CAMBRIDGE EAST

Marshall

SUSTAINABILITY VISION STATEMENT

FEBRUARY 2020

River Cam, Cambridge

Contents

PURPOSE OF DOCUMENT

Cambridge East is committed to become an exemplar sustainable development in the UK. We seek to address the UK Parliament's declaration of a climate and biodiversity emergency by aiming for a net zero whole life carbon target, including the seventeen United Nations sustainable development goals for all new development by 2030. Given the proposed development of Cambridge East will commence construction by around 2030, this means that the principles of net zero carbon can be built into the development from the outset.

The purpose of this sustainability vision statement is not only to provide a clear response to the Greater Cambridge Local Plan consultation, but to provide a vision of a sustainable 'place of places' which is inspired by the beautiful fenland landscapes, waterways and historic character of Cambridge.

In this statement we will highlight our vision, provide clear principles in addressing net zero whole life carbon, and explain how we will work with the Greater Cambridge stakeholders to deliver all key themes of the local plan consultation. This vision statement uses the Royal Institute of British Architects (RIBA) Sustainable Outcomes and RIBA 2030 challenge as a structure to align and expand on the Greater Cambridge four Big Themes:

CLIMATE CHANGE

Outcome 1: Net Zero Operational Energy and Carbon

Outcome 2: Net Zero Embodied Carbon

BIODIVERSITY AND GREEN SPACES

Outcome 3: Sustainable Water Cycle

Outcome 4: Sustainable Land-Use + Biodiversity

Outcome 5: Sustainable Connectivity and Transport

WELLBEING AND SOCIAL INCLUSION

Outcome 6: Good Health and Wellbeing

GREAT PLACES

Outcome 7: Sustainable Communities and Social Value

In addition, the Big Themes are interrelated and our thinking is holistic, and we have sought opportunities for outcomes to achieve multiple themes. It is important to track and measure the holistic economic benefits of a sustainable development and an approach to this is described within:

Outcome 8: Sustainable Life Cycle Cost

"Climate change is a defining issue of today and will have serious impacts for future generations. In response to the climate crisis, the two Councils and the County Council have committed to achieve net zero carbon by 2050", Greater Cambridge Local Plan Consultation.

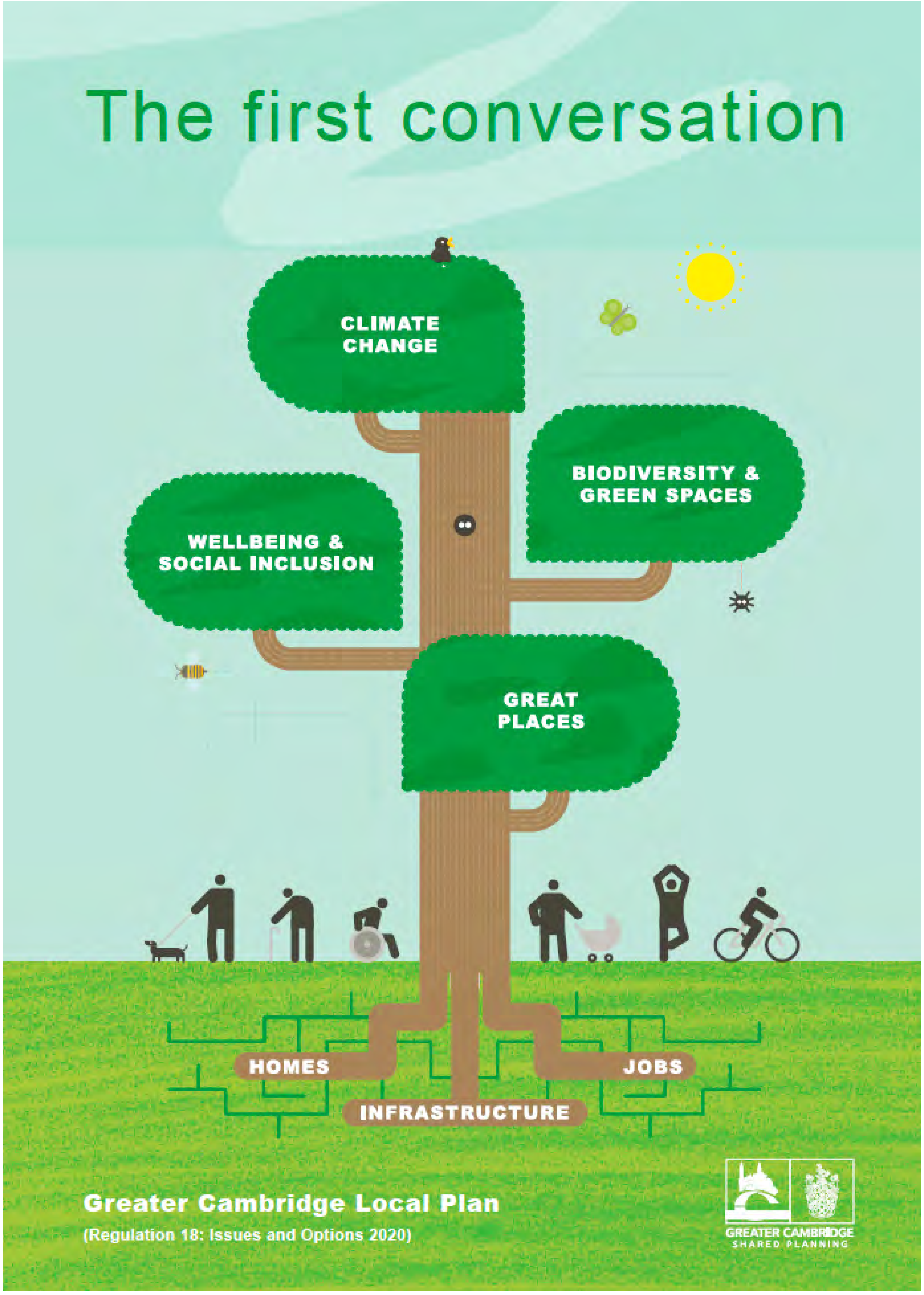


Figure 1. Greater Cambridge Local Plan Consultation document

The Cambridge East sustainability vision proposes the adoption of the RIBA 2030 Challenge for achieving a net zero society.

RIBA 2030 CHALLENGE:

1. **Reducing operational energy demand and carbon by at least 75%, before offsetting**
2. **Reducing embodied carbon by 50-70% before offsite renewables offsetting**
3. **Reduce potable water use by 40%**
4. **Achieve all core health targets (as described later).**

This challenge focuses on the three environmental sustainability outcomes that all new or refurbished buildings contribute to: energy use, embodied carbon and water use with an overall aim to target net zero whole life carbon emissions by 2030. We believe it is of critical importance to target 2030 and not 2050 for new and deep retrofit buildings, since the UK will require 20-30 years to refurbish the existing building stock in order to achieve the wider net zero for the whole of the UK by 2050.

Adopting the 2030 Challenge and Sustainable Outcomes is our initial proposal at this stage of the conversation, and we would seek to work closely with Greater Cambridge stakeholders to align our thinking and agree a joint sustainability vision and framework for Cambridge East. However, we believe the RIBA 2030 Challenge and RIBA Sustainable Outcomes address all key sustainability policy issues in the local plan consultation and provides an exemplary framework to deliver a sustainable future.

Marshall has appointed a team of leading UK sustainability experts to work alongside their design team, and who authored this sustainability vision of Cambridge East. The team have been responsible for key sustainability guides for professional bodies including the RIBA, RICS, and CIBSE. They are also currently advising and supporting the work of the Committee on Climate Change, Construction Industry Council Expert Panel on Climate Change, and numerous other sustainability initiatives around the UK and internationally. The team includes:

Gary Clark Principal of HOK, Chair of Cambridge East Sustainability Working Group (All Outcomes)

Simon Sturgis, Director of Targeting Zero (Outcome 2)

Rasmus Astrup, Director of SLA, Denmark (Outcomes 3, 4)

Julie Godefroy, Sustainability Consultant (Outcomes 1,6)

Flora Samuel, Professor at the University of Reading and expert on Social Value (Outcome 7)

In addition to the team members identified above, Marshall has also appointed

Dr Shaun Fitzgerald FREng, a Fellow of Girton College and Visiting Professor at the Royal Academy of Engineering at the University.

Shaun is appointed to assist in the development of the sustainability strategy, working collaboratively with the professionals identified above, and authors of this document.

We believe that Cambridge East can become the largest net zero whole life carbon development in the UK whilst incorporating The Greater Cambridge four Big Themes at its core. The final section of this vision statement outlines a suggested process to collaboratively develop a joint sustainability vision and framework for Cambridge East, that will effectively become a sustainable design guide for future development.

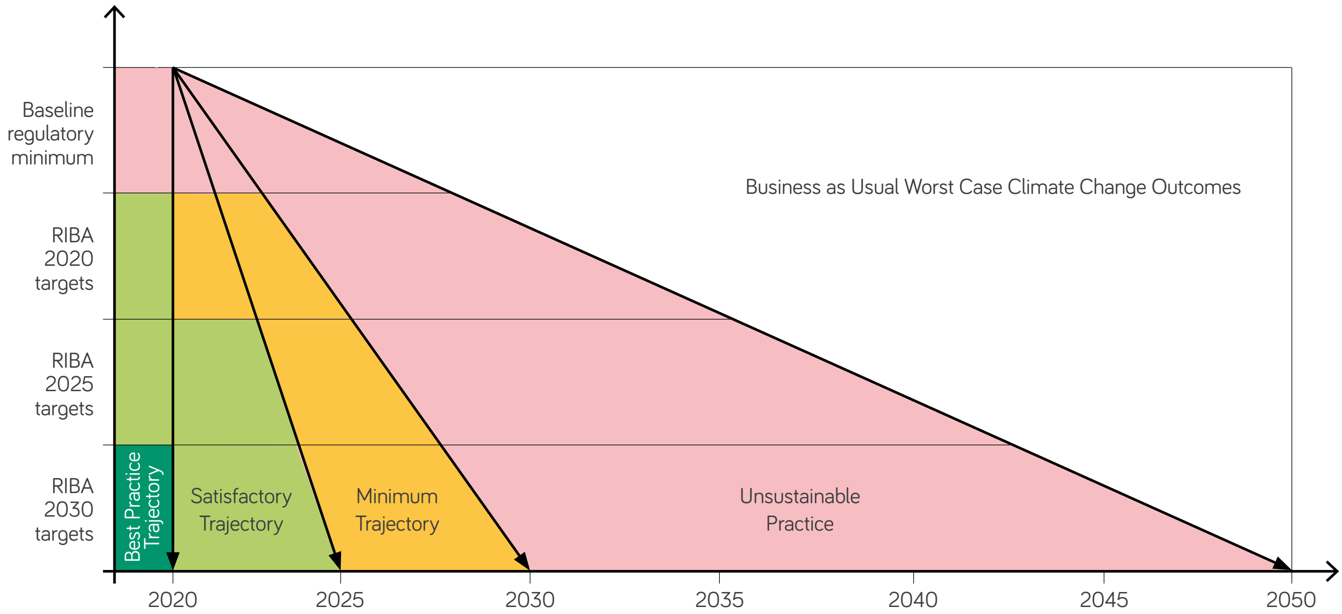


Figure 2. RIBA 2030 Challenge Trajectories, Gary Clark
The graph above illustrates the main trajectories of carbon emission reduction. The white zone is a business as usual scenario which may lead to + 4degC increase in global temperature. The red zone is the current UK carbon reduction target which still leads to + 2degC increase. The RIBA has set 2030 as the target for net zero emissions for all new and deep retrofit buildings. There are an increasing number of built examples which have already achieved net zero now within current cost benchmarks.

Figure 3. RIBA Sustainability guidance tools

INTRODUCTION

Marshall's vision for Cambridge East is to create a new cultural, living and working Cambridge quarter which combines the highest standards of modern living and working.

