupancy scenarios being misinterpreted. It must clearly describe how the modelling was carried out, all the input data and confidence levels, plus results from all the sensitivity tests and scenarios run with comparison against targets, and any recommendations for improvements to the design and maintenance of the building.

- Passivhaus PHPP could also be used to predict energy in-use requirements at early design stage to support the Dynamic Operational Energy Model results.
- Identify opportunities to reduce Operational Carbon emissions and implement a tracking system to assess the effectiveness of each option.
- The most significant operational carbon reduction measures shall be implemented in the design, which might include demand response and energy storage opportunities.
- Seasonal energy strategies should be developed, considering opportunities for passive systems, the impact of complexity of controls and management on energy consumption, comfort and occupant satisfaction.
- To the extent possible, the roles and opportunities for overcoming the performance gap shall be discussed, agreed and implemented (for example, by following the BSRIA Soft Landings Framework).
- The proposal must provide a resilient solution to optimise the building's thermal performance for projected climate change scenarios. For the University to gain a correct understanding of possible future risks, the Design Team shall develop a thermal analysis under the following climatic conditions, specific to the project's climatic location:
    1. For naturally ventilated buildings: Medium Risk emission scenarios for 2080s period, at 50th percentile, DSY2 and DSY3.
    2. For mechanically ventiladed or mixed mode buildings: High and Medium Risk emission scenarios for 2050s period, at 50th percentile, DSY2 and DSY3.
- Arrange Sustainability Workshop and Client Consultation. Include in the agenda tracking and review of Operational Carbon strategies, objectives and targets. Incorporare conclusions in Final Project Brief.



STAGE 3 - Spatial Coordination

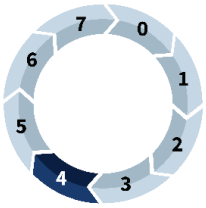
Client Team

- Review critical design information and decisions related to Operational Energy.
- Review and acknowledge any derogation from the Brief or current Sustainable Design Guideline, as well as the reasoning for and impact of that decision, using information presented by the Design Team.
- Review design decisions and approach to local Planning Authority advice.
- Ensure the Employer's Requirements contain latest agreed information regarding Operational Carbon objectives and targets.
- Operational energy strategies and their implications must be clearly understood by all members of the Project Team.
- Review costs associated with this theme. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop the Spatially Coordinated Proposal with integrated Operational Carbon strategies. Follow the Design Principles described in this section when producing the Spatially Coordinated Proposal.
- For a likely future climate change, the proposal should consider future resilience of the building and the development of appropriate adaptation strategies.
- Update and continue developing the Operational Energy Strategy inherited from Stage 2, with any new information available and to reflect any significant changes to the design.

- Further develop the Operational Energy Model inherited from Stage 2 and audit the Spatially Coordinated Design against Operational Energy Limits and Annual Heating Demand targets, including seasonal energy strategies.
- Any design changes that can impose a risk to the targets must be thoroughly explored, reported and agreed. Identify and record performance risks to inform Stage 4.
- Identify who will operate the building as early as possible. Design for usability and manageability, testing ideas with occupier representatives.
- Start planning for commissioning, including seasonal commissioning and fine-tuning.
- Arrange Sustainability Workshop and Client Consultation to track and review Operational Carbon objectives and targets. Any risks must be raised as early as possible by the Design Team.
- Dynamic Operational Energy Model:
    1. The Design Team will further develop the Modelling Roadmap inherited from Stage 2, as described in the 'UoE Energy Modelling Guideline'. Any risks associated with achieving the Client Requirements will be outlined, together with any further opportunities to enhance the building energy performance.
    2. A 'whole building' detailed energy model will be undertaken at this stage to predict its energy consumption. This shall include the proposed HVAC strategy, to ensure that the design can be accurately captured and presents an accurate assessment of its performance.
    3. The CIBSE TM54 Implementation Matrix shall be updated with the most recent information available, to increase the confidence levels within the input data.
    4. The Risk Assessment will be reviewed and updated, using a systematic approach of sensitivity and scenario analysis, as presented in CIBSE TM54.
    5. Scenario modelling to inform improvements to design of the building and to operational, maintenance, and handover strategies should be undertaken.
    6. The EUI targets will be reviewed following the results of the scenario modelling. Any deviation must have been thoroughly explored, reported and agreed.
    7. The Solar Exposure and Shading Analysis will be reviewed and updated with any updates on the design.
    8. The Operational Energy Modelling Report will be reviewed and updated to reflect how the design has developed throughout Stage 3. It shall be presented to the Client Team and checked by the Project Team to reduce the risk of any design elements, or occupancy scenarios being misinterpreted. It should clearly estate how the modelling was carried out, all the input data and confidence levels, plus results from all the sensitivity tests and scenarios run with comparison against targets.
    9. Additionally, a preliminary report will be provided to assure compliance with Section 6 of the Building Standards Technical Handbook.
- At the end of this stage, updated Outline Specifications will be delivered. Any Operational Carbon ambitions or requirements shall be included. Clarity on the tolerance levels accepted for any deviation from specification must be provided.



STAGE 4 - Technical Design

Client Team

- Review critical design information and decisions related to Operational Energy.
- Review and acknowledge any derogations from the Environmental Sustainability Guide, as well as the reasoning for and impact of that decision, using information presented by the Design Team.
- Ensure that requirements and targets for Operational Carbon are clear and prescriptive in the project specifications and tender documentation, at the start of procurement process.
- Ensure that questions related to Operational Carbon will be included in the Contractor's tendering process, on how the objectives will be delivered, monitored and reported.

- Review costs associated with this theme. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop and coordinate the Technical Design information with integrated Operational Carbon strategies.
- The Tender package will be produced to ensure that the competing contractors understand the Operational Carbon requirements, objectives and process of delivering, monitoring and reporting carbon reductions during in-use stage.
- Update the Energy Modelling Roadmap and Operational Energy Report.
- Review and update the TM54 Implementation Matrix and Risk Assessment with any new information available.
- Review and update the Building Control Tracker to monitor and report updates on the Building Control application process.
- Any carbon/energy declarations initiated at Stage 3 must be updated as part of the Building Regulations submission.
- Record, discuss and agree with the Estates Net Zero Team any design or specification changes that can influence the project's Operational Energy.
- Arrange ustainability Workshop and Client Consultation to track and review Operational Energy objectives and targets. Any risks must be raised as early as possible by the Design Team.

5.1 Whole-Life Carbon Emissions

5.1.3 Low and Zero Carbon Technologies (LZCT's)

Rationale

Scotland's climate change legislation sets a target date for Net Zero emissions of all GHG by 2045. In alignment with this national directive, the University of Edinburgh has set its own ambitious target to become Net Zero Carbon by 2040, five years ahead of the national schedule.

Within its roadmap to become a Net Zero Operational Carbon Estate, University buildings must eliminate the use of fossil fuels, operate entirely on renewable energy sources and meet a level of energy performance in-use that aligns with our national climate change targets. The University has prioritised the elimination of direct emissions from its Estate, consciously opting not to rely on offsets for achieving this part of its carbon reduction goals. Nevertheless, offsets via the University's Forests and Peatland program are strategically planned, but these are strictly reserved to counterbalance unavoidable CO_2 emissions such as the ones associated to international travel of students.

The integration of on-site Low or Zero Carbon Technologies (LZCTs) -those that generate energy from renewable or low carbon sources and emit low or no carbon dioxide-, is critical to achieving this goal. Nowadays and as a result of technological advancements, the range of LZCTs that supply electricity and heat is growing rapidly. This, alongside declining capital and operating costs, often makes them a cost-effective solution for achieving a reduction in operational CO_2 emissions.

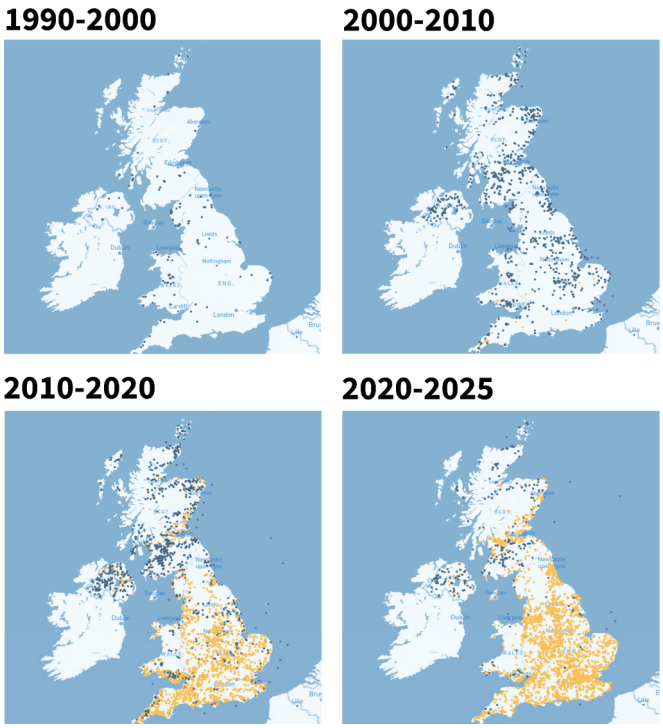


Figure 5.6 Onshore wind, offshore wind and solar PV developments in the UK between 1990 and 2025. Source: adapted from REPD February 2025.

In alignment with this strategy, there is an urgent imperative to transition from fossil fuel-based systems towards more sustainable alternatives. This entails prioritising the deployment of Air Source and Ground Source Heat Pumps wherever Life Cycle Cost (LCC) and carbon analyses substantiate the investment. Additionally, increasing on-site renewable energy generation is a key goal. This dual approach secures adherence to national regulations and the University's own environmental commitments..

Project Teams are required to ensure that their approach to managing Whole-life Carbon emissions aligns with both the University's Regenerative Sustainability Strategy and Energy Masterplan to 2040.

Reference documents

- UoE Regenerative Sustainability Strategy
- UoE Energy Masterplan to 2040
- UK Net Zero Carbon Buildings Standard (v1, 2026)
- WLC Assessment for the Built Environment, 2nd edition, RICS (2023)
- Climate Emergency Design Guide, LETI (2020)
- Client Guide for Net Zero Carbon Buildings, LETI (2021)
- Operational Modelling Guide, LETI (2023)
- BREEAM UK New Construction V7 - Ene 04 Low Carbon Design, (2025)

Consultation

The University's Net Zero Team, BSG and Controls Team must be consulted at every stage for decisions impacting LZC Technologies and their management.

Design Principles

The Design principles to guide the design and implementation of LZC Technologies shall be:

1. All projects of any size should aim to maximise the potential to utilise on-site LZCTs to meet the net zero carbon targets.
2. Project-specific LZCTs strategies should be reviewed in conjunction with the University of Edinburgh Energy Masterplan to 2040 and Regenerative Sustainability Strategy to ensure integration into the whole-institution approach.
3. The Design Team must produce a Stage 2 project-specific LZC Technologies Feasibility Study to inform a site based energy options appraisal. The study shall assess delivery cost, operating costs, carbon emissions, long term benefits, design and construction implications. The most suitable LZC Technology shall be grounded in long term site/campus requirements. This study shall be updated at RIBA Stages 3 and 4 to address design development and capture additional opportunities.
4. When considering the use of LZCTs, at least the following options should be taken into account:
   - Existing or planned low carbon thermal networks
   - Solar Photovoltaics and/or Solar Hot Water Heating panels
   - Ground, Water and Air Source Heat Pumps and opportunities for Heat Recovery
   - Heat and electricity storage, to improve load management and demands on mains supplies
   - Local opportunities for wind and water power and for community systems
5. Funding streams and incentive schemes must be considered at the time of developing the Stage 2 LZCTs Feasibility Study. This will help to accurately inform the potential benefits of system proposals and understand where incentivised schemes may prove beneficial to the capital and operational budgets throughout the system lifecycle.
6. The Design Team shall demonstrate their approach to meeting the local Planning and Building Regulations requirements on generation from renewable energy.
7. Where refurbishment works are proposed, progress shall be made to transition away from fossil-fuel based heating systems to low carbon heat networks or low carbon technologies, such as Air Source Heat Pumps (ASHP).
8. Network buildings heat systems should be designed for low temperature future heat networks.
9. Evaluate CDM implications of ongoing system maintenance, specifically assessing their impact on costs and practicability.
10. Prioritise user-friendly, intuitive, and simple designs that target consistent operation. While significant efficiency gains are desirable, they must be carefully weighed against any resulting increase in complexity. Do not introduce complexity unless the efficiency benefit is substantial and the system remains reliable and easy to maintain.
11. Where re-roofing is deemed beneficial to enhance thermal performance and facilitate renewable energy integration, the new roof finish must possess a design life exceeding 20 years and must not contravene warranty conditions. PV Systems should be installed on all suitable roofs meeting this criteria.
12. Any acoustic and spatial requirements of the systems must be considered and integrated as early as possible in the design process.

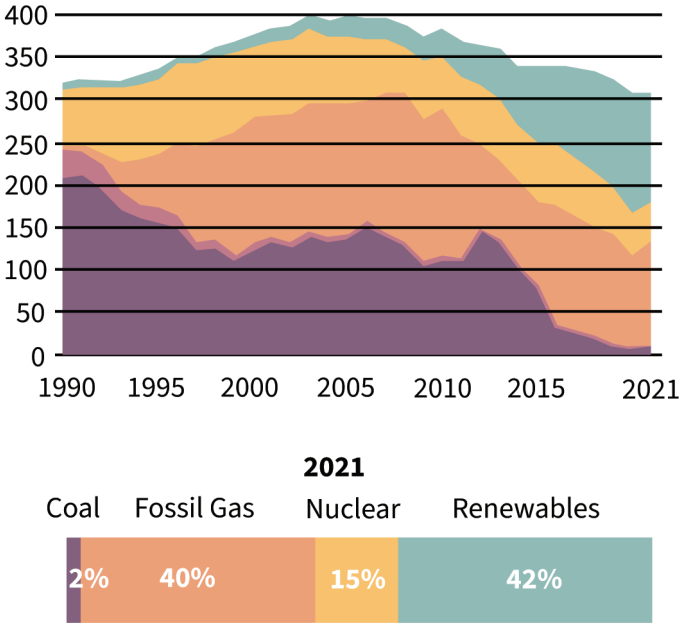


Figure 5.7 Electricity generation mix in the UK. Gross power generation (TWh). The UK generated 43% of its electricity from fossil fuels in 2021, mainly from fossil gas, but with minimal amounts of coal (2.3%) and oil (0,39%). The share of renewable energy in the UK's power sector has been increasing rapidly, providing around 42% in 2021, up from 13% a decade ago. Wind and solar alone produced 25% of all electricity generated. Source: adapted from Enerdata 2022. Climate Transparency 2022 UK Report.

Key Requirements

1. Complete LZCTs Feasibility Study compliant with Criteria 9-12 of BREEAM (v6.1) Ene 04 Low Carbon Design -Low and Zero Carbon Feasibility Study Assessment Type.

Evidence/Deliverables

1. RIBA Stage Sustainability Report
2. LZCT's Feasibility Study
3. Specification
4. Final Brief and ER's
5. Meeting Minutes

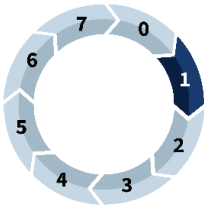
Requirements per RIBA Stage



STAGE 0 - Strategic Definition

Client Team

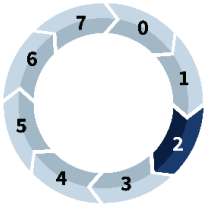
- The integration of on-site LZCT's while transitioning away from fossil fuel-based systems must be clearly stated in the Business Case and Strategic Brief.
- Evaluate the impact of integrating the LZCT's in the UoE Energy Masterplan and Regenerative Sustainability Strategy to ensure a whole-institution approach.
- Examine lessons learnt from past exemplar projects.
- Investigate LZCT's opportunities and limitations in potential sites/locations.



STAGE 1 - Preparation and Brief

Client Team

- Consider how LZCT's objectives and requirements are to be communicated to the Design and Construction teams. These can be embedded in a range of documents such as ER's, Scopes of Services, Specifications, Construction Contracts, etc.
- Arrange a Sustainability Workshop. Include in the agenda LZCT's Objectives and Targets. Incorporate conclusions in the Initial Project Brief.
- Organise Consultation with stakeholders. Agree objectives and any specific LZCT's requirements. Include this information in Initial Project Brief.
- Any costs associated with achieving these objectives (feasibility studies, design strategies, testing, etc.) must be clearly allocated in the Cost Plan.
- Any Sustainability Accreditation to be used shall be discussed and agreed with the University's Estates Net Zero Team. The appointment of a relevant assessor to monitor the process might be required.



STAGE 2 - Concept Design

Client Team

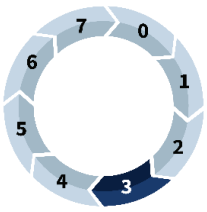
- Review the LZCT's strategies presented in the LZCT's Feasibility Study in the context of the building's lifespan.
- If applicable, preliminary surveys on existing building envelope and building services will be commissioned to identify risks and opportunities.
- The Client Team will ensure that the Design Team is provided with the information regarding number of occupants, periods of occupation, equipment, etc.
- Review costs associated. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop the Concept Design Proposal with integrated LZCT's strategies to achieve the agreed objectives and targets. Transitioning away from fossil fuel-based systems towards more sustainable alternatives should be a priority.
- The Design Team must demonstrate how the proposal aligns with the University of Edinburgh's Energy Masterplan to 2040 and Regenerative Sustainability Strategy.
- Any deviation from the Brief, University Energy Masterplan or current Environmental Sustainability Guide must be explored, reported and agreed with the Estates Net Zero Team.
- Fossil fuel-based heating systems should not be implemented in new builds. Use of low carbon, renewable heating systems should be proposed.
- An energy specialist shall carry out a LZCT's Feasibility Study to understand benefits and constrains associated with the implementation of different LZCT's systems. The study shall comply with Criteria 9-12 of 'BREEAM (v6.1) Ene 04 Low Carbon Design -Low and Zero Carbon Feasibility Study Assessment Type' and shall cover as a minimum:
  1. Energy generated from LZCT's energy source per year

2. Carbon dioxide savings from LZCT's energy source per year
3. Life cycle cost of the potential specification, accounting for payback maintenance costs and inflation rates
4. Local planning criteria, including land use and noise
5. Feasibility of exporting heat or electricity from the system
6. Any available funding/grants
7. All technologies appropriate to the site and energy demand of the development
8. Reasons for excluding other technologies
9. If appropriate:
   a. The building is connected to an existing energy network
   b. the building is connected to an existing source of waste heat or power OR
   c. a building or site CHP system is specified with the potential to export excess heat or power via a local community energy scheme or
   d. a source of waste heat or power is specified with the potential to export excess heat or power via a local community energy scheme
10. Energy storage

- The most appropriate LZCT's energy sources to be implemented will be specified based on these recommendations.
- The reduced regulated carbon dioxide (CO_2-eq) emissions resulting from the feasibility study shall be quantified in accordance with 'BREEAM (v6.1) Ene 04 Low Carbon Design -Low and Zero Carbon Feasibility Study Assessment Type' :
  1. For the specified technologies, any CO_2-eq savings shall be estimated using Dynamic Simulation Modelling.
  2. The reduction in regulated carbon dioxide (CO_2-eq) emissions can be demonstrated by comparing regulated carbon dioxide (CO_2-eq) emissions with LZCT's to the actual building-regulated emissions without LZCT's.
  3. When the CO_2-eq savings are compared for different technologies, they may be estimated separately from the building energy model where appropriate, e.g. by using manufacturers' data, simple hand calculations or spreadsheets.
- Arrange a Sustainability Workshop/Consultation. Include in the agenda tracking and review of LZCT's Objectives and Targets. Incorporare conclusions in Final Project Brief.



