BIDWELLS

BABRAHAM RESEARCH CAMPUS
FIRST PROPOSALS CONSULTATION (REGULATION 18) – DEC 2021
PLANNING REPRESENTATIONS
APPENDIX 9 : SUSTAINABILITY STATEMENT

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Babraham Research Campus.
Cambridge.
Babraham Research Campus Ltd.

SUSTAINABILITY
SUSTAINABILITY STATEMENT

REVISION 04 – 22 NOVEMBER 2021

Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
01	13/08/2021	Draft for comments	J. Quirin	K. Couling	K. Couling
02	27/09/2021	Revision based on comments and inclusion of appendices	W. Naismith	J. Quirin	K. Couling
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Contents.

Forward.

Starting with sustainability.
No longer simply ticking boxes, today sustainability is about making real-term impacts. Increasingly, it has become the starting point – and the heart – of ambitious projects. Babraham Research Campus Limited (BRC) are taking an exciting journey with their project team to help shape a more sustainable future for the site.

A sustainability framework.
Within the built environment, considering five defined factors and their value is key to a connected approach: the people, the building, the social network, the natural environment, and the economic aspects. These form the basis of the proposed sustainability framework which is tailored to the needs of BRC.

Stakeholder engagement.
Working with the project team we actively engage with the planning authorities, local community groups and the general public throughout the planning process. We have collaborated with BRC and project team as well as key stakeholders to create informed innovative strategies. It responds to the five capitals of sustainability and is articulated in an accessible and engaging way no matter the complexity.

Ahead of the industry.
Our team is actively shaping the future of sustainable practices. We conduct in-depth research, author industry guidance, build close links with sector-wide organisations, and sit on influential committees. The result is an unrivalled ability to provide informed, strategic advice that stays ahead of industry changes and is pivotal to our successful input to planning.

Purpose of this report
This Sustainability Strategy has been prepared on behalf of BRC in support of the promotion of the expansion of the Babraham Research Campus at the Regulation 18 ‘Preferred Options’ stage of the emerging Greater Cambridge Local Plan.

The Sustainability Strategy has a further role in underpinning future masterplan development at the Campus.

1. Introduction.

1.1 Purpose of this report.

This document has been prepared on behalf of Babraham Research Campus Limited and presents the sustainability statement and energy strategy in support of the promotion of the expansion of the Campus at the Regulation 18 'Preferred Options' stage of the emerging Greater Cambridge Local Plan. It has been informed by both national and local policy requirements, the Applicant's vision and sustainable design challenges and frameworks.

Future proposals for the Campus comprise the development of further employment land within and adjoining the existing built up area of the Campus. In addition, low density redevelopment of existing Campus-linked housing is proposed. A supporting infrastructure and renewable energy zone is also proposed south of the River Granta within an area of existing farm buildings.

An emerging Illustrative Masterplan has been prepared to indicate the locations of the key development zones . It will be based on exemplar sustainability aspirations and standards which underpin the following Sustainability Statement.

1.2 The Campus.

The existing Campus is located at the South East of Cambridge and comprises a range of Research and Development (R&D) buildings, conferencing and meeting facilities and business support services located on the north-west and south-east side of Babraham Hall, a 19th century Grade II Listed Building, situated within a parkland setting. There are currently over 60 companies, with 1,500 employees, and 300 academic researchers (including PhD students). The Campus also includes The Close, a development of 47 houses, including a nursery.

1.3 Greater Cambridge emerging local plan.

The Greater Cambridge Local Plan is the emerging joint Local Plan for the Cambridge City and South Cambridgeshire District Councils covering the period up to 2041. Babraham Research Campus is currently identified within the First Proposals consultation document, under Policy S/BRC, as a Policy Area, with a proposed policy direction to remove the developed area of the Campus from the Green Belt.

The future development proposals for the Campus will seek to respond and reflect robustly and comprehensively to the principles set out in the consultation document to demonstrate it is aligned with the ambition and vision for Greater Cambridge as a whole, and presents an opportunity for an exemplary development.

1.4 Our strategy for value creation

Approach to value creation

Sustainability has always been fundamental to the quality of what BRC deliver and the way they work with stakeholders, the communities around them and their people.

As the market has evolved in this area and given the growth of the business and increasing diversification of sites, in 2019 BRC has elected to formalise its approach to sustainability governance at a business and a project level.

Based on the last year's initial sustainability review, last year we progressed a comprehensive Sustainability Framework. BRC have embraced a capital-based model, following a review of 2019's outputs, as it promotes a holistic, interdisciplinary approach to sustainability which is aligned with BRC's understanding and demonstration of sustainable development.

The strategy continues to be based on the concept of realising long-term value to all stakeholders and investors, capturing the multifaceted benefits resulting from BRC's activities and operations across five the capitals: physical, social, economic, natural and human. Crucially, it aims to transform sustainability into an opportunity for growth rather than a challenge to overcome.

Focussing on what matters most

Rather than simple selecting a standard series of industry approaches, the bespoke strategy has been designed to respond to a wide range of macro drivers leading the global sustainability agenda, including the challenges associated with climate change and its implications for biodiversity and human health & wellbeing.

It aligns with the United Nations Sustainable Development Goals (UN SDGs), striving to maximise BRC's contribution towards their achievement. The SDGs set out a clear and ambitious framework for progress towards a more sustainable world, and BRC are cognisant that as part of the business community, they have a role in tackling these global challenges.

Introduction to the Sustainability Framework

This Sustainability Statement sets out the ambition and commitments that complement BRC in fulfilling its purpose of developing and facilitating world leading science and research using a Sustainability Framework that will underpin future masterplan development at the Campus.

Structured around the Five Capitals, the Framework defines five strategic objectives with respect to the key opportunity areas where BRC's business intersects the most with society and, therefore, has the most significant potential to make a positive difference.

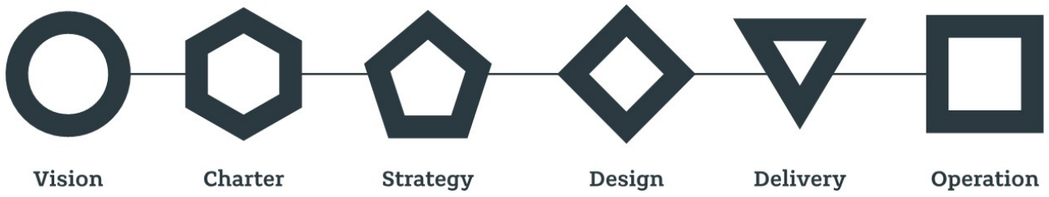
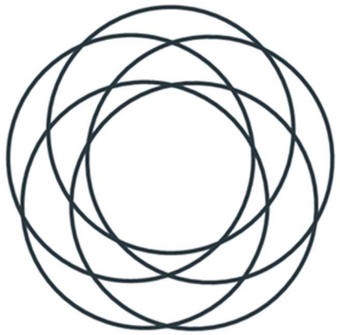


Figure 1: Sustainability strategy – Delivery phase (inception to completion).

As the masterplan design develops, these objectives will be supported by specific action areas along with detailed performance indicators and targets for the topics identified as most relevant to the Campus. The Framework will then define a set of "Minimum Standards" which apply to internal operations and across the Campus.

This Framework is informed by longer-term considerations and drivers of national significance, such as the UK government commitment to a "net-zero" emissions nation-wide target by 2050. Similarly, the approach remains flexible such that objectives, action areas and metrics may evolve over time in order to respond to changing stakeholder demands or legislative requirements.



A FRAMEWORK FOR SUSTAINABLE DEVELOPMENT

Physical capital	“Mobility and Energy” Creating high quality buildings ensures PHYSICAL VALUE is increased where buildings and infrastructure project an image of design for longevity and allow people to navigate easily on foot/by bicycle.
Social capital	“Placemaking” By enabling community identity, SOCIAL VALUE is increased where a great place brings people together and creates a community.
Economic capital	“A new economic hub” By ensuring equity for all, ECONOMIC VALUE is increased where all users of a place feel they have a level of ownership of the asset and buy-in to the outcomes it is seeking to achieve.
Human capital	“Healthy people” With a focus on people, HUMAN VALUE is increased where quality and longevity of life is improved, and happiness is increased.
Natural capital	“Enhanced natural environment” By seeking to achieve positive gain, NATURAL VALUE is increased where existing quality is protected, and new complementary resources are introduced.

Figure 2: Proposed framework for sustainability – Creating value.

2. Physical - Achieving net zero carbon.

2.1 Why it matters.

A development is much more than its buildings, but the buildings are the foundation upon which a community is built. The buildings will outlast most people, creating a lasting legacy of which residents and workers who have shaped the community can be proud.

Ultimately, sustainable development must enable value creation by building transport infrastructure, workplaces, and high-quality homes which are commensurate to the context of the development site and surrounding areas. It is this physical capital which unlocks the creation of value in other capitals, facilitating communities of comfortable, content, and cooperative people to emerge, experiencing an equity of opportunity and the ability to thrive alongside and within a diverse natural environment.

Set against this are warnings in the Intergovernmental Panel on Climate Change pivotal report, Global Warming of 1.5 °C report which shows that current commitments by the Paris Agreement signatories will be insufficient to prevent the world's average temperature rising 2 °C above pre-industrial levels. Scientists in the report are clear: we have a decade to radically alter our current trajectory and embark on a more sustainable path or suffer the most devastating impacts of climate change. Avoiding climate tipping points will require rapid decarbonization across the world by 2030, uniting people, businesses and governments.

Transport is a significant contributor to the UK's greenhouse gas emissions, accounting for 27% of emissions in 2018. This highlights the need for focus on decarbonisation to be holistic, considering both how emissions can be reduced from buildings – through good fabric and efficient building services, and renewable generation – and vehicles, doing everything possible to encourage a shift to sustainable modes. This section outlines BRC's current efforts and future intentions to mitigate climate change.

2.2 What will BRC do.

An energy strategy for the future

Approach

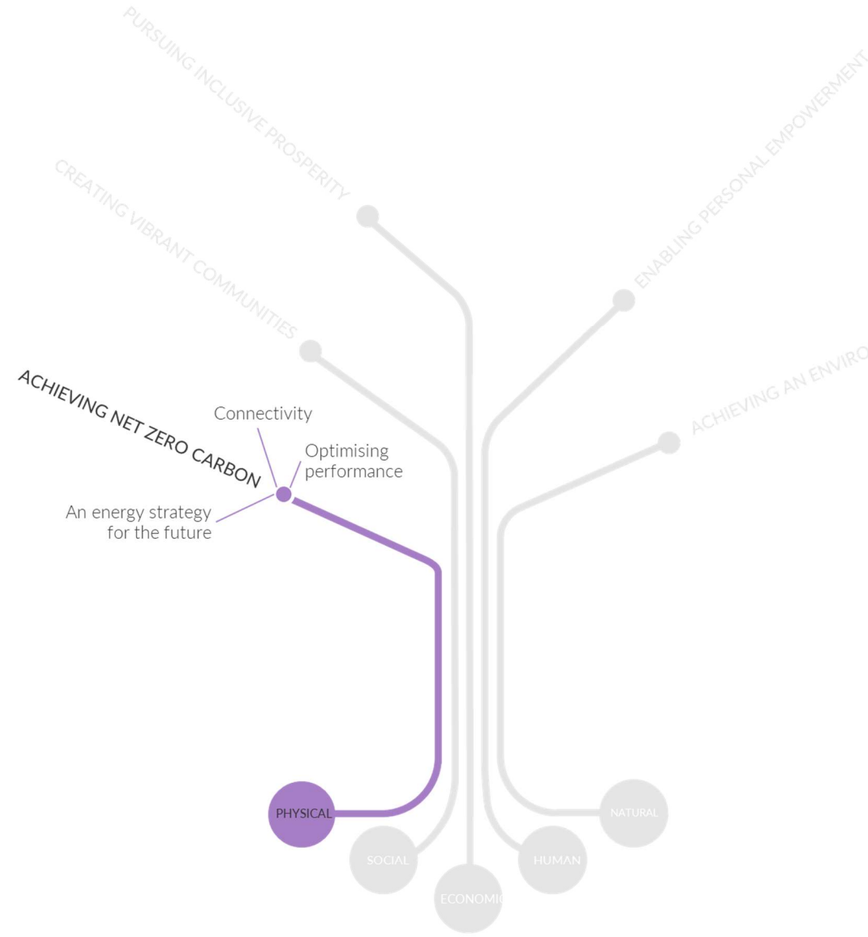
The energy sectors in the UK have seen a dramatic change over the last ten years and are likely to remain subject to great dynamism in the coming decades. The consequences of servicing non-residential buildings and homes without an eye on the future are plain to see in developments across the UK. In contrast, a forward-looking and flexible energy strategy is presented in Appendix A: Energy strategy.

Noting the historic and future projected decarbonisation of grid-supplied electricity in the UK and the government's intention to effectively ban the installation in gas boilers in new homes (and potentially other new buildings) from 2025, progress and policy are driving a shift to electric heating in the UK; this would provide wide-reaching benefits both in terms of greenhouse gas emissions and local air quality by avoiding the local burning of gas.