CAMBRIDGE EAST WILL EXTEND THE VERY IDEA OF CAMBRIDGE.

It will expand the way people think of the city — by changing its physical form and extending its character beyond that of the historic city. Cambridge East will form an integrated part of the city, creating a new focal point that complements the centre but has its own distinct character and offer.

GREEN CORRIDOR

Extending Cambridge in this way creates the opportunity for a distinctive green corridor, linking Stourbridge Common, Coldham's Common and a new green landscape across the site and eastwards towards Wilbraham Fen, contributing to East Cambridge what the Backs and Jesus Green do for the historic centre. New sports, cultural and leisure facilities within the development will enhance this major new public green space.

SCALE

We believe Cambridge East is the single best opportunity to build on Cambridge's economic strength and to deliver a new, vibrant, mixed use piece of city - bringing together places for people to live, to work and enjoy. The site will deliver significant employment, building on Cambridge's global reputation for science, research and innovation. Cambridge East will provide a world leading development, attracting globally significant investment, businesses and institutions.

CONNECTIVITY AND HOUSING

Congestion and the affordability of housing are the most common concerns raised by investors, residents and employers alike when it comes to Cambridge. Cambridge East has the potential to address both of these challenges, creating a step change in public transport connectivity and, by delivering housing at scale, offering a range of tenure types to address wider affordability across the city.

Key elements of this vision are highlighted below.

- Opportunities to combine high density, urban living at the heart of the development with distinct character areas which interact with the site's neighbouring villages and countryside;
- Opportunity to provide a tailored mix of housing types to meet market demands and local needs;
- Integrate housing with employment, sports, leisure, culture and open space, together with a rapid transit link to the city centre, to bring the site to life and promote sustainable living;
- Anchor the development with major learning institutions and respond to the complementary demand for life sciences, technology and emerging sectors of research and development;
- Provide an appropriately scaled new centre to complement the city centre and provide for demand that cannot be accommodated in the historic core; and
- Attract globally important cultural and leisure institutions – initial ideas include internationally significant arts institutions, a multi-use arena or stadium, exhibition and conferencing centre and a concert venue

So significant is the opportunity at Cambridge East, that we believe it can be one of the most ambitious sustainable developments in the UK. With the Big Themes of the Local Plan at its heart. We set out in this document how this could be achieved

Figure 4. Cambridge East Existing Site

UN SUSTAINABLE DEVELOPMENT GOALS AND RIBA SUSTAINABLE OUTCOMES

The United Nations Sustainable Development Goals (UNSDGs) has become the key reference document for sustainable development globally, which has been adopted by many countries, cities, and professional bodies including the RIBA. All UNSDGs should be considered holistically and can be integrated under SDG 11 Sustainable Cities and Communities. The RIBA has translated the seventeen UNSDGs into a set of eight sustainable outcomes that are designed to be used at a construction project level. The other UNSDGs within the UK context should addressed by primary legislation. (SDG 1,2,4,5,8,10,16)

The fundamental aim of RIBA Sustainable Outcomes is to distil the complexity of sustainable architectural design into a set of measurable and manageable outcomes that project teams can use on a daily basis on projects of all scales:

- They are holistic and include- environmental sustainability, social sustainability, and economic sustainability outcomes
- They are measurable by common industry accepted methods of building evaluation
- They align with requirements of the UK Government's Ministry of Housing Communities and Local Government (MHCLG) and the Treasury's Green Book
- They are rigorous and robust, built on cutting edge knowledge in the field, and expressed in interdisciplinary global language of research to encourage engagement across industry and academia, across disciplines and cultures.
- The RIBA outcomes approach also requires that performance metrics are independently measured and verified in use by recognised Post Occupancy Evaluation (POE) tools to ensure that the agreed target is achieved as closely as possible in use.

The vision statement incorporates a set of key performance metrics and design principles that underpin Marshall's aspirations for Cambridge East in terms of sustainable development. This approach gives future development partners the creative flexibility to use the sustainable assessment methods and modelling tools they prefer to achieve the outcomes and targets as described in this statement. It is important to note that the principles should be considered holistically at an early stage, to avoid unintended consequences and ensure a sustainable outcome will be fully realised.

It is also important to highlight that the outcomes should not be seen as separate silos, and instead are inextricably cross-linked. For example, Net Zero Operational Carbon and Net Zero Embodied Carbon should be seen as twin targets under the concept of Whole Life Net Carbon as defined by the UK Green Building Council (UKGBC) Net Zero Carbon Buildings: A Framework Definition (2019) and reported using the Royal Institution of Chartered Surveyors (RICS) Whole life carbon assessment for the built environment (2017).

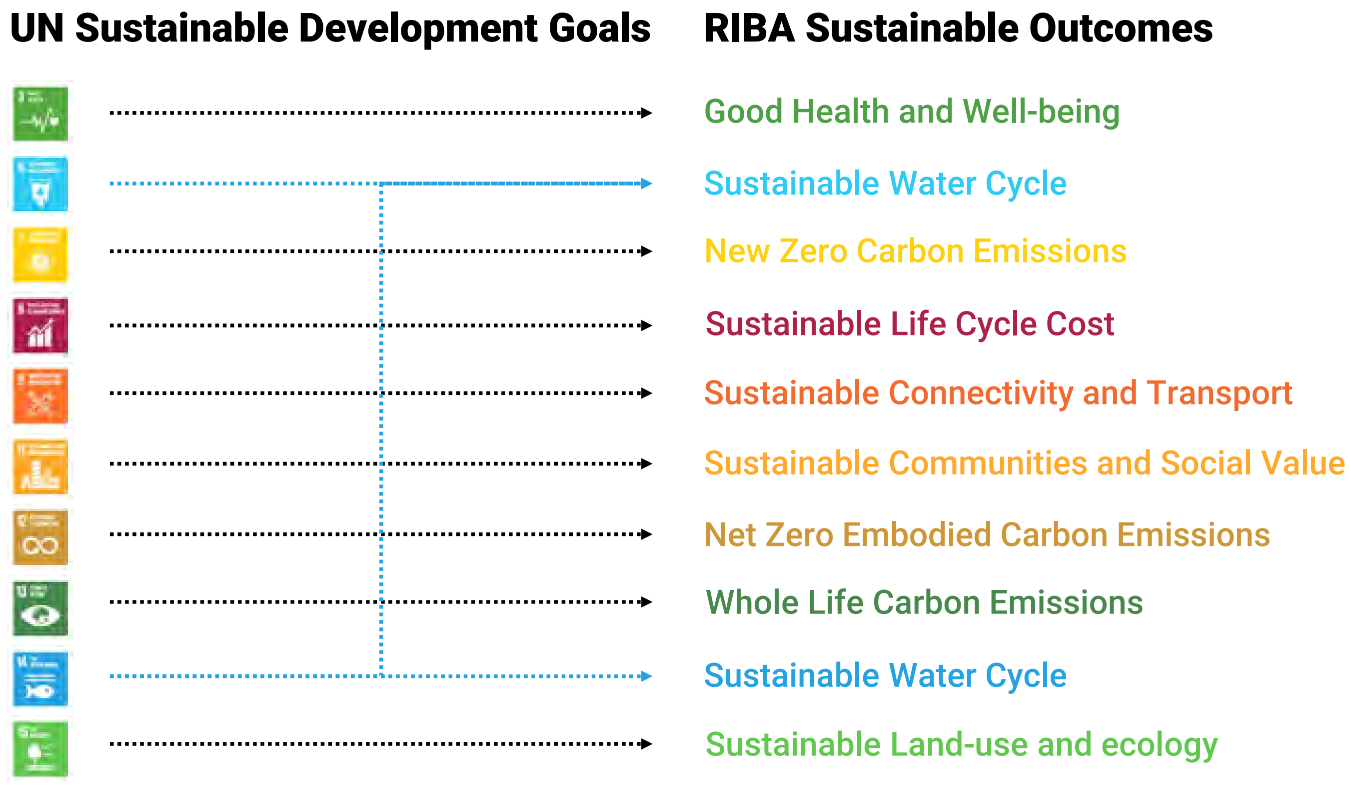


Figure 5. UN SDG's and RIBA Sustainable Outcomes

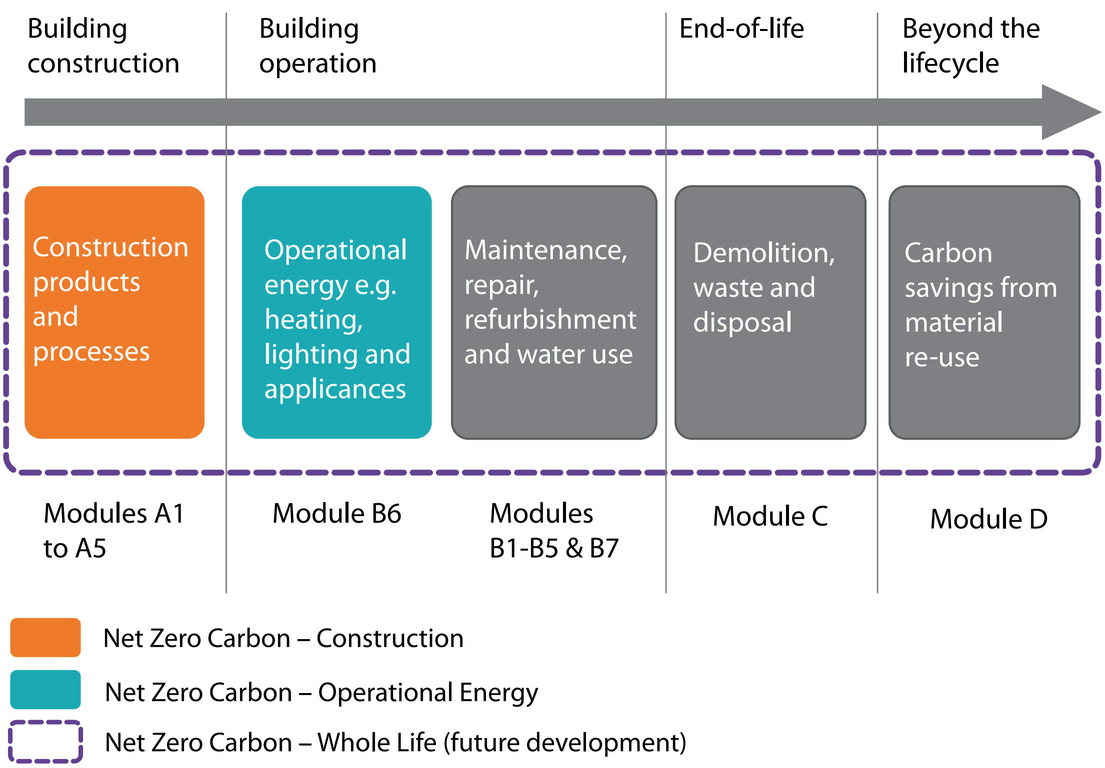


Figure 6. UKGBC Whole Life Carbon Definitions

THE RIBA 2030 CHALLENGE

The Intergovernmental Panel on Climate Change (IPCC) Climate Change and Land, and Oceanic reports of 2019 provide a stark assessment of the future impacts of climate change, while the UN Emissions Gap Report 2019 sets a clear trajectory to reduce carbon emissions to mitigate this worst impact scenarios. In order to limit global temperature increase to below 1.5degC, we will have to reduce carbon emissions by 7.6% per year until 2030. Alternatively, if we reduce carbon emissions by 2% per year until 2050, the UN and IPCC envisage this would likely stabilise global temperatures to around 2degC increase above historic levels.

The UK Government have legislated a target of net zero carbon emissions for the UK by 2050. The UK Government and the Committee on Climate Change are currently working on a fully costed implementation plan for the 6th Carbon Budget that will deliver net zero carbon emissions for the UK by 2050. This 2050 target has also been adopted by the C40 global group of world cities, a growing number of UK cities, and Greater Cambridge.