STAGE 3 - Spatial Coordination

Client Team

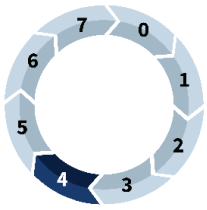
- Review critical design information and decisions related to LZCT's.
- Review and acknowledge any derogation from the Brief or current Environmental Sustainability Guide, as well as the reasoning for and impact of this decision, using information presented by the Design Team.
- Review design decisions and approach to local Planning Authority advice.
- Ensure ER's contain latest agreed information regarding LZCT's objectives and targets.
- Review costs associated. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop the Spatially Coordinated Proposal with integrated LZCT's strategies and in accordance with this theme's Design Principles.
- Update the LZCT's Feasibility Study inherited from Stage 2, with any new information available, and to reflect any significant changes to the design.
- Identify who will maintain/operate the systems as early as possible. Designs and controls should be a simple as possible, and target consistent operation rather than introduce complexity by chasing efficiency.
- Start planning for commissioning, including seasonal commissioning and fine-tuning.
- Ensure that the visual impact of any external plant or equipment is assessed and documented for inclusion in Planning applications.
- Assess the acoustic impact of equipment, with particular focus on Air Source Heat Pumps (ASHP). Consult and engage a qualified acoustic specialist to ensure compre-

hensive evaluation, if required.

- Arrange a Sustainability Workshop/Consultation to track and review LZCT's objectives and targets. Any risks must be raised as early as possible by the Design Team.
- The Design Team must demonstrate how the proposal aligns with Planning and Building Regulations requirements on generation from renewable energy.



STAGE 4 - Technical Design

Client Team

- Review critical design information and decisions related to LZCT's.
- Review and acknowledge any derogation from the Brief or current Environmental Sustainability Guide, as well as the reasoning and impact of this decision, using information presented by the Design Team.
- Ensure that requirements and targets for LZCT's are clear and prescriptive in the project specifications and tender documentation, at the start of procurement process.
- Ensure that questions related to LZCT's will be included in the Contractor's tendering process, on how the objectives will be delivered, monitored and reported.
- Review costs. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop and coordinate the Technical Design information. Integrate renewables and low carbon systems into the detailed M&E design.
- The Tender package will be produced to ensure that the competing contractors understand the LZCT's requirements.
- Coordinate with suppliers and installers to verify that the design of plant spaces and hydraulic systems are suitable for contractor design elements.
- Update the LZCT's Feasibility Study inherited from Stage 3, with any new information available and to reflect any significant changes to the design.
- Review and update the Building Control Tracker to monitor and report updates on the Building Control application process.
- Any carbon/energy declarations initiated at Stage 3 must be updated as part of a Building Regulations submission.
- Record, discuss and agree with the Estates Net Zero Team any design or specification changes that can influence the project's LZCT's strategy.
- Arrange a Sustainability Workshop/Consultation to track and review LZCT's objectives and targets. Any risks must be raised as early as possible by the Design Team.

5.2 Health and Well-being

5.2.1 Indoor Air Quality (IAQ)

Rationale

The World Health Organization (WHO) identifies air pollution as the primary environmental risk factor globally, attributing approximately 7 million premature deaths every year to the joint effects of outdoor and indoor air contaminants. Around 600,000 of those are children under the age of five.

Air pollution comprises a complex blend of solid particles, liquid droplets, and various gases. Sources of air pollution are diverse, ranging from natural to human-made origins, with human activities becoming increasingly prevalent since industrialisation commenced. Overall, the primary source contributing to air pollution is the combustion process, especially the burning of fossil fuels and biomass for energy production.

As described in the WELL Air Concept, on average people spend around 90% of their time indoors, where exposure to inhalation of indoor air pollutants can lead to various health and well-being issues of diverse severity. These can range from eye and nose irritation to headaches and fatigue, while also contributing to long-term health issues such as asthma, respiratory diseases and cancer. Additionally, researchers have also identified a clear relationship between indoor air quality and human productivity in buildings.

Indoor pollution results from a combination of internal sources with the infiltration of outdoor pollutants through ventilation and penetration through the building envelope. Additionally, IAQ is adversely affected by non-combustion activities, particularly those releasing

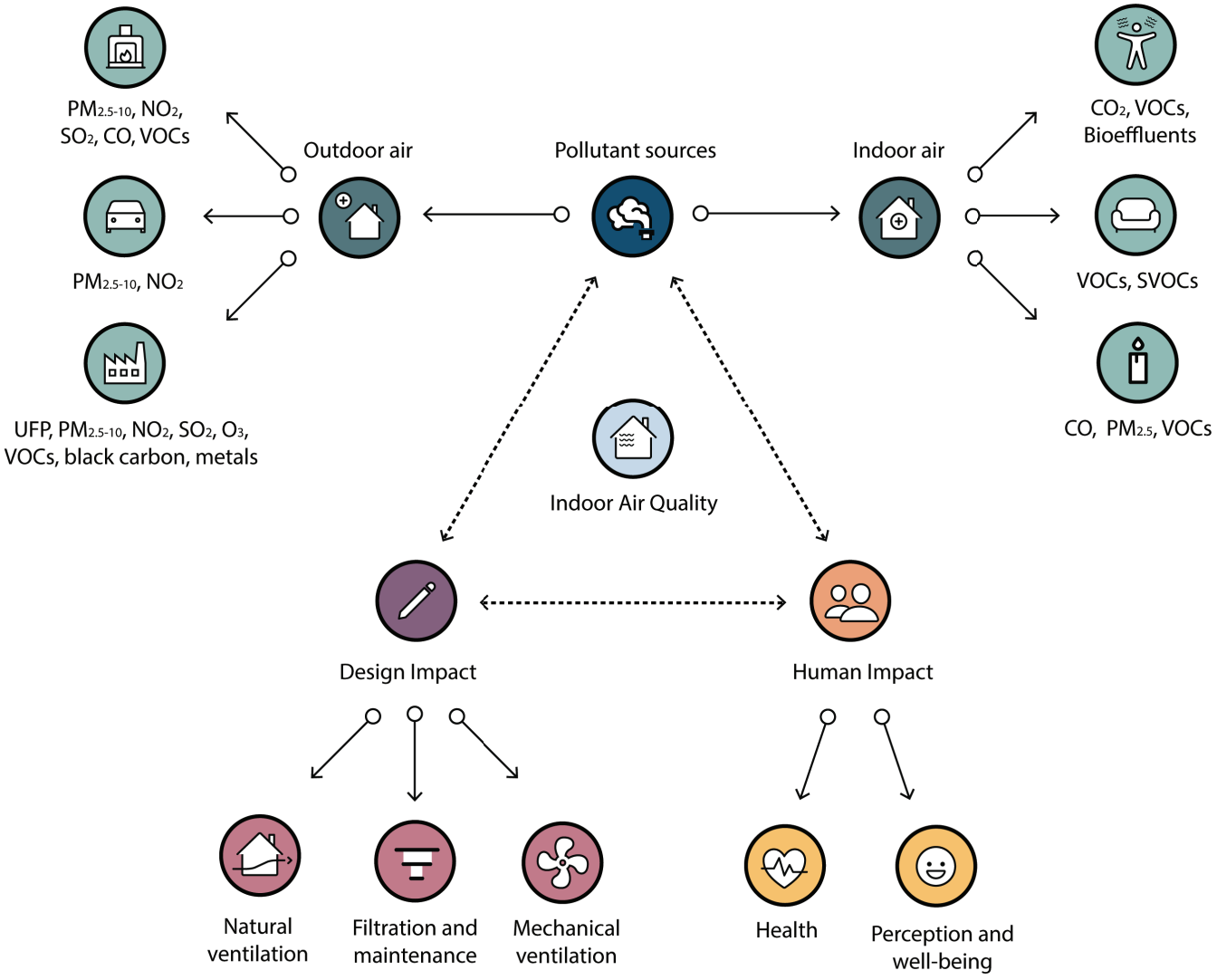


Figure 5.8 Key drivers of Indoors Air Quality. Adapted from CIBSE TM61 - Operational Performance of Buildings (2022).

volatile and semi-volatile organic compounds (VOCs) or ozone. These activities include building renovations, the application of products such as cleaners and insecticides, and the use of specific electrical appliances, like laser printers.

The University of Edinburgh is committed to enhancing the health, well-being and productivity of its buildings' occupants. This requires the implementation of effective design strategies to ensure that good IAQ levels are maintained, and to reduce the presence of common indoor air pollutants such as CO_2, NO_2, and VOCs. To achieve this, both designers and building users must work together on the implementation of the strategies.

Reference documents

- UoE Estates Design Guideline - No.3 Mechanical Engineering Services
- WELL Building Standard - Air, Version 2, (Q2, 2025)
- BREEAM UK New Construction V4 -Hea 04, (2025)
- TM40 - Health and wellbeing in building services, CIBSE (2020)
- TM61 - Operational Performance of Buildings, CIBSE (2022)
- BS 40102-1:2023 - Health and well-being and indoor environmental quality in buildings
- Public Health England - Indoor Air Quality Guidelines for selected Volatile Organic Compounds in the UK (2019)
- WHO Air Quality Guidelines (2021)

Consultation

The Estates Net Zero Team and BSG must be consulted at every stage for decisions impacting IAQ and its management.

Design Principles

These are based on CIBSE TM40, WELL (v2) Air, and BS 40102:2023 requirements:

1. Minimise the concentration and recirculation of pollutants inside the building:
   - Provide fresh air into the building through mechanical and/or natural means to dilute air pollutants. Ventilation rates must prevent overheating in summer and be adequate throughout the year (CIBSE AM10).
   - Provide an appropriate level of IAQ by meeting thresholds in accordance with WHO recommended Air Quality levels (2021), BS 40102:2023 and WELL standard v2 - Air.
   - Prohibit indoor smoking and restrict outdoor smoking within the building boundaries.
   - HVAC systems must include suitable filtration.
2. Protect IAQ during construction and renovation through a combination of strategies, such as envelope protection, air duct protection, moisture and dust management, filter replacement, air flush and proper equipment selection.

Particulate Matter Sizes

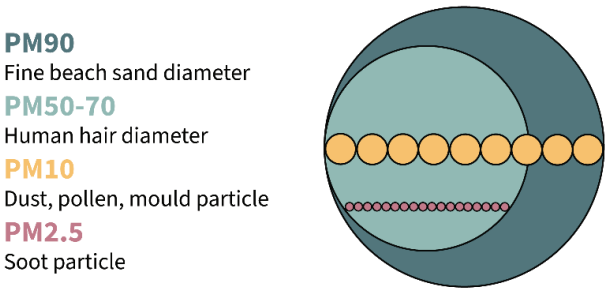


Figure 5.9 Particulate Matter Sizes at scale.

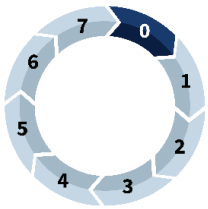
Key Requirements

1. Develop project-specific IAQ Plan in accordance with BREEAM V7- Hea 04 - GN06.
2. Meet the following air pollutant thresholds, in accordance with WHO recommended Air Quality levels (2021), BS 40102:2023 and WELL standard v2 - Air:
   1. Particulate Matter:
   - $PM_{2.5}$: 15 µg/m³ or lower (24-hour mean)
   - PM_{10}: 45 µg/m³ or lower (24-hour mean)
   2. VOCs:
   - Benzene: 10 µg/m³ or lower.
   - Formaldehyde: 50 µg/m³ or lower (30-min average)
   - Toluene: 300 µg/m³ or lower
   3. Inorganic Gases:
   - CO: 4 mg/m³ or lower (24-hour average)
   - CO_2: 900 ppm or lower.
   - NO_2: 25 µg/m³ (24-hour average)
   - Ozone: 100 µg/m³ or lower (8-hour mean)

Evidence/Deliverables

1. IAQ Plan
2. Thresholds for PM, VOCs and Inorganic Gases to be verified in accordance with WELL A01 Air Quality Concept
3. Specifications
4. Final Brief and ER's
5. Workshop/Consultation Minutes

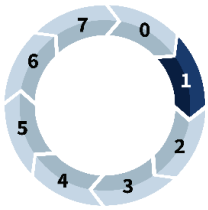
Requirements per RIBA Stage



STAGE 0 - Strategic Definition

Client Team

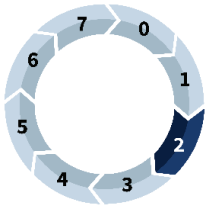
- Promoting excellence in good IAQ levels must be clearly identified in the Business Case and Strategic Brief.
- Review lessons learnt from previous exemplar projects, related not only to building performance but also in relation to costs, programme and risks.
- Identify air quality risks, opportunities and limitations of potential sites/locations.



STAGE 1 - Preparation and Brief

Client Team

- Appropriate IAQ targets shall be established in accordance with the current Environmental Sustainability Guide. Any deviation must be agreed with the Estates Net Zero Team, and included in the Initial Project Brief.
- Arrange Consultations with stakeholders, and agree objectives and specific IAQ requirements. Include this information in Initial Project Brief.
- Arrange a Sustainability Workshop. Include in the agenda appropriate IAQ objectives and targets. Incorporate conclusions in the Initial Project Brief.
- Any Sustainability Accreditation to be used (such as WELL or RESET) must be discussed and agreed with the University's Estates Net Zero Team. The appointment of a relevant assessor to monitor the process might be required.
- Establish whether any additional specialist sustainability consultants -such as a WELL Performance Testing Agent-,are required to deliver the IAQ requirements evidence. A revision of programme and fees may be required. This must be raised at the earliest opportunity on commencement of the project by the University.
- Assess how IAQ objectives and requirements are to be communicated to the Design and Construction teams. These can be embedded in a range of documents such as ER's, Scopes of Services, Specifications, Construction Contracts, etc.
- Any costs associated with these targets (design strategies, monitoring, testing, etc.) must be clearly allocated in the Cost Plan.



STAGE 2 - Concept Design

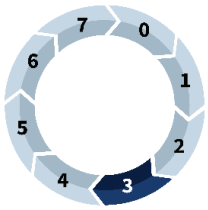
Client Team

- Determine the external air quality of the site and arrange for an air quality survey, if required.
- Appoint a Design Team with the appropriate skills to develop the agreed IAQ objectives and targets.
- Ensure that the Design Team is provided with the information regarding number of occupants and periods of occupation.
- Clear contractual IAQ targets must be communicated, discussed and agreed with the Design Team.
- If applicable, preliminary surveys on existing building fabric and building services will be carried out to identify risks and opportunities.
- If required, appoint any additional specialist consultant.
- Any deviation should be explored, reported and agreed with Estates Net Zero Team.
- Review costs. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop the Concept Design Proposal with integrated strategies to achieve the agreed IAQ Targets.
- Consider in the proposal the prevailing wind direction, especially if there are potential pollution sources nearby, like a busy road.
- Develop a project-specific Indoor Air Quality Plan that describes the different strategies that will minimise indoor air pollution during occupation of the building, in ac-

cordance with BREEAM V7- Hea 04 - GN06. This document must cover as a minimum:
    1. Removal of contaminant sources
    2. Dilution and control of contaminant sources, including air quality requirements of specialist areas such as laboratories, if applicable.
    3. Procedures for pre-occupancy flush out and purge ventilation
    4. Third party testing and analysis
    5. Maintaining good indoor air quality in-use
    6. Any relevant local authority plans or policies (for example, Air Quality Management Areas or Local Air Quality Action Plans)
- Any deviation from the Brief must be explored, reported and agreed with the Estates Net Zero Team.
- Arrange a Sustainability Workshop/Consultation. Include in the agenda tracking and review of IAQ Objectives and Targets. Incorporare conclusions into Final Project Brief.



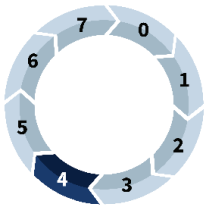
STAGE 3 - Spatial Coordination

Client Team

- Review critical design information and decisions related to IAQ.
- Review and acknowledge any derogation from the Brief or current Environmental Sustainability Guide, as well as the reasoning for and impact of that decision, using information presented by the Design Team.
- Ensure Employer's Requirements contain latest agreed information regarding IAQ objectives and targets.
- Review costs. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop the Spatially Coordinated Proposal with integrated IAQ strategies. Follow the Design Principles described in this section when producing the Spatially Coordinated Proposal.
- Further develop the IAQ Plan inherited from Stage 2, with any new information available and to reflect any significant changes to the design.
- Spaces containing cleaning products and printers should be separated spaces. Ventilation should be exhausted rather than recirculated.
- Promote the specification of products which are eco-certified (such as Green Seal, Green Star, EcoLogo or Blue Angel).
- If possible, ensure that the total equivalent area of openable windows is at least 5% of the room floor area to ensure adequate ventilation.
- If required, the Building Services Engineer should use CFD methods to analyse air and pollutant flow in rooms and to optimise ventilation system design.
- Identify who will operate the building as early as possible. Design for usability and manageability, testing ideas with occupier representatives. Start planning for commissioning.
- Any design or specification changes that can impose a risk to the targets must be thoroughly explored, reported and agreed. Identify and record performance risks to inform Stage 4.
- At the end of this stage, updated Outline Specifications will be delivered with any IAQ requirements included. Clarity on the tolerance levels accepted for any deviation from specification must be provided.
- Arrange a Sustainability Workshop/Consultation to track IAQ objectives and targets. Any risks must be raised as early as possible by the Design Team.



STAGE 4 - Technical Design

Client Team

- Review critical design information and decisions related to IAQ.
- Review and acknowledge any derogations from the Environmental Sustainability Guide as well as the reasoning and impact of that decision, using information pre-

sented by the Design Team.
- Ensure that requirements and targets for IAQ are clear and prescriptive in the project specifications and tender documentation, at the start of procurement process.
- Ensure that questions related to how the building's occupants health and well-being design targets will be delivered, monitored and reported, will be included in the Contractor's tendering process.
- Review costs associated with this theme. Any new information must be clearly allocated in the revised Cost Plan.

Design Team
- Develop and coordinate the Technical Design information with integrated strategies, as defined in the IAQ Plan.
- Review and update the IAQ Plan inherited from Stage 3 to reflect any new information available.
- The Tender package will be produced to ensure that the competing contractors understand the IAQ requirements.
- Record, discuss and agree with the Estates Net Zero Team and BSG any design or specification changes that can influence the project's Air Quality objectives.
- Arrange a Sustainability Workshop/Consultation to track and review IAQ objectives and targets. Any risks must be raised as early as possible by the Design Team.

5.2 Health and Well-being

5.2.2 Daylight and Visual Comfort

Rationale

Light serves as the primary regulator of the human circadian system, which controls various bodily processes including digestion, hormone release, body temperature and sleep cycles. Research has demonstrated that exposure to light during the day can enhance productivity and sleep quality, while also reducing symptoms of depression. Conversely, insufficient light exposure has been associated with the emergence of depressive symptoms and a decline in cognitive abilities. As such, lighting environments in which humans spend their time will significantly affect their visual, circadian, and mental health. Lighting design generally addresses visual requirements, but do not take into account circadian and mental health of individuals.

