



08 November 2021

Report

Strategic Sustainability Plan

**Cultural Heart
Kirklees Council**

making the **difference**


Associate Director

Turner & Townsend UK Limited
One New Change
London
EC4M 9AF

t: +44 (0)20 7544 4000
e: [w:](mailto:www.turnerandtowntsend.com)
www.turnerandtowntsend.com



Contents

1	Executive Summary	1
2	Introduction and Context	5
2.1	Introduction	5
2.1.1	Sustainability impact on budget	7
2.2	Key Definitions	7
2.3	Sustainability Scope	7
2.4	National Policy	8
2.5	Regional Policy	8
2.6	Local Council Policy	9
2.7	Industry Best Practice	10
2.8	Reflecting Sustainability Aspirations	10
2.8.1	Meeting the Climate Emergency	10
2.8.2	District Energy Scheme – Kirklees Council and AECOM Feedback	12
2.8.3	Additional Inclusions	13
3	Vision	15
3.1	Cultural Heart Sustainability Vision	15
4	Guiding Principles	16
4.1	Integration and Collaboration	16
4.2	Working to Industry Standards	16
4.3	Embedding Sustainability Principles from the Outset	16
4.4	Retention and Refurbishment	16
4.5	Futureproofing for Physical and Transition Risk	16
5	Strategy Aim	17
6	Focus Areas	18
6.1	Net Zero Embodied Carbon	18
6.1.1	Vision	18
6.1.2	Strategic Approach	18
6.1.3	Delivery Approach	19
6.2	Net Zero Operational Carbon	22
6.2.1	Vision	22
6.2.2	Strategic Approach	22
6.2.3	Development Targets	23
6.3	Design and Material Strategy	25
6.3.1	Vision	25

6.3.2	Strategic Approach	25
6.3.3	Delivery Approach	25
6.4	Energy Strategy	28
6.4.1	Vision	28
6.4.2	Strategic Approach	28
6.4.3	Delivery Approach	28
6.5	Net Zero Operational Carbon - Water Strategy	31
6.5.1	Vision	31
6.5.2	Strategic Approach	31
6.5.3	Delivery Approach	31
6.6	Certification	32
6.6.1	Vision	32
6.6.2	Strategic Approach	32
6.6.3	Delivery Approach	32
6.7	Transport	34
6.7.1	Vision	34
6.7.2	Strategic Approach	34
6.7.3	Delivery Approach	34
6.8	Air Quality	37
6.8.1	Vision	37
6.8.2	Strategic Approach	37
6.8.3	Delivery Approach	38
6.9	Green-Blue Infrastructure, Biodiversity and Ecology	40
6.9.1	Vision	40
6.9.2	Strategic Approach	40
6.9.3	Delivery Approach	40
6.10	Circular Economy	42
6.10.1	Vision	42
6.10.2	Strategic Approach	42
6.10.3	Delivery Approach	43
6.11	Climate Risk	46
6.11.1	Vision	46
6.11.2	Strategic Approach	46
6.11.3	Delivery Approach	46
6.12	Offsetting	47
6.12.1	Vision	47
6.12.2	Strategic Approach	47

6.12.3	Delivery Approach	47
7	Implementation and Delivery	48
7.1	Governance	48
7.2	Implementation	49
7.3	Decision Framework	49
8	Next Steps	50
	Appendix 1 – Definitions	52
	Appendix 2 - Proposed Key Performance Indicators	54
	Proposed Key Performance Indicator List	54
	Key Performance Indicators for Further Development	59
	Appendix 3 - Red Line Issues – Kirklees Council Feedback	61

Rev	Status	Originator	Approved	Date
0	Draft -WIP		-	18/08/21
1	Review			24/08/21
2	Draft Approved			31/08/21
3	Draft Approved			31/08/21
4	Final Issue			29/09/21

1 Executive Summary

Overview

National, regional, and local governments have declared climate emergencies with accompanying net zero carbon targets. Within the West Yorkshire Combined Authority and Kirklees Council there is a Net Zero Carbon target for 2038, and the 2019 *Climate Emergency Declaration and the Kirklees Air Quality Strategy and Five Year Air Quality Action Plan* emphasises the importance of delivering Net Zero Carbon programmes and projects in the statement:

"At 2017 emissions levels, Kirklees would use this entire [carbon] budget within 7 years from 2020. This means that Kirklees, as a district, needs to reduce its emissions as an urgent priority"

The message is startling but clearly echoes language from local government and across the built environment sector on the national scale. While sustainability is not the only driver, progressive and serious step-change is required to meet the needs of the Climate Emergency declaration and achieve the committed Net Zero Carbon target dates.

The second phase of the Kirklees Council Climate Emergency Declaration is intended to be a detailed action plan setting out and developing detailed ongoing service level proposals with accompanying budget and resourcing considerations. This item of work is under development with final versions of the action plan not expected until Spring 2022. In the absence of the aforementioned Kirklees Council report, this report has been designed to establish visions and principles and accompanying targets that can potentially be adopted to support the development of Kirklees Council documents. This is in addition to the primary objective of providing a robust foundation for the Cultural Heart programme to progress with sustainability requirements.

Regeneration programmes, such as the Cultural Heart, must deliver in line with net zero aspirations to support the wider transition to a net zero economy and to meet the requirements of Kirklees Council declarations. A net zero economy and net zero carbon design, construction and operation cannot be achieved overnight, but will be a process of incremental and positive actions to meet 2038 targets. The implementation of progressive and positive step change must be embraced to support the Kirklees Council declaration of a Climate Emergency.

The Cultural Heart programme has an opportunity to showcase how sustainability can be embedded in an ambitious regeneration programme, to demonstrate positive net zero carbon design and construction, and to be a regional and national exemplar of sustainable development within a local authority context with potentially constrained resources.

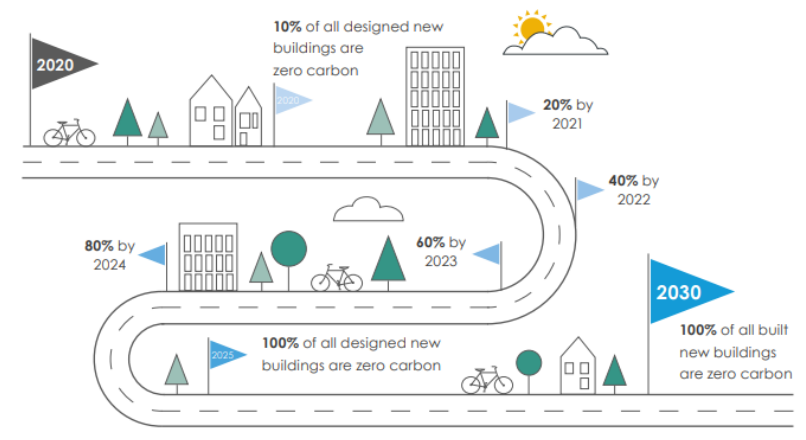


Figure 1: LETI Roadmap to net zero construction (source: LETI Climate Emergency Design Guide)

Report Summary

This sustainability strategy report outlines the steps that should be taken by Kirklees Council and its delivery partners to achieve net zero and wider sustainability aspirations. The report has been designed to align to the Kirklees Climate Emergency declaration as well as the regeneration aspirations of the Cultural Heart Programme. The report will also consider national trends that will need to be reflected in current plans or which will be integrated over time to future proof the regeneration programme in terms of increasingly wider ranging sustainability and climate regulations.

The overall aim of the strategy is to:

- Define a Net Zero Carbon and Climate Resilience Strategy for the Cultural Heart Programme - outlining and considering options to meet Climate Emergency aspirations.
- Align the programme of works to Kirklees Council strategic objectives, policies and general feedback received, notably to support the delivery of the Net Zero Carbon (NZC) emissions 2038 target.
- Establish a framework of topic-specific focus areas to deliver a sustainable Cultural Heart
- Establish sustainability and net zero carbon targets and metrics that can be adapted and aligned to core programme, project, and council wide KPIs and targets
- Outline a performance management, assurance and reporting framework, ensuring transparency around the carbon performance of the programme of works and individual projects over defined timescales

This strategy therefore addresses the wide range of sustainability topic areas that are now vital to realising net zero, sustainable schemes. The topics have been identified within Kirklees Council and supplemented with additional areas to provide a holistic and comprehensive report.

Primary themes addressed are:

- Carbon reduction - embodied and operational carbon reduction through design and improved operational performance
- Air quality – utilising urban regeneration as a catalyst for reducing pollution levels

- Energy (including renewable energy) – promoting energy security through reducing demand and on-site or district energy generation and distribution
- Green infrastructure (and green-blue infrastructure) - an approach that realises multiple benefits to maximise value for money and sustainability outcomes
- Transport – promotion of inclusive and accessible infrastructure to encourage a modal shift away from single occupancy and combustion engine vehicles
- Building design and certification – capitalising on industry-recognised design standards and certification processes to deliver achievable but progressive standards
- Climate resilience – recognising that there is a changing climate and designs need to be resilient to extreme weather events, to avoid premature write downs, depreciation or excessive cost of repair
- Biodiversity and ecology – integrating green-infrastructure in urban redevelopment to achieve net biodiversity gain and natural amenity
- Water – maximising the efficient control of water through minimising use and localised retention to prevent flooding events
- Offsetting – consistent measurement of ‘carbon’ so embodied carbon at practical completion and annual operational carbon can be offset through carbon sequestration

Each key theme that has been identified is supported with a vision, strategic approach, and delivery approach. Proposed key performance indicators (KPIs) are included for review and agreement, but further support the delivery of each theme to deliver in-line with Climate Emergency and net zero aspirations.

A suggested governance structure includes the creation of a Kirklees Council Net Zero Carbon and Sustainability Committee to provide a dedicated gateway for decision making prior to Cultural Heart project and programme board approvals. It is suggested that this group includes consultees who contributed to this report as well as an appointed third-party specialist. This approach combines project management and sustainability expertise to highlight the critical importance of delivering on sustainability requirements, while also being a conduit to share best or innovative practice across the Cultural Heart programme.

Supporting agreed governance structures, decision framework principles are suggested that encourage proactive decision making. This recognises that sustainability and net zero aspirations are among many likely critical success factors. Programme-specific priorities should be agreed with minimum standards, so that decisions can be made through a timely and confident process.

Following this report, a series of next steps are proposed to formally define and agree requirements so that they can be presented alongside design briefs and subsequent documents. The proposed KPIs should be reviewed so that minimum standards can be set for all elements of the Cultural Heart, with additional requirements or stretch ambitions to be defined on a project-by-project basis.

Early agreement and definition of KPIs, metrics and associated governance is greatly encouraged to allow for a detailed and structured reporting process to be applied equally across the Cultural Heart programme of works.

Summarised Targets

The targets within the report are reflective of industry benchmarks and best practice to allow decisions to be made for the Cultural Heart programme whilst recognising that there will potentially be competing budgetary and other pressures. The suggested minimum and stretch standards can be used as required whilst still representing a positive progression from recognised business-as-usual baselines (as noted in the below graphics).

As these targets are based on industry standards (e.g. from RIBA, LETI and BRE guidance, amongst others), they shall be familiar to appointed design partners and could be recognised within other Kirklees Council development programmes or projects.

Embodied and operational carbon targets are highlighted as a summary of the KPIs and targets within the report. These also showcase the scale of change from business-as-usual practice to achieve step change towards Net Zero Carbon delivery. True Net Zero Carbon delivery goes beyond these measures further still.

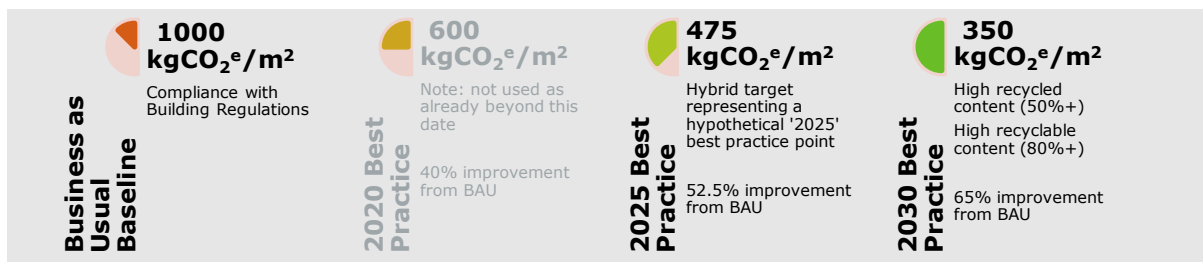


Figure 2: Embodied Carbon: (Data source: LETI embodied carbon target alignment publications)

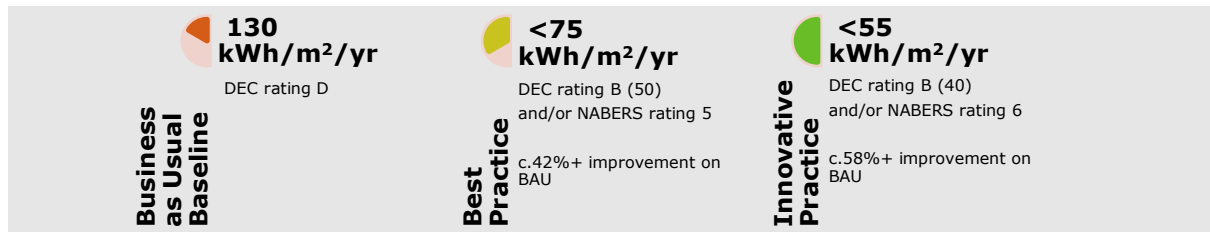


Figure 3: Operational Carbon: (Data source: RIBA Sustainable Outcome Metrics (2030 Challenge))

Supporting the verification of sustainable and net zero carbon delivery, certification targets have also included within suggested targets. It is proposed that these include:

- Verification of net zero carbon design/construction to Practical Completion – UK Green Building Council
- Verification of net zero carbon operation – UK Green Building Council
- Sustainable design and construction certification – BREEAM or CEEQUAL (minimum of Excellent, or equivalent)
- Operational performance certification – NABERS (minimum of 5 stars)

2 Introduction and Context

2.1 Introduction

The sustainability strategy report outlines the steps that should be taken by Kirklees Council and its delivery partners to achieve net zero and wider sustainability aspirations. The report has been designed to align to the Climate Emergency declaration made by the local authority in 2019 as well as the regeneration aspirations of the Cultural Heart Programme. The report will also consider national trends that will need to be reflected in current plans or which will be integrated over time to future proof the wider regeneration in terms of increasingly wider ranging sustainability and climate regulations.