In response to the UK Government declaration of a climate emergency, the RIBA has set the construction industry a 2030 Challenge of achieving the net zero targets as soon as possible. This date also aligns with the start on site date of 2030 for Cambridge East, and by accepting this challenge Cambridge East will one of the most ambitious sustainable developments in the UK.

The UKGBC and RIBA guidance will be used as a framework to firstly target reduction in energy demand by up to 75%, secondly maximise onsite renewables, and thirdly offsetting the remaining 25% emissions by offsite renewable generation and/or certified woodland offsetting. The 2030 Challenge targets outlined in the table opposite, take account of the latest recommendations from the Green Construction Board committees on operational carbon and on materials and waste.

We believe these targets are stretching yet realistic, and within the following sections of the statement we will provide benchmarking case studies of where these targets have been achieved in the UK.

We have reached a critical moment in human history. In 2018, we emitted approximately 38 Billion Tonnes of CO2, which if continued would lead to an increase in global temperature well beyond 1.5 degC, and therefore we must live within the means of Earth and reduce CO2 emissions as soon as possible. The following sections describe how Cambridge East can become the largest net zero whole life carbon development in the UK and provide an exemplar of sustainable development within the carrying capacity of our environment.

STEPS TO ACHIEVING A NET ZERO CARBON BUILDING
1. Establish Net Zero Carbon Scope
1.1 Net zero carbon – construction
1.2 Net zero carbon – operational energy
2. Reduce Construction Impacts
2.1 A whole life carbon assessment should be undertaken and disclosed for all construction projects to drive carbon reductions
2.2 The embodied carbon impacts from the product and construction stages should be measured and offset at practical completion
3. Reduce Operational Energy Use
3.1 Reductions in energy demand and consumption should be prioritised over all other measures.
3.2 In-use energy consumption should be calculated and publicly disclosed on an annual basis.
4. Increase Renewable Energy Supply
4.1 On-site renewable energy source should be prioritised
4.2 Off-site renewables should demonstrate additionally
5. Offset Any Remaining Carbon
5.1 Any remaining carbon should be offset using a local certified offsetting framework
5.2 The amount of offsets used should be publicly disclosed

Figure 7. Net Zero Carbon Framework

RIBA 2030 Climate Challenge target metrics for domestic buildings

RIBA Sustainable Outcome Metrics	Current Benchmarks	2020 Targets	2025 Targets	2030 Targets	Notes
Operational Energy $kWh/m^2/y$	146 $kWh/m^2/y$ (Ofgem benchmark)	< 105 $kWh/m^2/y$	< 70 $kWh/m^2/y$	< 0 to 35 $kWh/m^2/y$	UKGBC Net Zero Framework 1. Fabric First 2. Efficient services, and low-carbon heat 3. Maximise onsite renewables 4. Minimum offsetting using UK schemes (CCC)
Embodied Carbon $kgCO_2e/m^2$	1000 $kgCO_2e/m^2$ (M4i benchmark)	< 600 $kgCO_2e/m^2$	< 450 $kgCO_2e/m^2$	< 300 $kgCO_2e/m^2$	RICS Whole Life Carbon (A-C) 1. Whole Life Carbon Analysis 2. Using circular economy Strategies 3. Minimum offsetting using UK schemes (CCC)
Potable Water Use Litres/person/day	125 l/p/day (Building Regulations England and Wales)	< 110 l/p/day	< 95 l/p/day	< 75 l/p/day	CIBSE Guide G

RIBA 2030 Climate Challenge target metrics for non-domestic buildings

RIBA Sustainable Outcome Metrics	Current Benchmarks	2020 Targets	2025 Targets	2030 Targets	Notes
Operational Energy $kWh/m^2/y$	225 $kWh/m^2/y$ DEC D rated (CIBSE TM46 benchmark)	< 170 $kWh/m^2/y$ DEC C rating	< 110 $kWh/m^2/y$ DEC B rating	< 0 to 55 $kWh/m^2/y$ DEC A rating	UKGBC Net Zero Framework 1. Fabric First 2. Efficient services, and low-carbon heat 3. Maximise onsite renewables 4. Minimum offsetting using UK schemes (CCC)
Embodied Carbon $kgCO_2e/m^2$	1100 $kgCO_2e/m^2$ (M4i benchmark)	< 800 $kgCO_2e/m^2$	< 650 $kgCO_2e/m^2$	< 500 $kgCO_2e/m^2$	RICS Whole Life Carbon (A-C) 1. Whole Life Carbon Analysis 2. Using circular economy Strategies 3. Minimum offsetting using UK schemes (CCC)
Potable Water Use Litres/person/day	>16 l/p/day (CIRA W11 benchmark)	< 16 l/p/day	< 13 l/p/day	< 10 l/p/day	CIBSE Guide G

RIBA 2030 Climate Challenge target metrics for all buildings

Best Practice Health Metrics		References
Overheating	25-28 °C maximum for 1% of occupied hours	CIBSE TM52, CIBSE TM59
Daylighting	> 2% av. daylight factor, 0.4 uniformity	CIBSE LG10
CO_2 levels	< 900 ppm	CIBSE TM40
Total VOCs	< 0.3 mg/m^3)	Approved Document F
Formaldehyde	< 0.1 mg/m^3)	BREEAM

Figure 8: RIBA 2030 Climate Challenge Office and Domestic Targets

OUTCOME 1: NET ZERO OPERATIONAL CARBON

DEFINITION

Operational carbon is the carbon dioxide produced as a result of the production and use of the energy from fossil fuels consumed for the day-to-day operation of the building or structure, balanced by the use of renewable energy technologies both on- and off-site, plus recognised offset schemes.

Metric: Net Zero Operational Carbon Dioxide emissions, (kWh/m2/y and kgCO2e/m2/year)

WHY IS THIS OUTCOME IMPORTANT?

Forty percent of UK carbon emissions come from powering our buildings and cities. The urgency of reducing these makes a Net Zero Operational Carbon Outcome a critical construction industry target, and we consider net zero operational carbon is achievable now with only minimum reliance on offsetting.

WHAT DOES SUCCESS LOOK LIKE?

The aim of this outcome is to achieve net zero carbon emissions for the operational use of a building. To achieve this aim, the building structure and envelope should be designed to predominantly heat, light, ventilate and cool its occupants by passive means in the first instance- this is generally referred to as a 'passive first' approach. Once the building design has been optimised, highly efficient mechanical and electrical systems are used to reduce energy demand to very low levels (<100kWh/m2/y). Onsite renewables are then used to supply as much of this energy demand as possible. For small scale domestic buildings net zero carbon can be achieved on site, however, for large scale non-domestic buildings offsite renewables or woodland offsetting will be required to achieve net zero carbon.

As principally defined by CIBSE TM 54 Evaluating Operational Energy Use of Buildings at Design Stage, 2013, or Passivhaus PPHP.

CAMBRIDGE EAST TARGET:

Net Zero Operational Energy and Carbon Emissions

KEY PRINCIPLES AND STRATEGIES

The key design principles that we believe should be a prerequisite for all building design are outlined below, with the emphasis on energy efficiency measures before renewables or offsetting are considered. There are four key steps in the reduction of operational energy and carbon within a building:

1. PASSIVE FIRST

Use form, fabric and landscape to optimise ambient lighting, heating, cooling and ventilation

- Location, orientation, massing, protection and shading
- Windows, daylighting, ventilation, solar and acoustic control
- Insulation, airtightness and thermal mass.

2. FINE-TUNE, WITH GENTLE ENGINEERING

Use efficient and well-integrated mechanical and electrical systems and user-friendly controls

- Lighting systems, with effective controls
- Ventilation systems, both natural and mechanical.
- Heating, cooling heat storage and heat recovery systems where appropriate
- Responsive system and room controls, with good user interfaces.

3. INCORPORATE ON-SITE RENEWABLES AND LOW AND ZERO CARBON (LZC) TECHNOLOGIES

To minimise energy purchases and carbon emissions. Consider:

- Photovoltaic and solar hot water panels
- Ground, water and air source heat pumps and opportunities for heat recovery
- Heat and electricity storage, to improve load management and demands on mains supplies.
- Consider local opportunities for wind and water power and for community systems.

4. MAKE THE BUILDING AND ITS SYSTEMS USABLE AND MANAGEABLE

Many buildings prove too complicated to look after, annoying occupants and wasting energy.

- Start a dialogue in Stage 1 about how the building and its systems will be used and managed.
- Write and regularly update a narrative about this. Put the final version in the Log Book.
- Design for usability and manageability, testing ideas with occupier representatives.
- Identify who will operate the building as early as possible. Make sure they are kept informed.
- Develop easy to use controls for occupants using multi-disciplinary approach.
- If possible involve the future building users and managers to review the designs, ideally in mock-ups and with samples of the proposed user interfaces.
- Plan for commissioning, including seasonal commissioning and fine tuning during Year 1.

Figure 9: Ash Court at Girton College - Alliies and Morrison

To achieve the net zero operational target, it is important to use the principles of 'design for performance' tools, such as Passivhaus for domestic scale buildings, and CIBSE TM54 or Better Building Partnership Design for Performance tools for non-domestic buildings (NABERS: National Australian Built Environment Rating System). All these methods provide a number of benefits:

- Clear targets and guidance
- Robust Process
- Educated supply chain
- Detailed case studies
- Independent Verification & Certification

The success of Passivhaus in recent years in the UK consistently demonstrates the delivery of a step change in energy reduction. In Australia, similar benefits have come from NABERS Commitment Agreements, particularly for landlord's services – "the Base Building" in rented multi-tenanted offices.

To achieve net zero carbon emissions, carbon offsetting (removing carbon from atmosphere outwith the site) will be required.

We would therefore propose a hierarchy of options as follows:

- Local renewable energy generation- Wind turbines, photo-voltaic etc
- Carbon capture on site- tree planting on site
- Carbon capture local- tree planting in Greater Cambridge
- Carbon capture UK- tree planting elsewhere in the UK
- Carbon offsets- carbon savings achieved elsewhere (UK or abroad), using a recognised framework.

A key case study that demonstrates that net zero operational carbon is possible now is the 2019 RIBA Stirling Prize award winning housing scheme Goldsmith Street, Norwich for Norwich Council. This achieved the 2030 Challenge for £1,800/m2 construction cost without renewables or offsetting.

SPILLOVER BENEFITS

Less energy costs, less running costs, reduction in fuel poverty, enhanced comfort, robust design, climate resilience, better build quality

Figure 10: Goldsmith Street, Norwich

Figure 11: the vision for landscape led public realm at Cambridge East

OUTCOME 2: NET ZERO EMBODIED CARBON

DEFINITION:

Embodied Carbon is the carbon emissions associated with materials, construction and maintenance processes throughout the entire lifecycle of a building. Embodied carbon emissions therefore include those from; material extraction, transport to manufacturer, manufacturing, transport to site, construction (including temporary works), maintenance, repair, replacement, refurbishment, deconstruction, demolition, transport to 'end of life' processing facilities, and ultimate disposal of waste. Post 'end of life' reuse and recycling can have carbon emissions benefits and is sometimes referred to as the 'circular economy'.

METRIC:

Measurement of Embodied and Lifecycle embodied emissions should for Cambridge East be measured in TCO2e or KgCO2e/m2.

In accordance with the British (and European Standard) BS EN 15978

WHY IS THIS OUTCOME IMPORTANT?

The embodied carbon emissions from site preparation, new infrastructure, construction and maintenance of this scheme are likely to exceed the operational emissions over the lifetime of this project. This assertion is supported by research by the Department of Engineering at Cambridge University (see below), and other respected sources (eg RICS, RIBA, UKGBC, WGBC, etc).

Therefore, if the ambition for this scheme is to have the lowest possible carbon emissions and environmental impact over the whole life of the completed project these emissions will need to be addressed as a key priority. This would make the scheme consistent with the Climate Change Committee's Net Zero Report of May 2019 and the UK Government's subsequent commitment to achieving Net Zero Emissions by 2050.