The University is committed to enhancing the health, well-being, and productivity of its buildings occupants. This is reflected in the design of spaces with good indoor daylighting, glare control and adequate view-out. Achieving appropriate lighting levels involves careful consideration of building and façade design, spatial configuration, and lighting systems.

Reference documents

- UoE Estates Design Guideline - No.6 Electrical Engineering Services
- Research Insight 07- Daylight calculation methods in BS EN 17037, CIBSE, (2023)
- The SLL Code for Lighting, CIBSE, (2022)
- Lighting Guide 10: Daylighting, CIBSE, (2014)
- TM40 - Health and well-being in building services, CIBSE, (2020)
- BREEAM UK New Construction V7-Hea 01/02,(2025)

Consultation

The Estates Net Zero Team and BSG must be consulted at every stage for decisions impacting Daylighting and Visual Comfort, and its management.

Design Principles

The Design principles to deliver this theme are:

1. Prioritise natural daylight early in the design process. Use daylight modelling to evaluate and optimise daylight performance.
2. Optimise building orientation and layout according to local conditions.
3. Design windows and openings to balance daylight intake and energy efficiency. This includes considerations of size, location and technical performance of glazing and frame.
4. Choose interior finishes that reflect natural light deeper in the building.
5. Integrate daylight with artificial lighting systems.
6. Implement advanced daylighting controls.
7. Integrate shading devices to manage solar gain and control glare.
8. Mitigate glare risk, implement good UGR criteria.
9. Implement good practice Daylight Factor, and Daylight Uniformity criteria.
10. Meet good practice average and minimum Daylight Illuminance criteria.

Key Requirements

1. Internal lighting is designed to provide illuminance levels and colouring rendering index in accordance with CIBSE SLL Code for Lighting and LG 10.
2. 70% of all workstations are within 7.5m of view windows. VLT is greater than 40%.
3. Daylight Factors in at least 80% of occupied spaces will meet an average daylight factor exceeding 2%, and a minimum Uniformity Ratio of 0.4 (spaces with glazed roofs should achieve a UR of at least 0.7).
4. At least 75% of occupied spaces receive a minimum 300lux for at least 50% of operating hours each year (averaged over entire space), a minimum of 150lux for at least 50% of operating hours each year (at floor level), and less than 10% of the area can receive more than 1000lux for 250hours each year.
5. All regularly occupied spaces are classified with Unified Glare Rating of 19 or lower.

Evidence/Deliverables

1. RIBA Stage Sustainability Report
2. Daylight Analysis Report
3. Solar Exposure and Shading Analysis
4. Final Brief and ER's
5. Workshop/Consultation Minutes

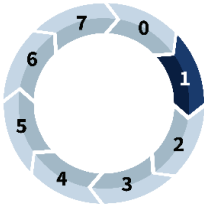
Requirements per RIBA Stage



STAGE 0 - Strategic Definition

Client Team

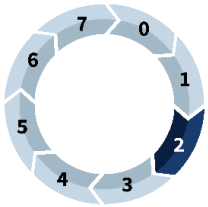
- Encouragement of best practices in lighting design and visual comfort must be clearly identified in the Business Case and Strategic Brief.
- Reflect on lessons drawn from previous exemplar projects, related not only to building performance but also in relation to costs, programme and risks.
- Identify daylight and visual comfort opportunities and limitations of potential sites/ locations.



STAGE 1 - Preparation and Brief

Client Team

- Acceptable daylight and visual comfort targets shall be established in accordance with the current Guide. Any deviation must be agreed with the Estates Net Zero Team, and included in the Initial Project Brief.
- Arrange consultations with stakeholders. Understanding the specific needs and preferences of users in a space is integral to creating effective lighting environments. Agree objectives and any specific daylight and visual comfort requirements. Include this information in Initial Project Brief.
- Arrange a Sustainability Workshop. Include in the agenda daylight and visual comfort objectives and targets. Incorporate conclusions in the Initial Project Brief.
- Any Sustainability Accreditation to be used (such as WELL) shall be discussed and agreed with the University's Estates Net Zero Team and BSG. The appointment of a relevant assessor to monitor the process might be required.
- Establish whether any additional specialist sustainability consultants -such as a Lighting Designer or a WELL Performance Testing Agent-, are required to deliver the targets. A revision of programme and fees may be required. This must be raised at the earliest opportunity on commencement of the project by the University.
- Assess how daylight and visual comfort objectives and requirements are to be communicated to the Design and Construction teams. These can be embedded in a range of documents such as ER's, Scopes of Services, Specifications, Construction Contracts, etc.
- Any costs associated with these objectives (design strategies, testing, etc.) must be clearly allocated in the Cost Plan.



STAGE 2 - Concept Design

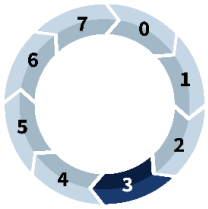
Client Team

- Appoint a Design Team with the appropriate skills to deliver the required daylight and visual comfort objectives and targets.
- Clear contractual daylight and visual comfort targets must be communicated, discussed and agreed with the Design Team.
- Ensure that the Design Team is provided with the information regarding number of occupants and periods of occupation.
- If applicable, preliminary surveys on existing building fabric and building services will be carried out to identify risks and opportunities.
- If required, appoint any additional specialist consultant.
- Any deviation should be explored, reported and agreed with Estates Net Zero Team.
- Review costs. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop the Concept Design Proposal with integrated strategies to achieve the agreed daylight and visual comfort objectives and targets. Optimisation of natural daylight will promote the occupier's mental and biological health, reduce energy costs and the

environmental impact of the building by diminishing the need for artificial light.
- Develop the preliminary Daylight Analysis Report using Climate-based Lighting Calculations -as described in CIBSE RI07- to make informed design decisions. It shall be linked to thermal comfort and energy studies.
- Produce the preliminary Solar Exposure and Shading Analysis.
- Arrange a Workshop. Include in the agenda tracking and review of the daylight and visual comfort objectives and targets. Incorporare conclusions in Final Project Brief.
- Any deviation must be explored, reported and agreed with the Estates Net Zero Team and BSG.



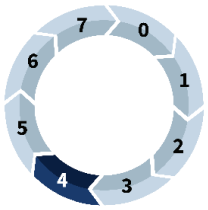
STAGE 3 - Spatial Coordination

Client Team

- Review critical design information and decisions related to daylight and visual comfort.
- Review and acknowledge any derogation from the Brief or current Environmental Sustainability Guide, as well as the reasoning and impact of that decision, using information presented by the Design Team.
- Ensure Employer's Requirements contain latest agreed information regarding daylight and visual comfort objectives and targets.
- Review costs. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop the Spatially Coordinated Proposal with integrated visual comfort and daylighting strategies. Follow the Design Principles described in this section when producing the Spatially Coordinated Proposal.
- The Daylight Analysis Report inherited from Stage 2 must be reviewed and updated with any new information available.
- Review and update the Solar Exposure and Shading Analysis inherited from Stage 2.
- Any areas at risk of glare should be identified using a glare control assessment. Where risk has been identified, a Glare Control Strategy must be used.
- If possible, ensure that the envelope glazing area is no less than 7% of the regularly occupied floor area. Additionally, the total equivalent area of openable windows is at least 5% of the room floor area to ensure adequate ventilation.
- Identify who will operate the building as early as possible. Design for usability and manageability, testing ideas with occupier representatives. Start planning for commissioning.
- Lighting zones must allow for an appropriate level of occupant control depending on the type or area.
- Any design or specification changes that can impose a risk to the targets must be thoroughly explored, reported and agreed. Identify and record performance risks to inform Stage 4.
- At the end of this stage, updated Outline Specifications will be delivered. Any daylight and visual comfort objectives or requirements shall be included. Clarity on the tolerance levels accepted for any deviation from specification must be provided.
- Arrange a Workshop to track daylight and visual comfort objectives and targets. Any risks must be raised as early as possible by the Design Team.



STAGE 4 - Technical Design

Client Team

- Review critical design information and decisions related to daylight and visual comfort.
- Review and acknowledge any derogations from the current Guide as well as the reasoning and impact of that decision, using information presented by the Design Team.
- Ensure requirements and targets for daylight and visual comfort are clear and pre-

scriptive in the project specifications and tender documentation, at the start of procurement process.
- Ensure that questions related to how the building's occupants health and well-being design targets will be delivered, monitored and reported, will be included in the Contractor's tendering process.
- Review costs associated with this theme. Any new information must be clearly allocated in the revised Cost Plan.

Design Team
- Develop and coordinate the Technical Design information with integrated daylight and visual comfort strategies.
- Review and update the Daylight Analysis Report and the Solar Exposure and Shading Analysis inherited from Stage 3 to reflect any new information available.
- The Tender package will be produced to ensure that the competing contractors understand the daylight and visual comfort requirements.
- Record, discuss and agree with the Estates Net Zero Team any design or specification changes that can influence the project's daylight and visual comfort strategies.
- Arrange a Workshop/Consultation to track and review daylight and visual comfort objectives and targets. Any risks must be raised as early as possible by the Design Team.

5.2 Health and Well-being

5.2.3 Thermal Comfort

Rationale

As defined in the BS EN ISO 7730:2005, thermal comfort refers to 'that condition of mind which expresses satisfaction with the thermal environment', and is influenced by a number of subjective perceptions. It is ranked as one of the strongest contributing factors to overall human satisfaction in the built environment. It significantly impacts the health and productivity of individuals by affecting various bodily systems -such as the integumentary, endocrine, and respiratory systems-, and their experiences in buildings by influencing factors like motivation, focus and mood.

Thermal comfort standards propose a method to predict whether humans will be thermally satisfied within a mechanically conditioned space, and is derived from a combination of six core parameters: air temperature, humidity, air movement, mean radiant temperature of surrounding surfaces, metabolic rate and clothing insulation. For naturally conditioned buildings, the adaptive thermal comfort model correlates human comfort directly with indoor operative temperature and outdoor temperature.

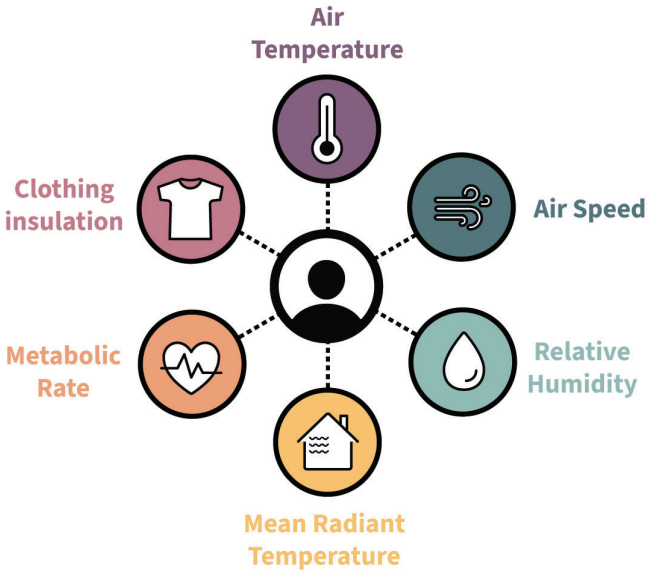


Figure 5.10 Thermal comfort diagram parameters. Source: adapted from the WELL Building Standard.

Given its subjective nature and the possible environmental variations, thermal comfort requires a holistic design approach. Additionally, when a certain level of occupant control is allowed by implementing thermal zones and controls, occupants comfort can be enhanced. But beyond each individual's experience, the regulation of indoor temperatures also contributes significantly to a building's energy consumption. According to the Climate Change Committee, heating and hot water demand currently accounts for more than 40% of the UK energy consumption.

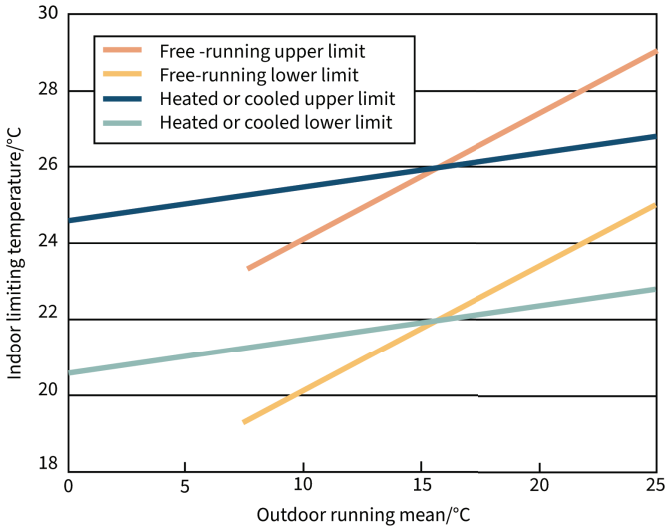


Figure 5.11 Comfort temperature ranges in PMV/ PPD models, versus 'free-running' as a function of outdoor running mean temperature. Source: based on data field surveys in offices in Europe by McCartney and Nicol (2002)

With climate change, issues of under and overheating are becoming more prevalent. Considering projected weather files which are expected throughout the building's lifespan is crucial to design a building that can adapt to future climatic conditions.

Reference documents

- UoE Estates Design Guidelines - No.3 Mechanical Engineering, and No. 5 Metering.
- BS EN ISO 16798-1:2019
- BS EN ISO 7730:2005
- TM52, CIBSE (2013)
- TM59 , CIBSE (2017)
- TM40, CIBSE (2020)
- Guide A - Environmental Design, 8th ed, CIBSE (2021)
- WELL Building Standard - Thermal Comfort, Version 2, (Q2, 2025)
- BREEAM UK New Construction V7 - Hea 05, (2025)

Consultation

The Estates BSG and Net Zero Team must be consulted at every stage for decisions impacting Thermal Comfort and its management.

Design Principles

The key design principles for good thermal comfort in buildings are:

1. Aim for thermal environments that the substantial majority of building users (above 80%) find thermally acceptable.
2. Take into account the local climate -including factors such as temperature fluctuations, solar radiation, wind patterns, and humidity-, in the design process. The building should be oriented and shaped to take advantage of -or shielded- from these elements as required.
3. The building's envelope plays a crucial role in maintaining internal temperatures. High-performance materials and construction techniques should be employed to ensure adequate insulation and airtightness. This includes choosing appropriate glazing ratios, considering factors like solar gain, thermal resistance, and light transmission.
4. Utilise passive design strategies such as thermal mass, natural ventilation, and daylighting to influence thermal comfort.
5. Implement solar shading devices to prevent excessive heat gain in warmer months while allowing solar gains during colder ones.
6. If possible, design for natural ventilation. This not only reduces reliance on mechanical systems, but can also improve air quality and help in maintaining comfortable temperature levels.
7. Design with an understanding that individual occupants have different comfort levels. If possible, provide systems and design features that allow occupants to adapt their environment to suit individual needs, such as controllable heating and cooling zones, adjustable window coverings, personalised equipments and user-accessible ventilation.
8. Efficient and intelligently controlled HVAC systems should be designed to complement the passive design features. These systems need to be flexible and responsive to the changing conditions and occupancy of the building.
9. If applicable, incorporate radiant heating and cooling systems into the building design.This will maximise volume of the space, reduce dust transmission, improve ventilation control and increase thermal comfort.
10. Thermal comfort strategies should align with overall sustainability goals. This includes optimising energy use, incorporating renewable energy sources, and minimising the environmental impact of building operations.
11. Including systems for monitoring environmental conditions and energy use within the building can help in fine-tuning operations to improve comfort and efficiency. Feedback from these systems can also inform occupants and facilities managers about the best practices for using the space comfortably, such as through display screens with real-time dry-bulb temperature and relative humidity information.
12. In addition to having calibrated sensors, the positioning of the sensors plays an important role in the accurate assessment of the thermal environment.
13. If possible, mitigate urban heat island effects and improve outdoor thermal comfort by adding vegetation, providing shading structures, increasing reflectance of building materials and introducing water features.
14. All aspects of design—from the macro scale of urban design considerations to the micro scale of interior finishes—need to be coordinated to ensure they work together to enhance thermal comfort.

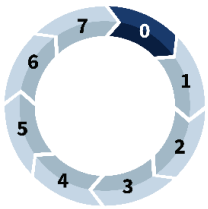
Key Requirements

1. Design criteria for mechanically heated and cooled buildings shall be based on the thermal comfort indices PMV-PPD in accordance with BS EN ISO 7730:2005 and BS EN ISO 16798-1:2019.
2. When designing naturally conditioned or mixed mode buildings, the adaptive thermal comfort method is recommended in accordance with BS EN ISO 16798-1:2019.
3. The building must be designed to limit the risk of overheating, in accordance with CIBSE TM52/TM59 (as appropriate).
4. The thermal modelling must demonstrate that the relevant requirements set out in items 1 and 2 are achieved for the projected climate change conditions:
    - For naturally ventilated buildings: Medium Risk emission scenarios for 2080s period, at 50th percentile, DSY2 and DSY3.
    - For mechanically ventiladed or mixed mode buildings: High and Medium Risk emission scenarios for 2050s period, at 50th percentile, DSY2 and DSY3.

Evidence/Deliverables

1. RIBA Stage Sustainability Report
2. TM52/TM59 Assessment
3. Dynamic Thermal Model
4. Thermal bridge calculations, if applicable
5. Final Brief and ER's
6. Meeting Minutes

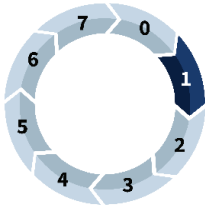
Requirements per RIBA Stage



STAGE 0 - Strategic Definition

Client Team

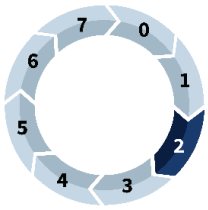
- Endorsing the adoption of best practices in appropriate indoor thermal comfort must clearly identified in the Business Case and Strategic Brief.
- Reflect on lessons learnt from previous exemplar projects, related not only to building performance but also in relation to costs, programme and risks.
- Identify thermal comfort opportunities and limitations of potential sites/locations.



STAGE 1 - Preparation and Brief

Client Team

- Appropriate thermal comfort targets shall be established in accordance with current Design Guide. Any deviation must be agreed with the Estates Net Zero Team and BSG, and included in the Initial Project Brief.
- Arrange consultations with stakeholders. Understanding the specific needs and preferences of users in a space is integral to creating thermally comfortable environments. Agree objectives and any specific requirements. Include this information in the Initial Project Brief.
- Arrange a Workshop. Include in the agenda thermal comfort objectives and targets. Incorporate conclusions in the Initial Project Brief.
- Any Sustainability Accreditation to be used (such as Passivhaus or WELL) shall be discussed and agreed with the Estates Net Zero Team. The appointment of a relevant assessor to monitor the process might be required.
- Establish whether any additional external specialist consultant -such as a Passivhaus Designer, Airtightness Champion or a WELL Performance Testing Agent-, are required to deliver the project. A revision of programme and fees may be required. This must be raised at the earliest opportunity on commencement of the project by the University.
- Assess how thermal comfort objectives and requirements are to be communicated to the Design and Construction teams. These can be embedded in a range of documents such as ER's, Scopes of Services, Specifications, Construction Contracts, etc.
- Any costs associated with achieving these objectives (design strategies, testing, etc.) must be clearly allocated in the Cost Plan.



