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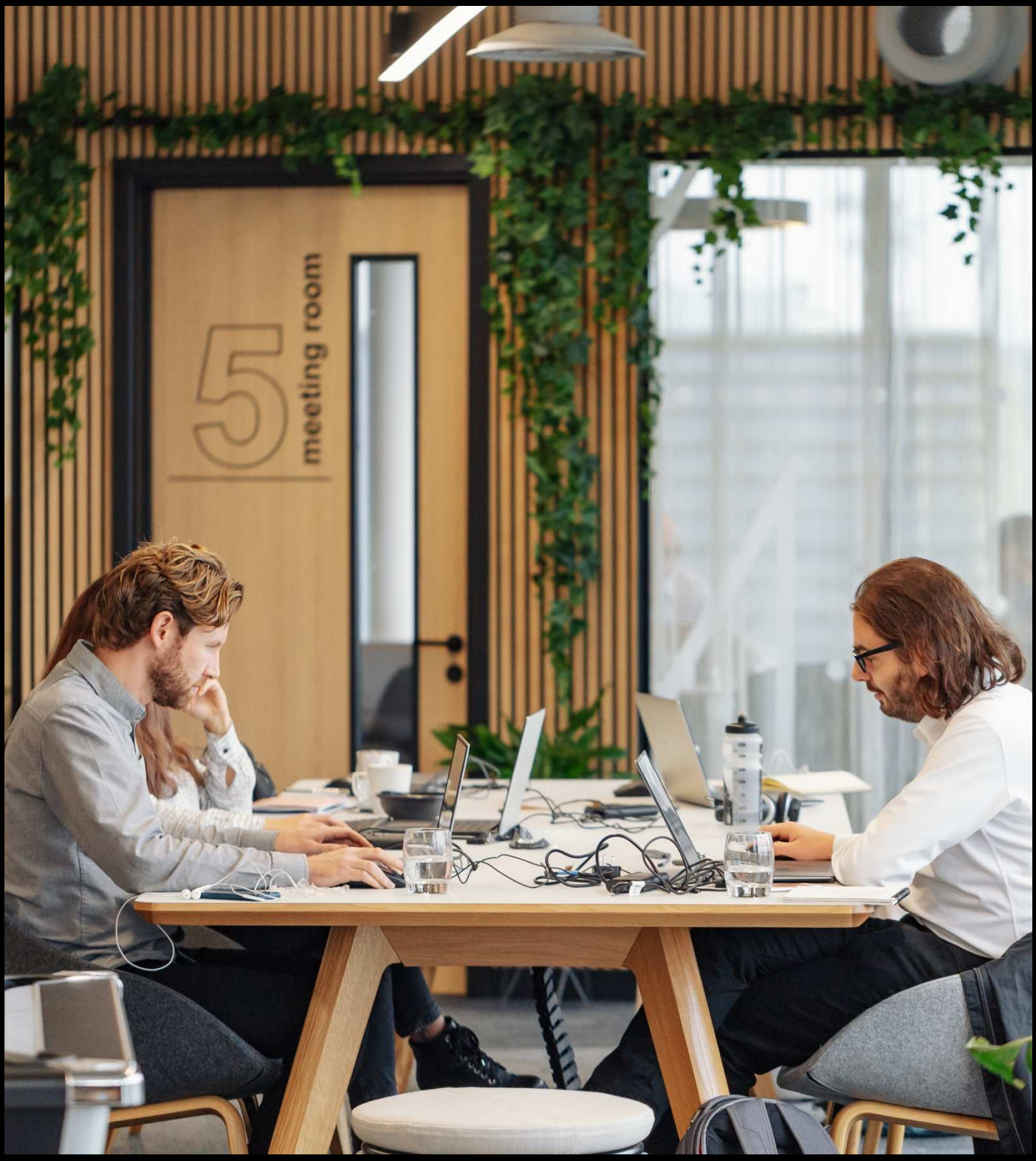
North Moons Moat Industrial Estate, Redditch.
Place-Based Decarbonisation Strategy



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Place-based decarbonisation looks beyond site boundaries to explore how communities can collaborate to collectively reduce their emissions.

This document presents our place-based decarbonisation strategy for North Moons Moat Industrial Estate, Redditch.


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diversity
Productive Landscapes
Habitat Creation
Biodiversity Net Gain

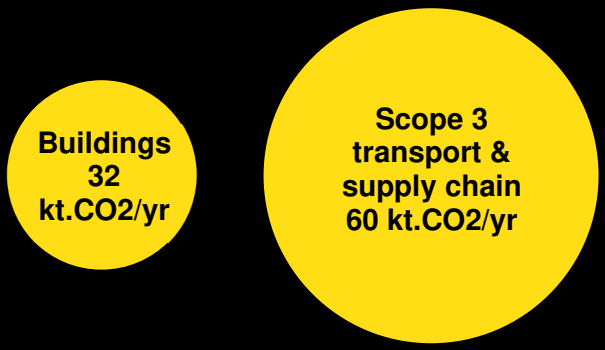
Executive Summary

AEW Architects are working on behalf of Redditch Borough Council on a Midlands Net Zero Hub–funded, place-based decarbonisation plan for North Moons Moat Industrial Estate.

With industrial activity driving nearly 30% of Redditch's emissions, the plan aims to harness shared infrastructure, early adopters, and coordinated action to cut carbon, boost resilience, and deliver wider economic and community benefits.

The North Moons Moat Estate, dating largely from the 1980s with ongoing additions including the Ravensbank Estate, comprises around 338,300 m² of mainly steel-framed, metal-clad buildings. The total floor area of the buildings within the study area can be split into 3 similarly sized architypes, Mid/Big box logistics, Mid/Big box manufacturing and small-diverse units.

Our high-level estimations of site-wide carbon emissions indicate that the small-diverse units are the largest contributing architype to carbon emissions, followed by mid/big box manufacturing and mid/big box logistics.



We also assessed climate resilience and found that the site suffers from a high risk of surface water flooding.

Stakeholder engagement from the very start is the key to developing a successful scheme. We carried out a number of measures to engage with the tenants on site, including an online survey, a stakeholder consultation event and a desktop study. We found that engagement levels were lower than expected, and so focusing on increasing this is important.

Based on stakeholder consultations and desktop research, we tested the feasibility of a number of mitigation measures, focusing on how they could be implemented not just to individual buildings, but to the site as a whole.

Based on consultation feedback we looked at measures such as retrofitting, low carbon/electric vehicles, process decarbonisation, central innovation hub, renewable energy sources, LED lighting, heat pumps, district network heating, active travel and biofuel. We tested the feasibility of each one against how applicable they were to the site and how they would impact each architype. This helped us develop the following visions:

+ Green innovation hub: Establishing a central hub where stakeholders and staff can learn, collaborate, and access tailored business decarbonisation advice will be key to building trust and driving engagement with the scheme.