WHAT DOES SUCCESS LOOK LIKE?

A successful outcome for this scheme would be for all project related embodied carbon emissions to be reduced to 'net zero'. Our objective is to maximise resource efficiency and minimise carbon emissions over the entire life of the scheme. Therefore, not only will low carbon materials and recycled content be recommended, but of equal importance will be future durability and resilience. Local sourcing is an important contributor to a low carbon outcome due to reduced transport distances during construction. Local sourcing also aids occupiers who wish to repair or adapt their property in the future. The reason for understanding 'end of life' scenarios at the design stage, is to ensure the maximum potential for future recycling, and reuse of components should the buildings be demolished post 'end of life' in part or as a whole. Success also includes optimising the relationship between operational and embodied emissions to ensure the most carbon efficient solutions are achieved.

To do this means thinking from first principles through the design, procurement and construction stages to ensure these objectives can be delivered. This will require us to start with the site's existing resources, both built and natural. These will form the resources that represent the 'opening statement' of a conceptual 'carbon bank account'. All activities towards the creation of the scheme, including site preparation, roads and other infrastructure, reuse of existing buildings and surfaces, and the creation of the new scheme should be designed and assessed to ensure minimum initial, as well as minimum lifetime, carbon emissions.

CAMBRIDGE EAST TARGET:

Net Zero Embodied Carbon for new buildings and retrofit buildings including offsetting

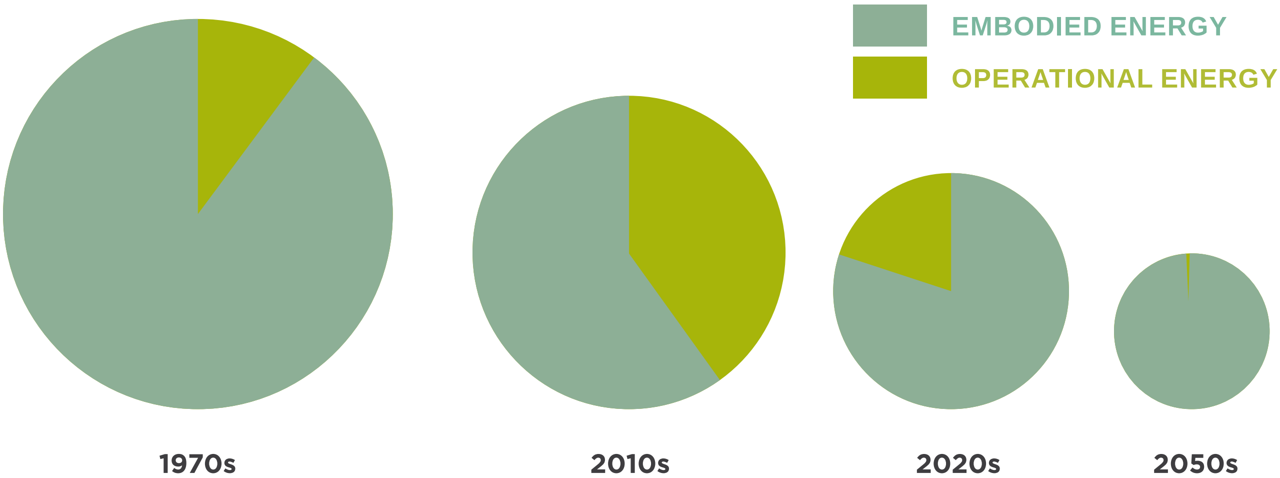


Figure 12: The increasing importance of embodied energy - credited to University of Cambridge Department for Engineering, MEICON August 2018.

Figure 13: Cranmer Road Image

KEY PRINCIPLES AND STRATEGIES:

Achieving net zero whole life carbon emissions means long term, 'holistic' thinking by the design team from the earliest project stages. This is to ensure that, at the design stage, the carbon impacts of the entire life of the scheme are taken into consideration. Key issues for the design team to consider are:

- Reuse of existing buildings and infrastructure
- Use of low carbon materials and recycled content
- Designing for disassembly and future reuse, ie the 'circular economy'
- The compactness of the building shape and form, also known as 'heat loss form factor'
- Long term durability and flexibility
- The supply chain, local sourcing and transport distances
- Efficient methods of fabrication
- Reducing waste to the absolute minimum;
- Optimising day to day energy use in relation to materials chosen, this includes assessing the carbon cost/benefit of operational energy reduction strategies such as PassivHaus, or renewable sources of energy such as Photovoltaic panels.

Offsetting of remaining emissions to achieve 'net zero' is an evolving area. We have suggested an offsetting hierarchy in section one, but could also potentially include properly assessed and verified scenarios for future reuse and recycling of materials and systems post end of life.

All embodied carbon assessments and a Life Cycle Analysis (LCA) will be done in accordance with BS EN 15978, and the RICS Professional Statement 'Whole Life Carbon assessment for the built environment' 2017. Reporting will be in TCO2e, for total scheme emissions or KGCO2e/m2 for building 'intensity' emissions.

To deliver the above, one possible approach is to develop a 'Carbon Master Plan' for Cambridge East, which can be produced as an intelligent map in GIS (Geographical Information System) to record existing carbon resources and test and record both embodied (material related) and operational (day to day energy use) carbon impacts of the various design options under consideration.

In addition, this could help understand the lifetime carbon impacts of the final scheme. The GIS master plan can also be used to record and manage any site and design data, including post completion if required. Taking this holistic approach will ensure that all lifetime carbon emissions are assessed, tracked and minimised. A high-profile example of this approach is New York City Greenhouse gas Emissions map, where it is planned to have the annual carbon emissions of all buildings in New York publicly accessible.

SPILLOVER BENEFITS

Reduction in resource use, less waste, potentially less capital costs, supporting local business and skills, better build quality, robust design, climate change resilience

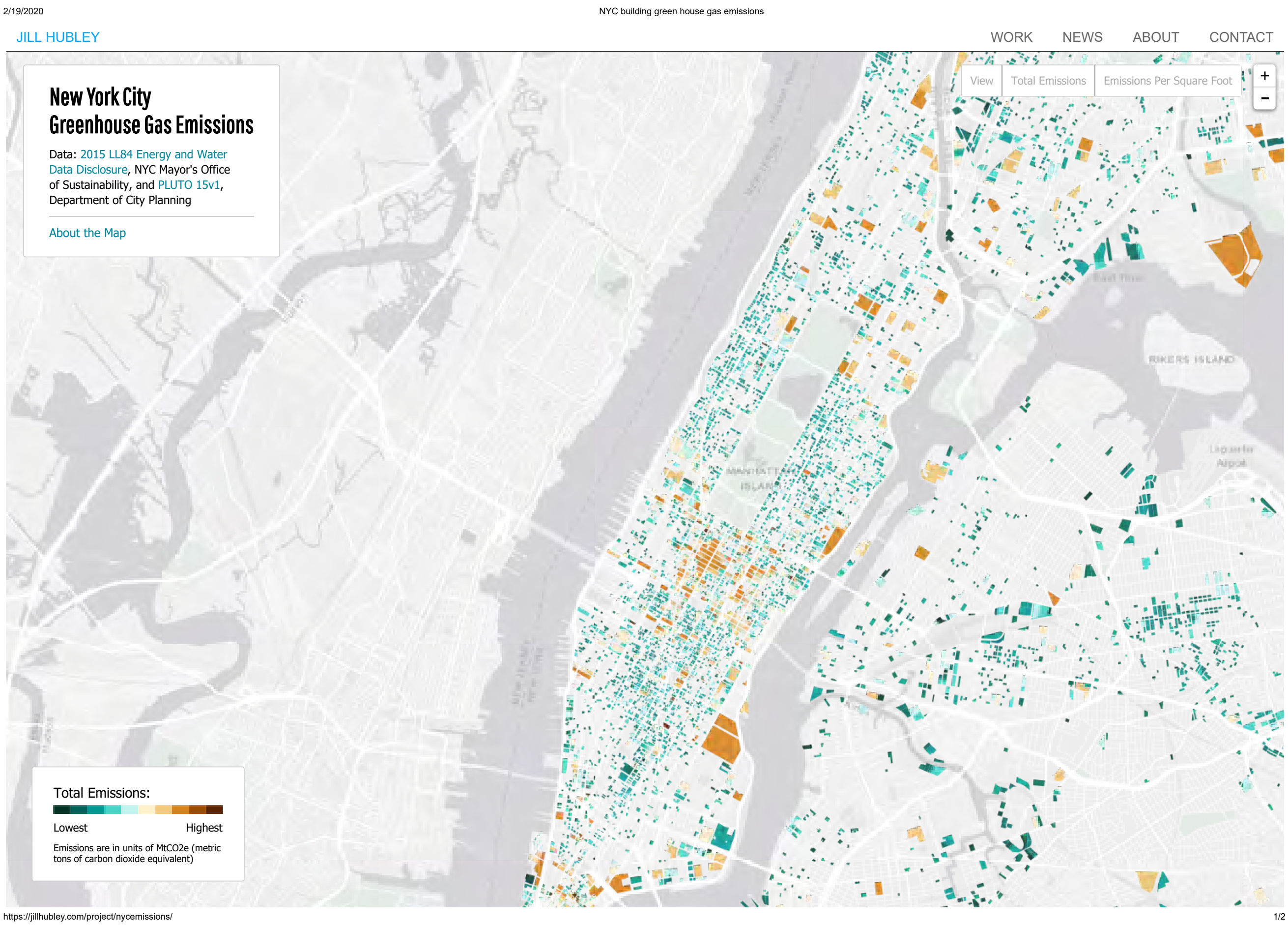


Figure 14: New York City Green House Gas emissions map

OUTCOME 3: SUSTAINABLE WATER CYCLE

DEFINITION

The water cycle of the urban build and grown area includes surface water coming from rain, secondary ground water penetrating the terrain in lowlands as well as ground water pumped and used for household and industry. In the planning of a sustainable water cycle for Cambridge East the handling of surface water and local secondary ground water will be primarily taken care of by the landscape design, while the potable water will be included in the urban architecture and infrastructure. The target is to establish a 100 per cent climate adapted landscape and urban realm that ensures sustainable stormwater management, handles all rainwater locally and uses water as a resource to both enhance the area's biodiversity, contribute amenity values and enable a reduction in potable water use.

METRIC

- **Amount of rainwater on site**
- **Discharge of water in streams and ditches to downstream areas.**
- **Percentage of rainwater recycled for grey water in buildings**
- **Potable water consumption in buildings**

WHY IS THIS OUTCOME IMPORTANT?

With Cambridge East we have an opportunity to work towards a sustainable and 100 percent climate adapted urban realm created through nature-based green and blue infrastructure solutions. It will create a development that handles risk of flooding in the area as well as the surroundings according to Cambridgeshire Flood and Water SPD 2016 and that improves the water quality of existing streams and rivers beyond the development. Simultaneously it enhances the biological value of the landscape, creates community amenity, and reduces the use of potable water. By supporting beneficial water-related ecosystem services such as microclimate regulation, air purification and water purification, a sustainable water cycle will add to the wider understanding of Cambridge East as an innovative and responsible development, where the impacts of climate change are addressed and integrated to support healthy living. Ultimately, it is an opportunity to communicate the sustainable values of the new piece of the city and to attract innovative businesses and future-oriented citizens.

In addition to the environmental and social benefits, a sustainable water cycle through local handling of surface water is an opportunity to be cost-effective and in total compliance with advice in the Cambridge City and South Cambridgeshire Local Plans (2018) as well as regional, national and international guidelines.

WHAT DOES SUCCESS LOOK LIKE?

Local handling of all rainwater is the core of the blue infrastructure of Cambridge East as well as a hook to the water surfaces of the surrounding landscape including River Cam. Restrictions associated with the current Airport operations at Cambridge Airport will be removed, freeing up the potential of the site to fully embrace the most innovative approaches to water management and improved landscape quality.