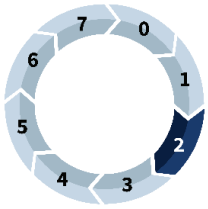
STAGE 2 - Concept Design

Client Team

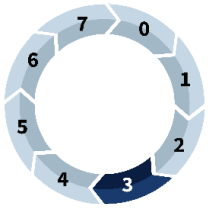
- Appoint a Design Team with the appropriate skills and expertise to deliver the required thermal comfort objectives and targets.
- Clear contractual thermal comfort targets must be communicated, discussed and agreed with the Design Team.
- Ensure that the Design Team is provided with the information regarding number of occupants, periods of occupation, equipment, etc.
- If applicable, preliminary surveys on existing building fabric and building services will be carried out to identify risks and opportunities.
- If required, appoint any additional specialist consultant.
- Any deviation should be explored, reported and agreed with the Estates Net Zero Team and BSG.
- Review costs and allocate any new information in the revised Cost Plan.

Design Team

- Develop the Concept Design Proposal with integrated strategies to achieve the agreed thermal comfort targets. The proposal must reduce the risk of thermal discomfort within the building, leading to unacceptable winter and summer indoor temperatures, and its immediate effect on the occupants' health and well-being.



- A Dynamic Thermal Model appropriate to the complexity of the building will be developed to test how the proposed design choices will impact the occupants thermal comfort, make informed decisions, and optimise the building's design. This model will be developed in accordance with CIBSE TM54 and the University's DSM Guide.
- For smaller and more basic building designs with less complex heating or cooling systems, an alternative less complex means of analysis may be appropriate (such as Passivhaus PHPP). The use of this alternative tool instead of a Dynamic Thermal Model will have to be discussed and agreed with the Estates Net Zero Team.
- The design criteria for mechanically heated and cooled buildings shall be based on the thermal comfort indices PMV-PPD in accordance with BS EN ISO 7730:2005 and BS EN ISO 16798-1:2019.
- When designing naturally conditioned buildings, the adaptive thermal comfort method shall align with BS EN ISO 16798-1:2019.
- The building must be designed to limit the risk of overheating, in accordance with CIBSE TM52/TM59 (as appropriate).
- The thermal model assumptions must be reasonable and represent typical use patterns and loads given the parameters and function of the building. Realistic allowance for the use of window opening must be included in free-running buildings. When factors are unknown (such as internal gain values), information shall be considered as stated in CIBSE Guide A.
- All modelling will consider projected future climate scenarios in thermal comfort calculations. The proposal must provide a resilient solution to optimise the building's thermal performance for projected climate change scenarios. For the University to gain a correct understanding of possible future risks, the Design Team shall develop a thermal analysis under the following climatic conditions, specific to the project's climatic location:
  1. For naturally ventilated buildings: Medium Risk emission scenarios for 2080s period, at 50th percentile, DSY2 and DSY3.
  2. For mechanically ventiladed or mixed mode buildings: High and Medium Risk emission scenarios for 2050s period, at 50th percentile, DSY2 and DSY3.
- Designing the building with thermal zones and controls should enhance the users' comfort by enabling a certain level of non-transient building occupant control.
- Thermal zoning must be planned to maximise efficiency of heating and cooling. The level of occupant control will depend on the building and area use, occupancy type and patterns and user expectations.
- Arrange a Workshop. Include in the agenda tracking and review of thermal comfort objectives and targets. Incorporare conclusions into Final Project Brief.
- Any deviation must be explored, reported and agreed with the Estates Net Zero Team and BSG.



STAGE 3 - Spatial Coordination

Client Team

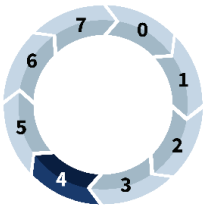
- Review critical design information and decisions related to thermal comfort.
- Review and acknowledge any derogation from the Brief or current Guide, as well as the reasoning and impact of that decision, using information presented by the Design Team.
- Ensure that Employer's Requirements contain latest agreed information regarding thermal comfort objectives and targets.
- Review costs. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop the Spatially Coordinated Proposal with integrated thermal comfort strategies. Ensure that thermal comfort strategies are properly coordinated with other aspects of the building design, including architectural, structural, and building services, to avoid conflicts and ensure a holistic design approach that benefits all aspects of usability and sustainability. Follow the Design Principles described in this section

when producing the Spatially Coordinated Proposal.

- The Dynamic Thermal Model inherited from Stage 2 will be further developed to test the design choices, optimise the building's design and make informed decisions. Any significant changes that might have occurred to the project, or new information that might have become available, will be reflected and updated in the new version of the model.
- Review thermal bridging potential and appoint specialist consultant to produce thermal bridge calculations of key details at next stage, if applicable.
- Evaluate ventilation supply rates and method for each space and day type, and how these will be controlled for occupancy.
- Identify who will maintain/operate the systems as early as possible. Designs and controls should be as simple as possible, and target consistent operation rather than introducing complexity by chasing efficiency.
- Start planning for commissioning, including seasonal commissioning and fine-tuning.
- Any design or specification changes that can impose a risk to the targets must be thoroughly explored, reported and agreed. Identify and record performance risks to inform Stage 4.
- At the end of this stage, updated Outline Specifications will be delivered. Any thermal comfort objectives or requirements shall be included. Clarity on the tolerance levels accepted for any deviation from specification must be provided.
- Arrange a Workshop to track thermal comfort objectives and targets. Any risks must be raised as early as possible by the Design Team.



STAGE 4 - Technical Design

Client Team

- Review critical design information and decisions related to thermal comfort.
- Review and acknowledge any derogations from the current Guide, as well as the reasoning and impact of that decision, using information presented by the Design Team.
- Ensure that requirements and targets for thermal comfort are clear and prescriptive in the project specifications and tender documentation, at the start of procurement process.
- Ensure that questions related to how the building's occupants thermal comfort objectives and targets will be delivered, monitored and reported, will be included in the Contractor's tendering process.
- Review costs associated with this theme. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop and coordinate the Technical Design information with integrated thermal comfort strategies.
- Review and update the Dynamic Thermal Model inherited from Stage 3 to reflect any new information available.
- The Tender package will be produced to ensure that the competing contractors understand the project thermal comfort requirements.
- Record, discuss and agree with the Estates Net Zero Team and BSG any design or specification changes that can influence the project's thermal comfort strategies.
- Arrange a Workshop to track and review thermal comfort objectives and targets. Any risks must be raised as early as possible by the Design Team.

5.2 Health and Well-being

5.2.4 Acoustic Comfort

Rationale

"Sound" is typically described as the way humans respond to mechanical vibrations traveling through a medium like air. According to this description, how humans perceive sound critically influences the formation of a sonic environment.

Acoustic comfort refers to the state of satisfaction expressed by individuals regarding the auditory environment around them. It is achieved when the sound levels in a space contribute positively to health, communication, and well-being, without causing disturbance or distraction. Factors that influence acoustic comfort include the volume, frequency, duration, and nature of sounds, as well as the acoustical properties of the environment such as reverberation time and sound insulation.

According to the WHO, noise -which is commonly defined as unwanted or disruptive sound that can interfere with communication, concentration and overall well-being-, is an important public health issue, featuring among the top environmental risks to health. Consequently, it is a growing concern among both the general public and policy-makers.

Noise in buildings can arise from a variety of sources. Sounds in enclosed spaces, such as those from occupants or HVAC systems, can impair productivity, concentration and memory retention in university students and workplace occupants. Furthermore, noise from adjacent activities like vibrations from mechanical equipment, can result in uncomfortable environments for building users. Another frequent acoustic problem is the lack of privacy within and between spaces, as conversations can easily travel through walls or across open offices, compromising confidentiality and disrupting focus.

To ensure its buildings provide a suitable acoustic environment, the University of Edinburgh will prioritise building acoustics in the design, construction, and maintenance of its facilities. By recognising and implementing project-specific strategies for acoustic comfort, the University aims to manage noise impact effectively, thereby improving comfort, productivity, and privacy for all occupants.

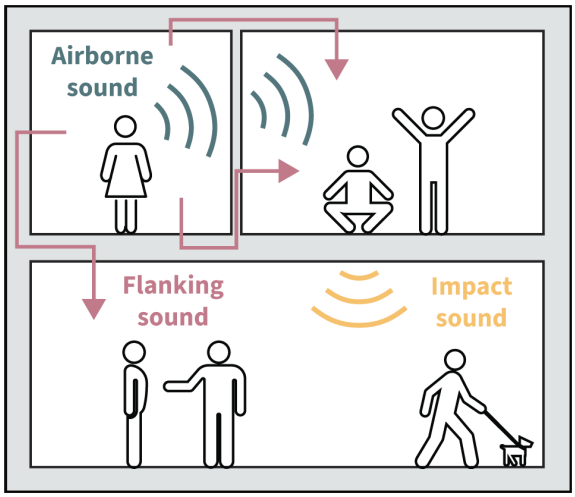


Figure 5.12 Types of sound transmission in a building: airborne, impact and flanking transmission.

Reference documents

- UoE Estates Design Guideline - No.3 Mechanical Engineering.
- TM40, CIBSE (2020)
- Guide A - Environmental Design, CIBSE (2021)
- WELL Building Standard - Sound, (v2, Q2 2025)

Consultation

The Estates BSG and Net Zero Team must be consulted at every stage for decisions impacting acoustic comfort and its management.

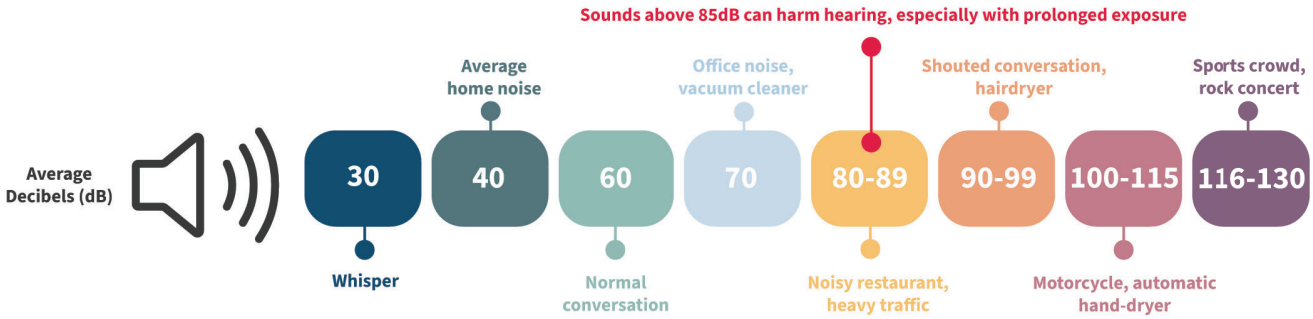


Figure 5.13 Noise levels chart.

Design Principles

The key Design principles to deliver this strategy are based on the WELL v2 Sound Conditions S01, S02 and S03:

1. Incorporate strategic planning to prevent acoustic issues by following the recommendation in WELL v2 S01 and produce a Map of Acoustic Zones. This is an annotated document that labels the different zones in the project as Loud, Quiet, Mixed and Circulation Zones. If Loud zones directly border Quiet zones, provide a plan for mitigating sound transmission between Loud and Quiet zones.
2. The Design Team shall provide an Acoustic Design Plan, with detailed information that describes existing conditions, recommended solutions and measurement results with a focus on managing background noise, speech privacy, reverberation time and/or impact noise within the project boundary, in accordance with WELL v2 S01.
3. Design to achieve desired ambient noise levels such that HVAC, exterior noise intrusion or other noise sources do not impact occupants health and well-being.
4. Control interior noise sources by selecting HVAC equipment with lower sound ratings and by designing the system to reduce sound within ducts.
5. Control exterior noise by providing sound reduction at the building façade, windows and any exterior penetrations.
6. Strategic layout planning can mitigate noise issues by positioning noise-sensitive spaces away from noisy areas. This also includes placing service equipment (i.e, lifts, HVAC systems,...) in locations where they will cause minimal disturbance to occupants.

Evidence/Deliverables

1. RIBA Stage Sustainability Report
2. Maps of Acoustic Zones in accordance with WELL v2 Precondition SO1.
3. Acoustic Design Plan in accordance with WELL v2 Precondition SO1.
4. Background Noise Levels Thresholds to be verified in accordance with WELL S02 Maximum Noise Levels
5. Technical Documents (drawings and specifications) to provide design information of sound isolation requirements at walls and doors.
6. Final Brief and ER's
7. Workshop/Consultation Minutes

Key Requirements

The project will meet the following acoustic requirements:

1. Map Acoustic Zones and provide Acoustic Design Plan in accordance with WELL v2 Precondition SO1.

2. Design to Limit background Noise Levels in accordance with WELL v2 Condition SO2:

Sound Pressure Level (SPL)		Cat 1	Cat 2	Cat 3
Average SPL (Leq)	dBA	40	45	50
	dBC	60	65	70
Max SPL (LMax)	dBA	50	55	60

   - Cat 1: Areas for conferencing, learning or speaking.
   - Cat 2: Enclosed areas for concentration
   - Cat 3: Open areas for concentration, spaces with PA systems, and areas for dining.

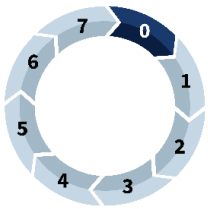
3. For Dwelling Units, Average SPL (Leq) not to exceed 35dBA in bedrooms.

4. For all spaces, interior walls to meet the following sound transmission class (STC) or weighted sound reduction (Rw) values, in accordance with WELL v2 Condition S03:

Interior Wall Type	Min. STC or Rw
Between loud zones and regularly occupied spaces	60
Between areas for conferencing, learning or sleeping and other regularly occupied spaces	55
Between adjacent quiet zones	50
Between rooms for concentration and other regularly occupied spaces	45
Between circulation zones and regularly occupied spaces	40

5. Doors that connect two occupiable rooms and doors to mechanical equipment rooms have a non-hollow core, minimum STC/Rw of 30 and seals at the head, jamb and base.

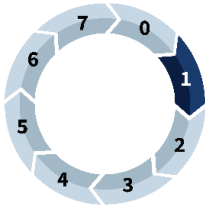
Requirements per RIBA Stage



STAGE 0 - Strategic Definition

Client Team

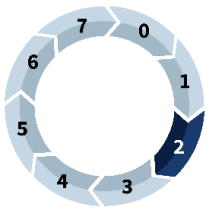
- The promotion of appropriate acoustic comfort standards must be clearly identified in the Business Case and Strategic Brief.
- Evaluate lessons learnt from previous exemplar projects, related not only to building acoustic performance but also in relation to costs, programme and risks.
- Identify acoustic comfort opportunities and limitations of potential sites/locations.



STAGE 1 - Preparation and Brief

Client Team

- Appropriate acoustic comfort targets shall be established in accordance with the current Design Guide. Any deviation must be agreed with the Estates Net Zero Team, and included in the Initial Project Brief.
- Arrange consultation with stakeholders. Understanding the specific needs and preferences of users in a space is integral to creating acoustically comfortable environments. Agree objectives and any specific requirements. Incorporate this information in the Initial Project Brief.
- Arrange an Acoustic Performance Workshop. Include in the agenda acoustic comfort objectives and targets. Incorporate conclusions in the Initial Project Brief.
- Any Health and Well-being accreditation to be used (such as WELL) shall be discussed and agreed with the Estates Net Zero Team. The appointment of a relevant assessor to monitor the process might be required.
- Determine whether any additional specialist consultants -such as an Acoustic Engineer or a WELL Performance Testing Agent- are required to deliver the project. A revision of programme and fees may be required. This must be raised at the earliest opportunity on commencement of the project by the University.
- Assess how acoustic comfort objectives and requirements are to be communicated to the Design and Construction teams. These can be embedded in a range of documents such as ER's, Scopes of Services, Specifications, Construction Contracts, etc.
- Any costs associated with achieving these objectives (design strategies, testing, etc.) must be clearly allocated in the Cost Plan.



STAGE 2 - Concept Design

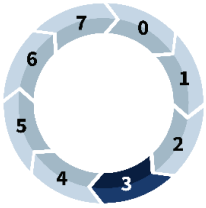
Client Team

- Appoint a Design Team with the expertise and skills to deliver the appropriate acoustic comfort objectives and targets.
- Clear contractual acoustic comfort targets must be communicated, discussed and agreed with the Design Team.
- Ensure that the Design Team is provided with the information regarding number of occupants, periods of occupation, equipment, room layouts, etc.
- If applicable, preliminary surveys on existing building fabric and building services will be carried out to identify risks and opportunities.
- An Acoustic Engineer, if required, or any additional specialist consultant shall be appointed.
- Any deviation should be explored, reported and agreed with Estates Net Zero Team.
- Review costs. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop the Concept Design Proposal with integrated strategies to achieve the agreed acoustic comfort objectives and targets. Designing for a positive acoutic environment will promote the occupiers' mental and biological well-being.
- Produce a Map identifying the different Acoustic Zones in the project floor drawings, with corresponding Acoustic Performance requirements for each zone.

- Develop an Acoustic Design Plan that outlines acoustic solutions and a timeline for implementation. The content presented should be in accordance with the requirements described in WELL v2 Precondition SO1.
- Arrange an Acoustic Performance Workshop. Include in the agenda tracking and review of Acoustic Comfort Objectives and Targets. Incorporare conclusions in the Final Project Brief.
- Any deviation must be explored, reported and agreed with the Estates Net Zero Team and BSG.



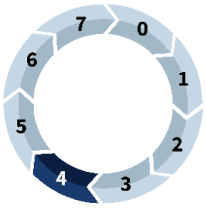
STAGE 3 - Spatial Coordination

Client Team

- Review critical design information and decisions related to acoustic comfort.
- Review and acknowledge any derogation from the Brief or current Guide, as well as the reasoning and impact of that decision, using information presented by the Design Team.
- Ensure that the Employer's Requirements contain complete and latest agreed information regarding acoustic comfort objectives and targets.
- Review costs. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop the Spatially Coordinated Proposal with integrated acoustic comfort strategies. Ensure that these strategies are integrated and coordinated with other aspects of the building design, including architectural, structural, and building services, to avoid conflicts. Follow the Design Principles described in this section when producing the Spatially Coordinated Proposal.
- In areas where Loud Zones directly border Quiet zones, a Noise Control Assessment must be provided. Where risks have been identified, a Noise Control Strategy must be used.
- The Acoustic Zones Map and Acoustic Design Plan must be reviewed and updated to reflect any significant changes or new information available.
- At the end of this stage, updated Outline Specifications will be delivered. Any acoustic comfort objectives or requirements shall be included. Clarity on the tolerance levels accepted for any deviation from specification must be provided.
- Arrange an Acoustic Performance Workshop to track and review acoustic comfort objectives and targets. Any risks must be raised as early as possible by the Design Team.



STAGE 4 - Technical Design

Client Team

- Review critical design information and decisions related to acoustic comfort.
- Review and acknowledge any derogations from the Design Guideline as well as the reasoning and impact of that decision, using information presented by the Design Team.
- Ensure that requirements and targets for acoustic comfort are clear and prescriptive in the project specifications and tender documentation, at the start of procurement process.
- Ensure that questions related to how the building's occupants acoustic comfort objectives and targets will be delivered, monitored and reported, will be included in the Contractor's tendering process.
- Review costs associated with this theme. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop and coordinate the Technical Design information with integrated acoustic comfort strategies.