+ Active travel plan and Sustainable drainage system: Introducing an active travel plan to site will work towards reducing scope 3 emissions caused by commuters in petrol/diesel vehicles. Installing SuDS will increase resilience against surface water flooding, whilst also supporting biodiversity net gain.

+ Peer-to-Peer solar energy trading scheme: This involves installing solar PV on suitable rooftops, generating electricity for the tenants within the building. Surplus energy is distributed through a digital optimisation platform to other members of the local energy community.

+ Anaerobic Digestion Plant: Used to convert domestic and agricultural waste into biomethane fuel. This is a low-carbon alternative to diesel for logistics HGVs. Additionally, the plant could generate biogas as a renewable energy source for on-site use or export to the local grid.

For each proposal we estimated potential cost and annual CO_2 savings, allowing us to understand the scale of likely the impact and what it will cost to get there.

Finally, we discussed next steps that could be taken to set the scheme in motion. This included:

+ Collaborating with local sustainability consultants to create an online Business Energy Advice Service (BEAS) for companies on site.

+ Consulting with Pro Enviro and Universities to collect more accurate energy performance data from the buildings on site.

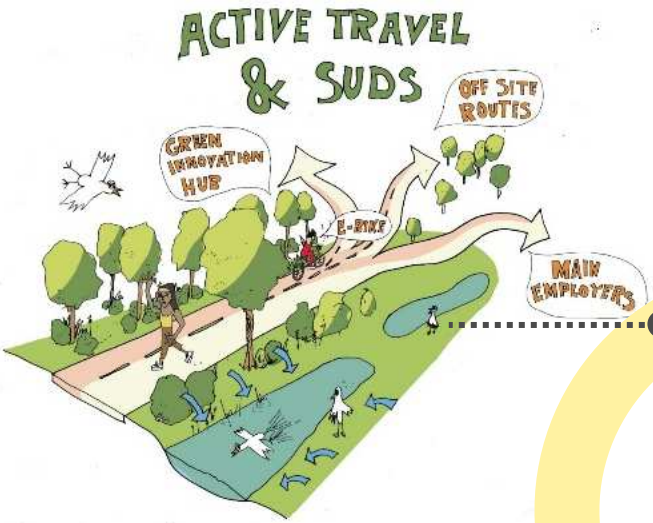
+ Having someone take charge in coordinating the active travel plan will allow for a much more organised system.

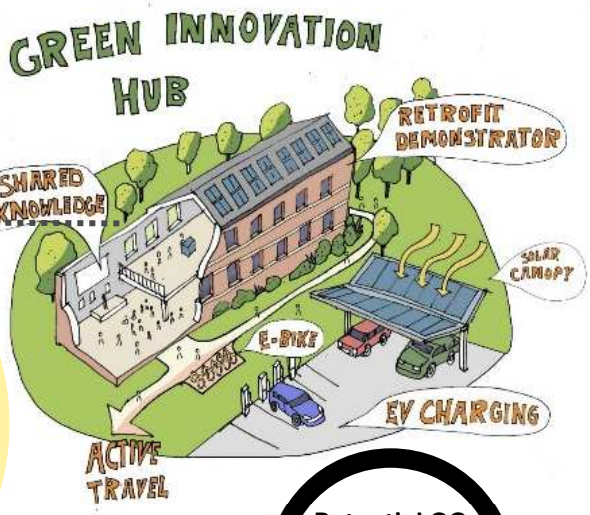
+ Focusing on building business cases and applying for funding for each of the proposals.

+ Collaborating with Consensus Power to bring the peer-to-peer energy trading scheme to life.

Now

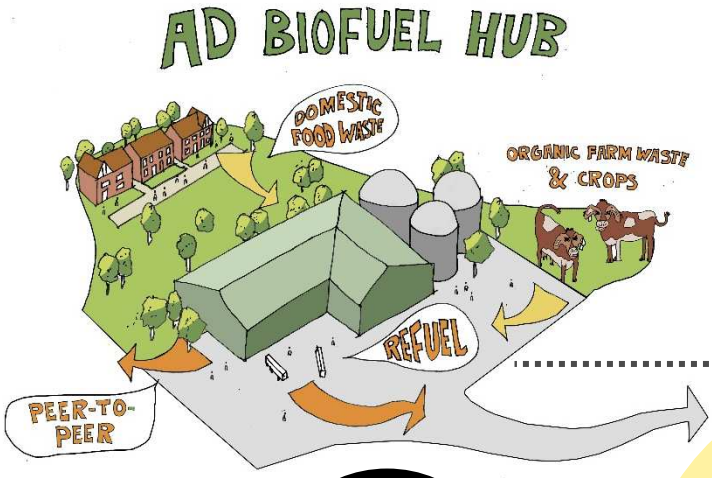
Potential CO_2 reduction:
50+
t.CO_2/yr





Potential CO_2 reduction:
50+
t.CO_2/yr

Potential CO_2 reduction:
1250+
t.CO_2/yr



Potential CO_2 reduction:
3400+
t.CO_2/yr

Future

The power of place-based decarbonisation

Conversations about decarbonisation often focus on individual buildings or national strategies. But somewhere in between lies a powerful opportunity: place-based decarbonisation. This approach looks beyond isolated interventions and considers the wider context on how buildings, infrastructure, transport, energy, land use and communities interact in a specific location.

Some of the uptick in interest around decarbonisation is driven by regulation and ESG commitments. But as pressure mounts to meet net-zero targets, there's a growing appetite to achieve more than compliance. The industry wants solutions that deliver not just emissions reductions, but wider benefits too. Tackling climate change can provide economic opportunity and help to create healthier, more resilient and fair communities.

Decarbonisation at the building level is well-trodden ground. Clients are familiar with the basics: improving building fabric, replacing heating systems, reducing energy demand and more. But this only scratches the surface of what's possible when you look beyond the red line boundary.

The opportunities within a place-based decarbonisation strategy

Scale unlocks ambition: Shared infrastructure becomes viable in a way that rarely makes sense for individual buildings. This includes solar generation, energy storage, EV charging or low-carbon heat networks.

Coordination enables resilience: Joined-up planning allows for better management of climate risks, including flood mitigation, heat resilience and energy security. Interventions like raingardens, shaded routes and permeable surfaces work best when implemented at scale.

Co-benefits become visible: Carbon reduction doesn't happen in a vacuum. A place-based approach reveals the wider benefits of decarbonisation: improved air quality, reduced traffic congestion, better access to jobs, and enhanced biodiversity.

Stakeholder buy-in is stronger: When businesses, communities and local authorities are involved in the conversation early, the solutions are more robust and supported. Co-design builds trust and makes implementation easier.

The challenges within a place-based decarbonisation strategy

The biggest barrier to decarbonisation at this scale isn't technical, but organisational. Too often, there's no single party responsible for coordinating change at this scale. Land ownership is fragmented, investment cycles are short, and infrastructure decisions are often made in silos.