In this new piece of Cambridge rainwater will be collected, stored and transported through a multitude of surfaces and run off systems; A high ratio of green roofs will collect and use rainwater to enhance the green surface and biodiversity in the urban area; Rainwater will be led from pavements into rainwater beds with

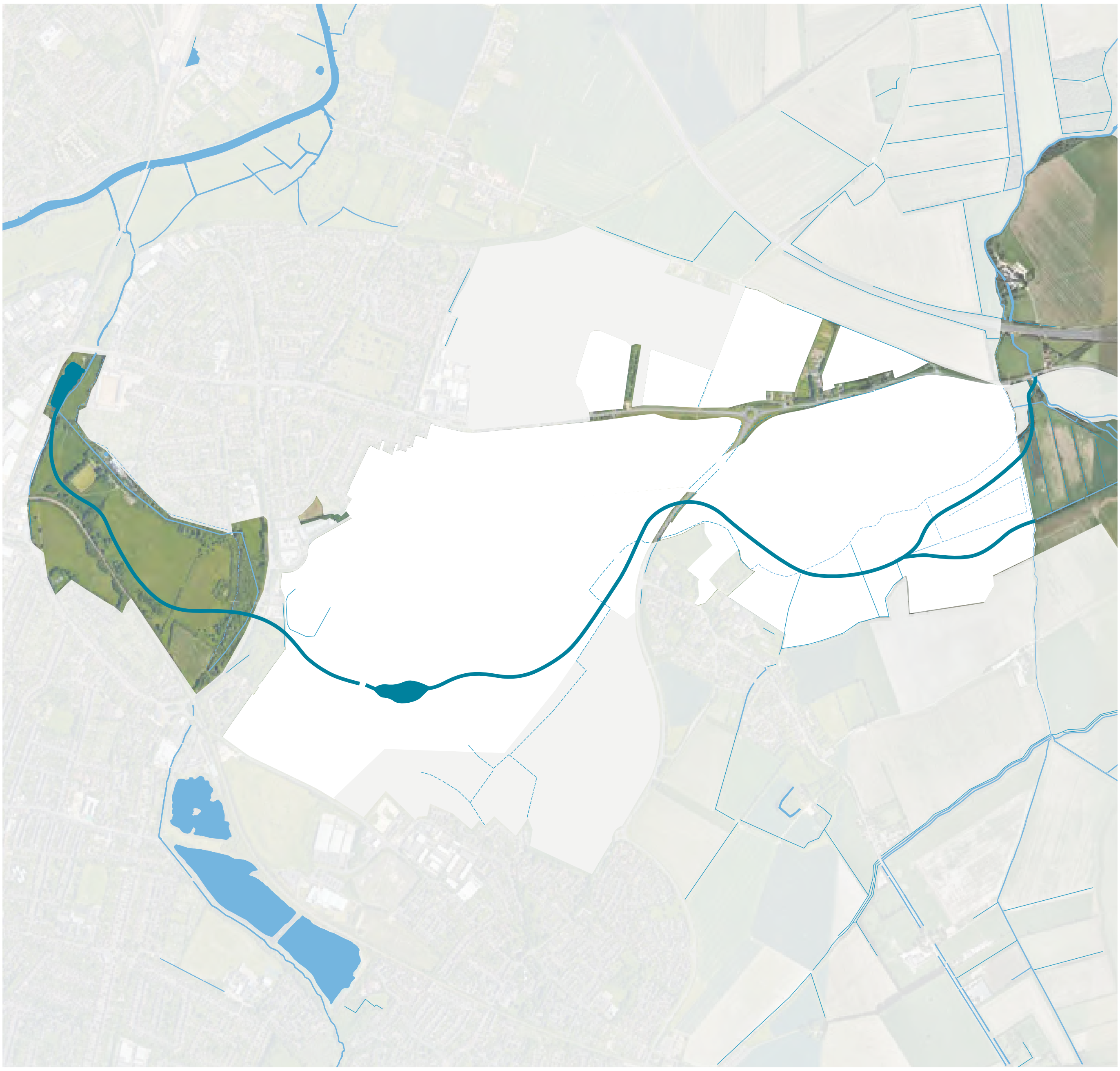


Figure 15 - A strong blue and green infrastructure in the developed area developed in harmony with the surrounding natural landscape will ensure an enhanced relationship on local wildlife, landscape and amenity.

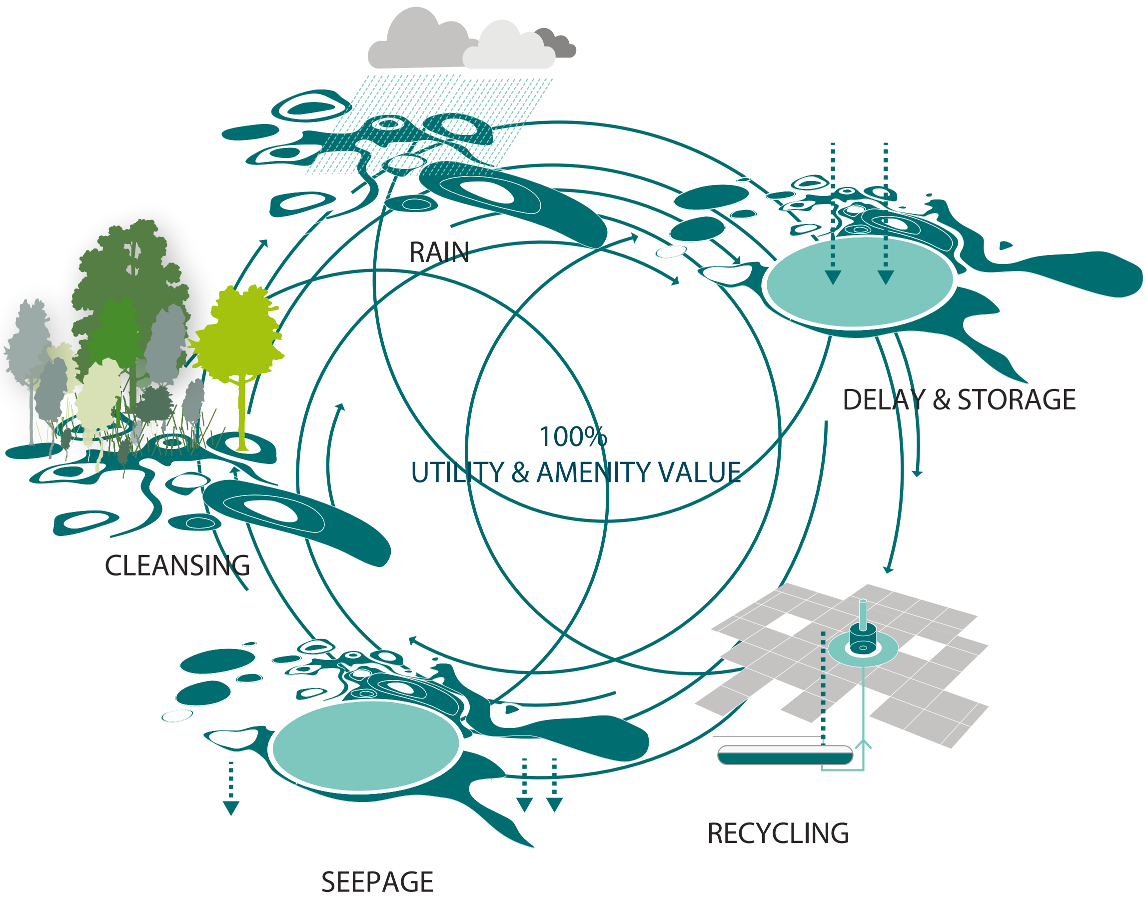


Figure 16: Sustainable Water Cycle

filtering substrate or vegetation depending on water quality and, from here the water will flow naturally into the larger green corridor, where it will infiltrate naturally and run to natural water bodies. In the green corridor, the capacity to store water in case of heavy rainfall events will be integrated holistically in the landscape.

Based on hydrological modelling the design of water storing features, we will strive to create holistic functionality and aesthetic value. E.g. green roofs with sufficiently deep substrate will be more the robust and hold a larger amount of rainwater and thereby also a more diverse vegetation. Retention basins with a smooth gradient between the water surface and land creates a larger buffer for flooding, while at the same time increasing the recreational use of the water element for people as well as wild animals.

We will work towards smart recycling of rainwater in buildings for e.g. toilets and washing machines as far as sound and possible. Recycled rainwater will ultimately run to the wastewater plants and thus, it will not be handled on surface.

CAMBRIDGE EAST TARGET

- **100 % local handling of rainwater manifested in recycling in buildings or surface runoff/ infiltration**
- **To achieve 40% reduction in potable water use per person per day compared to UK benchmarks**

As principally modelled by England and Wales Building Regulations water calculator.

KEY PRINCIPLES AND STRATEGIES

The key principle of establishing a sustainable nature-based water cycle in Cambridge East is local handling of all rainwater with the following four main benefits:

- Using rainwater to create an attractive landscape and provide unique recreational value for experiences and activities.
- Using rainwater to increase nature quality and biodiversity ensuring a healthy sustainable development.
- Ensure climate adaptation by free water flow and capacity to store flooding water temporarily

Figure 17: Hans Tavsens Park, Copenhagen - SLA

- Reducing the consumption of potable water by using rainwater for grey water in buildings as well as for irrigation of e.g. gardens.

The key strategies to support delivery throughout the planning, design and construction phases include:

- Strategy: Formulating and communicating targets for the sustainable water cycle and water management including e.g. preventing flooding of property in and adjacent to Cambridge East for a 100-year event, 80 % green roofs on flat surfaces, rainwater collection on other roof surfaces, only permeable pavements.
- Planning: Establishing a fundamental knowledge of existing topography, waterway systems and water quality, geology, ground water, and drainage.
- Design: Place new water features in coordination with a sustainable soil balance, land use and biodiversity as well as other functional and design parameters.
- Construction: Supervision
- Management: Guidelines and survey of water quality in the new water system.
- Building Systems:
- Low flow fittings
- Leak detection
- Distributed seasonal rainwater storage
- Rainwater use for non-drinking water uses

SPILLOVER BENEFITS

Using rainwater in recreational blue-green infrastructure will provide added amenity value and highlight the unique sustainable identity of the development. It will contribute to an enriching landscape that promotes the health and wellbeing of both residents, people working in the area and visitors, who are all invited to use the land for sports, fitness and other leisure activities as well as engage in water activities, such as going for a swim, paddle and going fishing. Refer to Outcome 5 for wider holistic benefits.

OUTCOME 4: SUSTAINABLE CONNECTIVITY & TRANSPORT

DEFINITION

The purpose of this outcome is to measure the resultant carbon impact of the travel of residents and visitors to and from Cambridge East, and to reduce emissions to net zero by 2050.

METRIC

Carbon emissions per person (kgCO2e per km per person per annum)

WHY IS THIS OUTCOME IMPORTANT?

Cambridge East vision is to deliver a world class, sustainable new piece of Cambridge. This creates the opportunity to deliver exceptional transport infrastructure. An integral part of the vision for Cambridge East is the delivery of a sustainable transport solution which can connect Cambridge East to the heart of Cambridge (and vice versa).

Delivering on this vision is a key step towards a low carbon future for Cambridge. By consolidating employment and housing together in a world class environment, Cambridge East can reduce the need to travel. In addition, by providing a sustainable transport infrastructure with the heart of Cambridge and Cambridge East can offer an alternative to road-based travel and kick start a sustainable transport network that can, in time, reach across the City and beyond.

WHAT DOES SUCCESS LOOK LIKE?

To unlock the potential at a macro level, we believe a new rapid transit link is required – from the Airport to Cambridge Station. The new link can operate as a freestanding solution or as the first phase of the CAM metro. The necessary work has already been carried out to demonstrate how this unique opportunity can be delivered.

This would be complimented by investment in cycle and pedestrian linkages and a network of bus routes to other key destinations.