We have approached the emerging energy strategy using the energy hierarchy; prioritising reducing demand, before supplying energy efficiently and innovatively, and finally deploying renewable technologies. Servicing of new buildings will focus on providing efficient systems which look to minimise demand on the grid, consequently minimising both CO_2 emissions and the cost of operation to tenants and residents. Finally, aligning with the principle of community and stewardship, BRC will explore strategies for providing tenants with the necessary information and guidance to procure green tariffs.

Passive design and energy efficiency

New buildings would be facilitated to reduce demand for energy as far as possible. This could be achieved by deploying building fabric with a high thermal performance, built to rigorous standards to minimise heat loss and favoured approach to reduced building energy demand. Designing with commensurate proportions of glazing could also be sought, balancing the need for good daylight and beneficial solar gain in winter against the need to reduce heat demand and to mitigate the risk of summer overheating in a warming climate.



Better fabric and construction will result in buildings which are more air-tight and this benefit must not come at the detriment occupants through poor internal air quality. Solutions such as mechanical ventilation with heat recovery (MVHR) would be explored to mitigate this risk for homes. MVHR will be provided to offices, and science and research buildings where appropriate, potentially utilising a mixed-mode strategy, enabling free cooling in the spring and autumn. The optimum ventilation solution for each building will be set out during its detailed design.

All-electric servicing strategy

The emerging strategy proposes an all-electric approach to servicing. The carbon intensity of grid-supplied electricity in the UK has reduced by almost 70% since 2012 and is projected to continue decarbonising to be zero at some point in the mid-2030s, according to National Grid projections. By leveraging this continuing decarbonisation, new development at BRC would be low carbon on day one, reducing to net zero carbon emissions when the electricity grid becomes zero carbon by the mid-2030s.

The emerging strategy proposes all homes and buildings utilise electric heat pumps, which allows the generation of heating, hot water, and cooling (where required) at very high efficiencies of 250% or more. This has multiple benefits including reduced carbon emissions, lower energy bills, and minimising the strain on the local electricity grid.

Renewable generation

Efficient electric systems can be complemented by renewable energy generating technologies such as solar PV. By generating zero carbon, renewable electricity on site, demand from the grid can be offset, potentially reducing the strain on local infrastructure grid and reducing the Campus's carbon footprint. This approach has been leveraged to good effect in recent years by installing PV arrays on available roof space.

As well as exploring and encouraging deployment of solar PV at the building-level, a strategic-scale solar installation is being explored in the zone south of the river, with the potential to supply significant quantities of zero carbon electricity to homes and buildings within the Campus. These will be pursued if technically feasible and viable, and if the impact on the surrounding environment can be mitigated to maintain the rural and heritage setting. Appreciating the dynamism and rate of technological progress, the approach to renewables deployment would remain flexible to alternate and emerging technologies. However, the emerging all-electric strategy is best complemented by electricity-generating technologies and solar PV is recognised as the most economic, lowest impact, and minimal maintenance solution currently.

Pathway to net zero carbon buildings

Whilst the buildings of BRC may not achieve net zero carbon operational emissions on day one, with electricity now lower carbon than gas and projected to improve to net zero carbon by the mid-2030s, homes and buildings serviced entirely by electricity will be low carbon today, demonstrating a clear route to net zero carbon in the next 10-15 years, in line with the UK's legally-binding obligations to decarbonise and stakeholders' target of net zero by 2040. Where residual emissions result from fossil fuel energy use, these will be offset. This approach gained considerable traction in recent years as offsetting provides a mechanism by which organisations fund schemes elsewhere that seek to either avoid additional emissions or remove carbon dioxide from the atmosphere and claim the carbon benefit.

There is currently no legislation or regulation regarding which types of offset, or which specific products must be purchased in order to declare a net zero emissions status. However, guidance does exist in terms of the best practice principles that should be followed for robust offsetting, developed the UK Green Building Council and BRC will adopt these principles in the development of the Campus.

Connectivity

Shift to sustainable transport modes

Recognising the need to decarbonise the transport sector, BRC will continue to encourage a shift to sustainable modes through local solutions in consultation with Transport for Cambridge.

First and foremost, this means facilitating and encouraging people to walk within the Campus and to cycle to work as much as possible. This is achieved both by making cycle and pedestrian routes safe, easy and inviting, and making these routes more convenient than driving.

Steps have already been taken to enable this, investing in local cycle routes and other on-campus measures. BRC provided land for the Council to put in multiuse permissive rights of way for the popular 10 km Campus to Cambridge cycle route. E-bike chargers are planned and cycle clinics have been run for several years to support cyclists.

Walking and cycling demonstrate a number of co-benefits beyond reductions in greenhouse gas emissions, including cleaner air and quieter streets; active modes of travel promote healthy people rather than being isolated and inactive within cars.

For those journeys for which active modes are inappropriate or for people who are unable to walk or cycle, an effective and affordable public transport network helps in avoiding the need to travel by private car whilst maintaining people's mobility. The public bus Route 13 stops at either end of the Campus, encompassing the area between central Cambridge and Haverhill. In addition, the Campus car share scheme has begun to move drive away from single car use.

The transport strategy also remain flexible to future transport innovations which enable zero carbon connectivity.

Electric vehicle charging

Whilst and facilitate sustainable modes will be encouraged as far as possible, the context of the site will necessitate some level of travel by private car. To mitigate the impact of this need, the transition to electric vehicles would be eased through design by ensuring local infrastructure provision is sufficient to accommodate the power demands of the future uptake of EVs. It will also require appropriate charging infrastructure, building upon current provision.

Digitally enhanced lives

Connectivity encompasses not only physical but also digital connectedness. With flexible working patterns expected to become increasingly commonplace, providing modern digital infrastructure as a means for creating an attractive and desirable location is another key priority.

Currently, all commercial buildings connect to the Campus network (BICS network), whilst tenant buildings also include provision for external fibre. As with current housing, the intention is to connect future homes in The Close to the fibre network in the adjacent village of Babraham.

By providing employment space and key amenities on site, internalising trips is also a key tenet to cutting transport emissions. By avoiding people needing to leave the local area, further private car use can be avoided.

Optimising performance

Building aftercare

Building a sustainable development is not finished when construction is complete, and ongoing support and monitoring helps to ensure the design intent is realised.

Post Occupancy Evaluation has proved an effective tool in the existing estate to ensure that new buildings are operating as per the design intent and in line with visitor and occupant expectations.

Commissioning is prioritised, evaluating HVAC systems and operational controls whilst embedding good energy management principles (all buildings are currently operated via PPM regimes using SFG20 standard for optimal plant and systems maintenance). The following principles will be incorporated:

1. Ensure good training and transfer of Knowledge
2. Ensure the commissioning program is not compressed
3. Recognize that testing unoccupied is not typical

4. Ensure that systems are tested to their limits
5. Ensure that there is seasonal testing

Metering

In order to undertake data-driven, focused and effective net zero action, quality of data is paramount. As part of developing the strategy, the intention is to incorporate automated meter reading systems to understand energy use and patterns at a granular detail (all buildings currently are run and operated from a centralised BMS system). This will allow building energy consumption to be optimised and intensity reduced over time, especially as building uses evolve.

Flexibility and adaptability

For the physical infrastructure of a development to be sustainable, it must have longevity and be appealing on day one. The long-term success of the buildings is reflected both in their physical condition – ensured by high quality, resilient materials and robust design – and their ability to support a population of happy and healthy occupants – delivered through human-centric approaches to masterplanning and building design. The long-term success of transport infrastructure is guaranteed by its ability to adapt to emerging trends, whilst facilitating safe, active, accessible, and affordable sustainable transport options.

The approach to developing the site is to enable flexibility, not prophecy; creating a development with sight of what form the future may take, but avoiding locking it into one solution, one technology, or one way of living. Ensuring buildings, road networks, public realm, and community facilities are flexible enough to adapt to changing demands in the future will ensure the Campus remains effective and desirable far into the future.

3. Social - Creating vibrant communities.

3.1 Why it matters.

BRC's is to be one of the leading locations in the world for bioscience discovery and research. The campus is a true catalyst for life-changing opportunities and offers the nurturing ecosystem that start-ups in biotech require to develop and grow out of the early stages of incubation, thus playing a pivotal role in societal and technological advances.

The proposed expansion of the campus is critical for enhancing the social capital on site, strengthening existing networks and facilitating the creation of new ones to enable the flow of ideas to be generated through formal and informal channels enabled by the concentration of highly specialised individuals and teams.

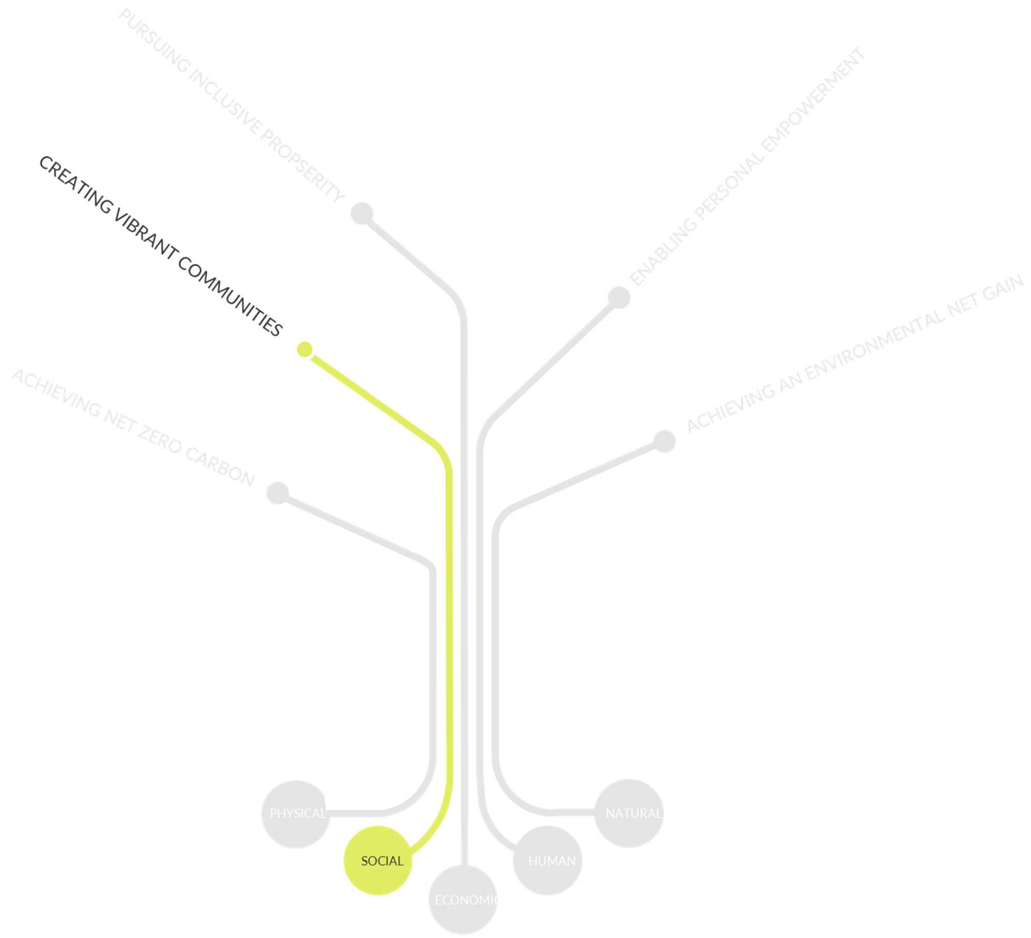
By applying best practice principles of design and masterplanning which respond to the specific local context and needs, BRC will operate optimally for the people who work on and visit the site and the surrounding area.

In addition to enabling the development of people and talent as part of the world-leading discovery bioscience research which takes place on site, the campus will also seek to create a sociable and vibrant place where early career scientists and entrepreneurs can also connect on a personal level thereby supporting community creation and mental wellbeing.

Moreover, the Campus will also seek to accelerate its own outreach work with the local community surrounding the site, encouraging tenants to get involved in volunteering activities where possible, facilitate learning and career development and engage with local schools and colleges to spark an interest in natural sciences in young people targeting areas of deprivation to maximise positive impact.

BRC will adopt a genuinely inclusive approach to placemaking and stewardship during the operational stage because this is an essential prerequisite for shaping well-integrated and self-sustaining communities. To create a sense of place, the Campus will offer outdoor spaces for tenants to organise events. It is envisaged that tenants will promote a range of activities in public space focusing on arts and culture but also nature, play and education as appropriate depending on the target audience.

The potential to open up some of these activities to the wider community will be explored to encourage interaction and draw in visitors from outside the campus to enjoy the public realm environment. This would simultaneously increase the overall value created by the site and contribute to the diversity and vibrancy of the site.



3.2 What will BRC do.

Accelerating knowledge and creativity

BRC is already a site of strategic national significance and the proposed development will only reinforce its ability to cultivate specialists essential to the UK and local social and economic development.

Strong performance of the companies based on site has generated a growing demand for additional floorspace coming from both existing and new tenants. There is a tangible risk of losing critical R&D capacity as businesses might look to relocate elsewhere (likely abroad given the unique profile of the campus) if their needs are not effectively met locally.