A successful place-based decarbonisation strategy will need to develop a plan or roadmap to help to work through these risks to success.

Crucially, this approach requires a shift in mindset where we're not treating each building in isolation. At its heart, it's about taking a systems view and designing a practical roadmap that responds to the physical, regulatory and economic realities of a place.

Introduction

Introduction

Redditch Borough Council, in partnership with Worcestershire County Council and the Worcestershire Local Enterprise Partnership, has delivered a Midlands Net Zero Hub–funded project to develop an industrial zone decarbonisation plan for Moons Moat Industrial Estate. The project aims to create a transferable methodology that can be applied across other industrial zones, focusing on electricity, heating, and transport decarbonisation.

This work will inform the revision of the Worcestershire Energy Strategy and support Local Area Energy Planning, with completion due by July 2025. Industrial and commercial activity together account for nearly 30% of Redditch Borough's greenhouse gas emissions, underlining the importance of a coordinated approach to energy and carbon reduction.

North Moons Moat Industrial Estate offers both challenges and opportunities: it is home to major distribution centres, redeveloped sites, and businesses already leading on sustainability, such as Thorlux Lighting and FAUN-Zoeller UK. These early adopters highlight the potential for local leadership to accelerate decarbonisation across the estate and provide a model for other zones.

Vision

North Moons Moat Industrial Estate will lead the way in creating a connected, forward-looking industrial community that embraces net zero. Through innovation, collaboration, and practical action, it will demonstrate how diverse businesses can decarbonise together and provide a model for sustainable industrial zones across the Midlands and beyond.

Our approach

Our approach to the project combines advanced data modelling with structured stakeholder engagement to deliver a robust, place-based decarbonisation strategy for Moons Moat Industrial Estate.

At its core is an interactive 3D visualisation platform that maps energy use, identifies high- and low-performing assets, tests retrofit options, and simulates multi-year carbon reduction scenarios. This evolving masterplan will guide decision-making, highlight opportunities for shared infrastructure, and help to quantify the carbon and cost impacts of different interventions.

The strategy follows the energy hierarchy—reducing demand, using cleaner energy, and generating renewables—evaluating measures such as fabric upgrades, process efficiency, heat networks, heat pumps, EV charging, hydrogen, and on-site generation. Each option considers a cost-benefit analysis to prioritise those with the highest carbon savings per pound invested.

In parallel, a structured **stakeholder engagement programme** underpins the work. This included:

+ **Stakeholder mapping** to understand ownership and tenancy profiles.
+ **Surveys and consultation events** to gather data on energy use, operations, and ambitions, while identifying early adopters to drive momentum.
+ **Workshops and visual presentations** to communicate options in accessible ways and surface barriers to change.
+ **Engagement with institutional partners** (e.g. local authorities, LEP, Growth Hub) to align with wider strategies and sustain momentum through knowledge-sharing networks.

Together, these technical and engagement approaches have informed a phased, evidence-based decarbonisation plan that balances collective site-wide opportunities with the diverse needs of individual businesses, while embedding climate resilience and long-term sustainability.

Wider Context and Legislative Drivers

Decarbonisation of industrial and commercial buildings is a global priority, driven by climate change commitments and international agreements.

+ Global Context

Paris Agreement (2015): Nearly 200 countries committed to limiting global warming to **well below 2°C**, with efforts to stay below 1.5°C, requiring rapid decarbonisation of energy-intensive sectors.

International Energy Agency (IEA) Net Zero by 2050 Roadmap: Highlights the need for deep energy efficiency improvements, electrification, and low-carbon heat in buildings worldwide.

EU & International Standards: Many UK industrial partners and supply chains are influenced by EU regulations (e.g., **Energy Performance of Buildings Directive**, F-Gas regulations) and international ESG reporting frameworks, creating pressure for early adoption of sustainable practices.

+ UK Legislative & Policy Context

Decarbonisation in the UK is shaped by statutory targets, regulatory standards, market mechanisms, and financial support programmes, which collectively drive industrial and commercial energy efficiency and low-carbon transition.

Climate Change Act 2008: Establishes the UK's legally binding Net Zero by 2050 target, delivered via 5-year carbon budgets.

Carbon Budgets: Statutory caps on emissions; the 7th budget (2023–2037) guides near-term business action.

Minimum Energy Efficiency Standards (MEES):
+ From April 2023, commercial properties must meet EPC E or above to be leased.
+ Future targets: EPC C by 2028, EPC B by 2030 (legislation pending).
+ Non-compliance can incur fines up to £150,000.

Future Buildings Standard (2025): New non-domestic buildings must be zero-carbon ready.

Energy Act 2023: Strengthens rules on heat networks, energy data, and low-carbon infrastructure.

Climate Change Levy (CCL) and Climate Change Agreements (CCAs): Incentivise energy efficiency.

UK Emissions Trading Scheme (UK ETS): Targets heavy industry and energy-intensive sectors.

Energy-Intensive Industry Relief Schemes: Support competitiveness during transition.

Energy Saving Opportunity Scheme (ESOS): Organisations that qualify for ESOS must carry out ESOS assessments every 4 years. These assessments are audits of the energy used by their buildings, industrial processes and transport.

Industrial Decarbonisation Strategy (2021): This strategy sets out how industry can decarbonise in line with net zero while remaining competitive and without pushing emissions abroad.

Transport Decarbonisation Strategy (2021): Strategy to decarbonise the entire transport system in the UK.

Hydrogen Strategy (2021): Strategy to develop the low carbon hydrogen sector.

Heat and Buildings strategy (2021): Strategy to decarbonise homes, commercial, industrial and public sector buildings.

+ Local Level

Redditch Borough Council declared a climate emergency in 2019. On declaration of a climate emergency, an LA is affirming that it will place the Climate Emergency at the centre of its decision-making process.

Redditch aims to reduce our carbon emission by 50% by 2030 and achieve Net Zero by 2040.

UK decarbonisation pathway

The current Climate Change Committee guidance to the UK Government lay out the allowable carbon budget for the UK economy to meet its Paris Agreement targets legislated within the Climate Change Act 2008.

Various strategies underpin the efforts to stick to this budget, the summary highlights reductions in emissions from various sources. Of note are the near term (2023 to 2030) reductions in emissions from industry by 39%, surface transport by 33%, and non-residential buildings by 29%.

In terms of meeting the 2050 net zero goals reductions from current data (2023) would need to be 93% from industry, 99% surface transport and 97% non-residential buildings. Although this will be hugely demanding, it should be noted that progress to decarbonisation the UK electricity supply (74% reduction in the near term and 97% in the long term), will assist in decarbonisation those other relevant areas alongside electrification of these systems.