Marshall is committed to collaborative working with the Cambridgeshire & Peterborough Combined Authority and Greater Cambridge Partnership to align transport proposals in the area with the potential of Cambridge East.

Reducing carbon emissions associated with transport should also consider reducing the need for travel in the first instance. The masterplan vision for Cambridge East is to create at a local level a truly mixed use piece of city that is walkable and extends Cambridge's cycle network.

This outcome would also seek to promote a greater digital connectivity for Cambridge East, which in turn will significantly reduce the need to travel in the first instance and in addition to reduce the length of travel time.

Finally, infrastructure will have to be upgraded to add renewable energy generation capacity, while new charging points or hydrogen supply will have to be created to support the future widespread use of electric and/or hydrogen vehicles.

CAMBRIDGE EAST TARGET:

To achieve Central Cambridge travel mode share from day one and to provide infrastructure to support net zero carbon emissions per person per day

As principally defined by BREEAM 2018 Transport Credits.

Figure 18: Cambridge East Rapid Transport Link Options

KEY PRINCIPLES AND STRATEGIES

The key design principles to deliver this outcome are ranged from macro level (city region) to medium (Cambridge East) level to micro (urban block) level. The focus is on promoting all local travel by foot or cycle; reducing the need for local trips, and its duration and associated carbon emissions by promoting alternative transport.

- Create comprehensive green transport plan including digital connectivity in partnership with Greater Cambridge that catalyses local transport schemes
- Prioritise high quality Digital Connectivity to avoid need for unnecessary travel
- Integrate into existing and planned public transport network- CAM Metro
- Create mixed-use with appropriate density masterplan- A ‘place of places’
- Provide high quality pedestrian and cycle links throughout the masterplan with connectivity to local communities and Cambridge networks
- Provide end of journey provision for active travel runners and cyclists (showers, dry lockers etc)
- Provide infrastructure for electric and hydrogen vehicles as a priority
- Provide car sharing spaces and opportunities

DESIGN TOOLS

This outcome we envisage will become an integral part of the Greater Cambridge Local Plan. Current best practice guidance can be found in BREEAM, Institution of Civil Engineers, and research led organisations such as Liveable Cities (refer to latest guidance by RTPI and TCPA). BREEAM 2018 has two sections and a number of credits related to sustainable transport use, these include:

- Tra 01 Transport assessment and travel plan
- Tra 02 Sustainable transport measures

SPILLOVER BENEFITS

Less congestion, less air and noise pollution, better health and wellbeing of residents, added value, greater permeability, better social inclusion

Figure 19: The vision of a vibrant High Street supporting rapid transit and active travel

OUTCOME 5: SUSTAINABLE LAND USE AND BIODIVERSITY

DEFINITION

Strategies for sustainable land use and biodiversity addresses urban development and the handling of impacts on nature from landscape level down to species level. As the quality of nature in Cambridge East is important for the delivery of vital regulating and cultural ecosystem services, ambitious sustainable land use and biodiversity targets provide a unique opportunity to ensure a healthy and sustainable development to benefit the wider population.

METRIC

- **Biodiversity Metric (Natural England method)**
- **Urban greening factor (London method)**
- **Guideline on net biodiversity gain (CIEEM)**

WHY IS THIS OUTCOME IMPORTANT?

We strive towards creating a world class climate and sustainability landmark in Cambridge East. With the transition and development of the existing airport we will improve the overall biodiversity of the future Cambridge East area through higher quality of natural habitats for wildlife and green spaces in the urban areas. Thereby the development will be an important factor in reaching both national and international biodiversity targets and sustainability goals.

Equally important, an ambitious nature-based development based on local nature qualities and biodiversity is an opportunity to ensure that the future of sustainable living will be present beyond the mental and political understanding of the new piece of the city; It will be experienced everyday by the people who live, work and visit Cambridge East and benefit from the many well-functioning ecosystem services provided by the green corridor, the high quality green spaces and linkages, as well as the regained access to the fenland landscape. Regulating ecosystems services will maintain a sustainable hydrological cycle, sequester carbon, reduce risks of flooding, and ultimately provide benefits to the environment far beyond the development. Social ecosystem services help strengthen the identity of outdoor and urban spaces, convey knowledge to citizens of nature, inspire to recreational activities that invigorates our physical and mental health as well as encourage new social communities around nature and nature maintenance.

WHAT DOES SUCCESS LOOK LIKE?

We know from a preliminary ecological survey which has classified and assessed existing habitats that the site supports as low value, widespread and common habitats of limited biodiversity value. At this point, the airfield is dominated by poor semi-improved grassland that is regularly cut and the land to the east of Airport Way is dominated by arable farmland with shelter belt planting, hedgerows and drainage ditches. The low-lying arable fields are located on what was once Teversham Fen.

We strive to achieve the net biodiversity gain of the development by following a range of principles which include conservation of endangered and rare species. We will work to increase the quality and diversity of existing and new habitats in order to attract species from the surrounding landscape and provide new habitats for e.g. species requiring woodland, wetland and warm and sunny wild spots. All opportunities will be taken to build in biodiversity into every aspect of the development from the most urban parts to the rural edge.

Figure 20: Anchor Park, Malmø - SLA

Figure 21 - Reed Warbler

Figure 22 - Short-Eared Owl

Figure 23 - Dragonfly

With the development of Cambridge East, we have a unique opportunity to deliver:

- A wildlife rich green corridor connecting the City to the iconic fenland landscape to the east of the City (120 hectare).
- The restoration of Teversham Fen, complementing the habitats and wildlife of Little Wilbraham Fen SSSI.
- The creation of a rich mosaic of habitats including ditches and wet grassland, stands of common reed, thickets of willow, pools, ponds, new hedges and flower rich meadows and pastures that will deliver a net increase in habitat and species diversity and at least a 10% increase in biodiversity value compared to existing land use.
- Improved access for new and existing residents of Cambridge to the fenland landscape via a new diverse green infrastructure and by creating fenland habitats within the development providing valuable opportunities for regular contact with nature and all the ecosystem services nature-based solutions bring.

CAMBRIDGE EAST TARGET

- **10 % minimum net gain in biodiversity**
- **Urban greening factor for the entire developed area (excl. 120 green corridor) of 0.4;**
- **Minimisation of indirect impacts on off-site biodiversity through material use and pollution.**

KEY PRINCIPLES AND STRATEGIES

The formulation of a biodiversity scope and strategy for the development, involving relevant stakeholders and ensuring it is clearly communicated to stakeholders and the public. The strategy will address targets for each project phase that will be evaluated stepwise through the project development.

- A baseline analysis of the biodiversity off-set and the natural history of the site and landscape. The base-line documentation will be used as input to the ongoing project development and design within and beyond the boundaries of the site.
- Integration of existing nature qualities in the development and input into design of new habitats for biodiversity. This includes incorporating local suitable soil fractions and surface handling of rainwater.
- Handling indirect biodiversity impacts of the landscape project by describing best practise for use of materials and reduction of pollution.
- Integration of mitigation and compensation efforts for nature qualities negatively impacted by the development.
- Creating green infrastructure that connects the project site to existing natural corridors and nature qualities beyond the development.
- Construction and site supervision by ecologist to ensure implementation of biodiversity features of project design.
- Ensuring possibilities for natural succession and dynamic development of the new urban nature through a management guideline.
- Follow-up surveys of biodiversity after construction with adaptive management practices and engagement of local citizens.
- Risk analysis and up-front avoidance of situations reducing the success of planned biodiversity activities. E.g. lack of competencies or financing.

SPILLOVER BENEFITS

Studies have shown that green space encourages social bonding between neighbours, inhabitants enjoy better health and people working in environments surrounded by natural elements report 15 % higher levels of well-being, are 6 % more productive and 15 % more creative

Source: SLA Architects.

Figure 24: the importance of Green and Blue Infrastructure at the heart of the vision for Cambridge East, with opportunities to support delivery of wider green infrastructure aspirations for the area

Figure 25 - Damp Meadow grassland_1

Figure 26 - Damp Meadow grassland_2

Figure 27 - Common Reed Fen

OUTCOME 6: GOOD HEALTH AND WELLBEING

DEFINITION

The World Health Organisation (WHO) define health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition". (Constitution of the World Health Organization, 1946) .

The external environment is equally important to the building level as sustainable masterplanning, to create supportive environments which increase the likelihood of achieving this state of complete physical, mental and social wellbeing. In effect healthier and happier communities.

"The places we live in affect our health in countless ways... and there is evidence that good urban design and planning can help to encourage positive social interactions and improve health" (NHS Healthy New Towns).

METRICS

The range of metrics will be as principally defined by the Chartered Institutions of Building Services Engineers (CIBSE) Technical Memorandum 40, covering a range of environmental factors including: Air quality, Thermal comfort, Light, daylight and views, Acoustic comfort and Humidity

WHY IS THIS OUTCOME IMPORTANT?

It has become clear over the past few years that a healthy and comfortable environment, both in buildings and outdoors, can greatly influence our physical and mental health, how we interact with others at work and in our community, our performance in workplaces, and the ability for our children to learn.

Furthermore, strategies to achieve health and wellbeing outcomes are inextricably linked with those achieving environmental outcomes: there is the opportunity for design strategies which offer multiple co-benefits to both people and planet, creating attractive places which engage citizens, facilitate active, healthy, and sustainable lifestyles, and reduce health inequalities. - see diagram.

By contrast, environmental factors such as air pollution can have a significant impact on population health. As life expectancies generally increase, so do the pressures on our healthcare systems. This is compounded by the rise in non-communicable diseases associated with lifestyles and environmental factors, such as those linked to air pollution and lack of physical activity.

With a changing climate, the risk of health consequences from heat waves and flooding are also increasing.

WHAT DOES SUCCESS LOOK LIKE?

Good Health and Wellbeing, including:

- Creation of a public realm that promotes a connection with nature, encourages community cohesion, and facilitates active and healthy lifestyles – see sections on Landscaping and Green Infrastructure, Transport, and Social value
- Provide good air quality: strive towards achieving WHO guidelines for key pollutants, particulate matters, nitrous oxides, and volatile organic compounds (especially formaldehyde), although for some this will be dependent on outdoor air pollution
- Provide good thermal comfort by principally meeting CIBSE comfort criteria (TM52 and TM59)
- Provide good practice acoustic levels appropriate for activity and setting