Supporting Kirklees Council's 'Council Plan' with sustainable economy and clean and green outcomes, the below is an extract from Kirklees Council briefs regarding the declaration of a climate emergency in Kirklees, which highlights the internal Kirklees Council requirements to address sustainability and net-zero:

"The scale of the Cultural Heart provides an opportunity for the Council to promote best practice in new build zero-carbon technology and to set a new standard for construction. Although the Council are aware that the proposals to date will see the removal of a number of existing buildings and the potential negative impacts created by additional carbon emissions created through replacement building projects, the understanding is that there will be a net reduction in the 'town centre floorplate' and the opportunity to create a new 'green heart'. The Council are looking at developing the Cultural Heart on the following principles:

- *Retention and reuse of a significant amount of the gross floor area of the existing property*
- *Retention of some of the existing redundant retail units and repurposed for cultural and community uses*
- *New and existing buildings to be 'Huddersfield Heat Network ready' via the sizing and location of new and existing Plant Rooms*
- *Extensive provision for Electric Vehicle charging points as part of a Town Centre Parking Strategy and also local charging points to service Council delivery vehicles*
- *The development of new and existing buildings will actively engage in a whole-building approach to achieving Part L of the Building Regulations compliance, particularly with respect to Regulation 25b and so will be looking to promote decentralised energy supply systems based on energy from renewable sources particularly with respect to PVs, both roof and façade mounted, given the nature of this building type*
- *Exploration of low and zero carbon technologies and products such as 'Low Carbon Concrete'"*

In brief, embedding sustainable design, delivery and operational solutions is no longer a desirable option, but an absolute requirement, as echoed in the 2019 Kirklees Council *Kirklees Climate Emergency Declaration and the Kirklees Air Quality Strategy and Five Year Air Quality Action Plan* emphasises the importance of delivering Net Zero Carbon programmes and projects in the statement:

"At 2017 emissions levels, Kirklees would use this entire [carbon] budget within 7 years from 2020. This means that Kirklees, as a district, needs to reduce its emissions as an urgent priority."

The principles defined above, combined with specific sustainability and net zero principles outlined in this report, set a clear benchmark for delivering a sustainable and net zero programme of works for the Cultural Heart that are also adaptable to other Kirklees Council programmes and projects.

As with similar programmes, it is recognised that there may potentially be constrained resources and competing requirements such as budget, procurement, and external market factors. This report also identifies the importance of collaborative working and early engagement of specialists so sustainability and net zero deliverables can be met to deliver a regeneration scheme with the lowest emissions possible.

The Cultural Heart regeneration sits within a context of increasing focus and action on net zero carbon. In addition, wider sustainability considerations must be reflected in any strategy to address issues that sit beyond net zero carbon, such as climate resilience and circular economy. This strategy therefore addresses the following sustainability topic areas.

- Carbon reduction – Buildings should reduce the amount of embodied carbon emitted in their construction through the choice of materials, transport and construction techniques. Buildings should be designed and managed to maximise efficiency and reduce operational emissions.
- Air quality – Reducing the volume of harmful pollutants by limiting combustion engines within the city centre and enhancing pollution removing measures such as tree planting and other green infrastructure
- Energy (including renewable energy) – Where possible, maximising the amount of energy generation that comes from renewable sources or diversifying the energy mix to reduce reliance on fossil fuels
- Green infrastructure – Using a combination of methods to create a comprehensive, whole scheme green infrastructure (GI) approach. GI could take the form of tree networks, parks, sustainable urban drainage or other approaches that perform several functions.
- Transport – Increasing modal shift away from private vehicles and combustion engines
- Building design and certification – Through design and certification, buildings can integrate a level of performance and standardisation to increase resilience and enhance the building offering.
- Climate resilience – Increasing the overall resilience of the scheme to manage the expected impacts of climate change, such as increased heat, changing rainfall patterns and more extreme events
- Biodiversity and ecology – Protecting and enhancing the ability of native species to thrive within an urban setting.
- Offsetting – Displacing those emissions that remain once all sources of emissions have been addressed requires a strategy and consideration of how to prioritise potential offsetting approaches
- Water – Reducing water consumption and associated risks of drought or flooding. Managing efficient water use is key to meeting climate and sustainability goals.

Each chapter sets out the overall vision for each topic area, actions and recommendations, with proposed performance indicators included within appendix 2.

Kirklees Council's own Strategy and Action Plan report (phase two of the Climate Emergency Declaration) is scheduled to be published in Spring 2022 and will provide additional clarity on Kirklees Council specific requirements and strategic themes.

2.1.1 Sustainability impact on budget

Advising on how budgets are impacted by specifying highly sustainable and NZC construction / operation is not feasible at this stage with any confidence. However, embedding NZC or sustainable strategies at the outset is the most economically advantageous approach. Principles are more likely to be understood and integrated without the need for abortive works. Early engagement with consultants and supply chain partners can also lead to identification of cost and carbon saving design solutions, that can become integral to the design development, construction, and operational processes that follow.

By means of a high-level indication of possible impact on budget, the UK Green Building Council (UKGBC) advise through their Building the Case for Net Zero: A feasibility study into the design, delivery, and cost of new net zero carbon buildings, that cost uplifts can be between 3.5% - 17%, based on the scenarios they tested in residential and commercial projects. Current market factors and material/supply chain accessibility, further influence the ability to predict impacts on budgets and can have positive and negative impacts on material options, construction methodologies and subsequent budgets.

Detailed cost versus carbon reviews should be undertaken when design partners are appointed so that informed decisions can be made, within the parameters proposed in this report.

2.2 Key Definitions

The terms Carbon Neutral / Carbon Neutrality (CN) and Net Zero Carbon (NZC) were used interchangeably during consultation meetings. This can lead to confusion and inconsistency when setting an approach for design partners and contractors. For the purposes of this report, we will use the definitions as outlined, and propose that these are adopted by Kirklees Council:

- **Carbon Neutral / Carbon Neutrality (CN)** – This requires consideration of Scope 1 and 2 greenhouse gas emissions only, with a passive approach to monitor, measure and ultimately offset the CO₂^e ('carbon') emissions.
- **Net Zero Carbon (NZC)** – This requires consideration of Scope 1, 2 and 3 emissions. These are supported with a proactive and positive set of actions to minimise emissions before then looking to offset the remaining emissions.

National and regional policy refer to NZC targets, while local policy refers to both NZC and CN. Throughout, this report will recommend using net zero carbon (NZC) as the correct terminology and to be a strategic tool to drive positive and proactive change.

Other definitions are included in Appendix 1.

2.3 Sustainability Scope

The scope of this sustainability strategy report is focussed on Net Zero Carbon and associated sustainability themes that were reported during engagement with Kirklees Council stakeholders, with additional topics based on knowledge and best practice from across the built environment sector.

This report does not consider economic or social value (SV). Both are elements of sustainability with a cross-over to other topics (e.g. In-operation maintenance costs, Corporate Responsibility and Social Inclusivity). Neither theme is within the core scope of works for this report.

This report also excludes in-use management across topics such as procurement, catering and general facilities management. The only in-use consideration is for energy and operational carbon relating to building systems.

2.4 National Policy

In 2019, the UK Government passed laws to set a net zero carbon target of 2050. This requires the UK to bring all greenhouse gas emissions to net zero by 2050, compared with a previous target of an 80% reduction compared to 1990 levels. The target is supported by the Committee on Climate Change.

Supportive publications, such as the HM Government National Audit Office's *Local Government and Net Zero in England* Report, provide further guidance and requirements for the delivery of net zero economies across local authorities. This is inclusive of topics such as surface transport (noted as responsible for 23% of 2019 UK emissions), buildings (18%) and power (10%) with suggested strategy, policy and enabling actions to be considered for implementation on a local scale.

Also in 2019, Regulation 25B of the Building Regulations (2010) came into effect for public buildings, requiring "a nearly net zero building". There are different routes to compliance but again emphasises the increasing set of requirements and considerations that are driving a net zero economy.

Additionally, the UK hosting events such as COP26 (26th UN Climate Change Conference of the Parties) casts the spotlight firmly on climate change and positive action. As a result, there has been increasing pressure to set more ambitious policy. The UK's 6th Carbon Budget (2021) set a new target to reduce emissions by 78% (from 1990 levels) by 2035, including aviation and shipping emissions. This is a step-change from the previous 2030 target to reduce emissions by 68% from 1990 levels and demonstrates the need to continually strive for more stringent requirements and to embrace ambitious policies and plans.

Key national policies and plans include:

- The Climate Change Act (2008)
- Climate and Ecological Emergency Bill
- Heat and Buildings Strategy (proposed)
- 25-Year Environment Plan
- Circular Economy Package

It is also noteworthy that a potential Part Z amendment to UK Building Regulations 2010 has been proposed to support the regulation of embodied carbon. This industry-supported amendment would require embodied carbon to be assessed on all projects, as part of a whole life carbon (WLC) assessment. In parallel, this also supports wider benchmarking and targeting for future developments.

2.5 Regional Policy

The West Yorkshire Combined Authority (WYCA), in partnership with the Leeds City Region Enterprise Partnership (the LEP) declared a Climate Emergency in 2019, with a target for a net-

zero carbon economy by 2038 at the latest. This requires a 14.5% year on year reduction in emissions across the region.

The WYCA have also signed the UK100 pledge, committing the Combined Authority area to focus on climate and clean energy policies and shifting to “100% clean energy by 2050”

Supporting this, a Climate and Environment Action Plan is due to be published in September 2021 with a focus on decarbonising transport systems, homes, and offices, amongst other topics.

Some key regional policies, plans and support programmes include:

- Transport Strategy 2040 and West Yorkshire Transport Fund
- Clean Energy and Environmental Resilience
- Carbon Emissions Reduction Pathways
- The Energy Accelerator
- Climate and Environment Action Plan (in development)

2.6 Local Council Policy

Kirklees Council have also declared a Climate Emergency and are working towards a Net Zero Carbon emissions target for 2038 (also referred to as “Our 2038 Carbon Neutral Vision”). There are 9 key topics listed within phase one of the Climate Emergency Declaration, with the phase two delivery and action plan now scheduled for publication in Spring 2022. At the time of writing the action plan had not been published and therefore could not be used to influence this report.

Based on verbal feedback, it is anticipated that the phase two action plan will establish more detail on delivering carbon neutrality by 2038. For the purposes of this report the content or ambition of the phase 2 action plan has not been allowed for as drafts or published versions were not available to review, prior to the issue of this report.

For the purposes of the Cultural Heart regeneration scheme, it is also noted that there is a wider 10-year vision to ambitiously transform urban regeneration across Huddersfield: The Huddersfield Blueprint. The Cultural Heart (Queensgate) is just one of six areas within the Huddersfield Blueprint. Therefore, there are opportunities for legacy learning and best practice to be shared across the wider blueprint of works. However, the aspirations around the Climate Emergency Declaration are currently not fully reflected in the Kirklees Council Climate Emergency declaration. The outline declaration contains several aspirations that will impact on the Cultural Heart Programme, with Key Performance Indicators (KPIs) and approaches to be confirmed

Furthermore, it is understood that Kirklees Council have a standard position to install PV arrays on buildings, where feasible, to address compliance with Building Regulations Part L and 25B. These are supported by requirements for BREEAM certification as evidence of delivery and compliance.

Examples of key local policies and plans include:

- Our 2038 Carbon Neutral Vision
- Kirklees Council Local Plan
 - Adopted Kirklees Local Plan – Sustainability Appraisal Post-Adoption Statement
- Kirklees Council Air Quality Action Plan

- Clean and Green – Council Plan 2020/21
- Kirklees Climate Emergency Declaration and the Kirklees Air Quality Strategy and Five Year Air Quality Action Plan (2019)
- Climate Emergency Programme and Action Plan (In development)

2.7 Industry Best Practice

There are numerous examples of metrics and strategies proposed by the wider built environment, construction, design, and engineering industries, of which many suggest approaches to deliver net zero carbon ahead of the proposed 2038 date for Kirklees Council. Some examples of net zero and sustainability frameworks, certification schemes and design principles are highlighted below, which will be further explored within the strategy.

- Zero carbon and sustainability frameworks
 - RIBA 2030 Climate Challenge metrics
 - RIBA Sustainable Outcomes Guide
 - London Energy Transformation Initiative (LETI) KPIs
 - UK Green Building Council (UKGBC) KPIs and Advancing Net Zero Programme
- Certification schemes
 - BREEAM – Design and Construction / Refurbishment
 - NABERS – Operational Energy
 - CEEQUAL – Civil and public realm works
- Design Considerations
 - Designing for modular construction or Methods of Modern Construction (MMC)
 - Designing for future flexibility
 - Designing for deconstruction and circularity
 - Designing for climate resilience, future demand, and green-blue infrastructure

Examples of best practice are integrated within section 4 of the report

2.8 Reflecting Sustainability Aspirations

2.8.1 Meeting the Climate Emergency

As the 2038 vision is being shaped by Kirklees Council, council officers were interviewed as to the specific climate and sustainability related aspirations. Through workshops and individual interviews, aspirations and direction of travel were gathered and used to shape the structure of this report as well as the vision and actions identified. There are areas that are of high priority to Kirklees Council. These are addressed below and are supplemented by key additional sustainability and climate topic areas later in the report.

The following are Kirklees Council staff who were primary consultees and provided input to support the development of this plan. It is recognised that some supporting staff also provided ad hoc support.