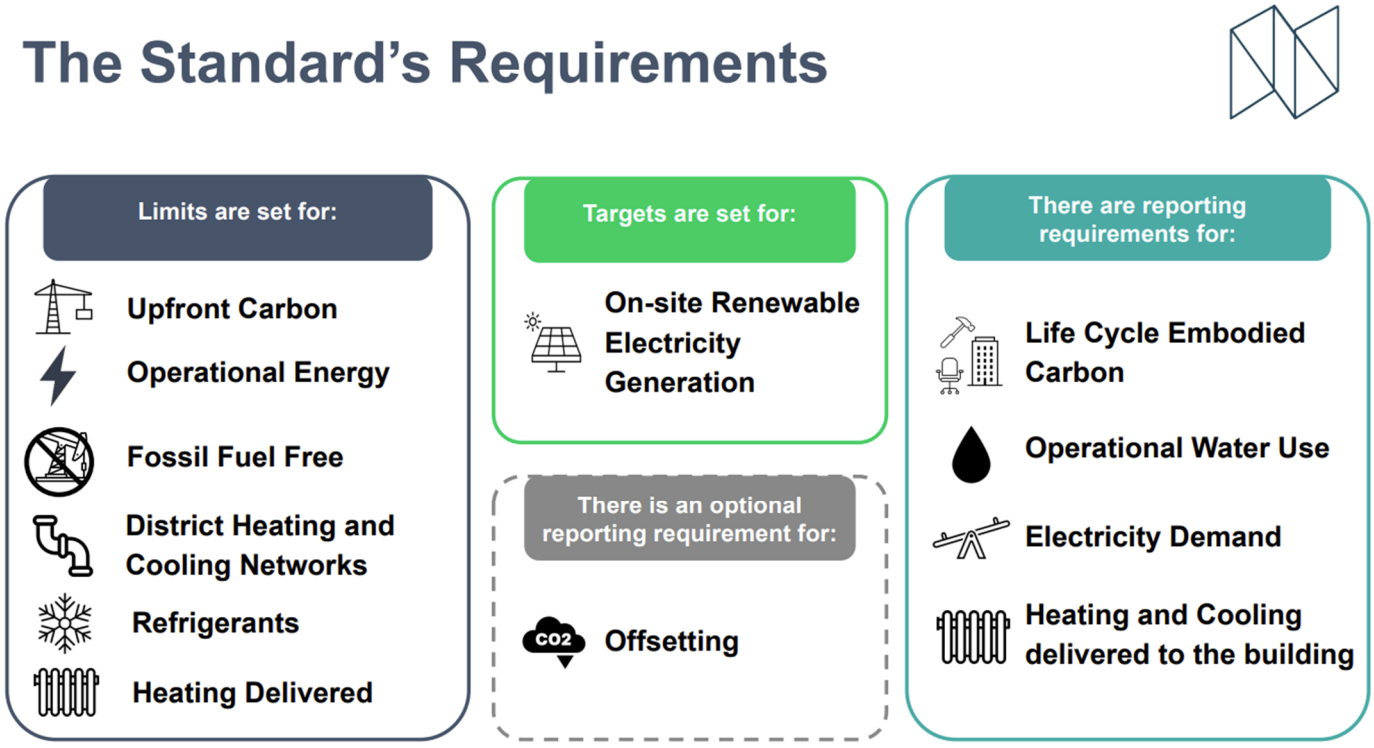
Emerging UK Net Zero Carbon Building Standard

The emerging UK Net Zero Carbon Building Standard is currently within a pilot phase with a full launch expected late in 2025. This standard has been developed through collaboration from experts across the UK Built environment Industry. The Standard provides a rule book for calculating carbon impacts in both new construction and refurbished buildings, it includes mandatory performance targets with the aim of enabling industry to robustly prove their built assets are net zero carbon and in line with the UK's climate targets.

Figure 1 illustrates the high-level requirements of the standard. Operational energy (energy use intensity kWh/m2.yr) are provided for both stepped retrofit plans and in one go retrofits giving science-based benchmarks for performance requirements to align with the 2050 UK Net Zero commitments. This standard will provide best practice benchmarks to assist with informing retrofit works across the study area. It should be noted however that industrial buildings do not have a performance target, although warehouse and offices do.

The Standard also helps with setting best practice benchmarks for solar PV generation and embodied carbon of retrofit works.

Figure 1: UK Net Zero Carbon Building Standard Requirements



https://www.nzcbuildings.co.uk/_files/ugd/6ea7ba_33db26ba808b4212801457963d2ed225.pdf

Case Studies

There are limited established examples of place-based industrial and commercial decarbonisation in action as it's a relatively new idea, evidenced by the number of funded projects over the past 6 years to develop pioneer projects in this area. The context of these competitions is summarised below.

Due to the limited examples of a complete place-based approach the second two case studies just look at a more limited scope of single building and single estate interventions to draw on examples of a wider range of potential interventions.

The case studies presented in the following pages consider:

+ **Industrial symbiosis** (applying circular economy principals to industrial supply chain)
  Black Country Industrial Cluster & Kalundborg, Denmark.

+ **Green Hydrogen**
  South Wales Industrial Cluster & Dachser Logistics, Freiberg, Germany.

+ **Industrial Retrofit**
  Deep retrofit concept by waparchitects and Guiness Enterprise Centre, Dublin.

+ **Clean Energy Hubs**
  Symmetry Park & Moorebank Logistics Park, Australia.

+ **Grant Funding & Business Support**
  Elite Plastics & Brockhouse Group

The Industrial Decarbonisation Challenge

This £210 million scheme which ran 2019 to 2024 has supported the UK's six largest industrial clusters to decarbonise at scale through the development of low carbon technologies and infrastructure, increased industry competitiveness and collaboration and contributed to the UK's clean growth.

A number of these projects were heavily focused on carbon capture and storage due to their geographical locations, however, two of these projects have relevant lessons around Industrial Symbiosis and promoting a place-based green hydrogen economy.

We have drawn on these two projects alongside relevant international examples of best practice in these areas in the coming pages.

Local Industrial Decarbonisation Plans

A further competition was launched by the Department for Net Zero and Energy Security in 2023 where applications were open for UK registered organisations to apply for a share of up to £5 million to develop strategic plans for place-based industrial decarbonisation. In July this year 13 projects were announced as successful bidders.

Midlands Net Zero Hub – Industrial zones competition

This project is one of 5 projects funded by the Hub aims to address the knowledge gaps around placed-based, non-domestic decarbonisation and foster closer working between, commerce, industry, and local authorities.

Industrial Symbiosis

UK Context

project: Black Country Industrial Cluster
location: West Midlands, UK

Supported through UK Research and Innovation's Industrial Decarbonisation Challenge (IDC), a blueprint is being developed for the Black Country to achieve its ambition to reduce carbon emissions to net zero by 2030 and lead the way in clean manufacturing. The Repowering the Black Country project is being led by the Black Country Consortium and low-carbon specialist consultancy, Camirus Ltd.