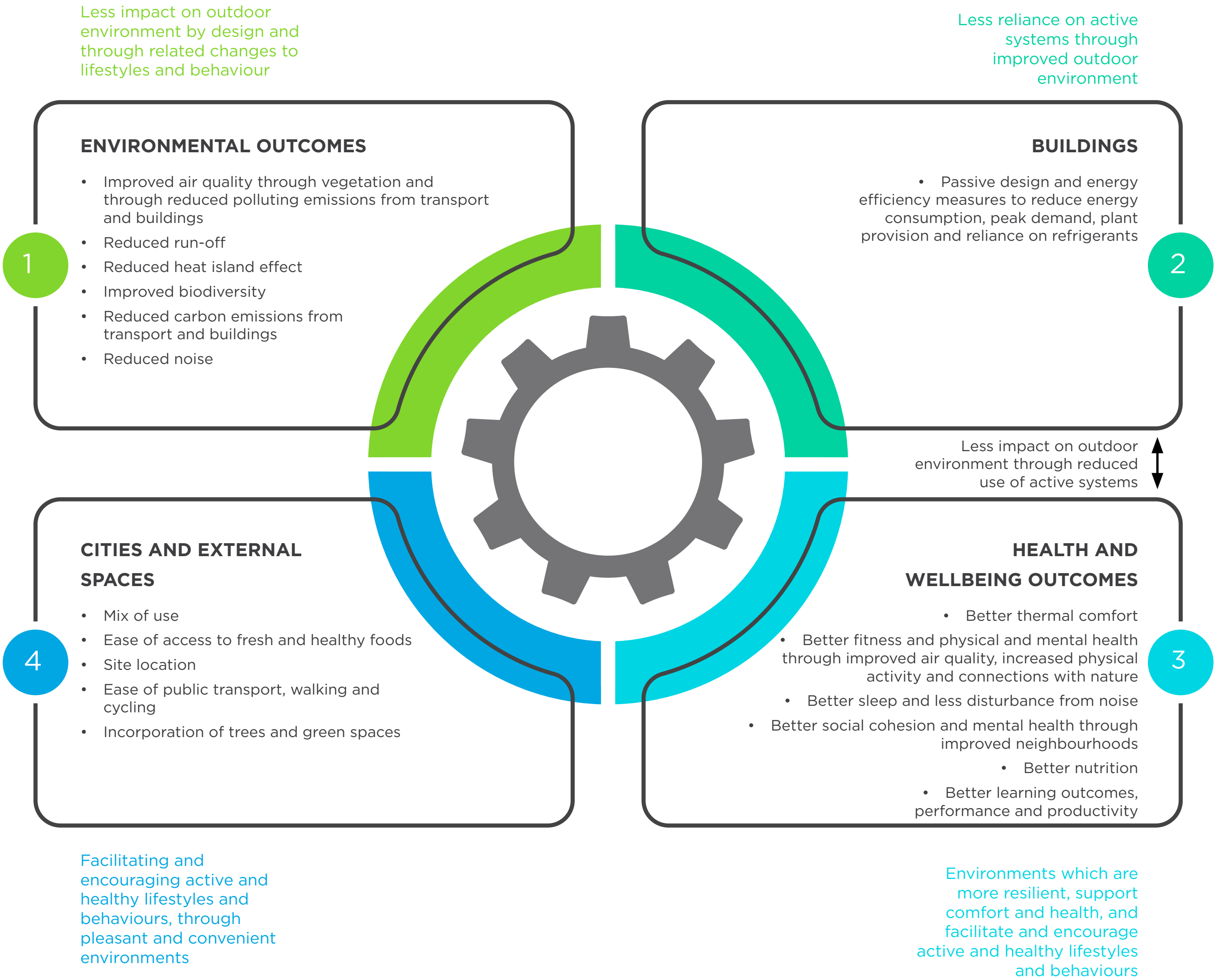


Figure 28 - Examples of built environment influence on health and wellbeing and environmental outcomes (ref: CIBSE TM40)

- Provide Good quality of daylight levels and views out e.g. average daylight factor of 2%,
- Provide Flexible, adaptable spaces which connect occupants to nature and offer occupants control over their environment.
- Create healthy and comfortable external spaces, away from sources of noise and pollution, shaded and sheltered seated areas; and; direct sun access to children's play areas.

CAMBRIDGE EAST TARGET:

Achieve Chartered Institutions of Building Services Engineers (CIBSE) Technical Memorandum 40 targets.

WHAT ARE THE KEY PRINCIPLES AND STRATEGIES?

- We will seek to engage from the early stages with bodies responsible for health in order to design in the best health outcomes (e.g. liaising with the Cambridgeshire and Peterborough Health and Wellbeing Board, and with the NHS Healthy New Towns initiative and Cambridgeshire & Peterborough Sustainability and Transformation Partnership (STP). This will help us to collectively identify needs for local health provision, but we will also explore opportunities for prevention through healthy lifestyles, as a pillar of public health.
- Social prescribing, which recognises that health is a holistic issue, is increasingly being used within the NHS by GPs, nurses and other healthcare professionals to refer people to a range of local non-clinical services which are typically provided by voluntary and third sector organisations – for example a dementia support group - but can also take the form of exposure to nature for mental health reasons.
- Early masterplanning to take account of health and wellbeing considerations, to maximise the opportunities and limit the need for complex design solutions later on. For example, as much as possible we will work to locate sensitive uses such as housing, schools and accommodation for the elderly away from the most noisy and polluted areas of the site; outdoor, green and play areas should be located in proximity to housing areas, and a daylight / sunlight analysis should be carried out to ensure they receive some direct sunlight.
- Building massing to maximise the use of low-energy solutions, with consideration of building shape and plan depth. As much as possible, the massing will be such that homes cab be dual-sided to allow cross-ventilation, provide pleasant changing daylight environments, and increase the opportunities for openings on quieter, safer sides.
- As part of the design codes, we will set guiding principles including passive design and the provision of adaptable and controllable environments, in order to improve the resilience of the design and increase the chances of occupant comfort and satisfaction. This would typically include measures such as natural ventilation, movable external shading, and careful design of glazed areas to provide good daylight and views out, but limit the risk of excessive winter heat losses and summer heat gains. We will also encourage the selection of materials which minimise impacts on the environment, on building users, and on construction workers.
- In our engagement with the later phases of delivery, we will promote approaches which follow through on our aspirations, including careful handover and commissioning, training sessions and simple building user guides, good maintenance, monitoring of environmental conditions and post-occupancy evaluation.

SPILLOVER BENEFITS

Happy, healthier people, reduction in local NHS burden, greater social value, greater productivity, attraction and retention of people and businesses, added value

Figure 29 - Rathbone Square, London

OUTCOME 7: SUSTAINABLE COMMUNITIES & SOCIAL VALUE

DEFINITION

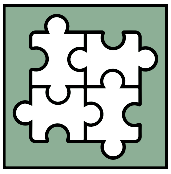
There is no simple agreed definition of social value, as its application to the built environment is such a new field, but we believe it is all about supporting the development of a sustainable community by creating great places for people to live and work where they have a sense of ownership, belonging and inclusion.

METRICS

Jobs and apprenticeships are widely recognised social value targets that will of course be addressed through the strategy, but we will work towards the inclusion of other important social value targets.

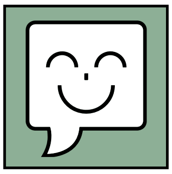
These are core elements of the Social Value Toolkit (SVT) for Architecture to be published by the RIBA in April 2020, which will be used as metrics within this sustainable outcome. In addition BREEAM for Communities can be used as a framework for the creation of sustainable placemaking.

Connections between people

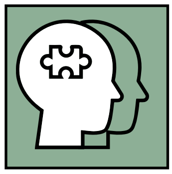


Active Lifestyles

Positive emotions (for example through access to nature)



Pride in the community



Participation

WHY IS THIS OUTCOME IMPORTANT?

What is good for people is good for the environment. Strategising for social value is about maximising the wellbeing potential of the project, both for its inhabitants and visitors, and for the surrounding community. Helping communities to work responsibly with their environments is a socio-technical problem with considerable overlap into other areas addressed in this strategy.

Since the advent of the Social Value Act 2012 in England , Social Value has been gaining traction as a requirement of procurement, contracts and planning in the public sector (UKGBC, 2019) yet there is as yet very little agreement on how it should be measured. A recent consultation by the UK Government on the percentage that should be attributed to social value in procurement suggested 10%, yet it seems that bodies such as Greater Manchester are already attributing a weighting of 30% in their decision making on bids to social value. The rise of social value in the evaluation of projects and decisions relating to land value is inevitable. The Greater London Authority is, for example, developing a social value strategy.

Cambridge is the UK centre for research on Digital Twins, virtual models of cities and places that test and predict flows within urban systems and values based procurement. There is a real opportunity here to develop sophisticated tools for the modelling and evaluation of social value. The Cambridge East project could be a laboratory for developing new products, services and tools using machine learning and other techniques to tailor the experience of places to the needs of people and the environment. Community learning through the process of delivering the project is one aspect of social value that we would hope to explore.

Figure 30 - Community Social Value Consultation, Orts Road, Reading

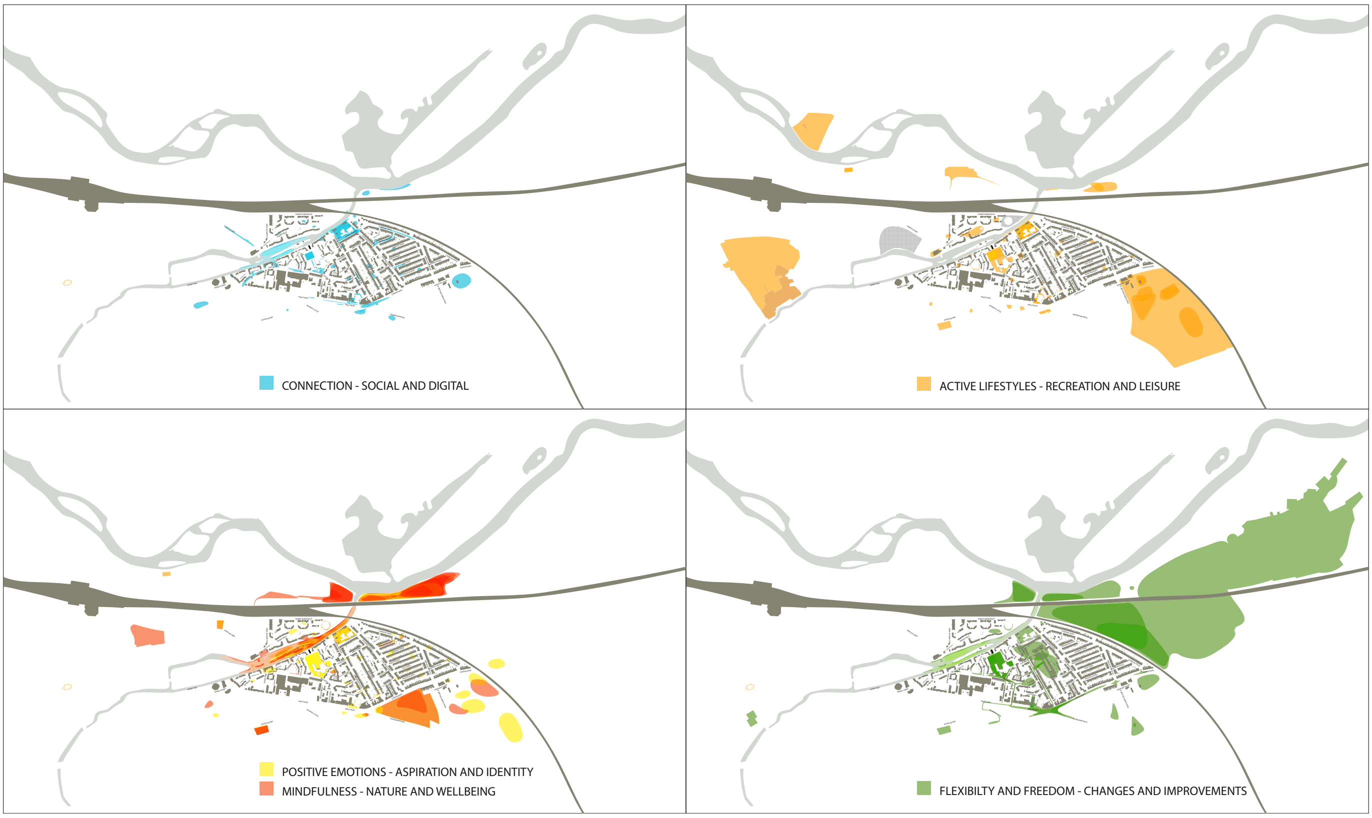


Figure 31 - Orts Road, Reading Social Value Mapping Exercise

WHAT DOES SUCCESS LOOK LIKE?

Although people may not understand what social value means they generally know what it looks like. Cambridge East will have great quality of life, helping the city maintain its reputation as a global magnet for talent in the long term. The strategy will address the full range of the Cambridgeshire Quality Charter's 'Five 'C's': Community, Connectivity, Climate, Character and Cohesion.