The Campus continues to be important for R&D in the biotech sector for both Greater Cambridge and the UK. The key differentiator for the Campus compared to other science and R&D centres in the country, however, is the support infrastructure it offers to start-ups.

In practice, there are insufficient alternative locations for biotech R&D start-ups in Greater Cambridge, or indeed the UK. The explanation for this is multi-faceted but it is largely associated with cost and commercial viability. The building of incubator facilities for start-up companies who often require small areas of floorspace on short term leases is typically less commercially attractive compared to larger and more established businesses.

In line with this, the proposed new office and laboratory buildings will be designed flexibly so that they can be adapted to facilitate the rapid growth of companies and smaller space requirements of start-ups and scale-ups, as required. A more flexible space offering is also anticipated to encourage vibrancy and promote higher levels of occupant diversity thus increasing the overall socio-economic value generated.

Knowledge growth will also be generated through the interaction and relationships between companies in this specialised sector at BRC. The proposed development will enable higher levels of collaboration and cross-fertilisation of ideas upskilling more people in the process thus also contributing to human capital growth and overall improvement in the quality of life of individuals and communities.

To support informal encounters and work environments, the proposed development will also explore the incorporation of outdoor office space as part of the public realm which can be landscaped more creatively to accommodate collaborative workspaces using solutions such as gradients like an amphitheatre.

Inclusive placemaking

Communities are the building blocks of a lively, interconnected network of services and relationships that enable places to thrive. Built assets should be designed, delivered and operated in a way that supports the strength of local networks and community groups, ensuring that local communities, workforce and the supply chain are supported and engaged with in a cooperative way.

There is an overwhelming consensus that simply constructing buildings in isolation is not enough. Thinking about the spaces between buildings is essential to help create a vibrant campus, where the connection between people and places is strong. A key priority will be to shape truly inclusive spaces which support the development of active, healthy, and inclusive communities.

Apart from the additional employment space, the introduction of new and affordable housing is proposed, built to Cambridge healthy homes standard and resilient to climate change. Building new homes on site will contribute to the creation of a healthier, more sociable and interconnected local ecosystem integrated through work connections.

The site has embraced key principles of inclusive design relating to the provision of suitable means of access for all people. BRC seek to ensure that people can make use of all relevant facilities, not only as spectators but also as participants who actively shape and continuously co-create the place to foster a genuine sense of place.

New open space will be provided on-site to meet the needs of residents, particularly children and teenagers, as well as workers addressing local deficits. This will enable a stronger connection to nature and enhance the natural incentive for casual encounters on the campus bringing about opportunities to grow personal relationships and networks in a more spontaneous and less formal fashion.

There is already a great breadth of campus users who are all committed to attracting and retaining the best talent irrespective of their background which will further reinforce the site's commitment to equality and diversity.

The Campus will seek to limit travel organically through the delivery of essential social infrastructure and amenities (e.g. a new shop) within easy reach bringing activities to the site. Convenient access to a range of social services and facilities will incentivise social interaction and active travel with a co-benefit of curbing carbon emissions.

The proposed development will be designed to provide employees with a range of opportunities appropriate to the working day for social interaction and engagement with the campus and wider community. More childcare capacity for employees at the popular onsite nursery is likely to be available in the future given the place allocation policies which favour BRC workers.

BRC will seek to activate public spaces with events and activities (arts and culture, nature, play, education, etc) whilst also enabling organic temporary and meanwhile uses to constantly evolve in response to demand. Outdoor spaces will also be provided for companies to hold ad hoc events on site as a team building exercise.

While community access to the Campus is restricted due to the sensitive nature of the R&D activity on site, consideration will be given to opening up some of the social events to the wider community in Greater Cambridge to draw in people to enjoy the public realm environment. This would contribute to the vibrancy of the place and also increase the overall value created by the site.

Empowered local voice

Community engagement is inherent to the wider placemaking approach. BRC have embraced the ideas of engagement with tenants and the wider community as a long-term, evolving, learning and sharing process that will go beyond the planning stage.

The primary beneficiaries of social value should be those most impacted by an action or intervention. In the context of the built environment this typically means the people local to a development site or infrastructure asset and the people in the associated supply chains. When translated to the BRC re-development, this means the existing and prospective businesses on site and key supply chain stakeholders. However, given the strategic significance of the campus, it could be argued that the needs of the population of Greater Cambridge and even the UK as a whole may need to be considered.

Effective community engagement is key to stimulating spontaneity and organic growth. BRC engaged in a genuine consultation exercise with planning officers and invited honest feedback from the local community as part of an open dialogue on the design of the proposed new multi tenanted office and laboratory building (to be known as B960). This resulted in changes being made in terms of access, design features and its impact on the wider landscape. Further details are provided in the Planning and Consultation Statement, with engagement on the wider scheme planned in due course.

In addition to the co-creation of ideas at design stage, there is also a key role to be played by management and stewardship of places once built. Placemaking is an ongoing process that doesn't end once a place is 'made'. Effective design and planning consider how the place will be used and managed over time as well as how it will respond to change. Local communities could be empowered to take on parts of the stewardship of suitable elements of public open spaces and/ or community facilities on site to help the site interact more effectively with its surroundings and foster a sense of belonging. Creating and promoting local social activities, building on existing initiatives such as the cricket club, is another measure planned to bring people together.

Volunteering and other forms of civic engagement including, for example, continuing the tradition of giving site tours and reaching out to local schools to support STEM outreach activities, such as school's careers events, science fairs, employability skills sessions, and STEM talks, is another key strand of the continuous community engagement strategy envisaged for BRC to be delivered in partnership with tenants.

4. Economic – Pursuing inclusive prosperity.

4.1 Why it matters.

Realising economic value unlocks value creation across all capitals, enabling positive, sustainable, and equitable growth and prosperity. BRC seek to create economic value as a developer and for all those who will live and work at the Campus. They have already established a cohesive community of life science companies looking to start and scale up their operations, providing flexible offices, laboratory space and amenities. The creation of local, quality employment via development is one of the most immediate economic benefits which could result from site allocation.

This is an extension of their current business practice, in which they promote direct employment and create opportunities for local companies. By recognising the value that placemaking has, a long-term financial return is ensured. This includes investing in infrastructure, local amenities and quality spaces as envisaged for BRC. Measures being considered to continue to translate development at BRC into tangible, local economic benefits as they have done successfully in the past are outlined below.

4.2 What will BRC do.

Circular economy
The construction and operation of the built environment consumes 60% of all materials in the UK. Designing for longevity and adaptability and maximizing the use of recycled and renewable materials could reduce greenhouse gas emissions while increasing innovation opportunities and economic growth. Current thinking on the circular economy is encapsulated by the diagram below:

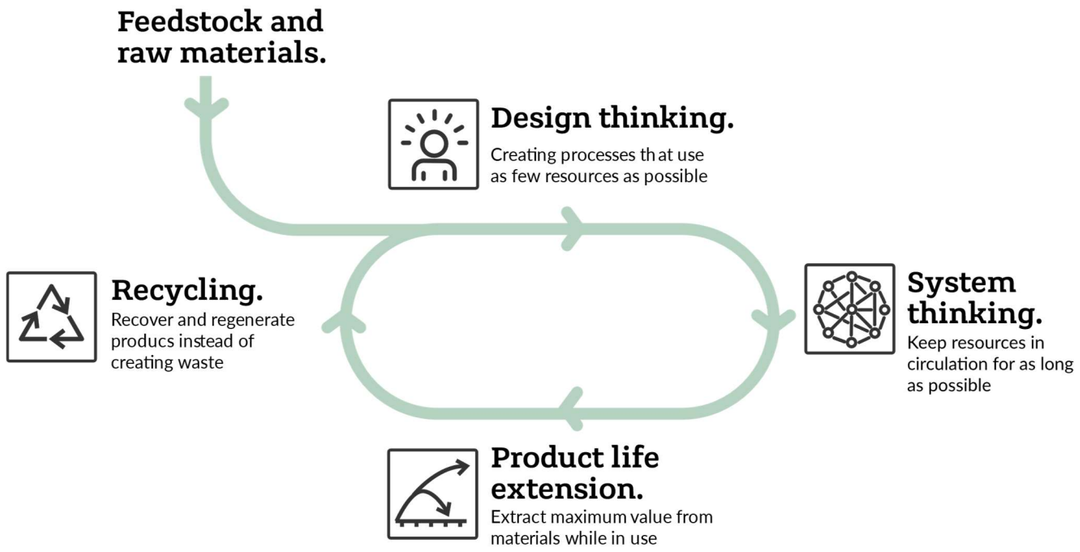
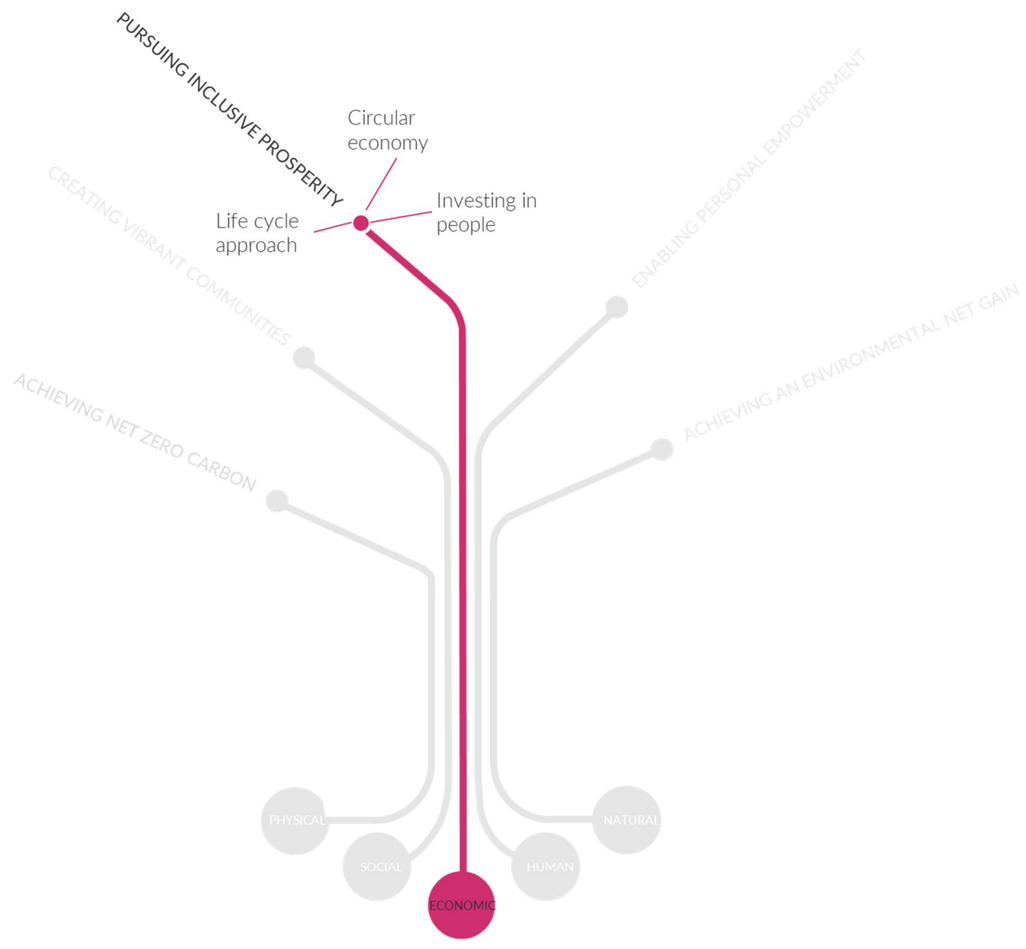


Figure 3: Simplified graphic of the Circular Economy highlighting the key components of the principle of circularity.

By considering the carbon emissions of a development from a whole life perspective, design decisions can be made to not only minimise embodied carbon in construction but result in a development which reduces resource consumption throughout its lifecycle.

The key principles of disassembly, re-use and adaptability will be adopted to enable the efficient use of natural resources during the whole asset lifecycle. Responsible material sourcing aligned with industry best practice will promote the use of low impact new materials, recycled content or secondary materials to deliver value outcomes through the whole supply chain.



This is an extension of the Campus's current approach to increasing asset lifecycles; furniture is already reused by offering it to other organisations. By applying the principles of circular economy to the construction process, maximising the proportion of reused and recycled materials used in construction and minimising the amount of waste sent to landfill, the embodied carbon impact of development can be reduced. During operation, residents will be facilitated and encouraged to recycle to minimise waste sent to landfill. Tenants are able to use communal scientific equipment and take advantage of the embedded expertise required to operate the more complex equipment.

Investing in people
Investment in people is a key tenet of the Campus, creating direct well-paying jobs to oversee and manage the Campus, whilst providing the necessary business environment to sustain and enhance Britain's flourishing life science sector.