A portfolio approach is being developed, which will see many projects being supported across a range of supply chains. The project is working to identify opportunities for local, strategically important supply chains to be reconfigured along 'circular economy' lines with:

+ businesses sharing resources
+ businesses making use of each other's waste products

The result will be circular economy clusters focused on different industrial activities distributed across the Black Country, each supported by a zero-carbon power hub designed for the local energy requirement.

ref: www.bcinc.org.uk/about-us.html

Industrial Symbiosis

International Context

project: Kalundborg Symbiosis
location: Kalundborg, Denmark

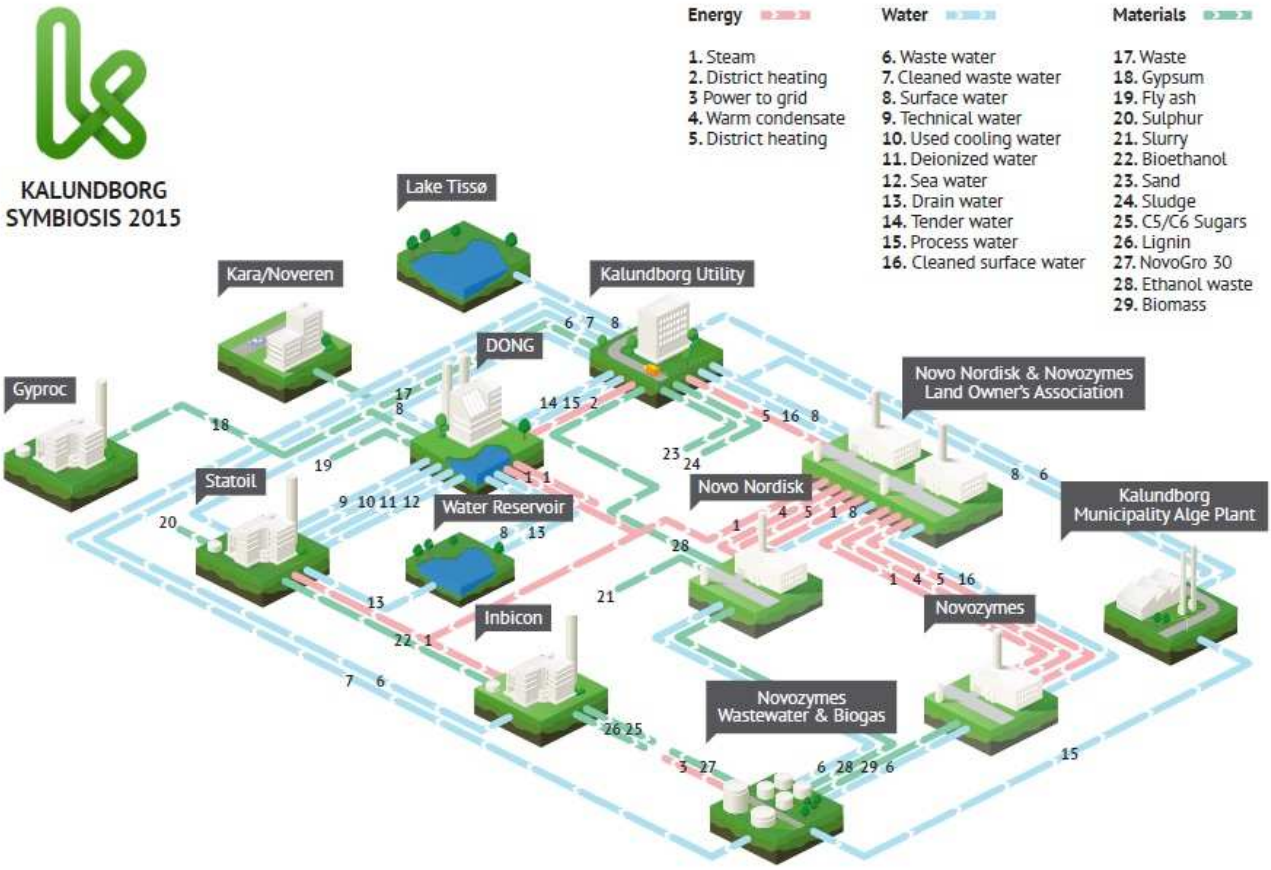
The Kalundborg Symbiosis, located in Kalundborg, Denmark, is globally recognised as the first full scale, industrial symbiosis network. Initiated in the 1960s and formally structured in the late 1980s, the project connects multiple public and private industrial partners in a closed-loop resource-sharing system, where the waste or by-products of one company become valuable inputs for another.

At the heart of the network is the Asnaes Power Station, which supplies surplus steam, heat, and fly ash to nearby industries and the local municipality. Other key exchanges include gypsum from flue gas desulphurisation used by wallboard manufacturers, wastewater reused by nearby facilities, and residual gas and heat used in district heating networks. The system currently includes over a dozen symbiotic exchanges between partners such as Novo Nordisk, Orsted, Gyproc, and the Kalundborg Municipality.

The Kalundborg Symbiosis demonstrates how systematic, cross-sectoral collaboration can drive decarbonisation, resource efficiency, and circular economy principles in industrial zones. Its success is rooted in strong local governance, trust-based relationships, and a long-term commitment to sustainability by both public and private actors.

ref: www.symbiosis.dk/en/

Green Hydrogen



UK Context

project: South Wales Industrial Cluster, (SWIC)
location: South Wales, UK

Supported through UK Research and Innovation's Industrial Decarbonisation Challenge (IDC), SWIC aims to extend the reach and responsibilities of its industrial partners to create a connecting industrial and energy network. There is a strong focus on collaboration between 47 organisations to reach net zero targets.

SWIC's holistic approach to decarbonisation has three core objectives:

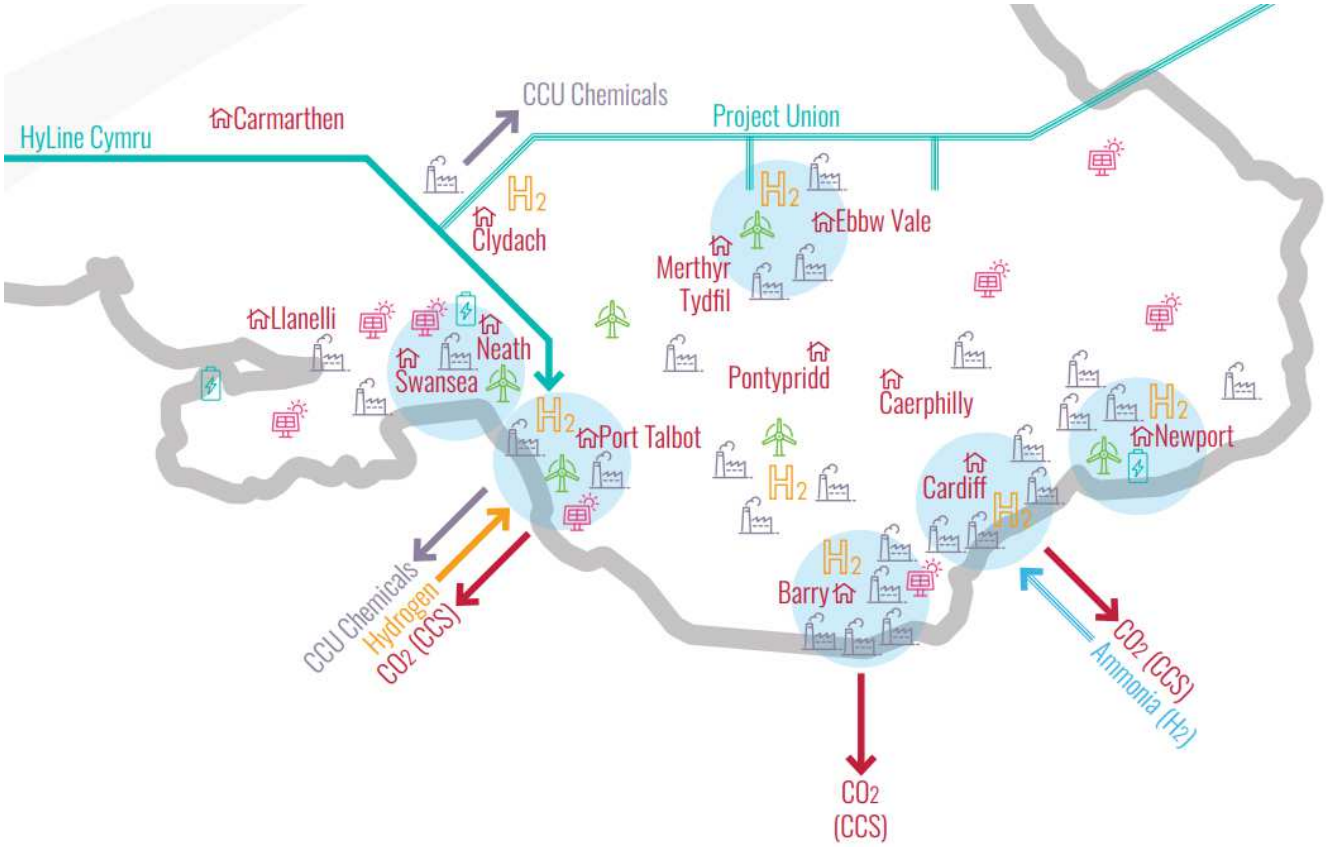
+ industry; through a just transition, deliver internationally competitive and sustainable low carbon industries
+ infrastructure; exploit renewable power capabilities available in the region to decarbonise industries
+ people; attract additional investment and create long term regional employment

These core objectives are delivered by:

+ energy and resource efficiency
+ fuel switching
+ clean growth hubs
+ carbon capture and utilisation
+ carbon capture and storage

Employment opportunities are created from the construction of infrastructure developments for hydrogen, Carbon Capture, Utilisation and Storage (CCUS) and electricity and the installation of the technologies on each industrial site. There are also losses associated with productivity improvements. Therefore, a net positive position on jobs is estimated.

ref: www.swic.cymru/clusterplan



Green Hydrogen

International Context

ref: https://www.dachser.com/en/

project: Logistics Centre by Dachser
location: Freiburg, Germany

Decarbonisation Focus	Actions
Emission Free Delivery	inner city deliveries using EV trucks & cargo bikes ~ 26% CO2 reduction per shipment
Zonal Coverage	49.8km^2 delivery zone covering 23 city districts
E-Mobility Infrastructure	installation of renewable powered charging systems and supporting electrical upgrades to enable EV operations
Vehicle Electrification	fleet of e-trucks from Fuso Renault & cargo bikes
Renewable Power & Efficiency	100% green electricity, heat recovery, LED
Innovation Hub	tests for hydrogen vehicles, smart logistics, AI

project: Hydrogen Refuelling Station by Dachser
location: Magdeburg, Germany

In 2023, DACHSER launched a significant pilot project at its Magdeburg logistics centre in Germany, integrating hydrogen fuel cell technology into its urban logistics operations. The centrepiece of this initiative is the deployment of a Hyundai XCIENT Fuel Cell truck, one of the first heavy-duty hydrogen trucks to be used in regular logistics distribution in Europe. The vehicle offers a range of around 400 km per tank and emits only water vapor, making it a zero-emission alternative to diesel trucks for medium-range deliveries.

To support this, DACHSER partnered with H2 MOBILITY Deutschland, utilizing a publicly accessible 350-bar hydrogen refuelling station located just minutes from the logistics terminal. This station allows for regular refuelling of the fuel cell truck within 10–15 minutes, enabling efficient operations without impacting delivery schedules.

This pilot reflects DACHSER's broader climate protection strategy, which aims to gradually decarbonise logistics through a combination of battery-electric vehicles, renewable energy, and alternative fuels like green hydrogen. The Magdeburg deployment helps validate hydrogen as a viable solution for heavier loads and longer distances where battery-electric vehicles may be less practical due to payload or charging limitations.

Additionally, the project supports regional sustainability goals and contributes to building real-world use cases for hydrogen infrastructure across industrial and logistics estates. DACHSER plans to monitor performance data, operational costs, and infrastructure integration to inform possible expansion to other sites.