Name	Title	Area of Consultation
██████████	Operational Manager- Air Quality, Energy & Climate Change	Air Quality, Climate Change and Electric Vehicles
██████████	Strategic Manager for Technical Services	Previous Kirklees Council Experience and Technical Design Solutions
██████████	Project Manager (Energy and Climate Change)	Energy Performance
██████████	Senior Mechanical Design Officer	Mechanical Design, Operation and Maintenance
██████████	Client Design Advisor	Design, Principles and Strategy / Previous Kirklees Council Experience
██████████	Project Manager - Transport Strategy & Policy	Transport
██████████	Project Officer – Transport Strategy & Policy	Transport

Additionally, AECOM were also directly engaged regarding District Heat Network plans. ██████████ (Associate Director, Buildings and Places) and ██████████ (Senior Sustainability Consultant) both supplied information and attended meetings.

The below are recurrent themes based on feedback from key interviewees:

- **Carbon Measurement** – required metrics, targets and a reporting structure to be used that supports the monitoring of carbon reduction in the built environment sector to address 2038 net zero target
- **Energy Generation and Renewable Energy** – a desire to incorporate on-site generation and supporting technology (e.g. battery storage). The regional UK100 pledge is a key driver for on-site generation and there is recognition of the opportunity to utilise district heating and electricity from a scheme currently in design.
- **Air Quality** – The Queensgate / Cultural Heart area is currently within an Air Quality Management Area (AQMA). As such there is significant desire to improve air quality through modal shift away from single occupancy vehicle use (notably for internal combustion engine

(ICE) vehicles). Additionally, there is scope to potentially introduce a Clean Air Zone that may impact the Cultural Heart area.

- **Transport** – No specific transport plan currently exists. There are policies in place as per the WYCA Connectivity / 2040 Strategy Plan. The key priorities are to encourage a shift away from car usage and to address accessibility and inclusivity.

Separately there is a strong focus on delivering an ambitious EV charging infrastructure to encourage hybrid and EV take-up and support a shift away from ICE vehicles. This is not limited to cars, but will support electric bikes, cargo bikes, taxis, delivery, and maintenance vehicles etc. These impact both air quality and transport themes, as well as future proofing infrastructure.

- **Green Infrastructure (and green-blue infrastructure)** – There is a desire to improve aesthetics and 'green' urban spaces. This is seen to have multiple benefits, from air quality and biodiversity, to providing an amenity benefit and incorporating sustainable drainage systems (SuDS).
- **Future Proofing** – Kirklees Council representatives are conscious that challenging decisions will be required and so there may not be all the ideal net zero solutions available for implementation at the time of design or construction. Therefore, an emphasis is also to be on future proofing and positive step-change. This is notably relevant when considering future district heat network or district energy connection, and topics such as infrastructure for increased electric vehicle (EV) charging demand. Therefore, topics such as allowing enabling infrastructure to be installed or flexible design are critical.
- **Building Design and Certification** – It was noted that there are currently no set standards within Kirklees Council for building design or certification. Providing clear direction on design and certification standards is a common approach across the industry to provide a recognised framework for delivery of some standards, especially when supporting metrics to deliver net zero carbon construction and building operation.

In addition, Kirklees Council representatives noted that there was interest in Passivhaus standards and timber construction. These are not representative of official Kirklees Council policy, but represent areas of interest to deliver positive change, improving on current building performance and standard designs.

Appendix 3 includes a summary of topics where Kirklees Council staff reported concerns based on past experiences. Where these are deemed to be red-line issues, they have been excluded from the strategy report. However, the focus of the report remains to showcase principles and design considerations to deliver NZC in line with wider Kirklees Council Climate Emergency declarations and NZC economy / performance deadlines.

2.8.2 District Energy Scheme – Kirklees Council and AECOM Feedback

AECOM are currently working with Kirklees Council to develop a District Energy Scheme business case and implementation programme. It is understood that the aspirations for a District Energy Scheme to be operational in Huddersfield by c.2024 and would supply both heat and potentially electricity. Details of loads and what would be accessible to Cultural Heart schemes are yet to be defined.

The intention is for energy generation from the current energy from waste (EfW) plant, with ambitions to convert the generation to a combined heat and power (CHP) anaerobic digestion (AD) source, utilising food waste streams that Kirklees Council propose to collect and manage.

Initial feedback and viewing proposed distribution plans suggest that the network would be directed along King Street (to the north of the Cultural Heart) and Queens Street (to the east) and

therefore suggests opportunity to connect to the scheme and utilise low-carbon energy within the Cultural Heart programme.

A route between Princess Street and Huddersfield University (within the southern part of the Cultural Heart red line boundary) had been proposed, but due to potential issues with disruption and abortive/duplicated infrastructure works, this route will not be adopted during any preparatory works. Exact details and infrastructure plans are yet to be fully developed, but this indicates energy network infrastructure will likely be situated to the Cultural Heart perimeter.

Generally, this needs more detailed analysis and understanding but provisionally suggests a low-carbon district energy scheme is available for connection to new developments, within the programme area, whether for practical completion, or for connection later.

However, this is caveated with anecdotal reporting of timeframes for completion varying. A better understanding will be available once the district energy scheme is submitted for approval in late 2021, to allow for more detailed planning and collaborative works to commence.

Building designs and energy strategies should accommodate potential future connection to the District Energy Scheme regardless of timescales.

2.8.3 Additional Inclusions

Key additional inclusions based on expert knowledge and exposure to other Local Authority works include:

- **Circular Economy** – Designing for minimal waste in construction, replacement, or demolition, with maximised recycled content and ability for re-use or re-processing of ‘waste’ materials. Strategy will set a clear approach using recognised principles.
- **Climate Risk** – Despite success in reducing emissions within the UK, extreme weather events are more likely to occur than in the past. Strategy will need to address issues around reduction in impermeable surfaces and reducing vulnerability to surface water flooding and overheating.
- **Offsetting** – Setting an offsetting strategy for the scheme that can be scaled up across the regeneration programme and Kirklees Council administrative area.
- **Biodiversity & Ecology** – baseline ecology surveys are required so subsequent net-positive designs can be implemented. This also supports some certification requirements.
- **Water** – A critical part of the operational performance, this will be separated to highlight key design principles and associated KPIs relating to water consumption

There are some areas of cross over with these topics and those raised as priorities, however these shall also be critical topics within the strategy plan to promote sustainability at the heart of the urban regeneration scheme.



Figure 4: Sustainability focussed Newcastle Helix urban regeneration scheme - hard landscaping, amenity and accessibility detail. Newcastle Helix is a joint venture between Newcastle City Council, Newcastle University and Legal & General (source: gillespies.co.uk)



Figure 5: Sustainability focussed Newcastle Helix urban regeneration scheme – soft landscaping, biodiversity, and green-blue infrastructure detail. Newcastle Helix is a joint venture between Newcastle City Council, Newcastle University and Legal & General (source: gillespies.co.uk)

3 Vision

3.1 Cultural Heart Sustainability Vision

Regeneration schemes present an opportunity to enhance existing assets and the built environment while at the same time integrating new approaches to tackling climate change and realising co-benefits. For example, planting more trees and other soft landscaping can improve air quality, provide amenity benefit to users, and reduce the risk of surface water flooding.

Given the aspiration that the environmental impact is considered in all decisions, the Cultural Heart Programme should aim for a net zero carbon and climate resilient offering that meet the wider Climate Emergency aspirations for 2038 and can be NZC at practical completion.

Verified and certified processes for design, construction and operation across sustainability topics not only enhance project and programme credentials but provide recognised and relatable frameworks when communicating innovative practices.

The Cultural Heart programme has an opportunity to showcase how sustainability can be embedded in an ambitious regeneration programme, to demonstrate positive net zero carbon design and construction to the wider Huddersfield Blueprint, but also be a regional and national exemplar of sustainable development within a local authority context with potentially constrained resources.



Figure 6: Greener Grangetown, Cardiff. Example of integrating green infrastructure and in an urban/residential area to promote air quality and biodiversity benefits. The scheme was led by City of Cardiff Council as the client, in partnership with Dŵr Cymru Welsh Water and Natural Resources Wales (Source: Greenblue.com and Arup)

4 Guiding Principles

The requirement for a net zero economy across the West Yorkshire Combined Authority and within Kirklees Council is clearly identified. In this context, the proposed guiding principles are critical to influence and inform decision making throughout all phases of the delivery of the Cultural Heart masterplan, as well as influencing other regeneration, real estate and built environment programmes of work.

4.1 Integration and Collaboration

Sustainability is not an area any single person or discipline can successfully deliver, particularly around net zero. Collaborative working must be at the core of any principles and ethos that is adopted. Programme and project teams will be required to work collaboratively towards agreed definitions, outcomes and expected performance. Where targets are not achieved, it is crucial to support these with lessons learned. NZC cannot be achieved overnight, but will be process of incremental and positive actions to meet 2038 targets

4.2 Working to Industry Standards

The Cultural Heart will work to set industry standards, certification, and frameworks to provide an element of standardisation and comparability across the programme of works. These are recognised and allow Kirklees Council to realise levels of performance that take account of budgetary and financial constraints by setting aspirations around expected performance.

4.3 Embedding Sustainability Principles from the Outset

By not considering sustainability implications of a scheme from the start, developments can often be left exposed to future refurbishment costs. Sustainability must be considered at the scoping phase of any new development in line with the focus areas outlined in this strategy.

4.4 Retention and Refurbishment

Achieving net zero or low carbon development requires a level of retention of existing assets that can be refurbished and utilised that provide benefit to end users through enhancement, or which extend the lifetime of the asset.

With a retention-first approach, the focus is on improving the existing built environment rather than demolition and replacement. Whether through intention or necessity with heritage assets, focussing on utilising existing buildings avoids carbon-intensive demolition and construction processes. With heritage assets, there are other challenges presented, however a fabric-first approach is still promoted to improve the operational performance. Benchmarking is more challenging in these instances, but the core principles and ambitions should not alter.

4.5 Futureproofing for Physical and Transition Risk

It is increasingly recognised that our climate is changing at an increasingly rapid rate and there are subsequent demands on our building stock and built environment. A major regeneration scheme such as this presents opportunities to adapt our urban spaces to accommodate future-proof solutions and demonstrate flexible design for climate resilient solutions. In parallel, the pace of policy change can leave organisations exposed to fossil fuels and increasing the risk of stranded assets – those that will experience a premature write down. The programme of works and individual projects should take account of their exposure to policy, technology, market and consumer sentiment risk associated with a changing climate.

5 Strategy Aim

The overall aim of the strategy is to:

- Define a Net Zero Carbon and Climate Resilience Strategy for the Cultural Heart Programme - outlining and considering options to meet Climate Emergency aspirations.
- Align the programme of works to Kirklees Council strategic objectives, policies and general feedback received, notably to support the delivery of the NZC emissions 2038 target.
- Establish a framework of topic-specific focus areas to deliver a sustainable Cultural Heart
- Establish sustainability and net zero carbon targets and metrics that can be adapted and aligned to core programme, project, and council wide KPIs and targets
- Outline a performance management, assurance and reporting framework, ensuring transparency around the carbon performance of the programme of works and individual projects over defined timescales

Additionally, the strategy recognises the pending 2038 carbon neutral action plan and subsequent integration, and accommodation of critical actions would be required for a complete all-encompassing strategy. Kirklees Council’s own action plan is scheduled for publication in Spring 2022.

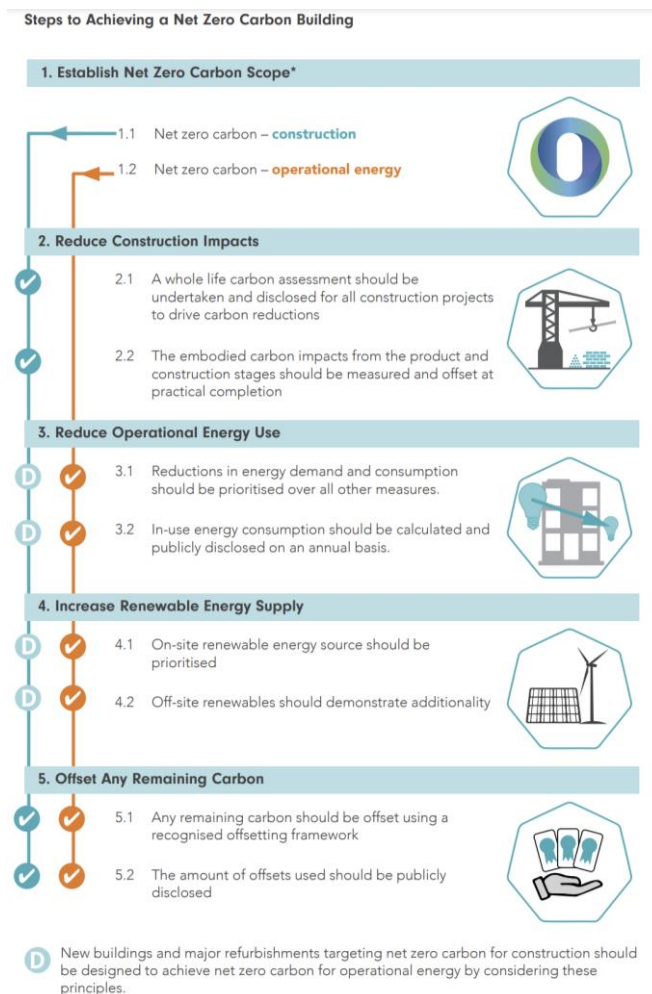


Figure 7: Extract from UKGBC Net Zero Carbon Buildings: A Framework Definition

6 Focus Areas

The following focus areas are the result of stakeholder consultation, desktop reviews and identification of best practice from across the built environment sector, identified through Turner & Townsend's experience. These have been developed to support the delivery of a net zero carbon and sustainable development in response to the policy requirements and other ambitions that have been expressed. All focus areas and subsequent targets are deemed to be achievable. However, in recognition of budgetary and other pressures, there are minimum standards and stretch standards that can be used as required. These will not dilute the ability to deliver a net zero and highly sustainable programme of works but allow flexibility for each project to define their own critical areas within respective red line boundaries.