Construction
Considering the long-term economic impacts of the expansion of BRC in the context of the local area is essential. It will enable sustainable growth in Cambridgeshire through the creation of new full-time equivalent jobs during construction and other opportunities for harnessing local talent. This includes implementing measures such as a procurement strategy which gives priority to local suppliers, particularly small- and medium-sized (SME) businesses, leveraging relationships with local construction contacts to maximise procurement from the area. Offering apprenticeships that prioritise local people, contributing to upskilling the community, will be pursued where possible.

Stewardship
BRC employ robust management regimes focussed on long-term stewardship. This involves direct employment, in the facilities, estates security, and management teams along with promoting the employment of people locally, at all levels, including apprentice and placements. Any training opportunities created during expansion will continue to be advertised locally, contributing to upskilling the community.

Life science
Launched in July 2021, the *Life Science Vision* sets out the government and the life science sector's plan to create a thriving industry and to tackle the major causes of death and disease. BRC already have a strong record of creating new jobs in the sector, supporting start-ups in the high risk-high reward research and development they undertake.

To keep up with demand for both wet and dry lab space in Cambridgeshire under the agile terms that emerging life science start-ups often require, BRC intend to increase the number of buildings on the Campus.

The Campus's new science and research buildings will enable them to continue to host early stage and growing bioscience companies and will leverage the co-location with the Babraham Institute to further enhance the community of like-minded businesses. This ecosystem facilitates the commercialisation of scientific research, allowing company growth, innovation and investment, to bolster Cambridgeshire's world leading life science cluster.

Life cycle approach
To establish cost effective construction, at both early design and detailed design stages, conducting life cycle cost analyses has proved BRC's favoured approach to quantify the economic benefit and costs savings that could be made for different construction methods, life cycles and cash flow scenarios.

The whole life cost, i.e. the combination of the capital, maintenance and operational costs informs the design and decision making, helping to achieve the following:

- Lowest possible building energy consumption over the operational life span of the building (compared to other options/alternatives analysed).
- Significant reduction in maintenance requirement/frequency.
- Prolonged replacement intervals of services infrastructure/systems or building fabric.
- Dismantling and recycling or re-use of building components.

The Campus utilised this approach to inform design and decision making of previous development.

5. Human – Enabling personal empowerment.

5.1 Why it matters.

Understanding of the impact of the built environment on the health and wellbeing of occupants is increasingly well documented and people now expect to live and work in an environment that facilitates high levels of mental and physical wellbeing.

Factors affecting physical health are more predictable and can be addressed using established principles of good design. Those affecting mental wellbeing are more nuanced, but by ensuring that the development provides a diverse range of opportunities within an environment which is comfortable and facilitates social cohesion, BRC will continue to cultivate self-worth and confidence as it already does across the Campus.

The promotion of physical activity, active living and maintaining good mental and physical health are central to the idea of cultivating human capital. Research shows that regular physical activity not only improves fitness but can also have a profound positive impact on health and well-being including reduced risk of chronic diseases such as cardiovascular disease and type 2 diabetes, and better mental health and wellbeing.

Strategies which embed health and wellbeing at the earliest stages of design ensure the most robust, reliable, and sustainable outcomes.

5.2 What will BRC do.

Healthy buildings

People are increasingly aware of their own health and wellbeing and contribution (or detraction) their home and work environments can have in the pursuit of leading happy and comfortably lives.

Environmental factors

Air quality is a critical determinant of health and poor ambient air quality is the number one cause of premature mortality worldwide. In the U.K. long-term exposure to air pollution contributes to between 28,000 and 36,000 deaths per year.

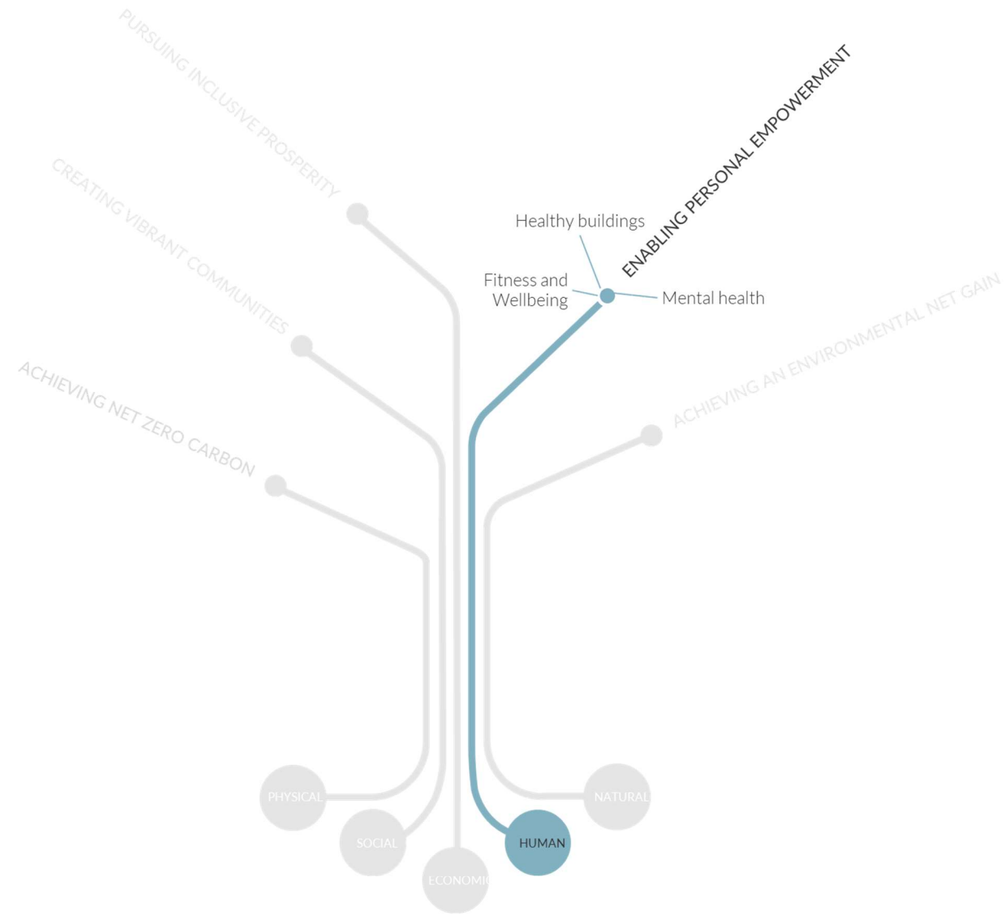
In the case of BRC, the nearest road, A1307, is separated by a significant tree belt and the A11 is a significant distance away, again with large areas of wooded landscape between BRC and it. The buildings have low emissions and the 20 mph speed limit on Campus reduces noise significantly. Combined, this reduces the pollution impact of roads on the Campus.

Best practice dust suppression measures would be explored during the construction phase to minimise detrimental impacts on construction workers and local residents and tenants. This represents a continuation of current activities, whereby BRC applies methods to reduce impact of construction activities and campus activity as a whole.

The energy and transport strategies are key to mitigating these issues; zero emission heating systems during operation, encouraging a shift to active modes of travel, and facilitating a transition to electric vehicles all form part of the emerging strategy to be taken forward.

In tandem to mitigating the impacts of construction and operation on external air quality, indoor air quality is also of paramount importance to the health and wellbeing of occupants and visitors. It has been shown that good indoor air quality can lead to increases in productivity of up to 11%. This will be achieved by specifying low VOC level products for interior finishes.

In response to these environmental risk factors set out above, BRC currently utilise best practice environment assessment methods such as BREEAM to secure sustainable outcomes. Other environmental factors affect the experience of public areas. Local microclimate, including wind, solar radiation, noise, and local thermal comfort will be considered when designing key areas of public realm.



Overheating within homes and buildings is a key consideration in a warming climate and the need to decarbonise will not come at the expense of providing comfortable buildings. Thermal comfort contributes significantly to an individual's perception of the quality of a space. However, it can vary depending on the amount of clothing people wear in different situations, and the extent to which a person is active.

BRC understand the risk of overheating, adhering to best practice industry guidance, designing and testing key areas at risk of overheating in accordance with CIBSE Guide A / CIBSE TM52: Avoiding overheating in European buildings.

Construction/phasing

If not managed sensitively, construction can be a disruptive time for both the existing BRC buildings and new residents as later phases are built. Ensuring best practice construction methods as BRC has done on all its previous projects will foster a culture of safety and action to address key issues which may arise, including environmental impacts and social nuisance

Safety and security

The safety of residents, employees, and other visitors to the site is of paramount importance and design can heavily influence both their objective and perceived security.

BRC already carry out a security needs assessment for new buildings, recognising the need for bespoke measures to be embedded within the design, whilst drawing on the benefits of measures such as CCTV and patrols. In this way, the systems are well established and underpinned by extensive technology and the experience of the in-house security team.

Fitness and Wellbeing

Active and healthy population

By encouraging people to walk and cycle, the local population and work are and will continue to be facilitated to be physically active. Sport England's '10 Principles of Active Design' reflect the importance of embedding an active lifestyle at the heart of placemaking and masterplan design and provide guidance on how most effectively to achieve this. Around two-thirds of Cambridge adults carry excess weight; creating opportunities for regular exercise will be critical to mitigating this issue.

Complementing the emphasis on physical activity, BRC ensure all regular building users have access to free drinking water and provide public water fountains that allow water bottle refilling.

Daylight

Good lighting is critical to health and wellbeing and occupant satisfaction. The need for and benefit of daylight varies by end use. This will inform the approach and, where feasible, the design of buildings with space uses where daylight access is deemed beneficial would seek to achieve good practice daylight levels whilst also considering the impacts of excessive daylight exposure i.e. glare.

Green space

The benefits of access to green space are well founded and most desire to live within and near to quality green infrastructure. The co-benefits of high-quality green and blue infrastructure are vast. It helps to mitigate flood risk, improves air quality and provides habitat for wildlife. Green space is most effective when it forms part of an integrated community and ecology strategy. The government recognises the importance of the access to green space in enhancing beauty, heritage and engagement with the natural environment in its 25 Year Environment Plan.

BRC place an onus on providing a network of high quality, permeable, well connected and accessible green spaces for the benefit of both the local community and wildlife. The result is that a significant provision of enhanced open space providing long-term environmental and social benefits. All of the existing buildings are connected by footpaths to the extensive green spaces, creating opportunities for structured and unstructured walks.

Mental health

BRC seek to deliver healthy buildings which facilitate high levels of mental and physical wellbeing.

For directly employed Campus staff, they have mental health first aiders who have been trained to spot the crucial warning signs and symptoms of poor mental health and to provide help and signposting support on a first aid basis in the same way that a physical first aider is there to help with poor physical health. Interactions can range from an initial conversation to support getting professional help.

BRC have also hosted seminars on mental health (e.g. Mindfulness, Stress Management) that are open to all.

As set out under social capital, communal work areas, open space, and informal 'corridor conversations' allow chance discussions between those who work at BRC. More formal events also bring people together on Campus and with the wider community.

Mental wellbeing is a priority outcome for new and existing development at BRC.

6. Natural – Achieving an environmental net gain.

6.1 Why it matters.

Over the last 50 years the natural world has been degraded at an unprecedented rate. Biodiversity loss and ecosystem collapse represent one of the top five threats facing societies, businesses and economies over the next decade. The built environment has contributed to this through the clearing of habitats and the extraction of construction materials. Sprawling urban development has historically encroached on natural environments pushing away and isolating nature from the places where we live, work and play. The campus presents an opportunity to integrate with nature, making use of the benefits it can provide.