Industrial Retrofit

UK Context

project: waparchitects concept
location: South Yorkshire, UK

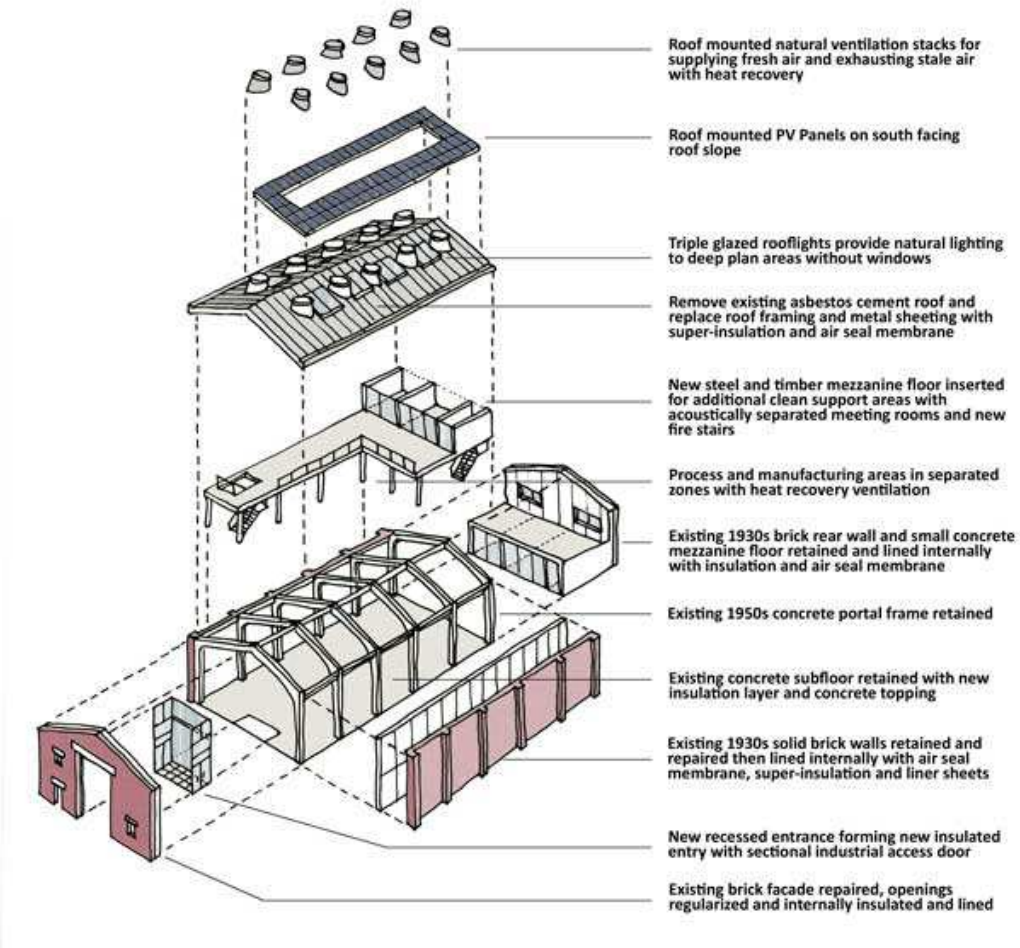
A specialist manufacturing business in South Yorkshire required more space, and instead of renting a new factory unit they proposed to buy an existing run-down industrial building close to central Sheffield. The old building could give them more space than they could otherwise afford and allow them to fine-tune it to their requirements while also futureproofing by incorporating high standards of insulation and energy use.

The existing roof is removed; a mixture of corrugated asbestos cement and plastic sheeting on rusting steel framing, completely uninsulated and leaking. The remaining fabric is stripped back to the existing walls and concrete sub-floor, leaving the precast concrete portal frame. The slab was then overlaid with a layer of dense insulation board and finished with a concrete topping and industrial floor finish.

The existing solid brick walls were repaired and repointed. The external brick walls were first lined with an air seal membrane, then wrapped with a thick blanket of insulation taking care to achieve continuity around the structural frame and at junctions with the new floor and roof insulation. The walls were finished with a robust sheet liner system supported on a subframe.

Triple-glazed rooflights are proposed to the new roof to provide natural lighting over the entire building. Some double-height spaces allow daylight to penetrate past the mezzanine floor down to the ground level.

ref: www.waparchitects.co.uk/industrial-retrofit-blog.html



Industrial Retrofit

International Context

project: Guinness Enterprise Centre
location: Dublin, Ireland

The Guinness Enterprise Centre (GEC), originally a Guinness warehouse built in 1908, underwent a deep retrofit and expansion to become a high-performance innovation hub for startups and entrepreneurs. The project preserved the historic structure while dramatically improving its energy and carbon performance.

Decarbonisation Focus	Actions
Reduce operational energy use and achieve low/ zero carbon retrofit	+ upgraded thermal envelope: insulation, airtightness, and high-performance glazing + installed high efficiency HVAC with up to 93% heat recovery + integrated natural ventilation to reduce mechanical load + retained structure and reused materials to minimise embodied carbon + balanced performance, cost, and comfort using digital simulation tools

ref: www.gec.ie/

Clean Energy Hubs

UK Context

project: Symmetry Park
location: Central Bedfordshire, UK

A logistics park is being developed with an integrated microgrid. The microgrid will supplement power from the national grid and aims to provide the park's tenants with reliable, sustainable, and cheaper electricity.

Decarbonisation Focus	Actions
Renewable Power & Efficiency	+ on-site roof top solar + three combined heat & power (CHP) plants + the CHP plants are readily convertible to hydrogen + two battery containers with 2.3MWh of capacity + two standby generators + two smart control systems to manage on-site solar & other connected power sources + the controllers will supply electricity by selecting the best power source or combination of sources

ref: https://www.tritaxbigbox.co.uk/our-spaces/biggleswade/

International Context

project: Moorebank Logistics Park
location: Sydney, Australia

The largest intermodal freight and logistics facility in Australia is to be powered by a rooftop solar microgrid. The solar microgrid will include a 60-MW rooftop solar array, a 150-MWh battery energy storage system, and off-site renewable energy sources. It will operate at both 11 kV and 33 kV to meet the different needs of tenants.

The facility is aiming to be powered by 100% renewable energy. The microgrid's solar array will fully meet the power needs of the facility's tenants during daylight hours, and an off-site wind farm and other renewable electricity sources will be used when solar is not available.

The microgrid will also be connected to Australia's National Energy Market (NEM) and will support NEM when required through demand response and the ancillary market.

ref: www.moorebankintermodalprecinct.com.au/

Grant Funding and Business Support

Business benefits from £100k grant to upgrade inefficient equipment

project: Elite Plastics
location: West Midlands, UK

Elite Plastics, a family run business in Hereford, is an energy intensive business producing, printing, converting and recycling polythene products.

Through the Business Energy Advice Service (BEAS), Elite Plastics received a free energy audit. This revealed that replacing outdated extrusion technology could yield significant cost and energy efficiencies. This outcome of the audit was a £100k match funded grant to implement the recommendation to replace outdated extrusion technology.

Post-BEAS improvements have enabled Elite Plastics to enhance production efficiency and better compete in an increasingly tight market. The upgrades also align the company with rising customer and supplier demand for sustainability.

Director Josh Salmon highlighted that BEAS provided crucial insight and funding that accelerated investment and delivered measurable performance, cost, and environmental benefits.

Following recommendations from the energy assessment, which highlighted the potential for greater energy savings, Elite Plastics completed Phase 2 of its solar installation earlier this year. Although this installation was not directly funded by the BEAS programme, the free assessment played a crucial role in identifying the opportunity and accelerating the investment decision.

ref: https://www.businessgrowthwestmidlands.org.uk/articles/from-resin-to-results-elite-plastics-sustainable-journey-with-beas/

Manufacturer saves £30,000 annually after implementing energy-efficiency measures.

project: Brockhouse Group
location: West Midlands, UK

Brockhouse Group, an energy intensive manufacturer specialised in closed die hammer and upset forgings based in the Black Country, enrolled in the Business Energy Advice Service (BEAS)—a UK government-funded pilot programme run by Business Growth West Midlands. The programme supports SMEs with free energy assessments and funding to implement energy-saving strategies and meet decarbonisation goals.

The implementation of the audit findings resulted in a £30k annual saving in the business energy costs.

Steve Walters, Brockhouse's Director and Owner, commended BEAS for its "fantastic opportunity to get independent advice on the best options for energy and cost reduction." He noted the programme has charted a clear path toward more sustainable and efficient operations.