- Review and update the Acoustic Design Plan and Acoustic Zones Map inherited from Stage 3 to reflect any new information available.
- The Tender package will be produced to ensure that the competing contractors understand the acoustic comfort requirements.
- Review, discuss and agree with the University Estates Net Zero Team and BSG any design or specification changes that can influence the project's acoustic comfort strategies.
- Arrange an Acoustic Performance Workshop to track and review acoustic comfort objectives and targets. Any risks must be raised as early as possible by the Design Team.

5.2 Health and Well-being

5.2.5 Healthy and Sustainable Materials

Rationale

According to the Organisation for Economic Co-operation and Development (OECD), the construction sector is a major consumer of global resources, accounting for over one-third of worldwide usage. Notably, 55% of global industrial carbon emissions come from the production of just five key materials: steel (25%), cement (19%), paper (4%), plastic (3%), and aluminium (3%). Of these, the building industry is a primary consumer of cement and uses approximately 26% of aluminum, 50% of steel, and 25% of the plastic produced.

This substantial consumption not only demands significant energy inputs but also generates considerable emissions and waste. While carbon is a key element of sustainability, it is only one part of the broader sustainability spectrum. A project must look beyond its site boundaries to fully understand its planetary impacts. EPDs provide quantifiable data on some environmental metrics, but do not include these broader metrics that can provide a wider context. Frameworks such as One Planet Living or the Living Building Challenge include the wider considerations for any project, such as water use, land and nature, waste and community.

As outlined in the BREEAM Technical Manual, the construction supply chain is complex, spanning local and global networks with significant environmental, economic, and social implications. These risks range from toxicity and corruption to modern slavery. Consequently, material selection is a critical component of the architectural design process. Strategies in this area should therefore focus on enhancing the efficiency and durability of construction products, promoting material's ingredients disclosure, encouraging responsible sourcing, and restricting hazardous chemicals.

Furthermore, given that manufacturer environmental claims can often be inconsistent or difficult to interpret, project teams should rely on recognised tools like EPDs. This approach ensures informed decision-making based on reliable data relevant to both the building and its entire life cycle.

Selection of construction materials and products should therefore prioritise efficiency, durability, and minimal environmental impact, while also considering the risks of material deterioration due to wear and tear and climate change. Effective design includes the identification and mitigation of potential vulnerabilities, implementing protective measures to extend materials' lifespan.

Sustainable material selection must equally address both environmental and human health impacts. Common products, including finishes (glues, varnishes, paints) and plastics found in carpets, furniture, and fixings, can compromise indoor air quality through off-gassing and leaching. While Volatile Organic Compounds are well-documented, numerous other hazardous chemicals pose significant risks to occupants. Certification schemes such as the Living Future Institute's Declare Label, NaturePlus, and Healthy Product Declarations (HPDs) empower designers to identify safer alternatives. Additionally, bio-based products often present a lower risk, typically involving fewer industrial processes and chemical additives.

The University of Edinburgh is committed to minimising occupant exposure to harmful chemicals throughout the construction, refurbishment, furnishing, and operation of its buildings. While legacy substances such as lead, asbestos, mercury, CCA, and PCBs are largely restricted, other compounds—including PFCs, orthophthalates, certain heavy metals, and HFRs—persist due to their performance advantages. It is vital to minimise exposure by limiting the presence of these substances and addressing product emissions.

Finally, to protect building occupants and maintenance staff, it is important to promote the use of low-hazard cleaning products and cleaning practices that reduce impacts in indoor air quality.

Reference documents

- Client Guide for Net Zero Carbon Buildings, LETI (2021)
- Embodied Carbon Primer, LETI (2020)
- Low Embodied Carbon Specification and Procurement Guide, LETI (2023)
- Embodied Carbon: Developing a Client Brief, UKGBC (2017)
- WELL Building Standard - Materials, (v2, Q2 2025)
- BREEAM UK New Construction- Materials, (v7, 2025)

Consultation

The Estates Net Zero Team must be consulted at every stage for decisions impacting sustainable and healthy materials and its management.

Design Principles

The following design principles based on WELL v2, BREEAM and SKA Rating Materials requirements :

1. Where reasonably practicable, design to maximise material efficiency and avoid unnecessary features, in line with BS 8895. This standard defines the processes, roles, and outputs for each project stage, offering the necessary tools and guidance for design teams to embed efficiency strategies effectively. Set targets and report on opportunities and methods to optimise the use of materials from Early Design Stages.
2. Encourage the use of reused and reclaimed materials wherever feasible, to minimise environmental impact and preserve resources.
3. Promote the use of materials with higher levels of recycled content, supporting the recycling industry and cutting down usage of virgin raw materials.
4. Consider the use of low carbon cement.
5. Design for durability and resilience to minimise costs and long-term environmental impact, resulting from premature building elements degradation, as a result of avoidable weathering and changing climate conditions.
6. Promote material transparency:
   - Favor construction products that are responsibly sourced and certified.
   - Advocate for the specification of products with independently verified ISO 14025 compliant EPDs (with third-party verification preferred) to enhance the access to reliable and comparable environmental impact data. This will support Design and Construction Teams when making informed choices.
7. Encourage the use of non-toxic materials:
   - Limit VOCs in wet-applied products such as paints, adhesives, and sealants, and control VOC emissions from furniture and other interior products.
   - Prioritise natural materials like wood, wool, or cotton for their low environmental footprint and minimal chemical processing.
8. Safe product use and maintenance:
   - Avoid hazardous or harmful substances in cleaning, disinfecting, and sanitizing products.
   - Establish comprehensive cleaning plans, maintain regular cleaning schedules, and provide proper training programs for staff regarding safe product handling and usage.

Key Requirements

1. All timber must be from chain-of-custody certified sources (FSC, PEFC or GiB).
2. All internal partitions, if new, must meet at least one of the following:
   - All plasterboards shall be supplied with ISO 14025 compliant EPD
   - Panels must be manufactured with at least 90% recycled content and 100% recyclable content. Additionally, the manufacturer has a Take Back scheme
3. All glazed partitions shall be supplied with an ISO 14025 compliant EPD.
4. All suspended ceilings and ceiling tiles, if new, meet at least one of the following:
   - Supplied with ISO 14025 compliant EPD
   - Manufactured aligns with: mineral/stone wool (50% min. recycled content)/ gypsum (80% min. recycled content)/steel (60% min. recycled content). Additionally, the manufacturer has a Take Back scheme
5. All soft floor coverings, if, new, shall be supplied with an ISO 14025 compliant EPD, or must be manufactured with at least 50% recycled content and 100% recyclable content.
6. All hard flooring, if new, shall be supplied with ISO 14025 compliant EPD, been awarded EU Ecolabel, or are manufactured with at least 25% recycled content and 100% recyclable content.
7. 75% of paints, coatings, polishes and varnishes should have been awarded the EU Ecolabel or are supplied with an ISO 14025 compliant EPD.
8. 50% of roofs, external walls, windows, external surfacing and insulation products shall be supplied with ISO 14025 compliant EPD.
9. Any EPD should be independently verified according to ISO 14025, with third-party verification preferred. EPDs using EN 15804 and ISO 21930:2017 are preferred. EPDs using EN 50693 may be appropriate for electrical equipment.

Evidence/Deliverables

1. Chain of custody certification documents for all timber used.
2. ISO 14025 compliant EPDs for required products, as described in Key Requirements.
3. Specifications
4. Final Brief and ER's
5. Workshop/Consultation Meeting Minutes

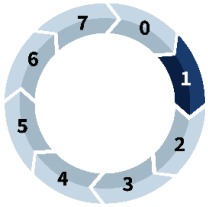
Requirements per RIBA Stage



STAGE 0 - Strategic Definition

Client Team

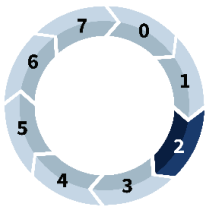
- Evaluate lessons learnt from previous exemplar projects, with a focus on costs, programme and risks.
- The requirement for best practices in the specification of sustainable and healthy materials must be clearly identified in the Business Case and Strategic Brief.
- Identify opportunities and limitations of potential sites/locations in relation to sustainable and healthy materials.



STAGE 1 - Preparation and Brief

Client Team

- Appropriate sustainable materials targets shall be established in accordance with the current Guide. Any deviation must be agreed with the Estates Net Zero Team, and included in the Initial Project Brief.
- Arrange consultations with stakeholders. Understanding the specific needs and preferences of users is integral to creating positive working environments. Agree objectives and any specific requirements. Include this information in Initial Project Brief.
- Arrange a a Materials Workshop. Include in the agenda sustainable and healthy materials objectives and targets. Incorporate conclusions in the Initial Project Brief.
- Any accreditation to be used (such as WELL or SKA) shall be discussed and agreed with the Estates Net Zero Team. The appointment of a relevant assessor to monitor the process might be required.
- Establish whether any additional specialist consultants -such as a SKA Assessor or WELL AP- are required to deliver the project. A revision of programme and costs may be required. This must be raised at the earliest opportunity on commencement of the project by the University.
- Assess how healthy materials objectives and requirements are to be communicated to the Design and Construction teams. These can be embedded in a range of documents such as ER's, Scopes of Services, Specifications, Construction Contracts, etc.
- Any costs associated with these objectives (design strategies, testing, etc.) must be clearly allocated in the Cost Plan.



STAGE 2 - Concept Design

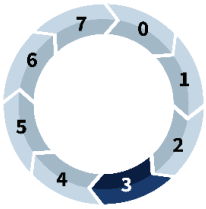
Client Team

- Appoint a Design Team with the expertise and skills to deliver the agreed sustainable and healthy materials objectives and targets.
- Clear contractual sustainable and healthy materials targets must be communicated, discussed and agreed with the Design Team.
- If applicable, preliminary surveys on existing building fabric will be carried out to identify risks and opportunities.
- Any required specialist consultant -such as SKA/WELL Assessor-, shall be appointed.
- Any deviation must be explored, reported and agreed with the Net Zero Team.
- Review costs. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop the Concept Design Proposal with integrated strategies to achieve the agreed sustainable and healthy materials objectives and targets. Follow the design principles described in this design theme.
- Encourage the use of sustainable and non-toxic materials.
- Advocate for the specification of responsibly sourced products with Environmental Product Declarations (EPDs) and appropriate environmental certifications.
- Outline Specifications will be provided at the end of this stage, to describe the main

components of the construction project in a sufficient level of detail to indicate the design intent and some information on performance and preliminaries. Any sustainable and healthy materials ambitions or requirements shall be included.
- Arrange a Workshop. Include in the agenda tracking and review of materials requirements, objectives and targets. Incorporare conclusions in the Final Project Brief.
- Any deviation must be explored, reported and agreed with Estates Net Zero Team.



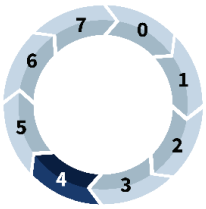
STAGE 3 - Spatial Coordination

Client Team

- Review design information/ decisions related to sustainable and healthy materials.
- Review and acknowledge any derogation from the Brief or current Guide, and the reasoning and impact of that decision, using information provided by the Design Team.
- Ensure that the Employer's Requirements contain latest agreed information regarding sustainable and healthy materials objectives and targets.
- Review costs. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop the Spatially Coordinated Proposal with integrated sustainable and healthy materials strategies. Ensure that these strategies are coordinated with other aspects of the building design, including architectural, structural, and building services, to avoid conflicts. Follow the Design Principles described in this theme when producing the Spatially Coordinated Proposal.
- At the end of this stage, updated Outline Specifications will be delivered. Any materials requirements and objectives shall be included. Clarity on the tolerance levels accepted for any deviation from specification must be provided.
- Arrange a Workshop to track and review sustainable and healthy materials strategies and objectives. Any risks must be raised as early as possible by the Design Team.



STAGE 4 - Technical Design

Client Team

- Review design information and decisions related to sustainable and healthy materials, provided by the Design Team.
- Review and acknowledge any derogations from the Guide, as well as the reasoning and impact of that decision.
- Ensure that requirements and targets for sustainable and healthy materials are clear and prescriptive in the project specifications and tender documentation, at the start of procurement process.
- Ensure that questions related to how healthy and sustainable materials objectives and targets will be delivered, monitored and reported, will be included in the Contractor's tendering process.
- Review costs. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop and coordinate the Technical Design information with integrated sustainable and healthy materials strategies.
- Updated Final Specifications will be submitted. Any sustainable materials requirements and clarity on the tolerance levels accepted for any deviation from specification must be provided.
- The Tender package will be produced to ensure that the competing contractors understand sustainable and healthy materials requirements.
- Record, discuss and agree with the Estates Net Zero Team any design or specification changes that can influence the project's sustainable materials strategies.
- Arrange a Workshop to track and review sustainable materials objectives and targets. Any risks must be raised as early as possible by the Design Team.

5.3 Sustainable Land-Use and Ecology

5.3.1 Biodiversity

Rationale

Nature plays a critical role in human health and well-being by providing food, energy, medicines and a variety of fundamental materials. Through its processes it sustains the quality of the air, fresh water and soils on which humanity depends, distributes fresh water, regulates climate, facilitates pollination and pest control. Furthermore, nature provides a multitude of essential services and functions that play a critical role in reducing disaster risk and adapting to climate change.

According to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), the rate of global change in nature during the past 50 years is unprecedented in human history due to changes in land and sea use, direct exploitation of organisms, climate change, pollution, and invasive species. Globally, human activities have significantly altered nature, leading to a steep decline in ecosystem and biodiversity indicators. Human actions threaten more species with global extinction now than ever before.

The State of Nature Scotland 2023 Report states that, since 1986, the abundance of 11 seabird species in Scotland has fallen by 49%, and 11% of the 7,508 species found in Scotland are threatened with extinction from Great Britain unless action is taken.

The University recognises that our sites encompass a range of habitats and species. We are committed to conserving and enhancing this biodiversity and actively contributing to local, regional, and national conservation efforts through our long-term environmental strategy.

Reference documents

- UoE Regenerative Sustainability Strategy
- University of Edinburgh Biodiversity Plan
- UoE Estates Design Guideline - No.14 Landscape Design
- Scottish Biodiversity Strategy to 2045
- Scottish Government Draft Planning Guidance on Biodiversity
- Developing with Nature Guidance, NatureScot
- Edinburgh Design Guidance, The City of Edinburgh Council
- Green Infrastructure Planning and Design Guide, Natural England
- UGF for England User Guide - Natural England

Consultation

The University SRS, Estates Landscape and Net Zero Teams must be consulted at every stage for decisions impacting biodiversity and its management.

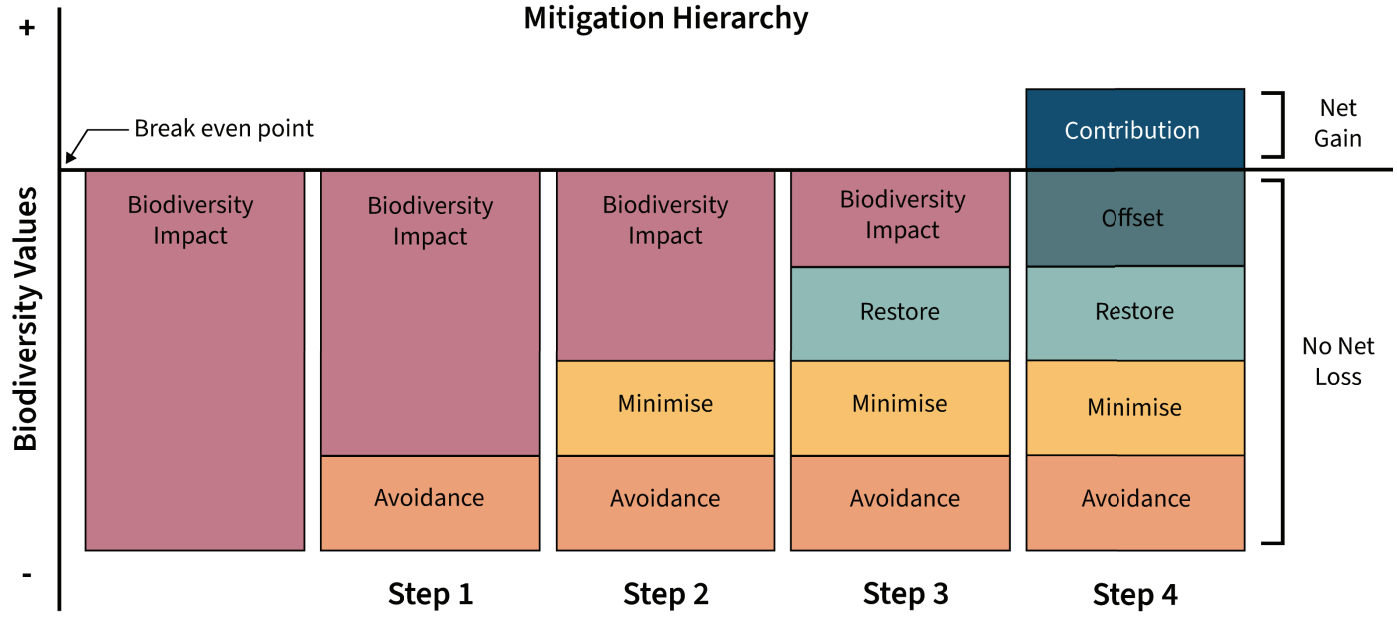


Figure 5.15 Biodiversity Mitigation Hierarchy Diagram. Source: adapted from diagram by EcologybyDesign.

Design Principles

These are based on the eight core principles set out in the NatureScot's 'Development with Nature Guidance', and the Scottish Government's 'Draft Planning Guidance on Biodiversity':

1. Apply the mitigation hierarchy, which indicates the order in which the impacts of development should be considered and addressed. Depending on the nature of the development, net positive may be achieved from restorative contributions. Prioritise brownfield site selection and building and site re-use.
2. Consider biodiversity from the outset. Planning ahead and having an early understanding of the existing biodiversity on site, including any irreplaceable habitats and the species populations they support, can help avoid costly delays as applications go through the planning system and can result in a smoother passage overall. Early consideration at all stages of project development can also support evaluation of the full range of opportunities for delivering the best outcome for biodiversity.
3. Provide synergies and connectivity for nature. No single action should be considered in isolation, but as an important component of the site and its wider setting. Every opportunity should be taken to safeguard, enhance and extend connectivity between the development itself and adjoining areas of habitat, ensuring 'permeable boundaries' are incorporated.
4. Integrate nature to deliver multiple benefits. Consider nature-based solutions, such as SuDS, green roofs and walls, street trees and green spaces. These can provide a cost-effective and climate resilient solution to issues such as extreme temperatures, high energy use, noise and water quality. Not all nature-based solutions automatically maximise biodiversity potential, however integrating biodiversity rich nature-based solutions into the early design phase of a development proposal offers opportunities to directly enhance nature, for example by providing suitable nesting, foraging and shelter habitat.
5. Prioritise on-site enhancement before off-site delivery. Leave a site in better 'regenerative' ecological condition than before development and retain existing natural features. Carry out sustainable remediation of site pollution.
6. Take a place-based and inclusive approach. An understanding of the main natural assets of the site and its surroundings and the opportunities they provide for enhancement will be important. Consideration should be given to any opportunities to contribute towards restoring and enhancing any habitats and species identified as national, strategic or local priorities.
7. Ensure long term enhancement is secured. Nature is uncertain and not fully within our control. Securing positive effects for biodiversity inevitably entails a degree of risk. Incorporating a contingency to compensate for this risk, designing for resilience and taking an adaptive approach that can respond to nature's uncertainty can help ensure successful outcomes. Consideration will be required as to the need for on-going management and future monitoring to ensure the intended enhancement is achieved in practice.
8. Additionality. Within a plan-led system, ensure enhancement delivered is additional to any measures which would have been likely to happen in the absence of the development.