Suggested key performance indicators (KPIs) and metrics within section 7 align to the following focus areas, and can either be used to deliver ambitious results, or to facilitate a positive step change, but should always promote progressive design and construction delivery. Minimum requirements – alongside net zero operational carbon and other themes – should challenge and not accept business as usual practices, while monitoring and measuring impact to allow for verified offsetting at practical completion.

6.1 Net Zero Embodied Carbon

6.1.1 Vision

To deliver capital work schemes in the Cultural Heart with a considered design to minimise embodied carbon and allow for offsetting so they can be verified net zero schemes.

6.1.2 Strategic Approach

A focus for both new builds and refurbishment projects is the delivery of net zero embodied carbon, in line with widely accepted frameworks and design standards, such as the UK Green Building Council's Net Zero Carbon Framework/LETI. The Cultural Heart can establish embodied carbon targets or budgets that could be adapted to set benchmarks for the wider Huddersfield Blueprint redevelopment schemes.

Embodied carbon emissions are generated from all construction activities that lead to practical completion, from obtaining base materials, through transport and manufacturing, to the construction processes. Whole life carbon incorporates additional stages, including all operational carbon and end of life, but this focusses on all activities up to practical completion.

To achieve a net zero carbon economy, we must account for and offset all carbon impacts from the construction and regeneration process, notably embodied carbon within capital works.

Central to the principle to deliver net zero embodied carbon is the understanding and calculation of material choices and construction processes. Embodied carbon assessments should be reviewed in isolation, however, and should be conducted alongside operational energy and carbon performance to address the most appropriate and value-driven solutions.

Embodied carbon assessments should be undertaken from the earliest design stages to allow for informed and proactive decision making, as they support procurement and design choices including material selection, procurement, construction methodologies and circular economy principles. They also allow for offsetting impacts and strategies to be considered from the earliest stage to further support timely decision-making processes. Offsetting embodied carbon (see section 5.12) will be inclusive all activities up to practical completion in line with guidance from the UKGBC Net Zero Carbon Buildings Framework. Without offsetting, the Cultural Heart programme (or projects within) cannot be defined as net zero carbon.

Successful delivery of net zero embodied carbon requires both design and construction processes to be addressed. The following Key Design Principles are based on RIBA guidance to highlight principles across both major phases of works up to practical completion. There are numerous cross-over topics, which highlights the need for collaborative and integrated working between Kirklees Council, design team and principal contractor:

Design Principle	Construction Principles
Prioritise building re-use	Prioritise ethical and responsible sourcing of all materials (KPIs)
Carry out embodied (or whole life) carbon analysis of building elements and establish a benchmark/target carbon budget (KPIs)	Target zero construction waste diverted to landfill (KPIs)
Prioritise low embodied carbon and healthy materials (KPIs)	Promote use of a local supply chain and local materials
Minimise materials with high embodied energy impacts	Monitor, measure and minimise construction impacts (including transport, energy and water consumption, waste management and circularity) (KPIs)
Design for modular off-site construction systems	Calculate performance against embodied (or whole life) carbon benchmark/target and carbon budget (KPIs)
Design for robustness and longevity	Offset remaining carbon emissions through recognized scheme (See section 4.9)
Design for flexibility and adaptation	
Design building for disassembly and the circular economy	

6.1.3 Delivery Approach

The Cultural Heart development should mandate net zero embodied carbon across all developments.

Design teams should be presented with a challenging brief supported by metrics to measure progress. Construction teams should also be challenged to implement sustainable ways of working.

Delivering net zero embodied carbon is critical to support the delivery of a net zero economy and region by 2038. Successful management can also be a catalyst for change. To deliver net zero embodied carbon, the following processes are required:

A1-A3: Raw material supply, manufacture, and transport

- Assess design and material choices within an embodied carbon budget or against a target
- Consider cost and carbon in parallel
- Stipulate clear specifications based on certified materials or products that are responsibly sourced and with Environmental Product Declarations
- Identify products with a high recycled content
- Identify products or materials that can be locally sourced, but as a secondary requirement to responsible sourcing
- Encourage supply chain partners to utilise sustainable methods of transportation, from energy source to minimising journeys
- Work with supply chains to share knowledge and educate

A4-A5: Transport to site / construction process

- Prohibit diesel use on sites for all temporary accommodation or plant
- Stipulate requirements for all temporary site set-up areas to incorporate energy efficiency principles and to include for on-site generation
- Set stringent circular economy and waste principles and KPIs
- Set stringent requirements for water management
- Encourage supply chain partners to utilise sustainable methods of transportation, from energy source to minimising journeys
- Work with supply chains to share knowledge and educate

All design and construction partners should be able to demonstrate a track record in sustainability, alongside quality, programme, H&S and other requirements. Innovation and collaboration should also be considered as it is recognised that successfully delivered highly sustainable programmes of work and individual projects are the result of close team working and challenging business as usual behaviours.

Royal College of Pathologists, London

Urban regeneration project re-using foundations and promoting passive cooling

A 2019 new-build project with exemplar re-use of substructure to minimise carbon-intensive foundation works. The seven-storey building is part of a larger programme of works, with design focus on reduced embodied and operational carbon by maximising re-use of existing and structurally strong foundation works, promoting passive cooling and exploiting natural lighting design solutions.



Image credits: bennettsassociates.com

Highlights and Features:

- Re-use of existing foundations
- Passive-cooling strategy – using a high-embodied carbon material (concrete) to maximise material benefits
- Virtually column-free floor plates, accommodating future flexibility and maximising natural light penetration
- Internal setbacks and multi-height space to further promote flexibility and daylight penetration
- Exposed slabs and structural materials minimise use of secondary fit-out materials

6.2 Net Zero Operational Carbon

6.2.1 Vision

To deliver assets within the Cultural Heart that achieve long term operational carbon performance in line with industry standards.

6.2.2 Strategic Approach

The percentage of whole life carbon emissions attributed to operational performance varies depending on building type, age and multiple other factors. Through industry-wide bodies such as the UK Green Building Council and RICS, it is recognised that carbon emissions attributed to operational and post-completion activities can account for in excess of half of a building's life emissions (the remaining being attributed to embodied carbon up to practical completion).

This represents a significant energy demand and carbon emission load, much of which can be addressed through simple measures, coordinated, considered design and high-quality construction and operation.

Operational carbon encompasses the following product life-cycle stages, each of which is addressed within a separate chapter:

- B1-B5 – Use, maintenance, repair, replacement, and refurbishment (see section 5.3)
- B6 – Operational Energy Use (see section 5.4)
- B7 – Operational Water Use (see section 5.5)

Each topic has its own principles and delivery considerations, though each should be considered within these general principles that consider the whole NZC agenda during the operational phase:

- Prioritise retrofit and fabric improvement to existing stock
- Prioritise fabric first principles (including air permeability and thermal performance)
- Support passive design with efficient mechanical solutions
- Provide simple-to-operate, responsive controls – building control and on a local level
- Minimise consumption and maximise efficiency
- Specify ultra-low consumption equipment (electric/energy and water)
- Maximise on-site generation and thereby minimising grid energy demand
- Comprehensive metering, monitoring and measuring requirements to understand operational carbon, so to inform improved management as well as subsequent offsetting

It is crucial to recognise that operational carbon is not just operational energy consumption and requirements for successful, NZC delivery of operational impacts requires collaborative design and management from a wide team, not just reliant on mechanical & electrical engineers alongside facilities management staff.

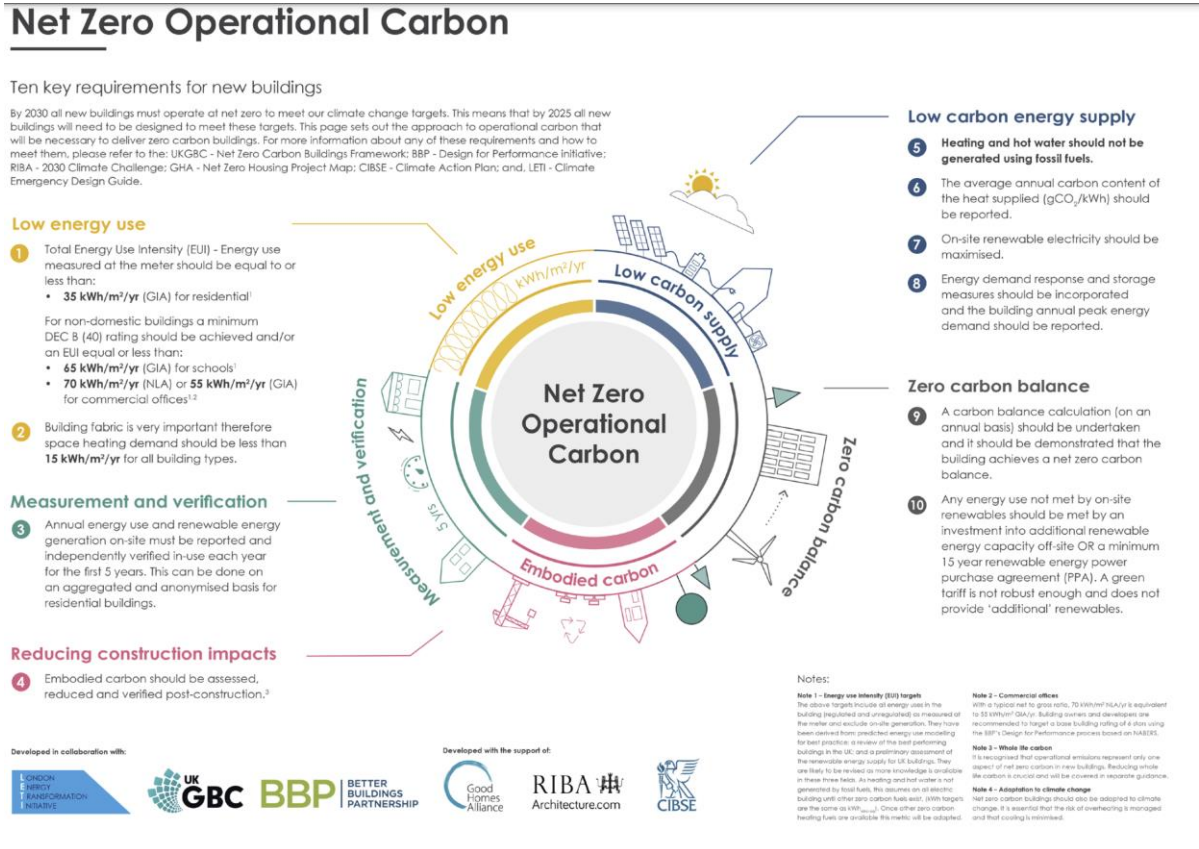


Figure 8: Net Zero Operational extract from LETI Client Guide for Net Zero Carbon Buildings

6.2.3 Development Targets

Targets will be further detailed but overarching net zero operational carbon, the following main themes are identified and must be managed:

- Delivering a passive- and fabric-first approach
- Engineered solutions to fine tune and optimise performance
- Avoiding or minimising consumption
- Incorporation of on-site energy generation solutions and supportive net-zero enabling solutions
- Defined building management systems (BMS) aligned to existing systems and in-house capabilities
- Designing for flexibility and futureproofing
- Designing for repair, replacement, refurbishment and de-construction

The Enterprise Centre – Norwich

Non-domestic Passivhaus; BREEAM Outstanding

A ground-breaking low carbon architecture project promoting Passivhaus design principles to minimise operational carbon and energy impact, completed in 2015.



Image credits: cibsejournal.com

Highlights and Features:

- Fabric first and material focussed design, with a timber frame
- Passivhaus certified
- Innovative local bio-based materials used, including flint, reed, straw, reclaimed oak, clay plaster and recycled rubber
- Low-carbon foundation - 70% GGBS concrete-mix (recycled sand, aggregate, and cement replacement)
- 100-year performance lifecycle
- Combined Heat and Power via a local heat network
- Building orientation provides significant levels of glare free daylight. High floor to ceiling heights, internal glazed partitions and central light shafts allows daylight to penetrate deep into the building
- Mixed mode ventilation approach with Variable Air Volume and night cooling strategies to restrict overheating
- 44MWh of PV generated electricity per year
- Primary energy demand < 120kWh/m²/year.

6.3 Design and Material Strategy

6.3.1 Vision

To deliver assets within the Cultural Heart that are designed to support net zero principles and reduce operational carbon impacts

6.3.2 Strategic Approach

The early definition of the programme's - and individual project's - scope and design aspirations are critical to efficient delivery of sustainably operated buildings. By embedding core design principles in early-stage briefs, the subsequent design development can enhance the requirements for core principles such as fabric-first design solutions.

All refurbishment and new build projects should aim for NZC across construction and operation phases, meaning the highest level of energy efficiency designs and specification of high-performing, responsibly and sustainably sourced materials.

This includes working with heritage and listed assets and buildings. These buildings present a more challenging set of restrictions, which emphasises the requirement for collaborative working to deliver sustainable outcomes. In these instances, the strategy may be influenced by specific requirements or restrictions on work, but where possible, the core delivery approach should remain the same.

Any assets that can be retained should be prioritised and subsequent refurbishment schemes should maximise opportunities to improve building fabric, integrate renewables, low carbon heating and cooling and drive down embodied and operational carbon.

The challenge of integrating net zero carbon and sustainable solutions into heritage assets should be addressed at the earliest opportunity, collaboratively between design and planning consultants and the council's planning officers. Reuse of existing assets should be prioritised and, where possible, demolition reduced.

As per guidance from Historic England, additional planning and aesthetic constraints may apply to heritage assets, but ambitions to improve operational performance remain. Groups such as Historic England and the Fit for Future Network (led by the National Trust) promote the considerate adaption and retrofit/refurbishment of historic buildings to support national and regional net zero targets.

6.3.3 Delivery Approach

Industry aligned operational energy and carbon emission targets should be set to influence design principles. Regarding operational energy, KPIs will be established but shall be supported by the following:

Passive- and fabric-first approach

- Building design should consider the following to optimise heating, cooling, ventilation, and lighting strategies:
 - Orientation
 - Massing
 - Shading and solar gain
 - Natural light, windows, ventilation and associated solar/acoustic controls

- Insulation levels, air permeability and thermal mass/performance (KPIs)
- Passivhaus principles (KPIs)

Mechanically or electrically engineered fine tuning to optimise performance and offer future proofing.