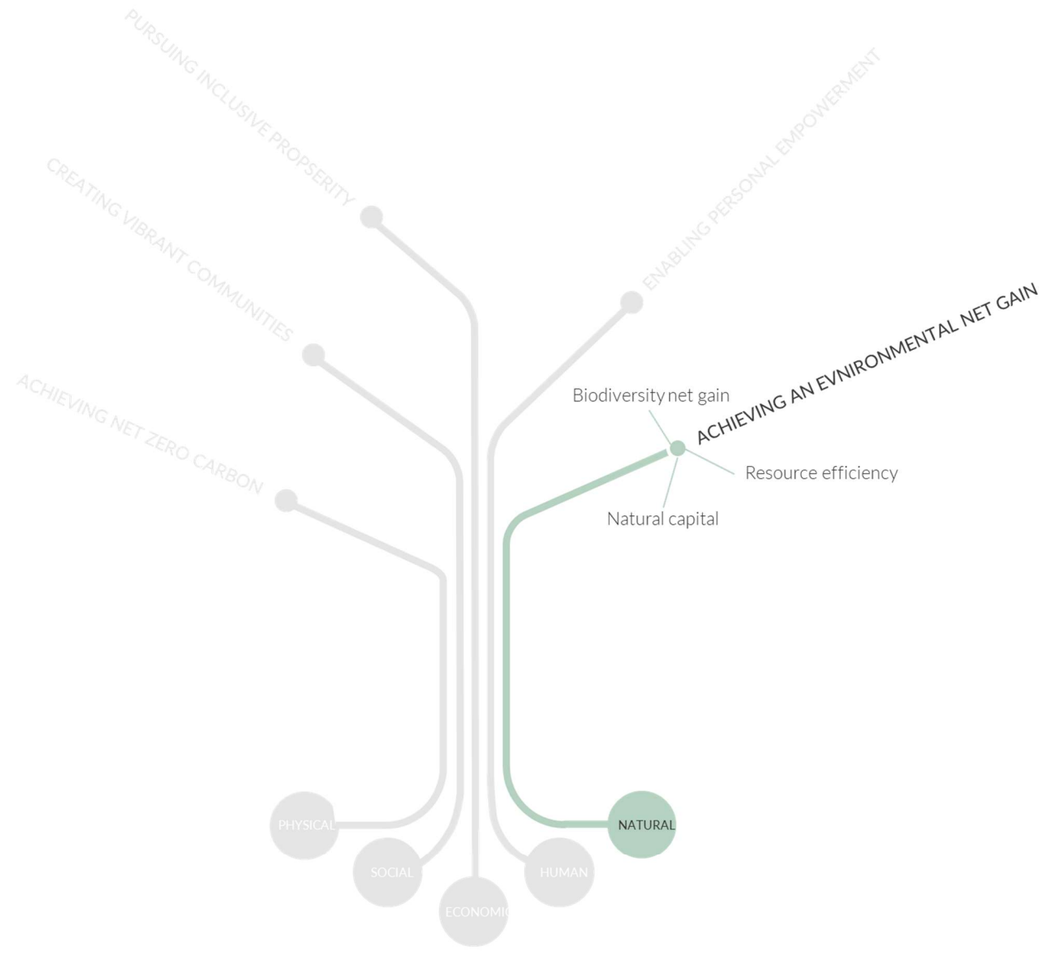
'Environmental net gain' is a term used to describe improvement to all aspects of environmental quality. Achieving this means first creating a biodiversity net gain (the variety of living things) and then going further to achieve increases in natural capital (the natural systems which provide a direct resource to us). The term is used within the Governments 25 Year Environment Plan, in which it sets out their objective to embed this into policy.

Nature-based solutions are a means of delivering both a biodiversity net gain and natural capital. They are the application of nature which creates environmental, social and economic benefits. Specifically, they are actions that involve the protection, restoration or management of natural and semi-natural ecosystems; the sustainable management of aquatic systems and working lands such as croplands or timberlands; or the creation of novel ecosystems in and around cities. They are actions that are underpinned by biodiversity and are designed and implemented with the full engagement and consent of local communities and Indigenous Peoples. Their use in masterplan developments can lead to financial opportunities including unlocking new revenue streams, delivering public environmental goods, increasing customer engagement and lowering operational costs.

When accounting for the provision of public goods and non-monetary benefits, using nature-based solutions over traditional grey infrastructure can often be more cost effective. The financial value of ecosystem services in the UK is £958 billion according to The Office for National Statistics, and Defra predict the value of nature to increase over time as:

- Demand for the benefits heightens
- The impacts of climate change intensify
- The user base increases through population growth
- Nature becomes scarcer in abundance and distribution

Nature-based solutions can be used as a multifunctional mechanism to connect and deliver on strategic objectives. BRC will maximise the creation of environmental, social and economic value which supports the investment and long-term integration of biodiversity in masterplanning using the services nature-based solutions provide. See Appendix B for the Nature-based solution strategy.



6.2 What will BRC do.

Biodiversity net gain

A priority for BRC's approach to nature is, in the first instance, retaining the existing ecological value such as the flood plain which provides flood alleviation and locks up carbon. Overall, Campus expansion will enhance ecological value by delivering at least a 20% biodiversity net gain (BNG) in line with Natural Cambridgeshire's Vision of doubling the nature conservation value of the area by 2050 . This will consist of wider enhancements to the campus, including improvements to the river systems, planting new trees and improving the quality of the woodlands. Biophilia will be used to bring nature indoors where practicable, enabling the buildings to actively engage occupants, improving their mental wellbeing, productivity and enjoyment of the space.

The development works of the buildings will result in the loss of chalk grassland in two areas (RD2B – 960, RD3 partially and not as a result of housing development), a high value habitat type, particularly for drainage. Mitigation measures previously employed include enhancing the remaining chalk grassland, expanding it through an eastward extension or replacing it through a green roof.

The species supported through the masterplan will prioritise those native to the UK but also consider future climate scenarios and local priorities, ensuring their longevity and value is retained. For example, maximising the use of more drought tolerant species and those that can tolerate chalk soils such as xerophytes.

The onsite biodiversity will be further enhanced by planting a mixture of woodlands and shrubs. This will establish new habitats and create habitat corridors, strengthening the resilience of the native populations such as bats and birds who could use the corridors for commuting and foraging. The developments impact on bats and other nocturnal wildlife will be further mitigated by reducing the level of artificial light. The added benefit of these methods will be carbon sequestration, carbon storage and reduced energy consumption.

Invertebrate and bird species will be supported by maintaining annually rotovated 'arable flora' strip c2-5m wide along all arable margins and to not apply broad-leaved herbicide within this zone. Biodiversity will be enhanced further by continuing to use composted material on grassland and restricting herbicide application to spot-spraying nuisance weeds. This will increase floristic and faunal diversity as well as increasing local pollinators and therefore agricultural yield.

To ensure the ecological value created is retained BRC will monitor and maintain the habitats throughout the asset's lifetime through an ongoing Landscape Management Plan.

Natural capital

It is planed is to mitigate flood risk through the creation of additional flood plains and flood scrapes. Whilst there is a low chance of flooding (Flood Zone 1), climate change will result in more frequent winter rainfall and flooding events. Nature provides an effective mechanism for rainwater drainage and filtration, taking it up, storing it, removing pollutants and creating soil stability. Onsite opportunities include restoring the minor watercourses to a more meandering profile; reinstating shallow foot-drains; restoring lost ponds; and re-wetting the grazing marsh. These approaches would increase water retention and encourage peat formation which can act as a carbon store. Additionally, by introducing new systems such as SuDS (Sustainable Drainage Systems). street trees, a green roof and green walls the water management capacity of the site could be further enhanced. SuDS enabled street trees could manage rainwater flow around access roads, car parks and walkways. Where deemed technically and financially feasible, onsite water management could be further supported through a chalk grassland roof, which could collect and store rainwater. The collected water could then be used for non-potable purposes such as toilets and irrigation.

Green roofs, walls and street trees will also be considered on a case-by-case basis where viable to cool the building and surrounding area through shading and the process of evapotranspiration. Street trees for example reduce the surround air temperature by 3^{o}C on average. This application will reduce the risk of building occupants overheating during the predicted hotter dryer summers. The installation of green walls will have the added benefit of reducing heat loss during the winter, subsequently reducing operational emissions. The green walls will utilise species accustom to growing on cliff faces inherently making it a defining resilient natural feature of the development.

Trees and woodlands created onsite will have the functional benefit of sequestering carbon, credits for this can be attained once the trees mature, this could form part of a long-term carbon management strategy. The green space south of the river is publicly accessible to maximise benefits to mental and physical wellbeing. These benefits could be elevated by integrating edible plants which would allow the building users to directly interact with the natural space.

Resource efficiency

BRC could recalibrate their approach to resource use to overcome the environmental impacts, lost value and embodied carbon associated with waste. To do this circular economy principles will be embedded into the construction, operation and deconstruction of the development by designing out waste. Initially sustainable, responsibly sourced materials that are reused, recycled or locally sourced will be utilised where possible. To further support waste reduction during the operation of the campus waste will be recycled including food waste. The compost created from the food waste could then be used to support onsite planting.

To prevent materials losing value and depreciating opportunities to buy and sell materials and products for reuse will be maximised. This could be done through future contracts whereby the exchange of products and materials are arranged whilst they are still in use. To support this process materials could be recorded and tracked using Building Information Modelling (BIM) or blockchain technology to create material passports. This ensures the resource value is retained and its lifespan extended both contributing to revenue generation and cost savings.

To help alleviate future water scarcity the masterplan will maximise the use of fittings which reduce water consumption with a target consumption of <100 litres/person/day for residential units. Rain water harvesting will also be implemented where possible to reduce the demand of potable water.

Appendix A: Energy strategy.

Executive summary.

The Energy Strategy will identify opportunities to reduce carbon dioxide (CO_2) emissions and optimise energy efficiency within the masterplan. The energy strategy will be developed using a 'fabric first' approach through the Be Lean, Be Clean and Be Green energy hierarchy to maximise reduction in energy through passive design measures in the first instance.

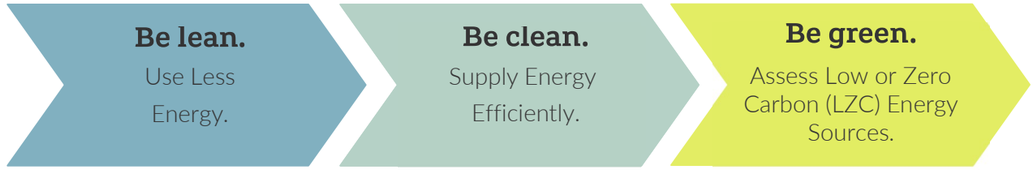


Figure 4: Energy hierarchy.

Emerging building regulations

The direction of travel of England's Building Regulations favours an electric servicing strategy and will drive a transition away from the de facto gas boiler approach over the next 5 years, with gas heating likely to be banned outright in new homes from 2025. The proposed strategy responds to this trajectory and the fabric first approach set out in the Future Homes Standard consultation, aiming to leverage the benefits of progress made decarbonising the energy supply sector, with a clear path to achieving net zero emissions in future, in line with the 2050 target.

Be lean – Use less energy.

A form and fabric first approach will maximise efficiency of building layout and form, as well as the thermal performance of the buildings' envelopes. This could be achieved through solutions such as low U-values, air permeability and efficient glazing to minimise heat losses in winter and maximise coolth retention in summer months.

Be clean – Supply energy efficiently.

The emerging strategy proposes an all-electric approach to servicing the development. By leveraging the continuing decarbonisation of the national electricity grid, future development would be low carbon on day 1, reducing to net zero carbon emissions around the mid-2030s in line with 2040 target established with BRC stakeholders if the current grid scenarios come to pass.

It is considered that the density of the proposed sites is not conducive to the effective or efficient deployment of a site wide heat network or ambient loop, due to the proposed low density housing, mix of heating and cooling led buildings, and distances between buildings.

Electric batteries and other forms of energy storage would be explored to add resilience to the strategy and reduce the carbon emissions, by diversifying energy demand away from peak times and maximising the proportion of any renewably-generated energy which is consumed onsite.

Be green – Low or zero carbon energy sources.

The strategy will flexible to and respond to the most appropriate technologies present at the time of delivery. The emerging all-electric strategy utilises electric heat pumps to meet the heating and hot water demands of the development. Heat pumps allow the extraction of renewable heat from the atmosphere, ground, or water source, with electrical efficiencies of 250% or more. Air source solutions are being explored. A provision of solar photovoltaic (PV) panels generating zero carbon electricity would complement the strategy and maximising the deployment on buildings and in strategic arrays is to be explored on the site south of the river.

The energy strategy set out in this report will ensure any subsequent proposals for new dwellings and new non-residential buildings of 1000 m^2 or more will reduce carbon emissions by a minimum of 10% through the use of on-site renewable energy and low carbon technologies.

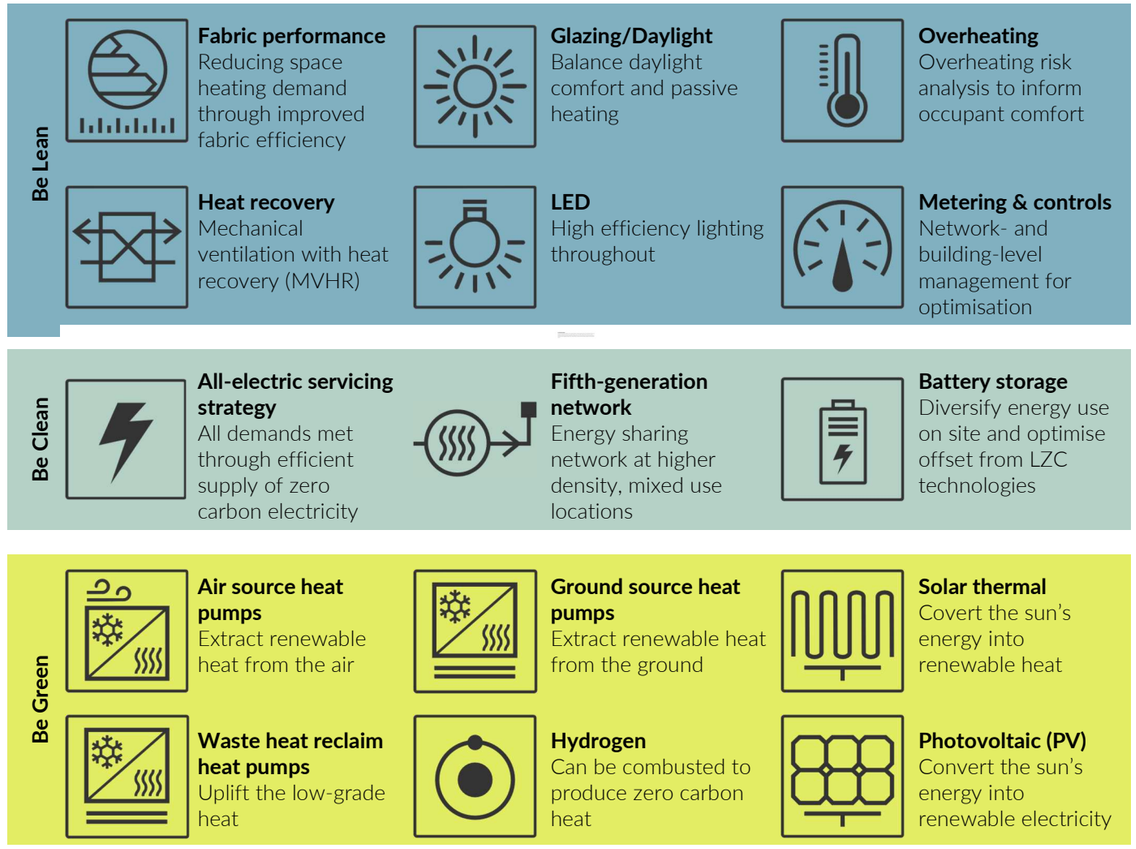


Figure 5: Technology options which could be explored for the masterplan.