The airport site is currently a barrier to social connection. We envisage a mixed development with a real sense of community, where people talk to one another, respect one another and nature and have a sense of shared authorship over their built environment. We will strive to ensure local culture and identity are recognised in the design of buildings and placemaking, including the use of local materials (which will in turn create local jobs). There will be plenty of good quality public space and amenities, with things for all ages to do, enabling people to lead active lifestyles – bicycles are of course central. Generally it is all about mixing: town with gown, multi-generational spaces, mixed tenures, mixed building types, mixed social groups, mixed businesses and mixed job opportunities. It won't just be tech jobs that are created – every one, 'SMART' job creates five others at different levels (Gratton and Scott, 2016, p. 79)

CAMBRIDGE EAST TARGET:

HACT Social Value Bank indices related to active lifestyles and freedom from depression.

WHAT ARE THE KEY PRINCIPLES AND STRATEGIES?

The social value strategy will strive to knit together the communities that surround the airport in a culturally appropriate way. More deprived areas such as Abbey will get improved access to green space and other important amenities and opportunities such as jobs. We will strive to create apprenticeships, training opportunities and jobs.

Sustainable Communities and Social Value has a clear correlation with Sustainable Development Goal 11 Sustainable cities and communities and multiple overlaps into other outcomes such as 3. Good Health and Wellbeing and 10. Reducing Inequality. The commonly used triple bottom line of sustainability is environmental value, economic value and social value. A community must deliver all three to be resilient.

The first step in developing a social value strategy for Cambridge East is a baseline survey drawing on participatory techniques to set out the social assets that are already there. The Social Value Toolkit offers a very simple, people focused methodology for measuring and monetising social outcomes (qualitative and quantitative), drawing on well-established financial proxies developed by the HACT Social Value Bank. Data is collected by asking members of the community about their feelings about the place and the changes they have personally experienced through the development of a new scheme. A technique for mapping social value spatially building on the SVT has been modelled by Flora Samuel working on the Orts Road Council Estate in Reading in collaboration with Reading Borough Council who are keen to develop a holistic evaluation system for inclusive decision making.

SPILLOVER BENEFITS

Learning, innovation, cultural value (performances and events), health and wellbeing, reductions in anti-social behaviour, creating aspiration for young people, Upskilling.

Figure 32 - Community Consultation

OUTCOME 8: SUSTAINABLE LIFE CYCLE COST

DEFINITION

A Life cycle cost definition is to measure and benchmark the capital and operational running costs of a building in use and compare this to the return on investment (ROI) value created by the project, including rental value, building value, and social value as described in the previous section

METRIC

Cost per £/m2 using ICMS Life Cycle method of measurement

WHY IS THIS OUTCOME IMPORTANT?

Life cycle costs play a pivotal role in the financial management of construction projects around the world. They allow critical decisions to be made regarding the relative importance of capital and longer-term costs, which ultimately impact asset performance, longevity, disaster resilience and sustainability. In the context of climate change, there is growing evidence of unsustainable levels of running costs in buildings with highly complex services: their resilience in extreme future climates is also questionable. It is becoming apparent that the insurance industry will vary premiums according to a building's resilience and ability to withstand climate change, possibly making such buildings uninsurable.

There is also compelling evidence of the significant economic benefits of low carbon and healthy buildings, not of all of which is anecdotal. The Urban Land Institute carried out a theoretical exercise of the potential savings of Leadership in Energy and Environmental Design (LEED) Platinum buildings in the States in 2005 which even then would total $60/square foot savings (over 20 years). In Australia a good NABERS rating has also been shown to increase the value and lettability of office buildings. Studies such as this are scarce, but the UKGBC Capturing the Value of Sustainability report, 2018 highlights a growing number of leading UK developers are at the forefront of defining the economic value of sustainability.

This outcome seeks to design for use and align capital expenditure and operational expenditure budgets which in turn unlocks whole life value over the life of the building.

WHAT DOES SUCCESS LOOK LIKE?

There are a growing number of exemplar projects that have already achieved or come close to the RIBA 2030 Challenge within conventional construction budgets. Three notable examples across a range of building typologies are included in the following images. These case studies demonstrate high design quality, good value, exemplary sustainable performance, which has in turn created significant economic and social value to the area.

CAMBRIDGE EAST TARGET:

Maximise sustainable added value within capital cost benchmarks.

WHAT ARE THE KEY DESIGN PRINCIPLES?

The key design principles for this outcome as discussed above is to align Capital expenditure with Operational expenditure budgets to ensure sustainable whole life value decisions to be made:

- **Carry out whole life cycle analysis of key building systems**
- **Carry out Soft Landings Graduated to Handover and aftercare**
- **Measure energy costs**
- **Assess management and maintenance costs**
- **Assess overall running costs**
- **Assess added value of occupant health and wellbeing**
- **Assess added value of sustainable outcomes of building**

Figure 33 - Kings Cross, London. Exemplar sustainable development which has created significant additional value for the developer.

DESIGN TOOLS

The principal method for measuring whole life value is set out in the International Construction Measurement Standards (ICMS) Life Cycle Method of measurement. ICMS are principles-based international standards that set out how to report, group and classify construction project costs in a structured and logical form.

The RIBA Plan for Use will be referenced to assist the project team deliver better outcomes.

BREEAM

In addition to the above design tools, BREEAM 2018 has a number of credits related to life cycle operational value, which include:

- Man 01 Project brief and design 4 credits
- Man 02 Life cycle cost and service life planning
- Man 03 Responsible construction practices
- Man 04 Commissioning and handover
- Man 05 Aftercare

SPILLOVER BENEFITS

Reduction in energy costs, reduction in running costs, better operation, higher asset values. More affordable living costs for residents

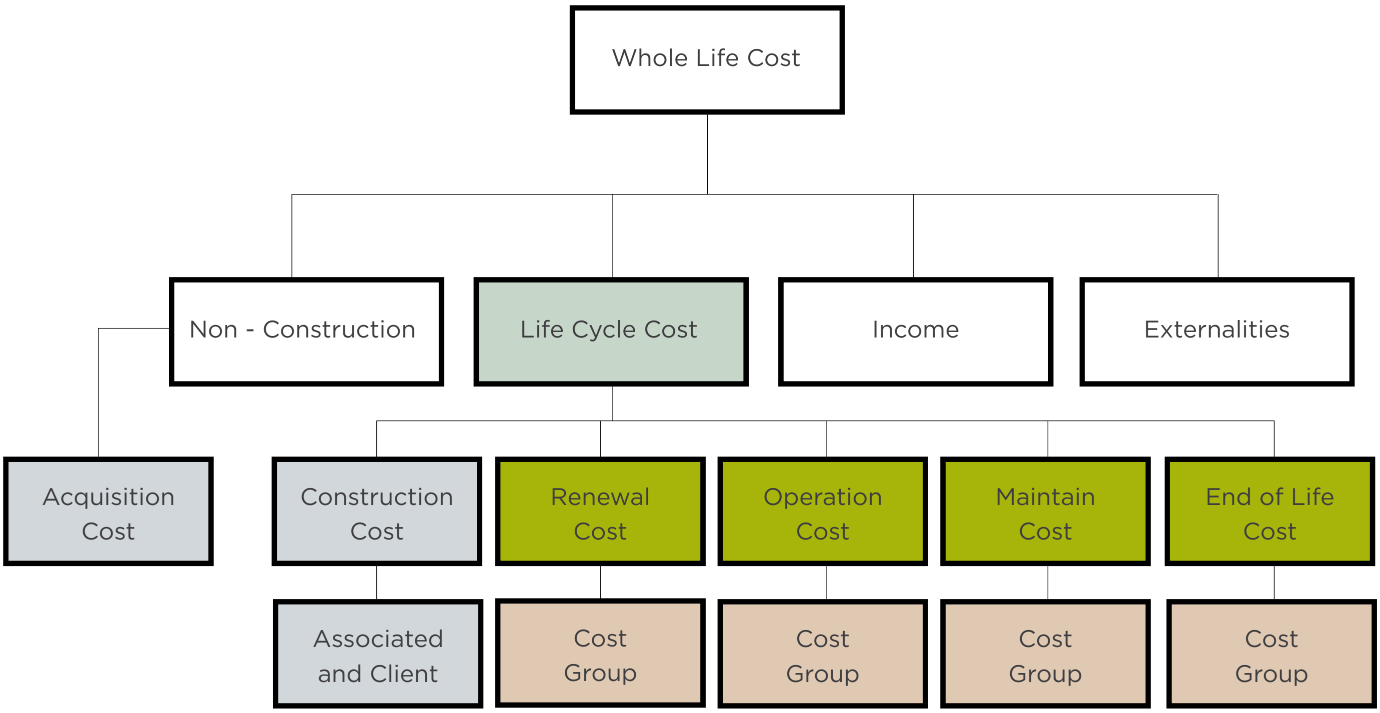


Diagram 34: ICMS Life Cycle Cost Method of Measurement

Figure 35 - Goldsmith Street, Norwich. Net Zero Carbon and eradication of fuel povertyhas been achieved for £1,800 per sqm capital cost.

Figure 36 - Enterprise Centre University of East Anglia, Norwich. Net Zero Carbon University building built for no extra cost.

NEXT STEPS

This vision statement is the starting point for developing a comprehensive sustainability framework for Cambridge East which we hope will become an international exemplar for sustainable development. The next step is to develop a Cambridge East Sustainability Framework in close collaboration with the key stakeholders in the Greater Cambridge area. We envisage the key steps in this collaborative process might include, but are not limited to:

- Comprehensive Engagement with key Council departments to align sustainability vision
- Carry out public consultation as part of developing masterplan pre-application activities
- Carry out benchmarking exercise to identify joint best practice examples across a key range of building types and landscapes
- Carry out baseline socio, economic, environmental surveys to guide the development of sustainable outcomes
- Agree a set of specific Cambridge East Sustainable Outcomes, metrics and targets
- Agree range of preferred tools and certification methods to deliver Cambridge East Sustainable Outcomes
- Encapsulate above into a Comprehensive Sustainability Framework for Cambridge East
- Comprehensive Sustainability Framework could be developed into a Design Guide for future development

In conclusion, the Greater Cambridge Local Plan has stated its aim of achieving net zero carbon for the region by 2050. The latest UN, IPCC guidance together with RIBA 2030 Challenge provides a stark message about the immediate targets that must be met if we are to achieve a net zero carbon future by 2050. We believe that the RIBA 2030 Challenge targets are realistic, and the design principles, strategies and case studies contained within this report demonstrate that aspects of this sustainable future are being achieved now within a reasonable capital cost budget.

We believe this ambitious Cambridge East Sustainability Vision is not only viable but is vital in the creation of a vibrant and sustainable community that could become a world class exemplar of sustainable development.

The scale and opportunities at Cambridge East are unparalleled, allowing the scheme to embrace holistically the sustainability objectives of the Local Plan, as set out in the Big Themes. We look forward to working in partnershjp to develop the vision for Cambridge East.


OLIVES

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All links were accessible at the time of publication (February 2020).

GLOSSARY

BREEAM	Building Research Establishment Environmental Assessment Method
CIBSE	Chartered Institutions of Building Services Engineers
GIS	Geographical Information System
HACT	Housing Association Charitable Trust
ICMS	International Construction Measurement Standards
IPCC	Intergovernmental Panel on Climate Change
LCA	Life Cycle Analysis
LEED	Leadership in Energy and Environmental Design
MHCLG	Ministry of Housing Communities and Local Government
NABERS	National Australian Built Environment Rating System
POE	Post Occupancy Evaluation
PPHP	Passive House Planning Package
RIBA	Royal Institute of British Architects
RICS	Royal Institute of Chartered Surveyors
ROI	Return on Investment
RTPI	Royal Town Planning Institute
SDG	Sustainable Development Goals
SPD	Suuplementary Planning Documents
SSSI	Site of Special Scientific Interest
STP	Sustainable and Transformation Partnership
SVT	Social Value Toolkit
TCPA	Town and Country Planning Association
UNSDG	The United Nations Sustainable Development Goals
UN	United Nations
WHO	World Health Organisation
WGBC	World Green Building Council

Marshall

Allies and Morrison

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SLA

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