- Efficient, easy to control systems that can be managed at local (room or zone) levels, or at a building management level (via a BMS). These should include
 - Lighting systems
 - Heating / cooling systems, inclusive of storage and recovery
 - Ventilation systems
 - Smart or adaptive solutions to automate efficiency changes, supported by education exercises
 - Simple user interfaces

Specifying low-carbon materials to address embodied carbon and promote sustainable manufacturing and procurement.

- Conduct capital versus carbon assessments of key materials to specify affordable design solutions. Based on consultation and industry experience, examples include:
 - Low-carbon concrete
 - Electric-arc furnace steel with high percentage recycled content
 - Timber (glulam/CLT) complete or partial structures
 - Modern Methods of Construction (MMC) solutions
 - Lightweight M&E solutions (e.g. cable baskets replacing cable trays)
 - Steel replacement with copper, HDPE or other reduced-carbon alternatives

Ashton Old Baths, Manchester

Redevelopment of a heritage building with Placefirst and Tameside Metropolitan Borough Council as clients

A Grade II listed building converted into council business facility with office/coworking space. Utilising a difficult heritage space with sensitive but bold transformational design solutions.



Image credits: ashtonoldbaths.co.uk

Highlights and Features:

- Designed for modularity and functional adaptation
- Development of workspaces, communal areas, meeting rooms, shared kitchens and a data centre to improve internal floor areas without major new upper floor structures being installed
- Minimal physical impact on the existing structure to reflect the history of the building and minimise works directly impacting heritage features
- The former entrance, roof lights and tiled floors were restored to maintain the character of the site
- Use of timber and steel and focus on internal performance
- Controlled environments with lighting and comfort heating and cooling
- Innovative design solutions minimised risk and retained heritage amenity

6.4 Energy Strategy

6.4.1 Vision

To provide buildings that operate with minimal energy consumption and maximise locally generated (building integrated or district energy scheme) low or zero carbon energy

6.4.2 Strategic Approach

To meet 2038 NZC aspirations, energy consumption must be managed and reduced, as well as changing the source of our energy. There is expected increased demand that will be placed on national and regional infrastructure as a result of wide-spread electrification of energy sources for the likes of vehicle fuel and heating.

The combined investment in energy management (minimising use through avoidance and efficiency) alongside on-site energy generation or use of district energy schemes is seen as paramount to deliver energy security and net zero carbon energy.

Energy quantification, through design and operation, allows for progressive development and step-changes that can continue to be implemented year on year. This begins with a clear energy strategy to influence design principles to establish a clear benchmark and subsequent performance targets.

Supporting this, the energy strategy incorporates the following as core principles to be primary considerations:

- Fabric- and Passive-first principles – focus on reducing overall energy demand, including initial design focus on the balance of Passivhaus standards, air permeability, thermal performance and utilising natural ventilation
- Efficient mechanical and electrical supporting systems – to fine performance and further drive efficient energy demand
- Delivery of smart and easy to operate building controls
- Incorporate Demand Response Strategies, designed to reduce peak electrical demand from the grid supply by utilising battery storage and/or active measures such as automatic temporary alteration of set point controls or lux levels.

Energy performance and principles should be subject to continual review to adapt to best practice and end-user feedback

6.4.3 Delivery Approach

Incorporation of on-site energy generation solutions and supportive net-zero enabling solutions

- Prioritise the incorporation of photovoltaic (PV) electricity generation but consider all low and zero carbon technologies, to include:
 - Building integrated PV
 - Combine with green roof spaces as priority
 - Building integrated solar hot water
 - Based on early engagement, this is a secondary solution and PV is preferred
 - Air Source Heat Pumps (ASHP)
 - Other heat pump solutions are available but based on early discussions, ASHP would be a priority)

- Incorporate decentralised energy solutions where applicable and viable
- Incorporate heat recovery within assets where relevant/viable
- Incorporate battery storage solutions where technically feasible and viable to further decrease reliance on grid-energy solutions.
 - This also supports Demand Side Response that allows buildings to draw on their own back-up battery solutions and decrease grid-energy demand. These should work in conjunction with BMS systems that allow ramped down energy demand (through decreasing lighting demand and lux levels, for example)
 - Active and passive measures should be supported with education and behavioural changes, such as encouraging EV charging at times of energy excess.
- Other energy generation solutions such as wind, biomass and ground source heat pumps have been dismissed based on experience within Kirklees Council and concerns over legacy operation and management
- Fossil-fuel energy sources should not be permitted as a standard solution (e.g. natural gas) but where these may be required (e.g. for catering) then there should be a suitable plan in place to phase this out and to replace with suitable alternatives throughout the lifetime of those individual facilities.
- Where it can be predicted, infrastructure should be installed to support the facilitation of alternative fuel sources.
- Connection to the proposed district energy scheme is seen as a highly positive proposal and should be core to the operational energy strategy

Supporting the above, to accurately determine design principles, a whole life carbon assessment should be undertaken, supported by CIBSE TM52 (Thermal Comfort Analysis) and TM54 (Operational Energy Performance)

These influence the efficient design and performance criteria for the building's operation, but there is a recognised performance gap between design and operation. To address this gap, we advise implementation of a robust 'Soft Landings' programme on all projects across the programme of works, that includes integration of Facilities Management staff to observe and understand the building's systems being installed and commissioned, alongside relevant training sessions. Additionally, there should be stringent commissioning and seasonal commissioning processes to monitor predicted v actual performance and to fine tune systems accordingly. Building system management is a further key area for consideration:

Design principles should encourage design for simple control and to adapt to existing facilities management principles, but also to support and encourage positive change through:

- Engage Facilities Management staff throughout the design process – support with end user stakeholders where feasible
- Test solutions and new technologies
- Collaborative design is required to maximise the benefit of engineered solutions with user interfaces and ease of control
- Stipulate a strict post-completion fine tuning period, seasonal commissioning requirement and multi-year operational performance review

Hull: Yorkshire's Maritime City

Non-domestic Passivhaus cultural facility for Hull City Council

A cutting-edge low-carbon visitor centre currently under construction, within an urban redevelopment scheme. Designed for Passivhaus certification, it is a design to promote net zero operational carbon and showcase design to attract visitors to explore this part of the city.



Image credit: purcelluk.com and passivhaustrust.org.uk

Highlights and Features:

- Concrete and timber hybrid construction.
- Focus on design to promote amenity and attract visitors
- Designed for minimal operational energy consumption
- Highly insulated building fabric, doors and windows, and incorporate an MVHR system, ensuring air quality and comfort
- Remaining energy demand will be met via renewable technologies on-site
- Predicted airtightness of $0.6\text{m}^3/\text{h}\cdot\text{m}^3@50\text{Pa}$
- Predicted thermal energy demand of $12\text{kWh}/\text{m}^2/\text{annum}$
- Predicted thermal energy load of $10\text{w}/\text{m}^2$

6.5 Net Zero Operational Carbon - Water Strategy

6.5.1 Vision

To provide buildings that operate with minimal water consumption

6.5.2 Strategic Approach

Albeit a less carbon intensive element than electricity production, for example, water management is still a crucial aspect of delivering a net zero operational carbon programme of works and individual projects.

Water critical situations – both scarcity and flooding events - is an increasingly common issue that is impacting built environment design and operation in all parts of society. Climate resilience in terms of surface water and drainage management shall be addressed in section 5.9, but is also a responsibility of building operation where there is scope to reduce water demand, monitor infrastructure and subsequently both alleviate pressure on water supply / drainage, but also reduce operational carbon.

The overarching principle is to reduce potable water demand which can be achieved through behavioural and mechanical solutions, supported by sensitive leak detection monitoring systems and greater use of greywater

Specific design principles to include:

- Specifying waterless solutions where feasible
- Specifying low-flow fittings and appliances
- Utilising grey-water, where attenuation tanks and pumping permit this without excess energy consumption
- Designing comprehensive leak detection and metering systems

6.5.3 Delivery Approach

While a focus should remain on reducing water consumption, where solutions lead to an increase in energy usage (e.g. through pumping or vacuums), or water storage designs led to a significant embodied carbon increases (e.g. additional structure, reinforcement etc.) then these need to be assessed and embodied and energy related carbon should be given precedence.

In line with RIBA Sustainable Outcomes guidance, it is proposed that a development target of up to 13 litres / person / day is stipulated as a target for design and operation

6.6 Certification

6.6.1 Vision

Verified process and certified procedures not only give credibility to the programme of works and individual projects but provides further robust frameworks for the delivery of sustainable design and in-operation solutions.

Certification processes have their own nuances that should be discussed for each project to identify the relevant approach to achieve the requirements but allow for a clearly defined set of minimum standards that have to be achieved. This allows stakeholders to have confidence in the processes undertaken, enhances reputation, and provides clear evidence of delivering proactive change to deliver a net zero economy.

6.6.2 Strategic Approach

Certification methodologies, such as BREEAM, have been discussed as a requirement to evidence delivery to - and compliance with – Building Regulation Part L and 25B requirements. However, there is currently no clear strategy for agreeing certification standards for capital works within Kirklees Council. The following are standards or certification and verification processes that are recommended to be targeted for all developments in the Cultural Heart and can be utilised to benefit other Council developments:

- BREEAM – New build and refurbishment (KPIs)
- CEEQUAL – Civils, infrastructure and public realm works (KPIs)
- EPC – Energy performance (KPIs)
- NABERS – Operational energy performance (KPIs)
- CIBSE TM52 – Thermal Comfort Analysis (KPIs)
- CIBSE TM54 - Operational Energy Performance (KPIs)
- UK Green Building Council Net Zero Verification (KPIs)

WELL and WiredScore are additional certification processes that have been excluded from this plan as they do not certify sustainability actions. However, achieving certification to standards such as these would be welcomed due to the crossover benefits regarding sustained use of each building and social wellbeing that support long-term operation and building life expectancy.

- As was determined in the initial consultation, Passivhaus standards should be considered and embedded in design and operational principles but achieving verified Passivhaus has been excluded as a target at this stage. Principles and elements of Passivhaus delivery have been included throughout this report and within KPIs. Full delivery of Passivhaus could be incorporated as an added-value target if deemed suitable and viable during design team development discussion.

Soft Landings has also not been considered within this report as a core target or KPI. While there are crossover benefits with sustainability and operational performance, it is not a core sustainability topic. As such, implementing a Soft Landings approach to completion and handover of built assets is encouraged.

6.6.3 Delivery Approach

Certification targets need to be agreed at the outset of each project within the programme of works so they can be clearly established in all subsequent specifications and documentation.

Certification processes may require additional third-party input which requires management, but further enhances the opportunity for collaboration and inclusion of best or innovative practices.

All design and construction partners would be required to demonstrate a track record of successful delivery to required standards to minimise risk and showcase where they could add value to the process.

As with all KPIs and critical standards set, each process would be subject to regular reporting – monthly via general project reviews, but also subject to topic-specific reviews on a frequency to be agreed.

The Catalyst, Newcastle

BREEAM Outstanding building within an urban regeneration programme

A Grade II listed building converted into council business facility with office/coworking space. Utilising a difficult heritage space with sensitive but bold transformational design solutions.



Image credit: constructingexcellence.org.uk, bauder.co.uk and gillespies.co.uk

Highlights and Features:

- Focus on performance and reducing operational energy - high-standards of construction quality and design detailing, which greatly reduced the expected thermal losses (89.9% improvement) and air permeability rates (48% improvement – $2.61\text{m}^3/\text{hr}/\text{m}^2$)
- District Energy Network connection (network was not operational during design/construction phases) and was managed in parallel to allow for district energy use when the district energy centre became operational
- Integrated 30.78kWp PV and biodiverse green roof generating c.26,140kWh/annum
- Climate resilient design with soft landscaping and rainwater gardens – linked to swales and other SuDS across the development
- BREEAM Outstanding
- Multiple award-winning development, including National Sustainability award through Constructing Excellence

6.7 Transport

6.7.1 Vision

For the Cultural Heart development to be promote a modal shift in transport use and to create an inclusive and accessible area for all for residents and visitors

6.7.2 Strategic Approach

The Cultural Heart presents an opportunity to realise a modal shift away from internal combustion engine (ICE) vehicles and single-occupancy journeys, to promote a cleaner and more diverse transport network.

A transformational approach to deliver accessible urban areas should be core to wider programme works and the coordinated public realm and infrastructure delivery. Designing public spaces that encourage all modes of transport, alongside providing new amenity spaces, are core principles that are encouraged for adoption. This extends beyond civils works and should be supported with sufficient facilities within buildings and secure parking or transport hubs.

Alongside Air Quality and Sustainability ambitions, there is a national and international shift towards low-carbon transport for public and private use. The low-carbon vehicle vision can capture the needs of future electric vehicle demand, alongside the needs of pedestrians, cyclists and disruptive transport methods such as e-scooters, e-bikes and e-cargo bikes.

The transition to an electricity-based transport network is not limited to cars and vans and so infrastructure plans should also accommodate current and future flexibility for charging of electric bikes, scooters, and cargo-bikes, as well as accessibility buggies or similar technologies to support a fully inclusive approach. Prioritising a mixed-transport hub approach rather designating set-car park areas, allows for equal accessibility to a mode of private transport methods while promoting future flexibility.

Recognising the anticipated future demand for electricity, existing and novel solutions should be included, such as PV-integrated EV charging points

Additionally, it is recognised that construction processes themselves are slow-adopters of changing transportation technology and there should therefore be measures in place to promote on-site reduction in diesel use and uptake of electric or other zero- or low-carbon vehicles

6.7.3 Delivery Approach

Integration of transport requirements in the programme of works should be outlined as soon as is feasible to allow for sufficient development and understanding of required infrastructure, especially where allowing for future installation of EV charging points.

There is an existing standard within Kirklees Council for 10% of all parking spaces to be allocated for EV's with charging points installed. It is understood that this will increase and may be supported by the possible generation of a Clean Air Zone or similar. There are options to support this with potential parking discounts for EVs or Ultra-low Emission Vehicles (ULEVs), which again suggests greater than 10% of available parking may require installed charging points, with infrastructure to all parking for future adaptation.