Site context.

To provide some context of the climate affecting the proposed development site, both in the near future and at the middle of the century, information was extracted from the CIBSE future weather files.

The aim of this initial modelling is to provide information to the design team to effectively inform the site layout, approach to fenestration, building fabric specification, and deployment of renewable generation for the development.

Temperature

External temperature is the primary driver dictated heating and cooling loads for a development. Whilst these are predictable and relatively consistent year on year, climate change is having a tangible long-term impact which means that an understanding of the likely future climate is essential to designing an effective development.

Error! Reference source not found.The figure below shows the average monthly and maximum temperatures for Test Reference Year under the 2016, 2050, and 2080 high emissions scenario, fiftieth percentile (median) weather files.

From these, the warming anticipated is plain to see. Most evident in the summer months, the average monthly temperature in the area is anticipated to be between 1.3 °C and 1.9 °C warmer in the summers of 2050, increasing to between 2.7 °C and 3.6 °C by 2080.

Mitigating the risk of summer overheating in this warming climate will become ever more challenging and may be exacerbated by the pursuit of increasingly airtight and thermally efficient buildings.

The analysis shows that winter temperatures are also due to rise by ~0.8 °C to 1.3 °C by 2050, rising to up to 2.7 °C by 2080. With this in mind, the need for active heating in new buildings may reduce dramatically, or disappear altogether. At the same time, the risk of overheating, which is challenging to mitigate in today's climate through passive design alone, may become an impossibility whilst seeking to maintain healthy access to daylight and views.

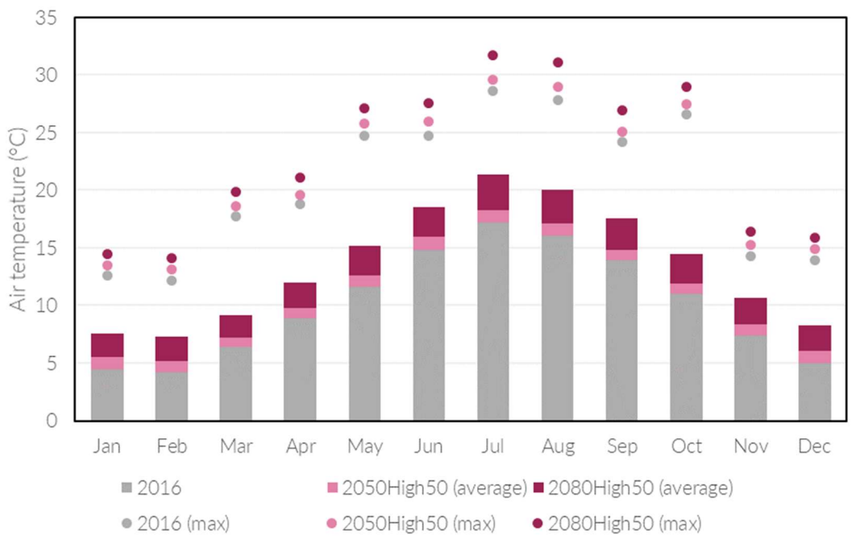


Figure 6: Top – Average and maximum monthly temperatures for the Norwich TRY 2016 , 2050, and 2080 High 50 weather files.

Wind

Wind is important for a number of reasons and poor design can cause wind to have a permanent negative impact on a development: wind's effect on acoustics, the environmental, health and safety, comfort, and building services all need to be considered.

Figure 7 is a wind rose showing the incident direction and speed of wind likely to affect the site in 2020. It is evident from this that wind from south-west and south-south-westerly directions are likely to be most prevalent though average wind speeds in all directions are in the range ~2-4m/s.

The figure also shows a boundary chart of the average wind speeds at various altitudes from ground level to 30 m. As is to be expected, wind speed rises steadily as altitude increases: this should be considered throughout the design of taller buildings.

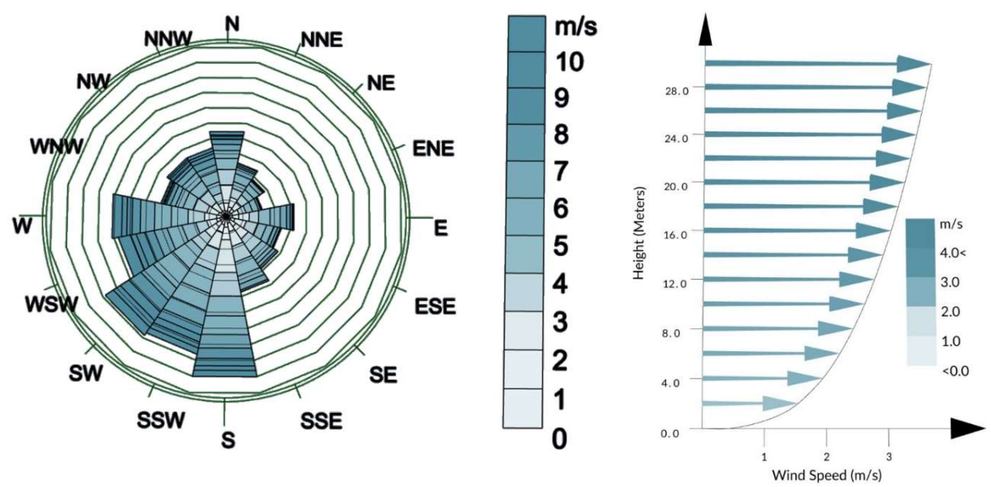


Figure 7: Left – Wind rose showing wind speeds affecting the site. Each enclosed polyline shows a frequency of 1.2% (108 hours). Average wind speeds for each direction are also shown next to the direction markers. Right – Wind boundary chart showing average wind speeds at altitudes between 0 and 30 metres above the ground.

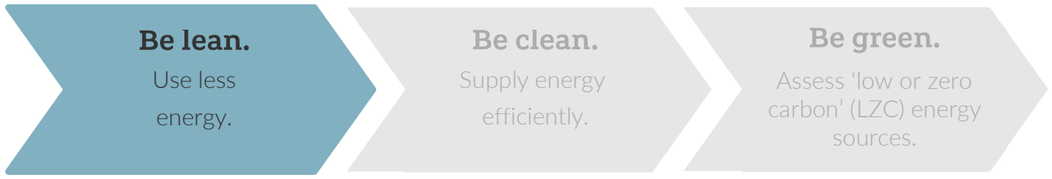
Irradiance

Incident irradiance is an important consideration in the design process for a multitude of reasons:

- Building form – buildings should be designed to avoid 'dark spots' or areas which are not exposed to sufficient levels of sunlight.
- Glazing aspect and ratio – equally, glazed areas exposed to high levels of sunlight can cause undesirable amounts of solar gains and glare. This impacts heating and cooling loads, increases the risk of overheating, and can reduce occupant wellbeing.
- Materials selection – the reflectance of building materials along with their thermal mass dictates how the building will perform when exposed to direct solar radiation. This will impact the thermal demands of the building and consequentially the servicing strategy.
- Renewable generation – technologies such as photovoltaics and solar thermal panels whose output is proportional to the irradiance must carefully consider orientation and tilt to maximise efficiency.

Total annual irradiance for the Campus is approximately 1000 kWh/m^2/year, which is higher than the UK average. The stability of the sun's output means irradiance is unlikely to change, even as the climate warms.

Be Lean.



A form and fabric first approach will maximise efficiency of building layout and form, as well as the thermal performance of the buildings' envelopes. This could be achieved through solutions such as low U-values, air permeability and efficient glazing to minimise heat losses in winter and maximise coolth retention in summer months.

Reducing energy demand as a priority has several benefits. It reduces operational energy costs and carbon emissions in the most robust and reliable way, without the need for ongoing maintenance or the replacement of plant.

Fabric performance

Fabric performance is an integral part of sustainable design development. By taking a fabric first approach to building design, the Proposed Development will reduce energy demand passively. These measures are the most reliable, robust, and long-lasting compared with technological solutions.

The overriding objective for the façade design of the buildings at BRC will be to achieve the optimum balance between providing natural daylighting benefits to reduce the use of artificial lighting, the provision of passive solar heating to limit the need for space heating in winter, and limiting summertime solar gains to reduce space cooling demands.
Best practice thermal performance, such as the Future Home Standards, is detailed in Table 1.

Thermal insulation

Typically, the demand for space heating is dominant in new homes, whereas non-domestic buildings can be either heating- or cooling-led, dependent on their use. In either case, solar gains will be controlled by the optimisation of the fabric and approach to fenestration i.e. ensuring appropriate levels of glazing to control winter heat loss and summer heat gain.

Glazing energy and light transmittance

The design of homes and buildings will seek to benefit from passive solar heating in winter where appropriate, minimising unwanted summer heat gains whilst optimising the transmittance of light for internal daylight.

Fabric air permeability

Fabric air permeability is a measure of the volume of air that can penetrate through the fabric of a building, leading to ventilation heat loss and gain. High air permeability can lead to uncomfortable drafts and dramatically increase the demand for space heating in winter and space cooling in summer. The buildings at the Proposed Development will aim to achieve good practice levels of air permeability.

Table 1: Current and emerging fabric performance standards.

Building element	Current Part L 2021 notional targets			Future Homes Standard
	Residential	Non-residential Option 1	Non-residential Option 2	
External wall U-value (W/m^2K)	0.18	0.26	0.18	0.11
Roof U-value (W/m^2K)	0.13	0.18	0.15	0.11
Floor U-value (W/m^2K)	0.13	0.22	0.15	0.11
Window U-value (W/m^2K)	1.20 (g-value: 0.40)	1.60 (g-value: 0.40)	1.40 (g-value: 0.29)	0.80
Air permeability ($m^3/m^2.hr$ @50Pa)	5.00	5	3	3.00

Space heating

The strategy for delivering space heating to the homes and buildings aims to remain as flexible as possible, with the aim of delivering low carbon, affordable heat in the most appropriate way as and when serviced parcels are brought forward for development; this is discussed further in the Be Green section. The emerging heating strategy uses highly efficient electric heat pumps; this is presented in the Be Green section.

Domestic hot water (DHW) system

As fabric performance improves, the proportion of new homes' energy consumption represented by the demand domestic hot water (DHW) increases.

To reduce the demand for hot water in all buildings, the use of water-efficient fixtures and fittings including flow reducers in the taps of wash hand basins and aerated shower heads will be considered and installed where appropriate.

Other means of passively reducing the demand for hot water will be considered. One such technology is Waste Water Heat Recovery Systems (WWHRS). These systems capture a proportion of the heat from the hot water, which is typically lost to the drain, using it to either pre-heat the incoming water or return heat to a hot water store. By capturing a proportion of the heat from the waste water, WWHRS can reduce both energy demand and CO_2 emissions, as well as reducing the energy cost to occupants. Such systems will be explored.

For non-domestic buildings, water consumption requirements in environmental assessment methods such as BREEAM will be considered further during detailed design stages.

Space cooling

Active cooling is often critical for the comfortable operation of many non-domestic buildings, required as the internal gains from equipment and people can result in a propensity to overheat which cannot be mitigated with conventional ventilation. However, effective building design, both

from the perspective of architectural form and specification, as well as the building services strategy, can often be used to reduce the risk of overheating prior to any active measures.

These passive measures are the most robust and lowest carbon solutions to mitigating the risk of overheating and the Cooling Hierarchy below will be used to prioritise passive solutions in the design of the non-domestic elements of the proposed development.