Key Requirements

1. A minimum Urban Greening Factor (UGF) of 0.3 for non-domestic and 0.4 for residential developments in accordance with 'Natural England – Urban Greening Factor for England User Guide'.

2. A minimum 10% Biodiversity Net Gain (BNG). The Biodiversity Net Gain Metric 4.0 developed by the UK Government and the UK Habitat Classification system should be used to measure the proposal's BNG.

Evidence/Deliverables

1. Ecologist Report and Site Surveys
2. Landscape Plan
3. Biodiversity Management Plan
4. UGF Calculation in accordance with 'Urban Greening Factor for England User Guide - Natural England'.
5. BNG Calculation in accordance with The Biodiversity Net Gain Metric 4.0 developed by the UK Government and the UK Habitat Classification system
6. Final Brief and ER's
7. Workshop/Consultation Minutes

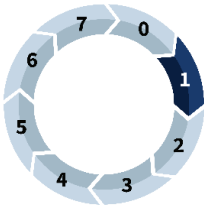
Requirements per RIBA Stage



STAGE 0 - Strategic Definition

Client Team

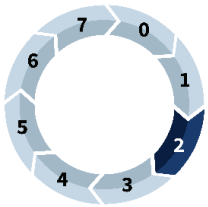
- A priority for protecting and enhancing biodiversity and creating new habitats must be clearly identified in the Business Case and Strategic Brief.
- The biodiversity objectives shall align with the University Biodiversity Plan, the University Adaptation Framework and the University Landscaping Design Guide.
- Assess the knowledge acquired from previous exemplar projects.
- Identify biodiversity related opportunities and limitations of potential sites/locations.



STAGE 1 - Preparation and Brief

Client Team

- Appropriate biodiversity objectives and targets shall be established in accordance with current Guide. Any deviation must be agreed with the Estates Net Zero Team, Landscape Team, and SRS, and included in the Initial Project Brief.
- A registered ecologist, if required, shall be appointed.
- Commission required surveys to evaluate the existing ecology and achieve biodiversity targets. The type of required assessments will be determined based on project specifics, such as an ecological survey.
- Early stage analysis and feasibility studies may be required to test biodiversity objectives in the Initial Project Brief against a particular site.
- Arrange consultations with stakeholders. Understanding the specific needs and preferences of users in a space is integral to creating positive environments. Agree objectives and any specific biodiversity requirements. Include this information in Initial Project Brief.
- Arrange a Biodiversity Workshop. Include in the agenda biodiversity objectives and targets. Incorporate conclusions in the Initial Project Brief.
- Establish whether any additional specialist consultants are required to deliver the project. A revision of programme and fees may be required. This must be raised at the earliest opportunity on commencement of the project by the University.
- Assess how biodiversity objectives and requirements are to be communicated to the Design and Construction teams. These can be embedded in a range of documents such as ER's, Scopes of Services, Specifications, Construction Contracts, etc.
- Any costs associated with achieving these objectives (design strategies, surveying, etc.) must be clearly allocated in the Cost Plan.



STAGE 2 - Concept Design

Client Team

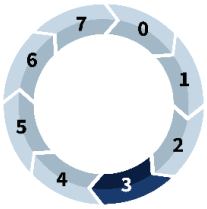
- Appoint a Design Team with the expertise and skills to deliver the agreed biodiversity objectives and targets.
- Clear Contractual biodiversity targets must be communicated, discussed and agreed with the Design Team.
- Consider ecological health in procurement strategy to help avoid toxic supply chain practices.
- If applicable, any necessary surveys will be carried out to identify site-specific biodiversity risks and opportunities.
- Any required specialist consultant -such as a Landscape Architect or Ecologist-, shall be appointed.
- Review costs. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop the Concept Design Proposal with integrated strategies to achieve the agreed biodiversity objectives and targets. Follow the design principles described in this

design theme.

- Develop the preliminary Landscape Plan and Biodiversity Management Plan, and include initial calculations to demonstrate that the Concept Design proposal meets the required UGF and BNG targets established.
- Carry out consultations with the Ecologist to ascertain biodiversity health and diversity outcomes, if applicable.
- Outline Specifications will be provided at the end of this stage, to describe the main components of the construction project in a sufficient level of detail to indicate the design intent and some information on performance and preliminaries. Any specified products that can have an impact on the biodiversity objectives shall be included.
- Arrange a Workshop. Include in the agenda tracking and review of biodiversity objectives and targets. Incorporare conclusions in Final Project Brief.
- Any deviation must be explored, reported and agreed with the University's SRS and Estates Net Zero and Landscape Teams.



STAGE 3 - Spatial Coordination

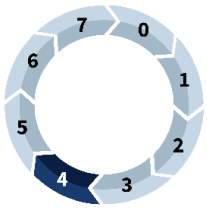
Client Team

- Review critical design information and decisions related to biodiversity.
- Review and acknowledge any derogation from the Brief or current Environmental Sustainability Guide, as well as the reasoning and impact of that decision, using information presented by the Design Team.
- Ensure the Employer's Requirements contain latest agreed information regarding biodiversity objectives and targets.
- Review costs. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop the Spatially Coordinated Proposal with integrated biodiversity strategies. Ensure that these strategies are integrated and coordinated with other aspects of the building design, including architectural, structural, and building services, to avoid conflicts. Follow the Design Principles described in this section when producing the Spatially Coordinated Proposal.
- The Design Team must demonstrate how the proposal aligns with the University of Edinburgh Biodiversity Plan and Landscape Design Guide.
- Determine as early as possible who will be responsible for maintaining and monitoring the local ecosystems, habitats and landscapes in order to discuss and agree on design proposals.
- The design should allow for a diverse landscape utilising a variety of native trees, shrubs and small plants. Drought-resistant planting should be used, and tree species should be chosen to minimise the risk of disease.
- The proposal should seek to retain existing nest sites and be aware of hidden habitats. Integral nest/roosting bricks should be considered the preferred option, although these must not completely replace boxes on trees. Expert advice for installation should be consulted
- The building's design must avoid or mitigate the risk of bird collisions with external glazing/other features.
- If applicable, green walls and roofs designs should be reviewed at this stage and checked with the University's insurers.
- Review and update the Biodiversity Management Plan and Landscape Plan inherited from Stage 2 with any new information available.
- Prepare and submit as part of the detailed Planning Application, the biodiversity supporting information, including surveys, specialists reports, and the Design, Access and Sustainability Statements.
- At the end of this stage, updated Outline Specifications will be delivered. Any biodiversity objectives or requirements shall be included. Clarity on the tolerance levels accepted for any deviation from specification must be provided.

- Arrange a Workshop to track and review biodiversity objectives and targets. Any risks must be raised as early as possible by the Design Team.



STAGE 4 - Technical Design

Client Team

- Review critical design information and decisions related to biodiversity.
- Review and acknowledge any derogations from current Guide, as well as the reasoning and impact of that decision.
- Ensure requirements and targets for biodiversity are clear and prescriptive in the project specifications and tender documentation, at the start of procurement process.
- Ensure that questions related to how biodiversity objectives and targets will be delivered, monitored and reported, will be included in the Contractor's tendering process.
- Review costs. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop and coordinate the Technical Design information with integrated biodiversity strategies.
- Review and update the Biodiversity Management Plan and Landscape Plan inherited from Stage 3 with any new information available.
- Updated Final Specifications will be delivered. Any biodiversity requirements shall be included. Clarity on the tolerance levels accepted for any deviation from specification must be provided.
- If applicable, develop a specific Management Plan for SuDS schemes.
- The Tender package will be produced to ensure that the competing contractors understand biodiversity requirements.
- Record, discuss and agree with the Estates Net Zero Team, Landscaping Team and SRS any design or specification changes that can influence the project's biodiversity strategies.
- Arrange a Workshop to track and review biodiversity objectives and targets. Any risks must be raised as early as possible by the Design Team.

5.3 Sustainable Land-Use and Ecology

5.3.2 Waste Management and Circular Economy (CE)

Rationale

According to the UKGBC, construction, demolition, and excavation account for 60% of material use and waste generation in the UK.

To address this, the University is committed to becoming a Zero Waste University by adopting Circular Economy (CE) principles. Unlike the traditional "take, make, dispose" model, CE extends resource lifecycles by prioritising prevention, reuse, and recycling. This approach maximises resource value and ensures materials are recovered or regenerated at the end of their use.

The revised UoE Zero Waste Strategy Policy treats waste as a valuable resource, outlining sustainable methods to cut raw material use, boost product reuse, and reduce landfill reliance through recycling, composting, and energy recovery. By shifting to this model, the University aims to mitigate global resource shortages, reduce environmental harm, and significantly cut whole-life carbon emissions in the built environment.

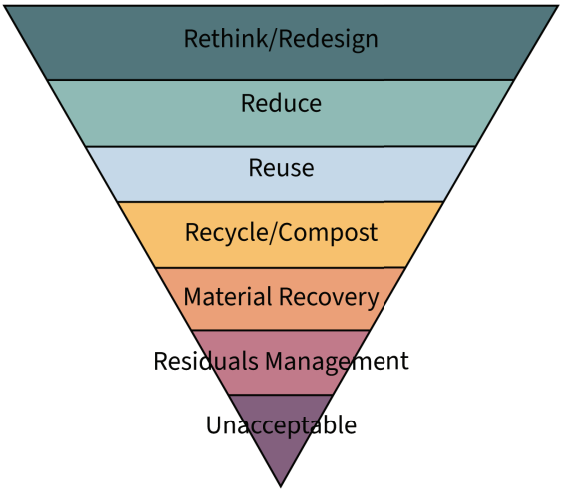


Figure 5.16 The Zero Waste Hierarchy.

Reference documents

- UoE Zero Waste Strategy Policy and Plan
- Zero Waste Scotland's Construction Sector Guide
- BREEAM UK New Construction V7-Waste, (2025)
- Scotland's CE and Waste Route Map to 2030
- Circular economy how-to guide, UKGBC (2020)
- Circular Economy 1-pager, LETI (2022)

Consultation

The University SRS, Estates Waste Office, and Net Zero Team must be consulted at every stage for decisions impacting Circular Economy and Waste Management.

Design Principles

As described in the UKGBC CE Design Guide and LETI Circular Economy for the Built Environment:

1. Minimise waste going to landfill by working with Waste Hierarchy principles.
2. Design the building for optimisation: for easy maintenance and renovation, longevity, flexibility, adaptability, assembly, disassembly and recovery.
3. Encourage reuse where appropriate and avoid waste and pollution arising from disposal of demolition and other forms of waste
4. Use standardisation.

Key Requirements

1. Target Exemplary Level on 'Diversion from landfill' benchmarks in accordance with latest version of BREEAM Wst 01, Table 10.2.
2. Complete a pre-demolition survey of any existing buildings to maximise the recovery of material. It must be carried out at Stage 2 prior to strip-out or demolition works.
3. If appropriate, prepare an outline SWMP at design stage and implement its revised version during construction to manage materials more effectively, reduce the amount of waste produced and associated costs. Follow recommendations by Zero Waste Scotland.

Evidence/Deliverables

1. Pre-demolition Survey, if applicable
2. SWMP
3. Letter of assurance from Main Contractor to confirm compliance with 'Diversion from landfill' in accordance with latest version of BREEAM Wst 01, Table 10.2.
4. Workshop/Consultation Minutes

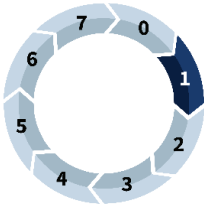
Requirements per RIBA Stage



STAGE 0 - Strategic Definition

Client Team

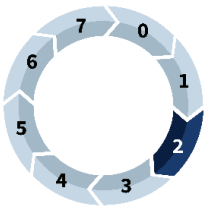
- Project-specific waste and CE objectives must be clearly captured in the Business Case and Strategic Brief. These shall align with the University's Zero Waste Strategy and Implementation Plan.
- Examine lessons learnt from previous projects, related not only to building performance but also in relation to costs, programme and risks.
- Identify waste and CE related opportunities and limitations of potential sites.



STAGE 1 - Preparation and Brief

Client Team

- Appropriate waste and CE objectives and targets shall be established in accordance with current Guide recommendations. Any deviation must be agreed with the Estates Waste Office, Net Zero Team and SRS, and included in the Initial Project Brief.
- Gather as much information as possible about the existing building, if applicable. A new measured survey should be carried out if no 'as-built' information is available.
- If applicable, a pre-refurbishment/pre-demolition audit shall be commissioned. The information should be shared with the Cost Consultant to identify cost saving opportunities.
- A Materials Inventory that includes a detailed breakdown of all products and materials, and the ability for each material to be reused/recycled should be created, and included as part of the Brief, if applicable.
- Ensure that the Project Programme allows for materials to be removed, stored and retrieved for reuse, if required.
- The lifespan of the different elements and layers of the building shall be agreed.
- Arrange a Workshop. Include in the agenda Waste and Circular Economy objectives and targets. Incorporate conclusions in the Initial Project Brief.
- Arrange consultations with Stakeholders. Include information in Initial Project Brief.
- Establish whether any additional specialist consultants are required. If that is the case, a revision of programme and fees may be required. This must be raised at the earliest opportunity on commencement of the project by the University.
- Assess how waste and CE objectives and requirements are to be communicated to the Design and Construction teams. These can be embedded in a range of documents such as ER's, Scopes of Services, Specifications, Construction Contracts, etc.
- Any costs associated must be clearly allocated in the Cost Plan.



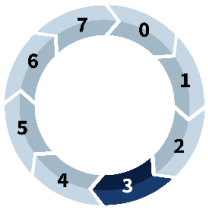
STAGE 2 - Concept Design

Client Team

- Appoint a Design Team with the appropriate level of experience and skills to develop the strategy to achieve the waste and CE objectives and targets.
- Clear waste and CE objectives and targets must be communicated, discussed and agreed with the Design Team.
- CE principles and its implications must be clearly understood by all members of the Project Team.
- Complete a pre-demolition audit of any existing buildings to determine whether refurbishment or reuse is feasible and to maximise the recovery of material.
- Nominate a Waste Champion to produce the outline SWMP and comment on waste and resource minimisation strategies. The role responsibilities must be embedded within the Responsibility Matrix and relevant contractual documents.
- Review Circular Economy strategies in the context of the building's lifespan.
- Review costs associated to this theme. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop the Concept Design Proposal with integrated strategies to achieve the agreed waste and CE objectives and targets. To achieve this, the Design Principles described in this section shall be followed.
- Any deviation must be explored, reported and agreed with the University's SRS, Estates Waste Office, and Net Zero Team.
- Arrange a Workshop. Include in the agenda tracking and review of waste and CE objectives and targets. Measurable targets for the project must be set (i.e. specification and installation of at least 10 low-impact materials). Incorporare conclusions in Final Project Brief.



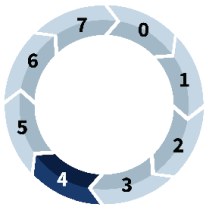
STAGE 3 - Spatial Coordination

Client Team

- Review critical design information and decisions related to waste management and CE strategies.
- Review and acknowledge any derogation from the Brief or current Guideline, as well as the reasoning and impact of that decision, using information provided by the Design Team.
- Ensure that Employer's Requirements contain latest agreed information regarding waste management and CE objectives and targets.
- Review costs. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop the Spatially Coordinated Proposal with integrated waste management and CE strategies. Design and select components following the Circular Economy Principles for Construction. Avoid toxic materials. Follow the Design Principles described in this section when producing the Spatially Coordinated Proposal.
- Maximise the durability and service life of building elements and services in relation to their replacement cycle. Plan for an appropriate and simple maintenance strategy.
- Any design or specification changes that can impose a risk to the targets must be thoroughly explored, reported and agreed. Identify and record performance risks to inform Stage 4.
- Arrange a Workshop to track waste management and CE objectives and targets. Any risks must be raised as early as possible by the Design Team.



STAGE 4 - Technical Design

Client Team

- Review critical design information and decisions related to waste management and CE strategies.
- Review and acknowledge any derogations from this Guideline as well as the reasoning and impact of that decision.
- Ensure requirements and objectives for waste management and CE strategies are clear and prescriptive in the project specifications and tender documentation, at the start of procurement process.
- Ensure that questions related to how waste management and CE strategies will be delivered, monitored and reported, will be included in the Contractor's tendering process.
- If applicable, a demolition contractor should be engaged early in the design process to enable products to be reused.
- Review costs. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop and coordinate the Technical Design information with integrated waste management and CE strategies.

- Updated Final Specifications will be delivered. Ensure that material specification is clear, especially with regards to the use of low-impact materials. Any CE requirements shall be included. Clarity on the tolerance levels accepted for any deviation from specification must be provided.
- The Tender package will be produced to ensure that the competing contractors understand waste management and CE requirements.
- Record, discuss and agree with the University SRS, Estates Waste Office, and Net Zero Team, any design or specification changes that can influence the project's waste management and CE strategies.
- Arrange a Workshop to track and review waste management and CE objectives and targets. Any risks must be raised as early as possible by the Design Team.

5.4 Sustainable Water Use and Management

5.4.1 Water Use and Management

Rationale

According to the Climate Change Committee Risk Assessment (CCCRA2) updated projections, the UK may face water deficit of up to 16% by the 2050s and up to 29% by the 2080s, significantly impacting cost and resource levels. In Scotland, the average individual consumes about 180 litres of water daily across various applications, with considerable potential for savings. More than 10% of the total water demand in most resource zones is lost to leaks.

Water usage in the UK also contributes by 6% to the nation's carbon emissions, equivalent to the emissions from the aviation industry. Of this, 1% comes from the collection, treatment, and distribution of water to homes, and the treatment of waste water before its return to the environment. The other 5% results from heating water in homes.

In response, the University is committed to implementing sustainable water use and management strategies, which focus on water conservation, while enhancing the resilience of our buildings to future extreme weather events.

Reference documents

- UoE Estates Design Guidelines - No.3 Mechanical Engineering Services and No.5 Metering
- University of Edinburgh Adaptation Framework
- BREEAM UK New Construction V7 - Water, (2025)
- Sustainable Outcomes Guide, RIBA (2019)

Consultation

The Estates BSG and Net Zero Team must be consulted at every stage for decisions impacting water use and its management.