Short-stay parking or collection points – such as taxi ranks – could be targeted for ultra-rapid charging infrastructure. This approach is already adopted by Kirklees Council and would allow for taxis to access an ultra-fast charging network which encourages the uptake of EV taxis, especially when aligned with possible Clean Air Zone charges.

Similar infrastructure could be considered for loading/unloading areas to further allow for future flexibility and adaptation of EV charging infrastructure for delivery and logistics vehicles, as well as private or for-hire vehicles.

More broadly, public infrastructure such as bridges and areas of public realm, should be designed alongside accessibility design partners to promote design solutions that encourage the co-existence of able-bodied and disabled individuals, alongside cyclists and other road or public realm areas.

The generation of a Cultural Heart is recognised as potentially promoting both food and drink and night-time economies for the area and so infrastructure is encouraged to promote accessibility for the likes of delivery and cargo bikes as well as traditional transport methods. Transport hubs or individual buildings should provide supporting facilities such as changing, showering or secure storage areas, which may be managed using schemes such as BREEAM.

Transport partners such as Sustrans or the City Regions Sustainable Transport Settlements (CRSTS), may be additional sources of advice, funding and transport-critical guidance which should be allowed for during transport-specific development reviews. Sustrans are advocating planning to accommodate disruptive transport options such as the cargo bike, while CRSTS (working with WYCA) encourages the promotion of low-carbon, net-zero transport options.

Within requirements for contractors and sub-contractors, measures should be included to recognise the transition to zero- or low-carbon plant and on-site vehicles. Production of electric and hydrogen vehicles by major construction plant suppliers are gradually becoming commonplace and while the use of such vehicles may not be mandated due to cost implications, it should be greatly encouraged and recognised in tender or review processes.

Similarly, commuting and visiting members of the contractor and sub-contractor partners should be strongly encouraged to utilise varied methods of transport with highly limited on-site parking.

Fastned, Sunderland

EV charging with integrated PV

Example of novel combination of technologies to provide a resilient and futureproof transport and parking network in our urban environments.



Image credit: fastnedcharging.com

Highlights and Features:

- Charging capacity up to 350kW
- Range of chargers from 50kW up, to support flexible lengths of parking
- Initially free, but now charged so providing revenue potential
- Canopy design generates PV electricity and is a clear symbol of sustainability integration

6.8 Air Quality

6.8.1 Vision

To utilise the Cultural Heart redevelopment scheme to improve local air quality standards, ultimately removing the area from the Air Quality Management Area list.

6.8.2 Strategic Approach

Sustainability solutions outlined for the Cultural Heart should seek to realise multiple co-benefits across topic areas where possible, aligned to Kirklees Council's Air Quality Priorities, including to deliver a sustainable economy and provide high-quality, clean, sustainable and green environments.

Kirklees Council recognise that poor air quality is associated with several adverse health impacts and as such, the inclusion of air quality improvement measures is seen as a matter of priority from a public health perspective as well as from a sustainability and environmental point of view.

Previous successful schemes to improve air quality within the Kirklees Council geography have included:

- Ultra-Low Emission Vehicle promotion through discounted parking and EV charge point installation
- Cycle schemes
- Creation of inclusive cycling and pedestrian areas, with separation from cars and other vehicles

As the Cultural Heart area is currently within an Air Quality Management Area, there is a clear vision to use urban regeneration to facilitate meaningful change; to introduce soft landscaping and biodiverse ecological areas to urban settings, alongside sustainable drainage, green infrastructure and addressing transport themes.

The wider Kirklees Council Air Quality Action Plan should direct strategy approach, with a focus on the following areas that can be implemented within the Cultural Heart Programme:

- Transport options as identified in section 6.7, but to include:
- Integration of EV charging infrastructure and charging points
- Promotion of zero or low carbon transport options – with supporting infrastructure
- Supporting the transition to low or zero emission vehicles through construction activities, including plant on site. Also, regarding generator emissions and the medium combustion plant directive
- Incorporating air quality mitigation measures – as may be mandated through planning requirements
- Designing accessible and inclusive public realm areas
- Integrate planting and green infrastructure

Consultation also raises the possibility of generating a Clean Air Zone, which could impact on design, construction and operational requirements. This would be viewed as an ambitious development but impact with the Cultural Heart programme would require further consultation and defining.

6.8.3 Delivery Approach

Air quality is a pressing sustainability and public health issue that transcends various themes and influences green-infrastructure and transport approaches. However, there are standalone approaches that are recommended for implementation across the programme of works that support the Kirklees Council Air Quality Action Plan's 'broad topic' themes, and related ambitions.

Setting clear ambitions for the Cultural Heart allows these ambitions to be clearly established in all subsequent specifications and documentation. These should include:

- Approaches to reduce pollutants being emitted
 - Linked to transport
 - Linked to operational energy and avoiding or minimising on-site combustion
 - Linked to installed plant
 - Enforcement of the Medium Combustion Plant Directive and requirements for minimising or avoiding diesel use on construction sites (plant and generators)
- Approaches to monitor air quality
 - Extension of existing monitoring schemes to record air quality before, during and after the redevelopment. Best practice in construction and design can be shared
- Approaches to remove pollutants
 - Increased planting and green infrastructure

Monitoring schemes would likely be led by Kirklees Council and not be specific to the Cultural Heart, though air quality monitoring is not uncommon on construction sites and could be linked to potential academic research projects (as has been undertaken in other urban regeneration schemes in cities like Newcastle and Birmingham).

DEFRA publications such as the Air Quality Expert Group Impacts of Vegetation on Urban Air Pollution recognises that urban vegetation does not answer the air quality issue alone but can have a positive effect dependent on planting criteria. Some urban landscaping designers report that green infrastructure such as green roofs and living walls can have up to a 60% increased deposition rate on harmful particulate matter, so green infrastructure and planting should be promoted within designs to maximise the significant impact that can be realised in improving air quality as well as presenting many co-benefits.

Wild West End Garden, London

A temporary urban and public garden space showcasing Air Quality improvements through planting and urban design

Initially designed for the Chelsea Flower Show, this award-winning urban garden was identified as an exemplar design to showcase how re-thinking urban spaces to minimise traffic and maximise planting could have a positive impact on air quality as well as amenity.



Image credit: marble-arch.london

Highlights and Features:

- Communal garden amenity space
- Planting designed to improve air quality and to be resilient to pollutants
- Combined with increased pedestrianisation and cycle-positive road layouts, as well as creation of ICE vehicle free roads
- Temporary design showcases how design solutions can be trialled alongside consultation to determine impact before committing to long-term plans

6.9 Green-Blue Infrastructure, Biodiversity and Ecology

6.9.1 Vision

The priority is to deliver net-positive biodiverse environments through incorporation of green-blue infrastructure throughout the Cultural Heart.

6.9.2 Strategic Approach

Maximising green-blue infrastructure in new build and regeneration schemes provides multiple benefits, from increased biodiversity to increased heatwave protection, and from amenity/aesthetic improvement to future proofing from flood events.

Incorporation of green-blue infrastructure, biodiversity and ecology should be core considerations and present efficient approaches to benefit multiple outcomes.

Principles are to include:

- Net biodiversity gain (KPIs)
- Regeneration of brownfield sites and protection of greenfield sites
- Sustainable land remediation, if required
- Retain any existing natural features
- Create a range of green or green-blue spaces, including:
 - Green / Green-blue roofs (KPIs)
 - Vertical greening (KPIs)
 - Pocket parks and soft landscaping areas
 - Green / biodiversity corridors (cross-programme / city)
 - Sustainable drainage systems (SuDS) that support biodiversity
- Planting to comply with Kirklees Council Biodiversity Action Plan (KPIs)
- Planting and soft landscaping to enhance air quality and amenity
- Integration of green / green-blue roofs to insulate buildings and enhance PV performance efficiency
- Integration of soft landscaping and green-blue infrastructure can reduce peak urban temperatures (urban heat island effect) and provide localised cooling

6.9.3 Delivery Approach

Baseline ecological surveys are required to accurately record existing biodiversity levels to then inform subsequent designs to deliver net-positive biodiversity gain.

Supporting these surveys, tools such as the Environment Agency and CIRIA's B_{EST} (Benefits Estimation Tool) can be used to calculate the value of the benefits of blue-green infrastructure. This can help inform decisions and be used to develop and monitor additional KPIs. This particular tool is predominantly aimed at SuDS and Natural Flood Management (NFM) and quantifies the benefits across 18 categories to demonstrate financial, environmental and social benefits of implementing green-blue infrastructure.

Use of assessment tools such as B_{EST} supports decision making processes to determine the true value of decisions.

Practical Green Infrastructure Examples

Small-scale and easy to implement solutions to integrate green infrastructure based on consultation engagement

Vertical planting co-existing with existing or new infrastructure.



Image credits: Scotscape.co.uk - London

- Simple integration with infrastructure such as lighting columns
- PV-powered watering system with inbuilt irrigation
- Planting mixes to biodiversity and/or air quality
- Visible delivery of sustainable design

Small-scale green roof integration – Sheffield and Leicester



Image credits: greenroofs.com and designboom.com

- Simple integration with existing or new infrastructure
- Low maintenance planting mix to support biodiversity and/or air quality
- Visible delivery of sustainable design
- Co-benefits with climate resilience

6.10 Circular Economy

6.10.1 Vision

To minimise waste generation and materials sent to landfill during all phases of construction, operation and at end-of-life, by promoting circular economy principles through designing out waste and pollution, keeping products and materials in use and regenerating natural systems

6.10.2 Strategic Approach

Required circular economy principles should be defined at the programme, and projects, outset so designs, and construction methodologies can be developed within a clear set of requirements.

At all times, waste should be minimised and where waste is generated, it should be segregated to allow for ease of management to allow for re-use, recycling or other measures with only the absolute minimum sent for energy recovery or landfill. Waste to landfill is the absolute final consideration and all other options should be exhausted before that point.

Circular economy principles also require the use of recycled or re-processed materials to minimise the use of virgin materials, as well as designing for repair, replacement, and re-manufacturing. This promotes a circular economic model (see figure 9) where significant destructive works can be avoided, and traditional waste materials can be re-utilised and treated as a resource rather than a waste.

Additionally, there are links between circular economy design principles and reducing embodied and operational carbon, thereby supporting Kirklees Council's NZC ambitions aligned to the climate emergency declaration. A design that accommodates flexibility and refurbishment over destructive works, will also be a design that is minimising carbon impact and considering whole life carbon.

By promoting a consistent approach through schemes such as BREEAM, there are opportunities for all individual projects to be assessed on circular economy principles, from traditional waste management through to designing for disassembly and adaptation. This provides a recognised route to assess delivery without Kirklees Council having to establish additional metrics and reporting mechanisms.

Between using materials with a high-recycled content, minimising waste generation and maximising circularity, there is scope to implement a clear and strong strategy that can transcend the Cultural Heart works and impact Kirklees Council's future works.

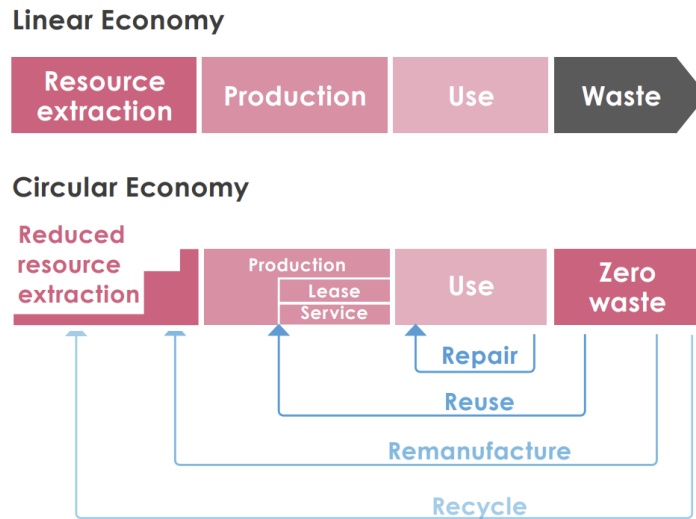


Figure 9: Linear vs Circular Economy Principles (extract from LETI Embodied Carbon Primer - Supplementary guidance to the Climate Emergency Design Guide)

6.10.3 Delivery Approach

Delivery of a circular economy strategy should focus on three areas: Design and material use, operational performance and designing for repair and disassembly. By considering these areas, Kirklees Council can support circular economy delivery in their building stock across all phases of a building's lifecycle.

Design and Material Use:

- Specify materials with a high recycled content to minimise virgin materials used
- Specify materials that can utilise demolition waste (carpet tiles through to superstructure materials) in their manufacture and engage those industries in the design process
- Maximise the use of Modern Methods of Construction and techniques that promote high-quality and low-waste generation solutions
- Design for flexible spaces to prevent destructive works in the future
- Reduce material usage through efficient, considered design and by omitting materials such as secondary grid-ceilings, for example
- Avoid speculative finishes
- Allow for protection measures to maximise lifespans of materials
- Enforce quality-first and waste minimisation strategies for contractors

Operational Performance:

- Design material and building performance solutions that are flexible so spaces can be adapted rather than requiring destructive works
- Design solutions that allow for replacement of materials

- Coordinate operational MEP solutions with space flexibility so fabric changes do not negatively impact on user comfort
- Design for modularity and functional adaptation, especially in heritage buildings such as the example in section 5.3 (Ashton Old Baths - this is one example of a design approach that aligns to expected planning restrictions within the Cultural Heart's listed and heritage buildings, minimises or avoids high-cost works that directly impact heritage structure or architecture and allows for increasing gross internal floor area to enhance potential commercial sustainability. This is, however, only one example and should not be seen as a definitive design solution.)
- Allow for building users and operators to segregate waste streams with ease and minimise waste contamination

Designing for disassembly:

- Prior to disassembly, materials should be designed for durability that require less-frequent repair, replacement, or other works. If required, protective design solutions can be used
- Materials should be designed for ease of assembly and disassembly, thus minimising destructive works and waste generation where repairs or end-of-life replacements are required. Reversible connections (e.g. screws and bolts opposed to welding) should be considered as part of this approach
- Materials that are typically hidden, such as MEP, should be considered to be exposed or accessible to allow for ease of access and repair or replacement
- Independent connections between materials allows for materials to be removed in layers to access the relevant area. This also allows for ease of material segregation when being removed at product or building end-of-life.
- Standardised design solutions allow for ease of understanding and are more likely to accommodate future adaptation, re-use or upgrading

Supporting, there is an increasing demand on digital twin or Building Information Models (BIM) to be supplied. These may require additional upskilling of current end-user and facilities management staff but allows for a highly detailed understanding of a building or structures assembly and disassembly process to accommodate circular and low-carbon management and operation throughout the asset's lifespan.