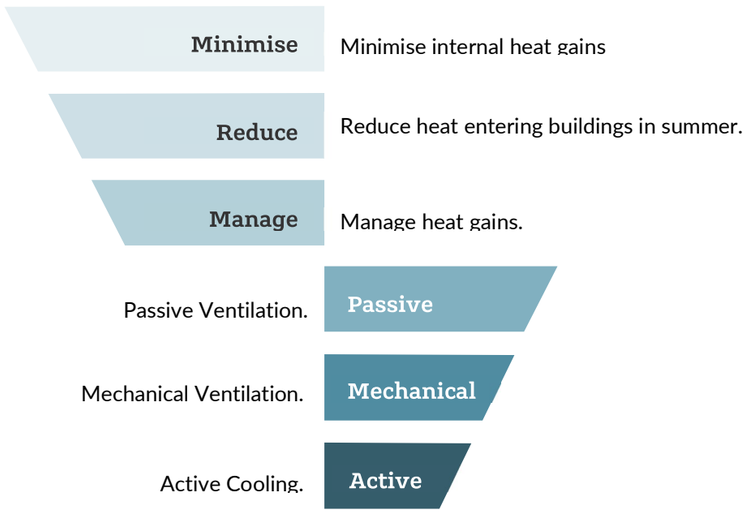


Figure 8: Cooling hierarchy.

Glazing and daylighting
The importance of exposure to good daylighting in homes, schools and workplaces is well documented. It improves comfort, wellbeing, and productivity.

Glazing is required to provide adequate daylight. However, higher proportions of glazing can increase heat loss in winter months and increase risk of overheating in summer months due to excessive heat gains.

The design will seek to both reduce energy demand and ensure occupant comfort and wellbeing through appropriate form, fabric and glazing.

Overheating
As a result of the warming climate and improving thermal performance of building fabric, the risk of overheating in dwellings is an ever more present concern. Through good design, this risk can often be mitigated without the need for active cooling, though this requires careful consideration.

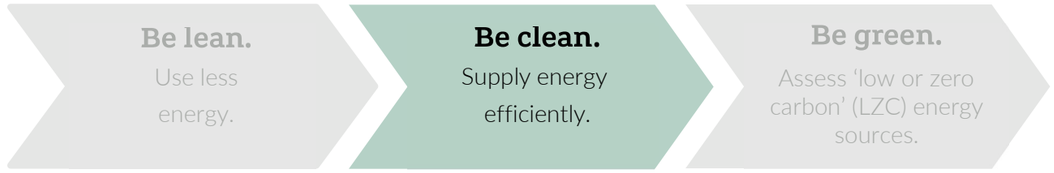
Assessing both the non-domestic buildings and new homes of the Proposed Development using the recognised methodologies of CIBSE TM52 and CIBSE TM59 through a dynamic overheating model to inform the design and maximise passive approaches to cooling will be considered and conducted where appropriate and useful.

Heat recovery
Mechanical ventilation with heat recovery (MVHR), can be used to maintain sufficient air supply to occupants as well as reduce heating demand through recirculation of waste heat. Mechanical ventilation will be explored for the buildings and homes of the Proposed Development.

LED lighting
For office developments, lighting often represents the majority of energy demand. Commercial buildings at the proposed development will seek to specify the highest performance in efficacy (lumens/circuit Watt) to reduce lighting demand and reduce operational costs to building users.

Metering and controls
The development could explore opportunities to incorporate smart energy systems and controls to intelligently use energy to minimise energy cost and consequent carbon emissions. These tools can also be used to educate building occupants on energy management and use to implement behavioural change to provide long term positive impacts on and off site. Metering is essential for performance verification and optimisation.

Be Clean.



The emerging strategy for the development proposes an all-electric approach to servicing the development. By leveraging the continuing decarbonisation of the national electricity grid, the buildings would be low carbon on day 1, providing a pathway to zero emissions.

It is considered that the density of the Campus is not conducive to the effective or efficient deployment of a site wide heat network. Opportunities to deploy an ambient loop energy sharing network in the local centres will be considered below.

Electric batteries and other forms of energy storage, alongside demand management, would be explored to add resilience to the strategy and reduce the carbon emissions, by diversifying energy demand away from peak times and maximising the proportion of any renewably-generated energy which is consumed onsite. Research has shown that the carbon intensity of electricity varies by 32% throughout the day on average and over 50% on the coldest winter days. Energy storage enables the demand during highest carbon periods to be avoided, meaningfully reducing carbon emissions.

All-electric servicing strategy
The emerging strategy for proposes an all-electric approach to servicing the development. The carbon intensity of grid-supplied electricity in the UK has reduced by almost 70% since 2012 and is projected to continue decarbonising to be zero at some point in the mid-2030s, according to National Grid projections. By leveraging this continuing decarbonisation, the proposed development would be low carbon on day 1, reducing further as the grid decarbonises. This aligns with the 2040 target established by BRC's stakeholders.

Combined heat and power (CHP)
CHP offers high emissions savings under the Part L 2013 methodology. However, this is not representative of the performance of CHP in reality. Low carbon grid electricity means CHP can actually increase emissions relative to the development as served by gas boilers (the baseline). Furthermore, CHP requires on site combustion which can have a negative impact on local air quality throughout the lifetime of the development. As such, natural gas CHP is not being explored for the Proposed Development.

Site wide network
Heat networks can demonstrate benefits where heat is generated centrally with highly efficient plant and distributed to buildings within the vicinity. The Central Campus area does have district heating which utilises CHP.

However. for a low density sites such as the proposed expansion to the existing Campus, the distribution losses associated with connection are likely to entirely outweigh any benefit that would be realised from generating heat centrally. Additionally, for the reasons outlined above, connecting to CHP led heat network is not advised.

Ambient loop energy sharing network
So-called ambient loop or fifth generation energy networks differ from traditional heat networks – which generate heat centrally, distributing it to meet the thermal demand of buildings on the network – as they facilitate the sharing of energy between buildings with simultaneous heating and cooling demand. This is achieved by circulating water at ambient ground temperatures, with local heat pumps allowing buildings to both extract heat from and reject heat to the network i.e. buildings with cooling demand are able to share what would typically be waste heat rejected to atmosphere with buildings in the vicinity that demonstrate a demand for heat.

Ultimately, this is not favourable for lower density areas or areas without a mix of heating and cooling demand, as the design develops, this may provide a viable and desirable option and will be explored.

Energy storage
Energy storage, be that in the form of an electric battery or simply a hot water cylinder, can complement the energy strategy. By storing electricity or heat generated during off-peak times for use when the demand on the grid is greatest, the impact of new development on the resilience of local grid infrastructure can be minimised. Off-peak electricity is also lowest cost and lowest carbon, so deployment of energy storage can also reduce energy bills and consequent carbon emissions.

Be Green.

Be lean. Use less energy.

Be clean. Supply energy efficiently.

Be green. Assess 'low or zero carbon' (LZC) energy sources.

Low and zero carbon (LZC) technologies can be used to extract or generate onsite renewable energy. This can be in the form of renewable heat, such as from the atmosphere or ground, or as renewable electricity, to be used on site or sold back to the national grid to offset emissions.

The emerging all-electric strategy utilises electric heat pumps to meet the heating and hot water demands of the development. Heat pumps allow the extraction of renewable heat from the atmosphere, ground, or water source, with electrical efficiencies of 250% or more. Air and ground source solutions are being explored, along with ambient loop solutions where these present a benefit.

The potential for solar PV, generating zero carbon electricity, is also being explored to complement the strategy.

Heat pumps significantly reduce CO_2 compared to gas boiler or direct electric heating strategies. Twinned with solar PV, heat pumps offer a route to zero carbon, reducing demand on a strained electricity grid and reducing operating costs. A hydrogen boiler to deliver net zero carbon heat along with low carbon grid electricity and a provision of solar PV offers an alternative route.

Air source heat pump (ASHP)

ASHPs work to extract heat from the air at efficiencies much higher than can be achieved by electric resistance heaters. This improved efficiency of heat generation significantly reduces the energy consumption to heat and provide hot water to a home or building, reducing bills and carbon emissions, whilst also minimising impact on local grid resilience. Heat pumps can also provide cooling in applications which require it, though the design of buildings would seek to minimise the need for active cooling. ASHPs are one solution being considered for the proposed development, but other heating and renewable technologies will be reviewed.

With the projected continued decarbonisation of electricity in the UK, an all-electric strategy such as the ASHP scenario above could provide a viable route to achieving a net zero carbon development in future.

Ground water source heat pump (GSHP)

GSHPs operate in much the same way as ASHPs, instead using the ground (rather than the atmosphere) as the heat source. This has benefits to the overall efficiency of the system, as the ground source typically has a more stable temperature than the air throughout the year, particularly during heating season. However, these systems are more complex and come with increased constraints, with ground source systems typically requiring a large area of land or deep boreholes to operate and water source systems requiring careful consideration, as extracting or rejecting significant amounts of heat to a natural water body can have implications for the local environment and ecology.

The feasibility of such systems has been explored on the Campus previously but limits on vibration required by adjacent science research and buildings would preclude borehole drilling, discounting GSHPs.

Waste heat reclaim heat pumps

While typical heat pumps uplift the low-grade heat present within natural sources such as the ground or air, waste heat from artificial or industrial sources can be captured and uplifted by a heat pump to meet the space heating and domestic hot water demands of a development.

Capturing heat from wastewater, along with other sources of waste heat, is already a well-established industry in other countries. In Sweden, 57% of all heat demand is met through district heating, with 46% of that heat recovered from waste sources.

The feasibility of introducing waste reclaim heat pumps to the proposed development will be explored.

Hydrogen

Hydrogen can be combusted to provide zero carbon heating and hot water with water as the only direct emission. Whilst reliant on a suitable supply of hydrogen, new generation 'hydrogen-ready' natural gas boiler can be converted to combust hydrogen with relative ease.

The emerging all electric strategy negates the need for natural gas, but appreciating the dynamism in the energy sectors, BRC would remain flexible to developments in the hydrogen generation and supply sector. Though consideration of the impact on air quality, through the increased NOx emissions produced by hydrogen boilers, would be necessary.

Solar thermal panels

Solar thermal panels can be used to meet a proportion of a building's thermal demand renewably. PV systems are much simpler and require minimal maintenance, unlike solar thermal systems which are complex and require regularly inspection. As such, solar thermal is not currently being explored in depth, but could be considered further should this be deemed a desirable technology by the local authority and community.

Photovoltaic (PV) panels

PV panels can be used to generation renewable electricity from the sun. this energy can be exported back to the National Grid or directly used on site.

The masterplan has both a large available roofscape which could be used for the deployment of PV, along with areas where a ground-based utility-scale array may be appropriate; both are being explored. There is potential for a strategic deployment in the zone south of the river.

Appendix B: Nature-based solution strategy.

Introduction

Over the past 50 years wildlife across the UK has been decreasing at an unprecedented rate.[1] The loss of biodiversity and the collapse of ecosystems is now one of the largest threats to functioning societies, businesses and economies.[2] The built environment has contributed to this through the clearing of habitats; the extraction of construction materials; and sprawling urban development. A consequence of which has been the loss of nature's social and economic benefits from the places where we live, work and play.

The Government is working to change the current system that is leading to a loss of nature in urban environments. It is seeking to do this by fostering the creation of 'Environmental net gain', a term used to describe improvements to all aspects of environmental quality and maximising its multifunctionality. Achieving this means first creating a biodiversity net gain (the variety of living things) and then going further to achieve increases in natural capital (the natural systems which provide a direct resource to us).

Nature-based solutions are an approach to deliver both biodiversity net gain and natural capital. It is a concept that was introduced towards the end of the 2000s by the World Bank and IUCN. They are the application of nature which create environmental, social and economic benefits. Specifically, they are actions that involve the protection, restoration or management of natural ecosystems. Their use in masterplan developments can lead to financial opportunities including unlocking new revenue streams, delivering public environmental goods, increasing customer engagement and lowering operational costs.

This summary guidance note will demonstrate how nature-based solutions can be used as a multifunctional mechanism to deliver on the strategic objectives of the Babraham Research Campus. It will explore the opportunities of nature-based solutions to contribute towards climate change mitigation and adaptation, resource use, nature and biodiversity, health and wellbeing, and socio-economic impact. The note will also highlight project examples and supporting industry guidance relevant to the context of the Babraham.

The opportunities

As recognised in the Sustainability Charter, Babraham Research Campus will align with Natural Cambridgeshire's Vision of doubling the nature conservation value of the area by 2050 by maximising all available opportunities to create functional natural space.

When accounting for the provision of public goods and non-monetary benefits using nature-based solutions over traditional grey infrastructure can often be more cost effective. The financial value of ecosystem services in the UK is £958 billion according to The Office for National Statistics and Defra predict the value of nature to increase over time as:

- Demand for the benefits heightens
- The impacts of climate change intensify
- The user base increases through population growth
- Nature becomes scarcer in abundance and distribution

This section will review the opportunities nature-based solutions provide across a spectrum of strategic objectives.

Climate change mitigation

Nature-based solutions have a role in accelerating business transition to net-zero carbon through both carbon sequestration and storage as well as through reducing energy consumption. If UK businesses achieve net zero carbon by 2030 rather than by 2050, they could avoid a £1.1tn cost to society.[3]

Plants and soils are part of the sequestration and storage process, with plants themselves acting as carbon sinks. In an urban landscape street trees can provide the greatest level of carbon capture; on average 5.5kg per annum.[4] Trees and woodlands created at Babraham will have the functional benefit of sequestering carbon, credits for this could then be attained once the trees mature, this could form part of a long-term carbon management strategy.