Design Principles

As described in the RIBA Sustainable Outcomes Guide and BREEAM UK New Construction - Water Category:

1. Prioritise the specification of low flow sanitary fittings and appliances, and promote the design of efficient water-consuming processes.
2. Minimise accidental water usage from leaks by implementing leak detection systems and installing flow control devices.
3. Avoid inaccessible pipework, where possible.
4. Assess the lifecycle carbon and cost benefits of rainwater collection (BS EN 16941-1:2018) and grey water recycling (BS 8525-1:2010). Consider the challenges and costs previously encountered by the University due to the implementation of rainwater harvesting systems.
5. Provide adequate water meters to allow for monitoring and management.
6. It is critical to consider the unintended consequences of significantly reduced water targets, such as:
   - High maintenance requirements of water collection and recycling.
   - Difficulty of flushing low flow toilets (efficient design or vacuum systems should be considered).
   - Impact on Victorian sewage system of low water use.

Key Requirements

- For new-built projects with standard facilities, a minimum 45% reduction in baseline potable water consumption is required, as determined by the BREEAM Wat 01.
- Target 10 litres/person/day for non-domestic buildings (laboratories and other specialised typologies excluded) and 60 litres/person/day for domestic buildings.
- For laboratories/other specialised typologies, the Design Team must demonstrate:
  1. Their design incorporates technologies and equipment that are either water-efficient or waterless.
  2. There is an operational management procedure in place to reduce water consumption.

Evidence/Deliverables

1. If applicable, confirm compliance with a minimum 45% reduction in baseline potable water consumption, and litres/person/day targeted (in accordance with building type)
2. Specifications
3. Final Brief and ER's
4. Workshop/Consultation Minutes

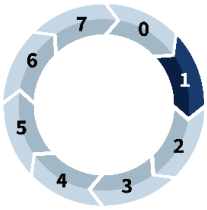
Requirements per RIBA Stage



STAGE 0 - Strategic Definition

Client Team

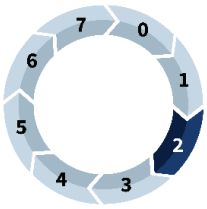
- The adoption of best practices in sustainable water use and management must be clearly stated in the Business Case and Strategic Brief.
- Water use and management objectives must align with the University Biodiversity Plan, the University Adaptation Framework and the University Landscaping Design Guide.
- Examine lessons learnt from past relevant projects.
- Identify opportunities and limitations of potential sites/locations regarding sustainable water use and management.



STAGE 1 - Preparation and Brief

Client Team

- Appropriate sustainable water use and management objectives and targets shall be established in accordance with current Guide. Any deviation must be agreed with the Estates BSG and Net Zero Team, and included in the Initial Project Brief.
- Gather as much information as possible about the existing building, if applicable. A new measured survey shall be carried out if no 'as-built' information is available.
- Arrange a Workshop. Include in the agenda sustainable water use and management objectives and targets. Incorporate conclusions in the Initial Project Brief.
- Arrange consultations with stakeholders. Understanding the specific needs and preferences of the users and maintenance team is critical. Include this information in the Initial Project Brief.
- Any sustainability accreditation to be used (such as WELL) shall be discussed and agreed with the Estates Net Zero Team and BSG. The appointment of a relevant assessor to monitor the process might be required.
- Assess how sustainable water use and management objectives and requirements are to be communicated to the Design and Construction teams. These can be embedded in a range of documents such as ER's, Scopes of Services, Specifications, Construction Contracts, etc.
- Any costs associated must be clearly allocated in the Cost Plan.



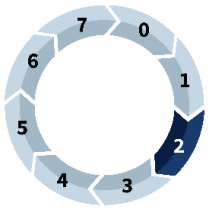
STAGE 2 - Concept Design

Client Team

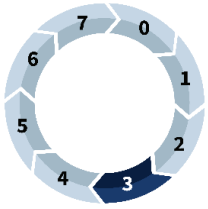
- Appoint a Design Team with the required experience and skills to develop the agreed sustainable water use and management objectives and targets.
- Ensure that the Design Team is provided with the information regarding the maximum -and variability of- occupancy through the facility daily and annual use cycle, equipment, etc.
- Clear water consumption targets must be communicated, discussed and agreed with the Design Team.
- If applicable, preliminary surveys on existing building services will be carried out to identify risks and opportunities.
- Review costs. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop the Concept Design Proposal with integrated strategies to achieve the agreed sustainable water use and management objectives and targets. The reduction in demand for potable water through the provision of efficient sanitary fittings, rainwater collection and water recycling systems must be considered and if applicable, implemented from early design stages.
- Develop the preliminary metering strategy to allow for management and monitoring



of water use in the building, together with leak detection systems and flow control devices.
- Develop a project-specific Water Use and Management Assessment to confirm compliance with a minimum 45% reduction in baseline potable water consumption in the Concept Design proposal, and litres/person/day targeted.
- Any deviation from the Brief or the current Guide must be explored, reported and agreed with the Estates Net Zero Team and BSG.
- Arrange a Workshop. Include in the agenda the review of sustainable water use and management objectives and targets. Incorporare the conclusions into the Final Brief.



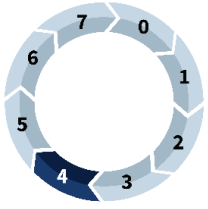
STAGE 3 - Spatial Coordination

Client Team

- Review critical design information and decisions related to sustainable water use and management.
- Review and acknowledge any derogation from the Brief or current Environmental Sustainability Guide, as well as the reasoning and impact of that decision, using information presented by the Design Team.
- Ensure Employer's Requirements contain latest agreed information regarding sustainable water use and management objectives and targets.
- Review costs. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop the Spatially Coordinated Proposal with integrated sustainable water use and management strategies. The design must be coordinated and integrated with the architectural, civil, structural, building services and landscaping packages, as well as with the biodiversity strategy. Follow the Design Principles described in this section when producing the Spatially Coordinated Proposal.
- The Water Use and Management Assessment inherited from Stage 2 must be reviewed and updated with any new information.
- Review the strategy and specification of water meters, sub-meters, leak detection systems and flow control devices.
- Coordinate the sustainable drainage and biodiversity strategies, where possible.
- Maximise storm water attenuation through permeable paving, planted areas and storage and attenuation tanks.
- Identify who will operate the building as early as possible. Design for usability and manageability, testing ideas with occupier representatives. Start planning for commissioning.
- Any design or specification changes that can impose a risk to the targets must be thoroughly explored, reported and agreed. Identify and record performance risks to inform Stage 4.
- At the end of this stage, updated Outline Specifications will be delivered. Any sustainable water use and management requirements shall be included. Clarity on the tolerance levels accepted for any deviation from specification must be provided.
- Arrange a Workshop to track sustainable water use and management objectives and targets. Any risks must be raised as early as possible by the Design Team.
- Arrange consultations with stakeholders.



STAGE 4 - Technical Design

Client Team

- Review critical design information and decisions related to sustainable water use and management.
- Review and acknowledge any derogations from the current Guide, as well as the reasoning and impact of that decision, using information presented by the Design Team.
- Ensure that requirements and targets for sustainable water use and management are

clear and prescriptive in the project specifications and tender documentation, at the start of the procurement process.
- Ensure that questions related to how the building's sustainable water use and management strategies will be delivered, monitored and reported, will be included in the Contractor's tendering process.
- Review costs associated with this theme. Any new information must be clearly allocated in the revised Cost Plan.

Design Team
- Develop and coordinate the Technical Design information with integrated and coordinated sustainable water use and management strategies, to deliver outcomes for reduced water use, including fittings and appliances and recycled waste water, and incorporating sustainable drainage.
- Review and update the Water Use and Management Assessment inherited from Stage 3 to reflect any new information available.
- Leak detection and flow control devices shall be coordinated and integrated with other aspects of the building design, including architectural, structural, and building services, to avoid conflicts.
- The Tender package will be produced to ensure that the competing contractors understand the sustainable water use and management requirements.
- Record, discuss and agree with the University BSG and Estates Net Zero Team any design or specification changes that can influence the project's sustainable water use and management strategies.
- Arrange a Workshop to track and review sustainable water use and management objectives and targets. Any risks must be raised as early as possible by the Design Team.
- Arrange consultations with stakeholders.

5.5 Sustainable Connectivity and Transport

5.5.1 Sustainable Transport

Rationale

According to the National Transport Agency for Scotland, approximately 28% of Scotland's total GHG emissions in 2021 were produced by transport. In the academic year 2022-23, travel was responsible for approximately 25% of the total primary GHG emissions associated to the University. Therefore, promoting locations and solutions that support reductions in these emissions is critical to achieving the University's commitment to becoming Net Zero Carbon by 2040.

In order to achieve this commitment, the University has developed its own Sustainable Travel Policy. This document underpins a 'Climate Conscious Travel' approach, which encourages the university community to understand the environmental impact of their journeys. Key strategies include prioritising lower-carbon transport modes, minimising the total number of trips to reduce emissions, and offsetting carbon from unavoidable travel.

As outlined in the RIBA Sustainable Outcomes Guide, buildings must be designed to prioritise active travel and sustainable mobility. This entails enhancing walkability, supporting cycling networks, facilitating seamless access to public transport, and providing adequate accommodation for electric vehicles.

Reference documents

- University of Edinburgh Sustainable Travel Policy
- BREEAM UK New Construction v7-Transport, (2025)
- Sustainable Outcomes Guide, RIBA (2019)

Consultation

The University's SRS, Estates Transport, and Net Zero Teams must be consulted at every stage for decisions impacting Sustainable Transport and its management.

Design Principles

As described in the RIBA Sustainable Outcomes Guide, the design should focus on:

1. Creating a comprehensive green transport plan that includes digital connectivity.
2. Facilitating high quality digital connectivity to avoid need for unnecessary travel.
3. Prioritising site selection with good proximity to public transport.
4. Providing high quality pedestrian and cycle links to local amenities.
5. Providing end of journey provision for active travel runners and cyclists (showers, lockers, etc).
6. Providing suitable onsite cycle storage.
7. Providing infrastructure for EV, if appropriate.
8. Providing car sharing spaces, if appropriate.
9. The design of buildings and campuses should promote the Sustainable Travel Hierarchy.

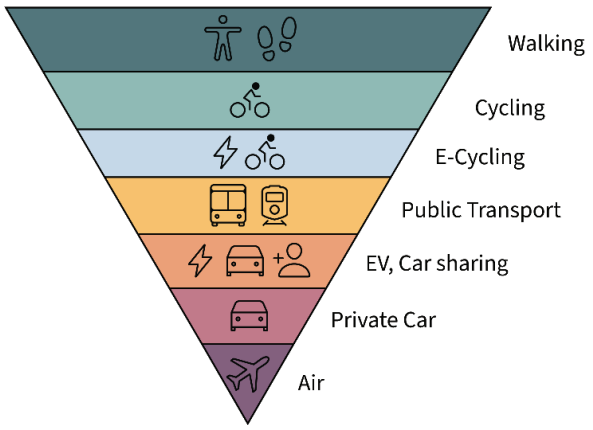


Figure 5.17 The Sustainable Travel Hierarchy.

Key Requirements

1. Produce a site-specific Sustainable Transport Assessment in line with BREEAM Tra 01.
2. Develop a site-specific Sustainable Travel Plan in accordance with BREEAM Tra 01.
3. Provide cycle storage at the ratio of one space per 10 occupants and in accordance with BREEAM Tra 02.
4. Provide compliant cyclists facilities in accordance with BREEAM Tra 02.
5. Aim for at least 5% of total car parking capacity to be provided for priority car shared spaces.

Evidence/Deliverables

1. Sustainable Transport Assessment
2. Sustainable Travel Plan
3. Specifications
4. Final Brief and ER's
5. Workshops/Consultations Minutes

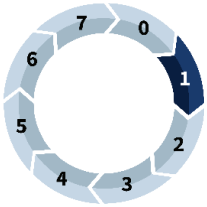
Requirements per RIBA Stage



STAGE 0 - Strategic Definition

Client Team

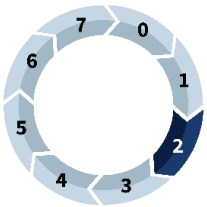
- The adoption of appropriate standards in sustainable transport must be clearly identified in the Business Case and Strategic Brief.
- Objectives and targets must align with the University's Sustainable Travel Policy.
- Reflect on lessons learnt from past exemplary projects.
- Identify opportunities and limitations of potential sites/locations regarding sustainable connectivity and transport.



STAGE 1 - Preparation and Brief

Client Team

- Consider how sustainable transport objectives and requirements are to be communicated to the Design and Construction teams. These can be embedded in a range of documents such as ER's, Construction Contracts, etc.
- Arrange Workshop. Include in the agenda sustainable transport objectives and targets. Incorporate conclusions in the Initial Project Brief.
- Organise consultation with stakeholders, Estates Transport Team and SRS. Understanding the specific needs and preferences of transport users is critical. Agree objectives and any specific requirements/considerations. Include this information in the Initial Project Brief.
- Any costs associated must be clearly allocated in the Cost Plan.
- Any accreditation scheme intended to evaluate sustainable transport requirements must be discussed and agreed upon with the SRS, Estates Transport, and Net Zero teams. Depending on the complexity of the chosen framework, the appointment of a relevant assessor to monitor the process may also be required.



STAGE 2 - Concept Design

Client Team

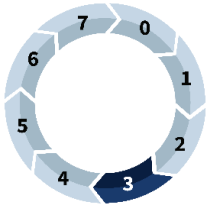
- Appoint a Design Team with the appropriate expertise and skills to deliver the sustainable transport objectives and targets.
- If required, preliminary site/transport surveys will be commissioned to identify risks and opportunities.
- Ensure that the Design Team is provided with required information regarding number of cyclists, parking spaces, etc.
- Review costs. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop the Concept Design proposal that integrates sustainable transport strategies in accordance with the UoE Sustainable Travel Policy. Incorporate options such as cycling, walking, public transportation, and electric vehicles. This approach not only cuts down on carbon emissions and pollutants, but also promotes active forms of transportation that can greatly enhance the building's occupants well-being.
- Develop a Sustainable Transport Assessment and a site-specific Sustainable Travel Plan in accordance with BREEAM Tra 01-, to identify site opportunites and constraints, and encourage more sustainable modes of transport and movement of people and goods during the building's operation.
- The Sustainable Travel Assessment shall cover the following information:
    1. Analysis of current travel patterns for cycling, walking, and public transport among existing building/site users. Identify key constraints and opportunities.
    2. Forecast of expected travel patterns and transportation impacts from future users of the building or site.
    3. Evaluation of the current local environment for pedestrians and cyclists, along

with available cycling facilities.
4. Assessment of disabled access, considering various degrees and types of disabilities, including visual impairments.

- Produce the Sustainable Travel Plan following the Sustainable Transport Assessment.
- Any deviation from the Brief or current Guide must be explored, reported and agreed with the University SRS, Estates Transport and Net Zero Teams.
- Arrange a Workshop. Include in the agenda tracking and review of sustainable transport objectives and targets. Incorporare conclusions in the Final Project Brief.
- Organise consultation with stakeholders, including Estates Transport Team and SRS.



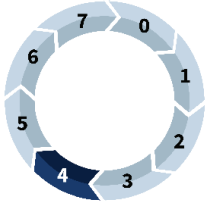
STAGE 3 - Spatial Coordination

Client Team

- Review critical design information and decisions related to sustainable transport strategies.
- Review and acknowledge any derogation from the Brief or current Guide, as well as the reasoning and impact of that decision, using information provided by the Design Team.
- Ensure the Employer's Requirements contain latest agreed information regarding sustainable transport objectives and targets.
- Review costs. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

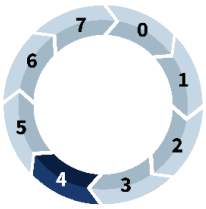
- Develop the Spatially Coordinated Proposal with integrated sustainable transport strategies. The design must be coordinated and integrated with the architectural, civil, structural, building services and landscaping packages. Follow the Design Principles described in this section when producing the Spatially Coordinated Proposal.
- The Sustainable Transport Assessment and Sustainable Travel Plan inherited from Stage 2 must be reviewed and updated with any new information.
- Review the connectivity between buildings. Promote that these are traffic free, aesthetically pleasing and safe to enhance walkability.
- Ensure all routes to cycling and public transport facilities are well-lit and overlooked to maximise safety and encourage usage. Cycle infrastructure must be user-friendly and appealing, with specific attention paid to path width, gradient limits, and the design of crossing points.
- Where applicable, one of every six parking spaces should have an active EV charging point in developments where ten or more car parking spaces are proposed, with 100% of parking spaces in all new developments having the provisions to convert to having EV charging units (passive). EV parking spaces should be counted as part of the overall car parking provision and not in addition to it.
- Prepare and submit any supporting sustainable transport information required for the Planning Application, including Transport Surveys, Specialists Reports, and Design, Access and Sustainability Statements.
- Arrange a Workshop to track and review sustainable transport strategies, objectives and targets. Any risks must be raised as early as possible by the Design Team.
- Organise consultation with stakeholders, including Estates Transport Team and SRS.
- Any design or specification changes that can impose a risk to the targets must be thoroughly explored, reported and agreed with SRS, Estates Transport, and Net Zero Teams. Identify and record performance risks to inform Stage 4.



STAGE 4 - Technical Design

Client Team

- Review critical design information and decisions related to sustainable transport.
- Review and acknowledge any derogations from the Environmental Sustainability Guide as well as the reasoning and impact of that decision, using information provid-



ed by the Design Team.

- Ensure that requirements and targets for sustainable transport are clear and prescriptive in the project specifications and tender documentation, at the start of procurement process.
- Review costs associated with this theme. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop and coordinate the Technical Design information with integrated sustainable transport strategies.
- The Sustainable Transport Assessment and Sustainable Travel Plan inherited from Stage 3 must be reviewed and updated with any new information available.
- Confirm measures to encourage active travel in the specification and the Building Manual.
- The Tender package will be produced to ensure that the competing contractors understand the sustainable transport requirements.
- Record, discuss and agree with SRS, Estates Travel Office and Estates Net Zero Team, any design or specification changes that can influence the project's sustainable transport strategies.
- Arrange a Workshop to track and review sustainable transport objectives and targets. Any risks must be raised as early as possible by the Design Team.
- Organise consultation with stakeholders, including Estates Transport Team and SRS.

5.6 Sustainable Management

5.6.1 Sustainable Life Cycle Cost

Rationale

Life Cycle Cost (LCC) analysis evaluates the comprehensive expenses of a construction project throughout its expected lifespan. This analysis encompasses the costs of design and construction, ongoing operations and maintenance, and eventual end-of-life disposal. LCC is crucial for making informed decisions about resource-efficient and cost-effective building strategies, especially in light of increasing operational costs and uncertainties about durability under future extreme climate conditions.

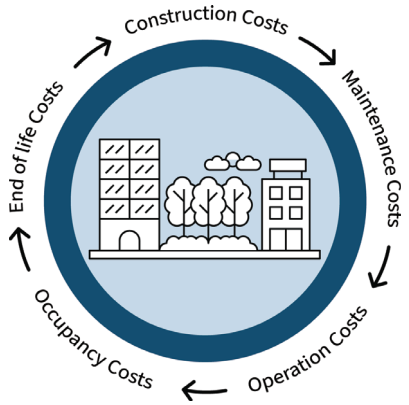


Figure 5.18 Key cost categories of LCC. Source: adapted from RICS PS - WLC Assessment for the Built Environment, 2nd edition.

The University of Edinburgh acknowledges that investing in efficiency measures, along with sturdy and durable building fabrics and services, can lead to substantially reduced operating costs. As such, we require that all projects consider long-term financial impacts, including operation, maintenance, refurbishment, and decommissioning costs, beyond just initial capital expenditures.