Maggie's Oldham, Royal Oldham Hospital

A timber and circular economy focussed development designed to support the Royal Oldham Hospital

Maggie's provides practical and emotional support services to those suffering with cancer and had a brief for a warm and welcoming space, open for community and regular use. The use of pine, birch and tulip poplar timbers creates a slender, flexible structure which can adapt to future needs. Structural off-cuts were then utilised for internal wall or ceiling finishings to maximise circularity and minimise traditional waste



Image credit: drmm.co.uk

Highlights and Features:

- Adaptable, flexible layout
- Utilising manufacture 'waste' as a resource for internal finishes
- Low-maintenance flooring from a natural rubber compound used to minimise replacement and maintenance impacts
- Very low embodied carbon impact
- Multi award-winning project, including RIBA National and RIBA Sustainability awards

6.11 Climate Risk

6.11.1 Vision

To provide buildings and facilities throughout the Cultural Heart that are designed to be resilient to future climate including excess heat, changing rainfall patterns and extreme events.

6.11.2 Strategic Approach

Despite success in reducing emissions within the UK, the amount of existing carbon dioxide (and other greenhouse gasses) emitted into the climate system means that we are already experiencing the impacts of climate change. Evidence of such events has been seen nationally and internationally with increasing frequency and severity. The Cultural Heart and Kirklees Council strategy will need to address resilience through design and process management.

As the UK's climate changes, the built environment will need to be adapted to deal with changing rainfall patterns, higher temperatures, and more frequent and severe extreme events. Climate resilience can be integrated into regeneration projects through design, in use management and the development of blue/green infrastructure as well as directing design teams to take account of the impact of different climate variables on design solutions.

Solutions to increase resilience for example are: permeable paving to manage surface water flooding from extreme rainfall; the integration of green-blue infrastructure and shading to reduce the overall temperature of the built environment and reduce reliance on mechanical cooling; and adaptive approaches to managing extreme events. All these approaches will be required to create a built environment that is equally attractive and comfortable to users at practical completion as it is during future extreme weather events.

6.11.3 Delivery Approach

Climate considerations should be integrated into all modelling and design considerations, providing a digital stress-test under predicted climate scenarios prior to agreeing design solutions. Risk, climate change and extreme weather event parameters can be agreed so the Cultural Heart remains resilient to current and expected weather scenarios.

Building designs should allow for passive cooling or shading and maximise the thermal efficiency of the structure, through material choice and design solutions such as green roof spaces. Designs should also consider layout of space, whether ascertaining risk of events such as flooding and therefore minimising fixed furniture or MEP equipment at ground or below-ground levels, or for flexibility of space and zoning of spaces.

Operational designs should prioritise passive solutions but be flexible to mechanical support during extreme events so building users can remain comfortable whether heating or cooling loads increase. Flexible zoning of heating, lighting, and other building operation systems, allows for spaces to increase or decrease in size for efficient management of occupied spaces.

Public realm and infrastructure works should allow for solutions such as permeable paving and SuDS, designed not only for extreme events, but for climate change scenarios i.e. not only 1-100 year events, but to allow for increased intensity, severity or duration of events

6.12 Offsetting

6.12.1 Vision

To achieve a genuine net zero regeneration, by offsetting residual emissions through a mix of approaches and verified by a reputable organisation.

6.12.2 Strategic Approach

Throughout the development of the 2038 carbon neutral vision, a strategic approach for offsetting will be required to determine how to offset outstanding carbon emissions through a verified process. However, this is an area for potential innovation and opportunity. Kirklees Council should develop a separate offsetting strategy, inclusive of:

- Setting a longlist of offsetting options – this should include human-made solutions such as solar PV and natural solutions such as tree planting and nature restoration.
- Setting a location hierarchy – this could set a hierarchy which allows for Kirklees Council to develop several offsetting options. For example, setting the local authority boundary as the highest element would ensure geographically local projects are brought forward as priority, with regional and national locations as secondary and tertiary options.
- Location specific options – throughout the local authorities existing plans such as the biodiversity action plan, school's refurbishment programme or other relevant council programmes, specific locations can be identified, and a pipeline of offset projects can be developed. For example, solar PV on schools, tree planting in areas earmarked for biodiversity action

The price of carbon and therefore the cost of offsetting, is driven by market demands. There has been a steady increase in the carbon cost with predictions for the rise to continue. It is therefore suggested that Kirklees Council agree a price structure to follow when assessing carbon and offsetting costs.

Suggested reporting to follow includes the UKGBC or the London Price of Carbon as set by the Greater London authority. For indicative purposes, these are currently noted at:

- £70/tCO₂^e based on UKGBC allowable offsetting approach within real estate.
- £95/tCO₂^e based on the London Price of Carbon as set by the GLA and adopted widely across the construction and built-environment sector.

The offset market generally recognises a lower cost for carbon, but there is a limited choice of where offset credits can be allocated (type of project, location). The GLA/UKGBC pricing is based upon a 2025-2030 forecast and so more realistic for longer term planning. Based on research and publications from the likes of the London School of Economics and Political Science, Grantham Research Institute on Climate Change and the Environment, and the Centre for Climate Change Economics and Policy, carbon offsetting prices are predicted to exceed £100/tCO₂^e, even up to £300/tCO₂^e by 2050.

6.12.3 Delivery Approach

Offsetting, particularly within a local authority and construction context is a developing area and as such can be an area for innovation. There are several examples of development focused offsetting by local authorities such as Islington and Milton Keynes that have generated offset funds to deliver much needed refurbishment or low carbon projects across the local authority. Some effort should be diverted into investigating how this could be delivered within a Kirklees Council context

7 Implementation and Delivery

Early consultation highlighted the importance of driving positive change and using this programme as a catalyst for sustainable development aligned to the declared Climate Emergency and net zero aspirations.

The successful implementation of this plan and strategies relies on initial consideration and agreement of requirements for all projects within the Cultural Heart programme of works. This plan sets out a series of visions, strategies, and targets, but acknowledges that sustainability is likely to be one of multiple critical success factors and therefore needs to be addressed in balance with other requirements.

By stipulating clear principles and targets – absolute or ambitions to aim for – every appointed member of the design and construction teams will have a clearly understood framework to operate within, while having flexibility to share their own knowledge to push for improved sustainable outcomes. This also identifies the need to appoint proactive design, delivery, and supply chain partners, with proven track records in delivering highly sustainable projects or programmes of work.

Clear reporting at defined timescales and against set metrics and KPIs is critical for several reasons, including allowing for like-for-like comparisons, but also to capture the clear communication of requirements, monitoring performance and progress. As with other reporting and governance strategies, this process can provide reassurance, give early warning where support is needed, or provide a structured route for analysing queries that arise. This should all be undertaken with the clear aim to embed core strategies and deliver in line with Climate Emergency and net zero aspirations as have been established by Kirklees Council.

7.1 Governance

To allow for transparent reporting and critique or approval of performance, a clear governance structure should be implemented.

The nature of the make-up of the relevant committees or reporting structures will be decided by Kirklees Council's established procedures; however, we suggest that a NZC and Sustainability Committee or Working Group is responsible for receiving and reviewing all reports. It is suggested that this working group includes consultees who contributed to this report as well as an appointed third-party specialist and would be supplemented by Project Management expertise. This forms a clear gateway for governance prior to project and programme board approval which is inclusive of client and project management personnel.

- Programme Board
- Project Board
- NZC and Sustainability Committee
 - With PM and Sustainability Expertise
 - Supplementary working groups on set themes could be established where guidance is required
 - Ability to share best practice and facilitate knowledge share across the Cultural Heart, between individual projects and across the wider programme of Huddersfield Blueprint regeneration schemes
- Individual Project Teams

This allows for a single committee to retain responsibility for implementation and oversight regarding progress, decision making and reporting, with scope to escalate to for further discussion or approval where required.

Each project team would have minimum set KPIs and metrics to report on that allow for comparison and parallel reporting to Project and Programme Board

7.2 Implementation

An appointed individual would lead the delivery of the plan, working in collaboration with Project Management and Design Team leads.

Reporting periods should be set regularly – suggested monthly throughout all RIBA phases – with the scope to establish additional reviews as required.

A clear mechanism for communication should be established within the governance framework that allows decisions to be made, but also to share live- and historic-lessons learned between projects and programmes.

7.3 Decision Framework

While there are several key principles and key performance indicators proposed in this report, it is recognised that sustainability and NZC delivery is one of many requirements that must be considered and delivered in coordination. It is therefore recognised that the ideal or stretch targets are not always feasible for immediate implementation. To make suitable decisions on topics where there is conflict, there should be a considered process to agree suitable alternatives.

We propose that these decisions are made by the suggested NZC and Sustainability Committee, in conjunction with Project Management and Sustainability expertise so there remains a level of approval and transparency with all required decisions.

A particular model or framework is not proposed; however, it is strongly suggested that these core principles are considered:

- Proactive decision making can still facilitate positive action
- Set programme and project-specific priorities with minimum standards, primary-focus, secondary-focus and supplementary themes
- Set timescales and responsibilities for decision making, but do not be defined by them
- A delayed correct decision is better than rushed incorrect decision
- Benefit from lessons learned and share knowledge to simplify decision making processes

8 Next Steps

This section outlines the key recommendations and next steps by theme.

Embodied carbon

- 1 Kirklees Council should formally set embodied carbon targets for specific new build and refurbishment projects within the Cultural Heart and encourage project teams to work to those targets before the end of Stage 2.
- 2 Kirklees Council should adopt the UKGBC Net Zero Framework and design principles outlined in this report (6.1.2) throughout the lifetime of the programme.

Operational Carbon

- 3 Kirklees Council should investigate the adoption of a NABERS UK target performance for all buildings before the end of Stage 2.

Design and materials

- 4 Kirklees Council should prioritise lower carbon options in material specification, allowing for hierarchy if the lowest carbon option is not available or viable within project budgets.

Energy

Defining energy ambitions and operational requirements may significantly influence building designs and should be agreed for a consistent approach. Kirklees Council should formally agree targets for:

- 5 Primary energy demand
- 6 Annual heating and cooling demand
- 7 PV strategy to achieve – or exceed – Building Regulation requirements
- 8 Battery storage and demand side response integration for the programme (or buildings within the Cultural Heart) to support energy flexibility and net zero carbon aspirations. This may include solutions and targets designed to reduce peak electrical demand, incorporate active-measures, and automate temporary changes. Targets should be within ranges for set-points, such as allowing operating temperatures to fluctuate by +/-2°C to reduce heating/cooling loads, for example.

Water

- 9 Kirklees Council should set minimum in-use water efficiency standards in line with water industry standards and requirements.
- 10 Kirklees Council to specify a comprehensive metering strategy across the regeneration programme to monitor and manage water usage throughout the lifetime of the project

Certification

- 11 Kirklees Council to undertake an option appraisal of certification to ascertain viability and appropriateness for the Cultural Heart scheme before project team appointment is complete.

Transport and Air Quality

- 12 Kirklees Council to define requirements or restrictions relating to potential implementation of a Clean Air Zone and subsequent design standards that may impact transport hubs and minimum

standards for improving air quality. The implementation of a Clean Air Zone has the potential to greatly influence design from incorporating charging network infrastructure for EVs to landscaping.

- 13 Kirklees Council to define requirements or restrictions for construction activities relating to on-site plant and air quality

GI, Biodiversity and Ecology

- 14 Kirklees Council to adopt a multi-benefits approach to GI to test solutions for climate resilience, amenity, biodiversity, and ecology benefits.
- 15 Kirklees Council to specify that any landscape strategy and integration within the built environment should attempt to provide at least two of the identified benefits.

Circular economy

- 16 Kirklees Council should adopt circularity principles as outlined in this report and challenge project team to realise these principles at design and construction stage

Climate Resilience

- 17 Kirklees Council to challenge appointed design team to integrate flooding and overheating considerations into design to reduce the reliance on mechanical cooling and high-cost flood defence infrastructure.

Offsetting

- 18 Kirklees Council to adopt the UKGBC Price as the shadow carbon price for the project and to direct the appointed cost manager to use this price throughout the project as a method of understanding potential offsetting exposure.
- 19 Kirklees Council to outline a long-term offsetting strategy by the end of Stage 4.