Nature-based solutions can also contribute to climate change mitigation whilst reducing energy costs by insulating buildings. Green roofs and walls provide thermal insultation to buildings meaning less energy is needed to regulate the building temperature. This occurs through the shade they provide to buildings, protecting them from solar radiation and external heat, keeping temperatures at a comfortable level through evapotranspiration. Green wall at Babraham could utilise species accustom to growing on cliff faces inherently making it a defining resilient natural feature of the development.

Climate change adaptation

Nature-based solutions can be used as part of an adaptive strategy to mitigate climate-related risks such as flooding and overheating.

Nature provides an effective mechanism for rainwater drainage and filtration, taking it up, storing it, removing pollutants and creating soil stability. Sustainable Urban Drainage (SuDS) systems are widely used to manage rainfall; these systems, for instance, can retain 60-73% of rainwater runoff.[5] They have also been found by Defra to reduce construction costs by up to 30% compared to traditional drainage systems. Whilst there is a low chance of flooding at Babraham (Flood Zone 1), there is an opportunity to avoid present and future flood risks through the retention and extension of the flood plain, planting SuDS enabled street trees, and the creation of a green roof and green wall. Other onsite opportunities include restoring the minor watercourses to a more meandering profile; reinstating shallow foot-drains; restoring lost ponds; and re-wetting the grazing marsh. These approaches would increase the water retention and encourage peat formation which can act as a carbon store. Any collectable rainwater could then be used for non-potable purposes such as toilets and irrigation.

Nature-based solutions can also significantly cool the air and material surfaces both within and outside of buildings through shade and the process of evapotranspiration. Applying these measures can help mitigate the Urban Heat Island and create temperatures comfortable to live and work in. Street trees for example reduce the surround air temperature by 3°C on average.[6] This application would reduce the risk of building occupants overheating during the predicted hotter dryer summers.

Chancellor, Rishi Sunak, announced that by 2025 reporting in line with the Task Force on Climate-related Financial Disclosures (TCFD) framework will be an obligation for most businesses. Disclosing climate-related risks and mitigation opportunities through frameworks such as this, will enable better access to capital through higher asset valuations and increased investor and lender confidence in the long-term viability of assets. This will be driven by knowledge of what the climate-related risks are and knowing that they are being assessed and managed.

[1] The State of Nature Partnership. (2019). The State of Nature 2019. Hayhow D. B., Eaton M. A., Stanbury A. J., Burns F., Kirby W. B., Bailey N., Beckmann B., Bedford J., Boersch-Supan P. H., Coomber F., Dennis E. B., Dolman S. J., Dunn E., Hall J., Harrower C., Hatfield J. H., Hawley J., Haysom K., Hughes J., Johns D. G., Mathews F., McQuattersGollop A., Noble D. G., Outhwaite C. L., Pearce-Higgins J. W., Pescott O. L., Powney G. D. and Symes N.

[2] World Economic Forum (2021) The Global Risks Report 2021. [online] Available at: http://www3.weforum.org/docs/WEF_The_Global_Risks_Report_2021.pdf [Accessed: 22/09/2021].

[3] Business in the Community (2020). Challenge 2030 – let's make the climate crisis history as we build back better from COVID-19. Available at: https://www.bitc. org.uk/blog/challenge-2030-lets-make-the-climatecrisis-history-as-we-build-back-better-from-covid-19/ [Accessed: 22/09/2021].

[4] R. Winch, S. Hartley, J. Lane (2020). Nature-based solutions to the climate emergency. Available at: https://ukgbc.s3.eu-west-2.amazonaws.com/wp-content/uploads/2020/08/05144641/Nature-based-solutions-to-the-climate-emergency.pdf [Accessed: 22/09/2021].

[5] R. Winch, S. Hartley, J. Lane (2020). Nature-based solutions to the climate emergency. Available at: https://ukgbc.s3.eu-west-2.amazonaws.com/wp-content/uploads/2020/08/05144641/Nature-based-solutions-to-the-climate-emergency.pdf [Accessed: 22/09/2021].

[6] R. Winch, S. Hartley, J. Lane (2020). Nature-based solutions to the climate emergency. Available at: https://ukgbc.s3.eu-west-2.amazonaws.com/wp-content/uploads/2020/08/05144641/Nature-based-solutions-to-the-climate-emergency.pdf [Accessed: 22/09/2021].

Resource use
Nature-based solutions can accelerate the movement towards a more circular economy and responsible consumption and construction. For instance, capture and storage of water onsite for use, reduces the pressure of rainwater on local waterways and drainage systems as well as reduce the onsite demand.

Such solutions can also decrease the costs and resources required to replace roofs. Green walls and green roofs provide buildings with an additional layer of protection from solar radiation and extremes in weather such as frost or heat waves. This has been found to extend the lifespan of the roof by an average of 23 years when compared to a conventional roof,

Nature and biodiversity
Babraham is seeking to create 20% biodiversity net gain onsite or where not feasible locally offsite. This will consist of wider enhancements to the campus, including improvements to the river systems, planting new trees and improving the quality of the woodlands.

Natural habitats are commonly fragmented or poorly connected making them vulnerable to factors like disease, climate change and invasive species. Babraham could maximise opportunities to creation of resilient ecosystems by planting a mixture of woodlands and shrubs which connect isolated wildlife population. Nature Recovery Networks are a concept developed by the Wildlife Trust that seeks to reconnect these isolated habitats through urban greening. The government is now piloting Local Nature Recovery Strategies to map areas where nature can be restored. The exploration of nature recovery in the context of Babraham could present opportunities to elevate and extend the value of the development.

Nature-based solutions which mitigate the Urban Heat Island Effect can also be mutually beneficial to native species by bringing the air temperatures in line with tolerable levels. Other beneficial factors of nature-based solutions to species include the reduction of noise and water pollution through their insulating and filtrating properties. These factors can otherwise disrupt normal behaviour patterns and decrease the ability of species to survive.

Health and wellbeing
Nature has been well evidenced to provide an uplift to human health and wellbeing, stimulating happier healthier communities. Around 67% of the UK population are exposed to air pollution at a level exceeding the World Health Organisations guidelines.[7] Nature-based solutions can filter air, removing harmful pollutants such as Nitrogen dioxide and particulate matter. This happens through the deposition and trapping of pollutants on the plant's surface, absorbing them and acting as a barrier to prevent their spread. Plants can therefore work to mitigate the negative health impacts of air pollution.

Approximately one in four people within the UK experience a mental health problem each year.[8] Nature-based solutions can act to improve mental health through the reduction of stress, anxiety and depression. Research has found that visits to outdoor green spaces of 30 minutes plus in a week can decrease the prevalence of stress by 7%.[9] Green space also provides the option for physical exercise which can help people to stay fit.

Babraham could ensure access to green space to maximise benefits to mental and physical wellbeing of occupants and visitors of the research campus. These benefits could be elevated by integrating edible plants which would allow the building users to directly interact with the natural space.

Socio-economic impact
The value of green space is determined by people's willingness to pay for access to it and the services within it. For instance, natural features such as parks and street trees can increase the attractiveness of an area and create recreational opportunities. Attributes like these can lead to increased property value. It has been found that green walls can increase property value by 2.5% on average and street trees 4.7%.[10]

Project examples
In this section three industry examples are highlighted to demonstrate different approaches taken to embed nature-based solutions and the impact this has had.

Wild West End
The Church Commissioners for England, The Crown Estate, Great Portland Estates, Grosvenor, The Portman Estate, The Howard de Walden Estate and Shaftsbury are collaborating to reverse the decline of London's wildlife through strategic masterplanning. They are doing this whilst maximising the multifunctionality of nature-based solutions by:

- Mitigating climate change through carbon sequestration
- Creating climate resilience through rainwater management and thermal regulation of streetscapes
- Improving wellbeing through the provision of sensory and active green space as well as improvements to air quality
- Creating greater social cohesion through public engagement and education

A key element to the scheme is the creation of more connected species which is achieved through the spatial use of nature-based solutions across the West End. The project has demonstrated that nature is more than just a "nice to have" that comes at a cost. It creates social, environment and economic value.

West Gorton Park
The new sustainable drainage park for Manchester City Council in West Gorton has been designed with an interconnected system of swales, rain gardens and bio-attenuation features. This park forms the final part of a £100m regeneration scheme, building 500 new homes, school improvements and new community facilities. The new park is designed to manage rainwater flow and prevent flooding. The use of permeable paving allows water to be channelled to irrigate the planting. Infiltration ponds soak up water and any remaining water flows into the sunken rain gardens.

The landscaping approach has been designed to promote social cohesion and bring environmental benefits to the city of Manchester whilst also delivering a biodiversity net gain.

Windsor Estate
The Crown Estate undertook a valuation of the ecosystem services provided on its Windsor Estate. The total valuation came to £21 million per annum, broken down into recreation (£14.1m), flood risk mitigation (£2.9m), carbon sequestration (£2.9m) and water quality improvement (£1m).

Guidance and tools
This section provides an overview of industry guidance and tools that support the creation of high-quality nature-based solutions and demonstrate leading best practice.

Construction Innovation Hub's Value Toolkit
The Construction Innovation Hub together with industry stakeholders is creating a toolkit containing a suite of tools to support value-based decision making across the investment lifecycle. This tool will provide

[7] Trading Economics (2018). United Kingdom – Urban Population. Available at: https://tradingeconomics.com/ united-kingdom/urban-population-percent-of-totalwb-data.html [Accessed: 22/09/2021].

[8] McManus S., Meltzer H., Brugha T., Bebbington P.E. and Jenkins R. (2009). Adult psychiatric morbidity in England: results of a household survey. Health and Social Care Information Centre.

[9] Shanahan D.F., Bush R., Gaston K.J., Lin B.B., Dean J., Barber E. and Fuller R.A. (2016). Health benefits from nature experiences depend on dose. Scientific reports, 6, p.28551.

[10] R. Winch, S. Hartley, J. Lane (2020). Nature-based solutions to the climate emergency. Available at: https://ukgbc.s3.eu-west-2.amazonaws.com/wp-content/uploads/2020/08/05144641/Nature-based-solutions-to-the-climate-emergency.pdf [Accessed: 22/09/2021].

organisations and projects with the information they need to focus the value creation. The value will apply to Natural, Human, Social and Produced capitals.

Building with Nature standard and accreditation

Building with Nature is a standard and accreditation tool that can be used by developers to go beyond legal compliance, supporting the creation of multifunctional nature-based solutions through its compendium of principles and criteria. Within this tool a wide range of social and environmental aspects are assessed to understand the success in the delivery of nature-based solutions and the retention of this value in perpetuity.

UKGBC's ambition

To support the creation of more high quality functional natural space, UKGBC has set an ambition for the built environment industry:

"By 2030, all buildings and infrastructure will, throughout their lifetime, be climate resilient and maximise environmental net gains, through the prioritisation of nature-based solutions."

Whilst highly ambitious, this statement sets a trajectory for industry to aspire to. At its core the ambition's focus is to utilise nature-based solutions as a mechanism for delivering multifunctional outcomes that benefit business, planet and society.

UKGBC's Nature-based solutions principles

UKGBC have developed a set of guiding principles for developers, owners, operators and occupiers of buildings to create nature-based solutions. The principles and their methods have been designed to support industry realise their above-mentioned ambition. The principles are:

- Principle 1: Define ambitions
  Set ambitions which will shape the trajectory of a project and the direction taken. The ambition should reflect the desired function and intended outcome of the project having engaged with stakeholders.

- Principle 2: Assess risks, baselines, and impacts
  Nature-based solutions can reduce some of the physical and financial risks associated with climate change and ecosystem degradation. Managing these risks can reassure financial stakeholders, increase investor confidence, generate higher asset valuations and enable access to preferential insurance premiums.

- Principle 3: Maximise multifunctionality
  Use nature-based solutions having considered their local environmental, social and ecological context and their role within a wider network of green infrastructure.

- Principle 4: Identify value, costs, benefits and funding
  Nature-based solutions can lead to lower operational costs, new revenue stream and the creation of public environmental goods. They are often more cost effective when compared to traditional grey infrastructure, particularly when accounting for the provision of public goods and non-monetary benefits.

- Principle 5: Create long-term management plans
  Nature-based solutions cannot be considered as one-off projects or interventions but should be approached as a long-term investment for the betterment of the built environment. Investments will become increasingly rewarding as time passes, as long as they have been planned with the requisite maintenance and monitor to ensure longevity in performance.

- Principle 6: Collaborate, educate and innovate
  Nature-based solutions are multi-stakeholder and extend beyond those directly involved in their creation. Users of nature-based solutions can derive a form of community ownership and shape future market trends.

Connecting nature

Urban natural habitats often exist as fragmented islands poorly connected or entirely disconnected from each other, preventing species, nutrients and water moving between these natural islands. This often results in smaller inbreeding populations, which due to limited genetic variation are more susceptible to disease, climate change and invasive species.

There are several initiatives that are working to better connect isolated urban habitats. The Wildlife Trust's Nature Recovery Networks and the government's Local Nature Recovery Strategies are looking to map and restore these areas through the creation of natural space in urban settings.

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