In alignment with recommendations from the RIBA, the University supports the use of ICMS methods to assess building operational costs. This approach helps benchmark performance against best practice exemplars, refining our building performance strategies and informing future projects.

Reference documents

The Project will align with the principles and objectives described on:

- Life cycle costing, 1st edition, RICS (2016)
- NRM: New Rules of Measurement, RICS (2022)
- ICMS explained, RICS, 3rd edition (2022)
- Sustainable Outcomes Guide, RIBA (2019)

Consultation

The University Estates Planning and Delivery, Construction, Procurement and Delivery, Net Zero, and Finance Teams, must be consulted at every stage for decisions impacting LCC and its management.

Key Principles

The key principles, as presented in the RIBA Sustainable Outcomes Guide, is to align CAPEX with OPEX budgets to ensure sustainable whole-life value decisions are made:

1. Carry out LCC analysis of key building systems.
2. Carry out Soft Landings and POE processes.
3. Measure energy costs.
4. Measure management and maintenance costs.
5. Measure overall running costs.
6. Measure added value of occupant health and well-being.
7. Measure added value of sustainable outcomes of building.

Key Requirements

1. Undertake LCC analysis for the different design scenarios following the RICS Practice Information Life Cycle Costing (1st edition). This analysis should include -as applicable- estimates for initial investment, operational expenses, maintenance, refurbishment, and potential decommissioning costs over the building's life cycle. Estimate potential financial savings and payback periods for each intervention scenario.
2. Use NRM framework for procurement and tendering processes, and apply ICMS 3 when strategic reporting or international benchmarking is required.

Evidence/Deliverables

1. LCC Report
2. Final Brief and ER's
3. Presentation to Client
4. Workshop/Consultation Minutes

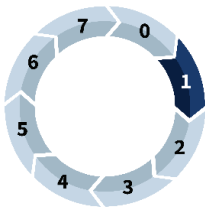
Requirements per RIBA Stage



STAGE 0 - Strategic Definition

Client Team

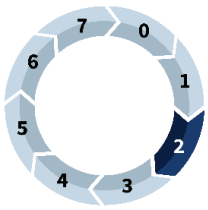
- Assess lessons learnt from past exemplar projects.
- Determine whether a project-specific LCC appraisal is required for the project. This could be essential to demonstrate the Business Case for different sustainable strategies, and how these could lead to operational savings if carried out effectively.
- If applicable, encouragement of best practice in LCC must be clearly identified in the Business Case and Strategic Brief.
- Define whether any specialist cost consultancy expertise is needed in the Client Team.
- Prepare a rough order of cost estimate, which captures a very high-level calculation of the project budget to meet the Client Requirements, including high level sustainability requirements, taking into consideration any project risks. The estimated construction cost may be used to inform the initial Project Budget figure as part of the Business Case, with the addition of professional fees and land acquisition costs.



STAGE 1 - Preparation and Brief

Client Team

- Prepare order of cost estimates to test the feasibility of achieving the project Brief, including the sustainability objectives.
- Breakdown the cost of elements or categories to highlight any areas which may cause significant cost-related sustainability risks. Consider how changes in the market and inflation could impact the risk profile.
- Agree the Project Budget.
- Arrange a Consultation to discuss and agree LCC approach, objectives and targets. Incorporate conclusions in the Initial Project Brief.
- Identify the cost consultant expertise required to develop the LCC objectives. Include it within the Responsibility Matrix and appoint any required consultants.
- Any additional costs associated must be clearly allocated in the Cost Plan.



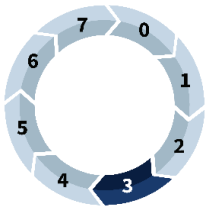
STAGE 2 - Concept Design

Client Team

- Appoint a Cost Consultant with the appropriate level of expertise and skills to deliver the LCC objectives and targets.
- At stage 2 an Elemental LCC Plan should be carried out by the Cost Consultant to guarantee that the operation, maintenance, refurbishment and eventual decommissioning of the building are considered. This is essential to validate the implemented sustainable strategies and how these could lead to operational savings.
- The LCC Plan should be realistic and must consider the direction of fiscal and regulatory policy on the environment to present a clear, long-term picture.
- Review the cost implications of iterations of the Concept Design, taking into account the sustainability objectives, the procurement strategy, project programme implications and risks.
- The LCC Plan shall demonstrate that the Concept Design proposal with integrated sustainability strategies, are aligned to the project budget.
- Arrange a Workshop/Consultation to track and review LCC approach, objectives and targets. Incorporate conclusions in the Final Project Brief.
- Any deviation must be explored, reported and agreed with the Estates Development, Net Zero, and Finance Teams.
- Any deviation that could impact the Environmental Sustainability and Health and Well-being objectives and targets of the project, must be discussed and agreed with the Estates Net Zero Team.
- Review costs. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop the Concept Design Proposal with integrated sustainable design strategies, which must have been allocated in the LCC Plan.



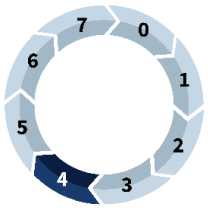
STAGE 3 - Spatial Coordination

Client Team

- Review critical design information and decisions related to LCC strategies.
- As the design progresses, carry out Cost Exercises to include more detailed aspects of the design, sustainable strategies and outline specifications to be tested.
- Review and update the Cost Plan iteratively using increasing levels of cost certainty as greater detail of the proposal develops. It should be realistic and must take into account the direction of fiscal and regulatory policy on the environment to present a clear, long-term picture. Increased certainty enables the balancing of higher costs through reductions in the project contingency.
- If required, involve suppliers or specialist subcontractors to determine affordability.
- Consider the financial impacts of achieving the sustainability objectives, including compliance with statutory requirements.
- Arrange a Workshop/Consultation to track and review LCC approach, objectives and targets. Any risks must be raised as early as possible.
- Review and acknowledge any derogation from the Brief or current Guide, as well as the reasoning and impact of that decision.
- Ensure that the Employer's Requirements contain latest agreed information regarding LCC strategies.
- Review costs. Any new information must be clearly allocated in the revised Cost Plan.

Design Team

- Develop the Spatially Coordinated Design incorporating the sustainable design strategies allocated in the LCC Plan and established in Stage 2.
- Create a list of strategies to apply in the event of cost being over budget. Review the Change Control Procedures and ensure that the integrated design is fully protected.
- Review the expected building lifespan against capital and operational energy, carbon and financial costs.



STAGE 4 - Technical Design

Client Team

- Review critical design information and decisions related to LCC.
- Review and acknowledge any derogation from the Brief or current Guide, as well as the reasoning and impact of that decision.
- As design progresses, carry out Cost Exercises to allow more detailed aspects of the design to be tested.
- Iteratively update the formal Cost Plan to the level of detail specified by the Procurement Strategy. This should include a detailed elemental cost analysis, complete with full bills of quantities, unit cost items, or pricing schedules. The final Cost Plan will then serve as a pre-tender cost estimate.
- Arrange a workshop to track and review LCC approach, objectives and targets.
- Identify risks and uncertain areas of work where provisional sums are required.
- Ensure that Employer's Requirements contain latest agreed information regarding LCC strategies.
- Ensure that LCC requirements and targets are clear in the project specifications and tender documentation, at the start of procurement process.
- Review the tender returns or contractors proposals, including any alternatives proposed to reduce costs, against the sustainability strategies, cost plan, quality aspirations, and statutory compliance. Monitor and report the cost of any variations to the technical design, between the point that the tenders are invited and up to the point

that the contractor has been appointed.

Design Team

- Develop and coordinate the Technical Design incorporating the sustainable design strategies allocated in the LCC Plan and further developed in Stage 3.
- Review and update the list of strategies to apply in the event of cost being over budget. Review the Change Control Procedures and ensure that the integrated design is fully protected.


Welcome
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6.0 TERMS AND DEFINITIONS

Airtightness	A measure of the amount of air that escapes or enters a building when there is a 50 Pascals pressure difference between interior and exterior. For Passivhaus calculations, this measurement is expressed in air changes per hour (ACH). UK Building Regulations express this is as the volume of air that escapes per m^2 of external surface area, also at 50 Pascals of pressure (sometimes referred to as Air Permeability).
Biodiversity	Refers to the variety and variability of life on Earth. It encompasses the range of all living organisms, including plants, animals, bacteria, fungi, and microorganisms, as well as the genetic differences within each species and the ecosystems such as deserts, forests, wetlands, mountains, lakes, rivers, urban areas, and agricultural landscapes in which they live. It's usually considered at three levels: Genetic Diversity, Species Diversity and Ecosystem Diversity.
BMS	Building Management System. A sophisticated control system that is installed in buildings to monitor and manage the mechanical, electrical, and electromechanical services in a facility.
Carbon sequestration	Carbon sequestration refers to the process of capturing and storing atmospheric carbon dioxide (CO_2). It is a method used to reduce the amount of CO_2 in the atmosphere with the goal of mitigating global warming and climate change. Car bon sequestration can take place through natural processes, such as the absorp tion and storage of CO_2 by trees, soil, and oceans, or through human-engineered methods, such as direct air capture and storage (DAC) or the injection of CO_2 into underground geological formations.
Circular Economy	A Circular Economy is an economic system aimed at eliminating waste with the continual use of resources. It contrasts with a traditional linear economy, which has a 'take, make, dispose' model of production. In a Circular Economy, resources are kept in use for as long as possible, extracting the maximum value from them whilst in use, then recovering and regenerating products and materials at the end of each service life.
District heating	District heating is a system for distributing heat generated in a centralised location through a system of insulated pipes for residential and commercial heating requirements such as space heating and water heating. The heat can be obtained from various sources, including fossil fuels, biomass, geothermal energy, surplus heat from industrial processes or electrically or gas-driven heat pumps.
Embodied Carbon	As described in the LETI 'Climate Emergency Design Guide', Embodied Carbon refers to the 'carbon emissions associated with the extraction and processing of materials, and the energy and water consumption used by the factory in producing products and constructing the building. It also includes the 'in-use' stage and 'end of life' stage and any transportation relating to the above'.
Embodied Energy	Refers to the total primary energy consumed by all the processes associated with the production of a building, product, or service. This includes the energy used during the raw material extraction, manufacture, transportation, assembly, and disposal stages. Essentially, it encompasses all the energy required to produce a product from cradle-to-grave.
Energy Use Intensity	Key metric used to measure the energy efficiency of a building. It is calculated by dividing the total energy consumed by a building in a year (including all regulated and unregulated energy sources) by the total GIA of the building (kWh/m^2/year).

	This measurement allows for a comparison of energy efficiency across different buildings, regardless of size and usage, making it a particularly useful metric for benchmarking energy performance in similar types of buildings or within sectors.
Environmental Product Declaration	A standardised and independently verified and registered document that provides detailed, comparable and transparent information about the environmental impact of a product throughout its lifecycle.
Form Factor	A design parameter obtained by the sum of the area of all surfaces of its envelope, divided by its gross heated volume. The smaller the form factor, the more efficient the shape of the building and the less surface area from which heat can escape.
Fossil Fuel	Naturally occurring substances formed from the remains of decayed plants and animals that have been converted to crude oil, coal, natural gas, or heavy oils by exposure to heat and pressure in the earth's crust over hundreds of millions of years. The burning of fossil fuels is the largest source of carbon dioxide emissions, which is one of the GHG that allows radiactive forcing and contributes to global warming.
Global Warming Potential	A measure of how much energy (e.g. heat) the emissions of 1 tonne of a gas will absorb over a given period of time, relative to the emissions of 1 tonne of carbon dioxide (CO_2).
Healthy Materials	Building materials that are selected based on their low or non-toxic profile, minimal environmental impact, and positive effect on human health and well-being. These materials are designed to reduce or eliminate the release of harmful chemicals into indoor environments, where people spend the majority of their time. The consideration for healthy materials is integral to sustainable building practices, as they contribute significantly to the creation of safer and healthier environments.
Life Cycle Assessment	Systematic technique for evaluating the environmental aspects and potential impacts associated with a product, process, or service throughout its entire life cycle. This encompasses all stages from raw material extraction (cradle) through production, use, end-of-life treatment, recycling, and final disposal (to grave). In the case of whole life carbon, an LCA assesses greenhouses gas emissions measured in carbon dioxide equivalent to also include Global Warming Potential (GWP).
Life Cycle Cost	An economic assessment that considers all the cumulative costs associated with a product, system, or asset over its entire lifespan.
LZC Technologies	Technologies that generate energy and emit low or no carbon dioxide.
Offsetting	Refers to the act of compensating for the emission of pollutants or the depletion of natural resources by participating in or funding activities that reduce or remove pollution elsewhere. The most common applications of this concept are found in carbon offsetting and biodiversity offsetting.
Operational Carbon	As described in the LETI 'Climate Emergency Design Guide', Operational Carbon refers to 'The carbon dioxide and equivalent global warming potential (GWP) of other gases associated with the in-use operation of the building. This usually includes carbon emissions associated with heating, hot water, cooling, ventilation, and lighting systems, as well as those associated with cooking, equipment, and lifts (i.e. both regulated and unregulated energy uses).

Performance Gap	Discrepancy between modeled or predicted energy consumption of buildings based on design simulation tools, and the actual energy consumption recorded when the building is in use.
Post-occupancy evaluation	Assessment carried out after a building has been occupied for a certain period of time. The main objective is to determine how well a building's design meets the needs of its occupants and whether the building performs according to the criteria set during its design and construction phases. These evaluations are crucial for gathering feedback on the building's performance, identifying issues, and providing data that can inform future building projects.
Renewable energy	Energy that is collected from resources naturally replenished on a human timescale. Unlike non-renewable resources like fossil fuels (coal, oil, and natural gas), which can take millions of years to form and are depleted much faster than they are replaced. The most common sources of renewable energy are solar, wind, hydropower, biomass, geothermal and ocean energy.
RIBA Plan of Work	Framework developed by the Royal Institute of British Architects (RIBA) for all disciplines on construction projects, which organises the processes of briefing, designing, delivering, maintaining, operating and using a building into eight stages. It explains key tasks and outputs required at each stage, with the aim of organising the project execution and ensure clarity and efficiency in the process.
Soft Landings	Framework aimed at bridging the gap between the design and construction of a building and its operation, ensuring that the transition is smooth and that the building performs as intended.
Sustainability Vision	Refers to the university's commitment and strategic direction towards integrating sustainability across all aspects of its operations, and community engagement. This vision is intended to guide the university in fostering a culture of sustainability among students, faculty, staff, and its extended community, ensuring that the practices carried out on campus have minimal negative impact on the environment and create positive social value. Such a vision is crucial as universities are often viewed as role models for innovation and leadership in society.
Sustainability Goals	These are specific long-term outcomes set by an institution aimed at promoting and achieving sustainable outcomes across economic, social, and environmental dimensions. These goals are designed to guide actions that lead to reduced environmental impact, enhanced social equity, and economic viability over the long term. They must be measurable, achievable, relevant and time-bound.
Sustainability Objectives	Specific, targeted steps to achieve the Sustainability Goals. They must be specific, measurable, achievable, relevant and time-bound.
Sustainability Targets	Are specific, quantifiable and time-bound sustainability benchmarks that serve as checkpoints towards achieving Sustainability Goals and Objectives.
Sustainability Outcomes	Refer to the results or impacts of initiatives and activities designed to promote sustainability. These outcomes are the tangible changes resulting from the implementation of sustainability practices, policies, and strategies.
Thermal Comfort	That condition of mind which expresses satisfaction with the thermal environment and is influenced by a number of subjective perceptions. It is influenced by several

	factors, including air temperature, radiant temperature, air velocity, humidity, metabolic rate and clothing insulation.
Visual Comfort	Refers to the condition under which building occupants experience pleasant and satisfying lighting conditions that assist with clear vision and perception without causing strain or discomfort. Achieving visual comfort is an essential aspect of building design as it directly impacts occupants' well-being, productivity, and overall satisfaction with their environment.
Whole-Life Carbon	Refers to the total amount of carbon dioxide emissions (CO_2) produced during the lifecycle of a building from its construction through its operation and eventual demolition. It includes embodied, operational and sequestered carbon. The concept of whole-life carbon is crucial for understanding and reducing the environmental impact of built environments in the context of global climate change.



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ABBREVIATIONS

ASHP	Air Source Heat Pump
AHU	Air Handling Unit
BEP	BIM Execution Plan
BIM	Building Information Modelling
BMS	Building Management System
BNG	Biodiversity Net Gain
BRE	Building Research Establishment
BREEAM	Building Research Establishment Environmental Assessment Method
BS EN	British and European Standard
BSG	Building Services Group
CCA	Chromated Copper Arsenate
CCC	Climate Change Committee
CE	Circular Economy
CHP	Combined Heat and Power
CIBSE	Chartered Institution of Building Services Engineers
CO_2	Carbon Dioxide
DSY	Design Summer Year
EIA	Environmental Impact Assessment
EPC	Energy Performance Certificate
ER	Employer's Requirements
EUI	Energy Use Intensity
EV	Electric Vehicle
FF&E	Furniture, Fixtures and Equipment
FSC	Forest Stewardship Council
GHG	Greenhouse Gases
GSHP	Ground Shource Heat Pump
GWP	Global Warming Potential
HVAC	Heating, Ventilation and Air Conditioning
ICMS	International Cost Management Standards
IES	Integrated Environmental Solutions
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
LCA	Life Cycle Assessment
LCC	Life Cycle Cost
LETI	Low Energy Transformation Initiative
LHEES	Scottish Local Heat and Energy Efficient Strategies
LZCT's	Low Zero Carbon Technologies
MVHR	Mechanical Ventilation with Heat Recovery
MEP	Mechanical, Electrical and Plumbing Engineering
NABERS	National Australian Built Environment Rating System
NZC	Net Zero Carbon
NZPTCS Tool	Net Zero Performance Target Certification Selection Tool
OECD	Organisation for Economic Co-operation and Development
PCBs	Polychlorinated Biphenyl
PDPM	Project Delivery Process Map
PEFC	Programme for the Endorsement of Forest Certification
PH	Passivhaus
PHPP	Passivhaus Planning Package
PI	Professional Indemnity
$PM_{2.5}$	Particulate Matter 2.5
PM_{10}	Particulate Matter 10
PMV	Predicted Mean Vote
PPD	Predicted Percentage of Dissatisfied
POE	Post Occupancy Evaluation
PV	Photovoltaic Panels
QS	Quantity Surveyor
RDD	Review Design Data
RFI	Request for Information
RIBA	Royal Institute of British Architects
RICS	Royal Institute of Chartered Surveyors
SPL	Sound Pressure Level
SRS	Social Responsibility and Sustainability
SuDS	Sustainable Urban Drainage
SWMP	Site Waste Management Plan
UGF	Urban Greening Factor
UKGBC	United Kingdom Green Building Council
UKNZCBS	UK Net Zero Carbon Building Standard
UN	United Nations
UN SDGs	United Nations Sustainable Development Goals
UoE	University of Edinburgh
VE	Value Engineering
VOCs	Volatile Organic Compounds
WHO	World Health Organization
WLC	Whole-life Carbon
WLCA	Whole-life Carbon Assessment

Find out more at:

https://estates.ed.ac.uk/
https://sustainability.ed.ac.uk/



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