Implementation and Delivery

- 20 Kirklees Council should adopt the approach to governance and implementation as outlined in this report before appointment of project team.
- 21 Kirklees Council to develop a term of reference and appoint a Sustainability Committee for the duration of the project to practical completion.
- 22 Kirklees Council to contractually obligate project team appointees to report on the focus areas relevant to their appointment for the duration of the project to practical completion.
- 23 Kirklees Council should adopt the proposed KPIs
- 24 Additional metrics and KPIs should be reviewed for discussion and inclusion, where not captured in the above processes

Appendix 1 – Definitions

Critical definitions include:

- **Carbon** – Carbon is the common abbreviation for carbon dioxide equivalent (CO₂^e) within sustainability and greenhouse gas reporting but is not to be confused with carbon as a singular element or carbon dioxide (CO₂) as a gas. Carbon dioxide is the most prevalent greenhouse gas and arises from numerous processes, such as burning fossil fuels. However, it is not the only greenhouse gas, so CO₂^e is used as a single metric to incorporate the impact of all the greenhouse gasses.
- **Scope 1 emissions** – Scope 1 greenhouse gas emissions are released as a direct result of an activity carried out by an organisation or process, also known as direct emissions e.g. from transportation or heating via an on-site boiler
- **Scope 2 emissions** – Scope 2 greenhouse gas emissions are indirect emissions created by the purchasing of energy that is used by the organisation or process
- **Scope 3 emissions** – Scope 3 greenhouse gas emissions are also indirect emissions, but are created through 15 categories (*Purchased goods or services, capital goods, fuel- and energy-related activities, upstream transportation and distribution, waste generated, business travel, employee commuting, upstream leased assets, downstream transportation and distribution, processing of sold products, use of sold products, end-of-life treatment of products, downstream leased assets, franchises, and investments*). Not all categories will relate to every organisation but are required for net zero carbon economies. Scope 3 emissions are typically more difficult to calculate as they are not directly within an organisation's control and are reliant upon supply chain and upstream partners to share information about various processes.
- **Embodied carbon** - The carbon that is emitted in the construction of a building, through manufacturing, transport, storage and construction related activities up to Practical Completion (PC). This should be inclusive of scope 1, 2 and 3 emissions. For the purposes of this plan, embodied carbon includes the following project lifecycle stages that cover cradle to practical completion:

A1-A3 - Product Stage – Raw material extraction and supply, transport to manufacturing plant, and manufacturing and fabrication

A4-A5 – Construction Process Stage – Transport to project site, and construction and installation activities

Stages B1-B7, C and D are also considered when reviewing whole life carbon

- **Operational carbon** – The carbon that is emitted during the in-use operation of a building or asset and should be inclusive of scope 1, 2 and 3 emissions. This should be subject to on-going monitoring and annual reporting as a minimum, to allow for offsetting. For the purposes of this plan, operational carbon includes the following project lifecycle stages that cover building operation:

B1-B5 – Use Stage – Use, Maintenance, Repair, Replacement and Refurbishment

B6 – Use Stage – Operational energy use

B7 – Use Stage – Operational water use

- **Offsetting / Carbon offsetting** – The process of investing in schemes that sequester (or absorb) CO₂ (or CO₂^e) from the atmosphere. In theory, this allows for the balance or offset of the emissions calculated with the natural sequestration.

- **Green Infrastructure** – Green infrastructure is the development of a network of ‘green’ spaces and features, that deliver multi-benefits to their immediate environment, whether urban or rural. In the context of an urban regeneration scheme, Green Infrastructure may include tree planting, soft landscaping, green roofs, living walls etc. that may provide amenity, aesthetic biodiversity, air quality and natural cooling/shading benefits, amongst others
- **Green-Blue Infrastructure** – Similar to Green Infrastructure, Green-Blue Infrastructure has the additional benefit of being designed to improve, manage or control water movement in an area. In an urban environment, examples could include Sustainable Drainage Solutions (SuDS) such as swales, or green-blue roofs (green roofs designed to retain water from rainfall). These can provide benefits as with green infrastructure, but also support surface water and flood water management to reduce the risk of the flooding or extreme weather events causing disruption

Appendix 2 - Proposed Key Performance Indicators

The proposed Key Performance Indicators (KPIs) have been developed to:

- Reflect aspirations and targets specific to Kirklees Council and consultation
- Take account of 2038 net zero targets and objectives
- Strengthen performance management and monitoring of previously unreported elements
- Align with industry best practice (BBP, UKGBC, RIBA etc.)
- Support transparency and consistency of reporting
- Have the potential to support wider Kirklees Council redevelopment programmes and set performance benchmarks

The table summarises proposed Key Performance Indicators (KPIs) that can be adopted for guiding design teams and governance reporting throughout. It is recognised that there may secondary implications, such as budgetary requirements or material availability, therefore these are identified to present a degree of flexibility and agreement for each project within the Cultural Heart programme of works.

Proposed Key Performance Indicator List

Theme / Topic	Stretch KPI	Suggested Minimum KPI
Certification		
BREEAM	Outstanding	Excellent
CEEQUAL	Outstanding	Excellent
NABERS	6 Stars	5 Stars
Certification – UKGBC net zero carbon verification (construction and operation)	Verification	
Certification – EPC	A+	B
Design Standards		
Embodied Carbon to Practical Completion (A1-5) (from LETI embodied carbon target alignment publications (combined LETI and RIBA targets) – aligned with office buildings as a guide)	<350kgCO ₂ ^e /m ² (GIA)	<475kgCO ₂ ^e /m ² (GIA)

Operational Carbon (energy) (from RIBA 2030 Climate Challenge (version 2, 2021) metrics for offices)	55 kWh/m ² (GIA) / year	<75 kWh/m ² (GIA) / year
Air Permeability (new construction)	0.6m ³ /h.m ³ @50Pa (Passivhaus standard)	1.5m ³ /h.m ³ @50Pa
Annual heating / cooling demand	15kWh/m ² /a (From LETI Climate Emergency Design Guide)	<25kWh/m ² /a
Water consumption (non-domestic buildings)	6 litres / person / day	<13 litres / person / day
Design – Energy (public realm and external)	100% external lighting (not building mounted), street lighting and street furniture with an energy demand to be fitted with PV to reduce energy demand from grid sources	75% external lighting (not building mounted), street lighting and street furniture with an energy demand to be fitted with PV to reduce energy demand from grid sources
Design – Sustainable Drainage Systems (SuDS)	Strategy that manages surface water in compliance with local policy while contributing to attractive public spaces and creating habitats for wildlife and supporting biodiversity. Designed to support 1-100yr events, +40% for climate change scenarios	Strategy that manages surface water in compliance with local policy while contributing to attractive public spaces and creating habitats for wildlife and supporting biodiversity. Designed to support 1-100yr events
Design - Biodiversity Net Gain	<20% Net Gain	<10% Net Gain
Construction Phase Requirements		
Air Quality – Construction	0% diesel use on site (including plant, generators etc. excluding delivery vehicles)	Evidence of measures to reduce air pollution and some non-diesel plant / energy sources implemented (including plant,

		generators etc. excluding delivery vehicles)
Construction	0 Environmental incidents (e.g. fuel spills, unconsented activities etc.)	
Construction	100 % Tier 1 contractors to have a certified Environmental Management System 66% of Tier 2 or 3 contractors on-site to have a certified Environmental Management System	
Construction	Monthly Environmental Impact Assessment (and supporting documents) to be updated and made available	Quarterly Environmental Impact Assessment (and supporting documents) to be updated and made available
Construction	Monthly environmental and sustainability audits to be undertaken and reports made available	Quarterly environmental and sustainability audits to be undertaken and reports made available
Procurement – Timber	100% legal and sustainable sourced timber	
Circular Economy – Construction Waste Management (tonnes)	≤ 1.9 tonnes / 100m ² GIA	≤ 3.2 tonnes / 100m ² GIA
Circular Economy – Construction Waste Management (diverted from landfill)	99%	
Procurement / Specifications		
Procurement – Responsible Sourcing	4 BREEAM credits (equivalent to responsible sourcing of superstructure, internal finishes, substructure, hard landscaping, and core building services – scoring greater than 50% within BREEAM’s metrics)	3 BREEAM credits (equivalent to responsible sourcing of superstructure, internal finishes, substructure, and hard landscaping – scoring greater than 30% within BREEAM’s metrics)

Design / Procurement – Responsible Sourcing	Specify products with ISO 14025 compliant EPDs (Environmental Product Declarations) and request that alternatives must have EPDs. Where EPDs are not available, a suitably justified similar product can be used for carbon calculation purposes, or follow CIBSE TM65 (Embodied Carbon in building services) calculation methodology	
Design / Procurement – Responsible Sourcing	Insulation - <95% of insulation by volume should have an A/A+ rating in the BRE's Green Guide or an ISO 14025 compliant environmental product declaration.	Insulation - <80% of insulation by volume should have an A/A+ rating in the BRE's Green Guide or an ISO 14025 compliant environmental product declaration.
Design / Procurement – Responsible Sourcing	100% of non-timber floor finishes/coverings should have an A/A+ rating in the BRE's Green Guide or an ISO 14025 compliant environmental product declaration	
Design / Procurement – Responsible Sourcing	All paints, coatings, polishes and varnishes should have the EU Ecolabel or an ISO 14025 compliant environmental product declaration.	
Design / Procurement – Responsible Sourcing	<95% of hard landscaping materials by volume should have an A/A+ rating according to the BRE's Green Guide	<80% of hard landscaping materials by volume should have an A/A+ rating according to the BRE's Green Guide
Design / Procurement – Responsible Sourcing	White goods and purchased equipment to be at least A++ rated	White goods and purchased equipment to be at least A rated
Infrastructure and Transport		
Transport - Electric Vehicle Charging (Suggested, depending on feasibility study)	<p>A minimum of 50% of available parking spaces are to be EV charging ready</p> <p>This should be Ultra-Rapid charging (100-350kW) in short-stay areas (taxi ranks, unloading zones etc.) and Fast (7-22kW / 3-4hour charging) in longer stay parking areas.</p> <p>Infrastructure to be installed to all parking areas for future</p>	<p>A minimum of 25% of available parking spaces are to be EV charging ready (uplift from existing 10% to reflect practical completion timescales)</p> <p>This should be Ultra-Rapid charging (100-350kW) in short-stay areas (taxi ranks, unloading zones etc.) and Fast (7-22kW / 3-4hour charging) in longer stay parking areas.</p>

	proofing, ease of adaptation and minimisation of disruptive installation works	Infrastructure to be installed to all parking areas for future proofing, ease of adaptation and minimisation of disruptive installation works
Transport – Facilities	All buildings to have changing, lockers or similar facilities as per BREEAM requirements	
Green Infrastructure, Biodiversity and Ecology		
Green Infrastructure – Green Roof Spaces	>50% of available roof space to be green roof with integrated PV (after plant, access etc. requirements are assessed)	>20% of available roof space to be green roof with integrated PV (after plant, access etc. requirements are assessed)
Green Infrastructure – Vertical Planting	Co-benefit landscaping should be considered e.g. self-watering planting system on lighting columns. <65% vertical street furniture to integrate planting Other vertical planting (e.g. living walls) to be encouraged but not driven by targets	<25% vertical street furniture to integrate planting Other vertical planting (e.g. living walls) to be encouraged but not driven by targets
Green Infrastructure – Planting & Biodiversity	100% planting to be in line with Kirklees Council’s Biodiversity Action Plan	
Green Infrastructure – Planting & Biodiversity	All soft landscaping and green infrastructure areas to have a 5-year maintenance plan	

Key Performance Indicators for Further Development

The following are recognised as important sustainability and net zero themes and sources for KPIs, but are subject to further assessment and development to determine targets as they represent themes that are more complex and would benefit from collaborative agreement.

Theme / Topic	Comments
Circular Economy	<p>Circularity is critical to delivering sustainable schemes, but metrics/KPIs would need further collaborative development beyond principles for designers and contractors to work towards.</p> <p>BREEAM credit Waste 06 could be used</p>
Design - Primary Energy Demand	Suggested that a KPI is set though needs consideration to reflect mix of new build and heritage works and needs collaborative development
Design – Frames	Linked to material choices, it is not appropriate at this stage to detail set KPIs for topics such as timber/glulam use v steel and concrete. However, the ethos of identifying low-carbon and responsibly sourced materials is paramount
Design – MMC	<p>Utilising off-site fabrication and Modern Methods of Construction (MMC) has multiple sustainability benefits, as well as having the potential to benefit programme and quality.</p> <p>Further analysis of MMC options would be required with design specialists, but the detailed principles promote use of MMC adoption of a <i>design for manufacture and assembly</i> approach, where feasible.</p>
Design – Energy	<p>At minimum, PV arrays to be designed and installed to achieve Part L and 25B compliance (Building Regulations)</p> <p>KPI details to be determined</p>
Design – Energy	<p>Allow for on-site battery storage of electricity produced by on-site generation to a) support Demand Side Response integration with the local grid and DNO and/or b) to support EV charging</p> <p>Further work is required to understand feasibility of using existing infrastructure (tunnels) and cost implications for capital, operational and integration with BMS and building management tools.</p>
Transport – Active travel	KPI details to be determined, but to promote active travel options and infrastructure (changing facilities, lockers etc.). BREEAM

	<p>requirements to be minimum delivery requirements, with ambitions to accommodate e-bike and similar storage and charging options.</p> <p>Creation of transport hubs</p>
Transport - Electric Vehicle Charging	<p>Conduct a feasibility study for incremental installation aligned to available capacity – suggested that the KPIs are not developed until a capacity study is undertaken</p>
Transport - Electric Vehicle Charging	<p>Charging points to also be installed for e-bikes, buggies and e-cargo bikes. KPI details to be determined</p>
Offsetting	<p>Defining an offsetting strategy to identify offsetting options and geographical preferences, to align with social value and reinvestment of funds where feasible.</p>

Appendix 3 - Red Line Issues – Kirklees Council Feedback

During initial consultation, Kirklees Council staff stated several 'red line' issues, alongside areas of concern that would require addressing subject to design development plans. Red line issues are those which currently do not align with Kirklees Council desired outcomes for the Cultural Heart programme and/or are where Kirklees Council have had negative experiences managing these topics which adversely impacted workloads, financial performance or efficient operation of Kirklees Council owned real estate.

Red Line Issues	Topics To Be Addressed
Biomass – No biomass within energy strategy due to past-experience highlighted ongoing concerns with maintenance, skills gaps (maintenance and operation) and sustainability credentials of the fuel source.	Some reservations with heat pumps, specifically where heat pumps and gas boilers were used in tandem and ongoing operation was an issue
Timber cladding – No timber cladding for long term aesthetics and fire risk concerns.	Noted that solar electric (PV) is preferred to solar hot water generation
Wind turbines – past issues with reliability and vandalism, as well as concern over cost	Some reservations with timber frames due to potential fire risk, but not a red line issue
Boreholes (deep ground source heat pumps) – past issues with 'open loop' operation and secondary issues such as odour	Generally, fire risk and material choices are to be reviewed, alongside suggested Kirklees Council desires for sprinklers within design solutions
	Green roofs in terms of installation and maintenance but not as a red line issue