Decarbonisation Focus	Actions
Industrial process efficiency measures	+ Fix leaks in compressed air systems. + Streamline and optimise compressed air systems. + Energy monitoring + Waste heat recovery

ref: https://www.businessgrowthwestmidlands.org.uk/articles/black-country-business-discovers-30-000-annual-savings-through-energy-efficiency-advice/

Site Analysis

Site Introduction

Moons Moat industrial estate in Redditch is located within easy reach of the M42 via the A435 direct to Junction 3.

The estate is sub-divided into a number of multi-unit sub-estates and individual units as shown in Figure 2. As agreed by the project partners we have widened the area of analysis to include the Ravensbank Estate to the east, this zone is predominantly where the larger logistics units are located.

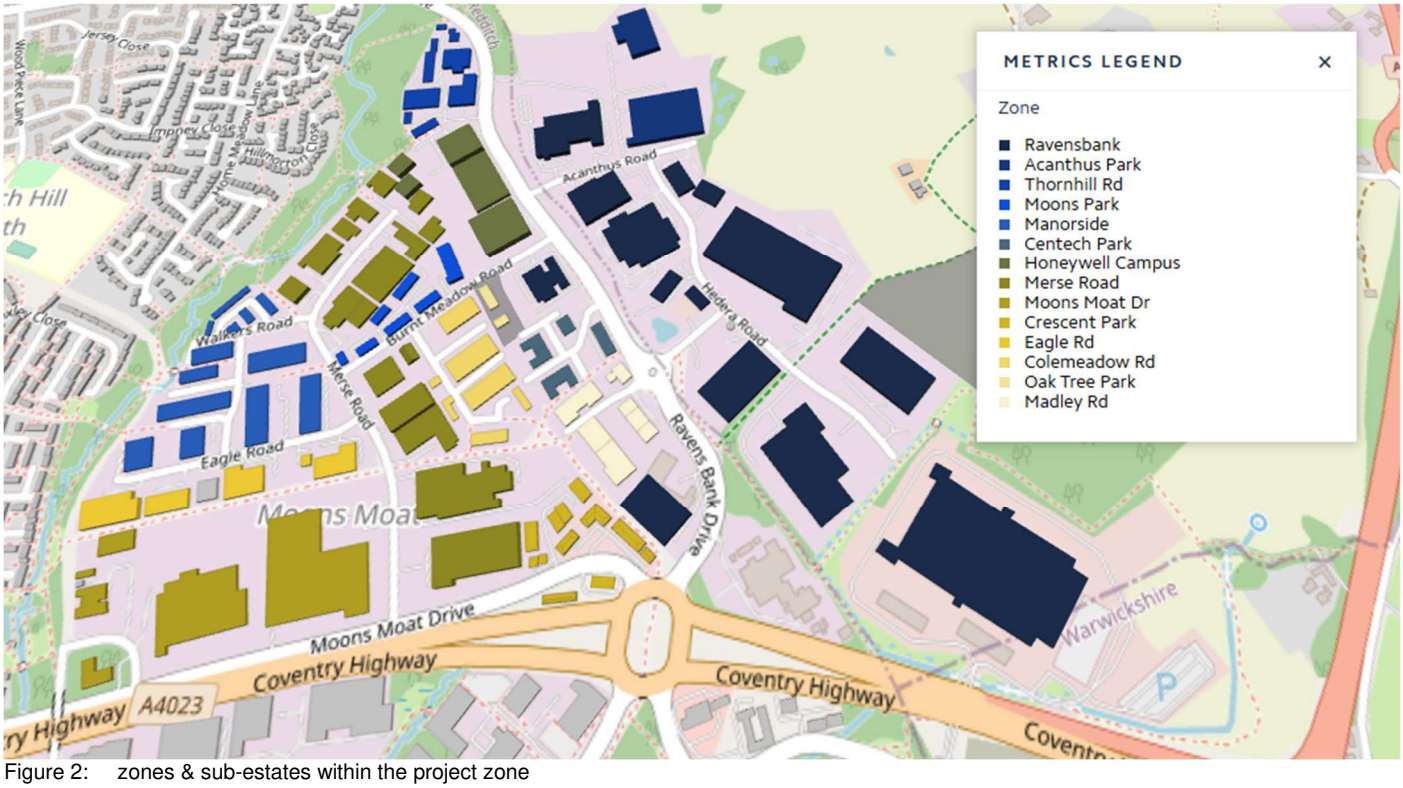


Figure 2: zones & sub-estates within the project zone

The earliest constructions on the estate are from the 1980s with half of the buildings from this era. The estate has been added to or redeveloped to some extent in every decade since. The more recent Ravensbank Estate being a notable significant example of a more recent addition.

Most of the constructions on site are steel frame with metal cladding, although there are a number of masonry constructions, particularly in the smaller sized units. Most buildings have a relatively low glazed area, although rooflights are present in many cases.

The total floor area of buildings within the project zone is approximately 338,300 m^2. The primary function of buildings in the area of interest are predominantly light industrial, office and warehouse.

In terms of floor area this is dominated by larger logistics units making up 34%, smaller warehouse and light industrial units 30%, larger manufacturing 29% and office and other buildings around 8%.

EPCs

Using publicly available data we have also assessed the EPC ratings of buildings across the project zone. Where a range of EPC ratings are associated with multiple units of one building, we have chosen the most representative rating at a building level. Tenants may let multiple adjacent units in the future.

We were unable to find data for 13% of buildings, including some large manufacturers. About 9% of buildings are rated E or worse. The largest proportion are rated D (31%). The remaining: 19% are rated C, 19% B and 9% A.

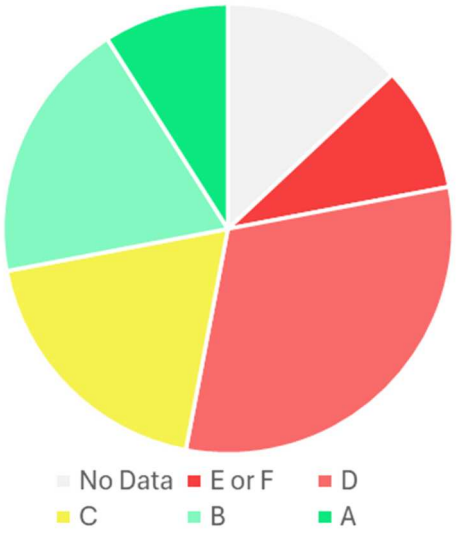


Figure 3: EPC rating pie chart for North Moons Moat

In terms of the expected minimum energy efficiency standards (MEES), for all commercial buildings to be C or better for new tenancies from 2028, 47% of buildings would be compliant with only 28% of buildings compliant with the expected B rating required from 2030. However, EPCs don't always align with in-use energy consumption, particularly in circumstances where there is significant process related energy consumption.

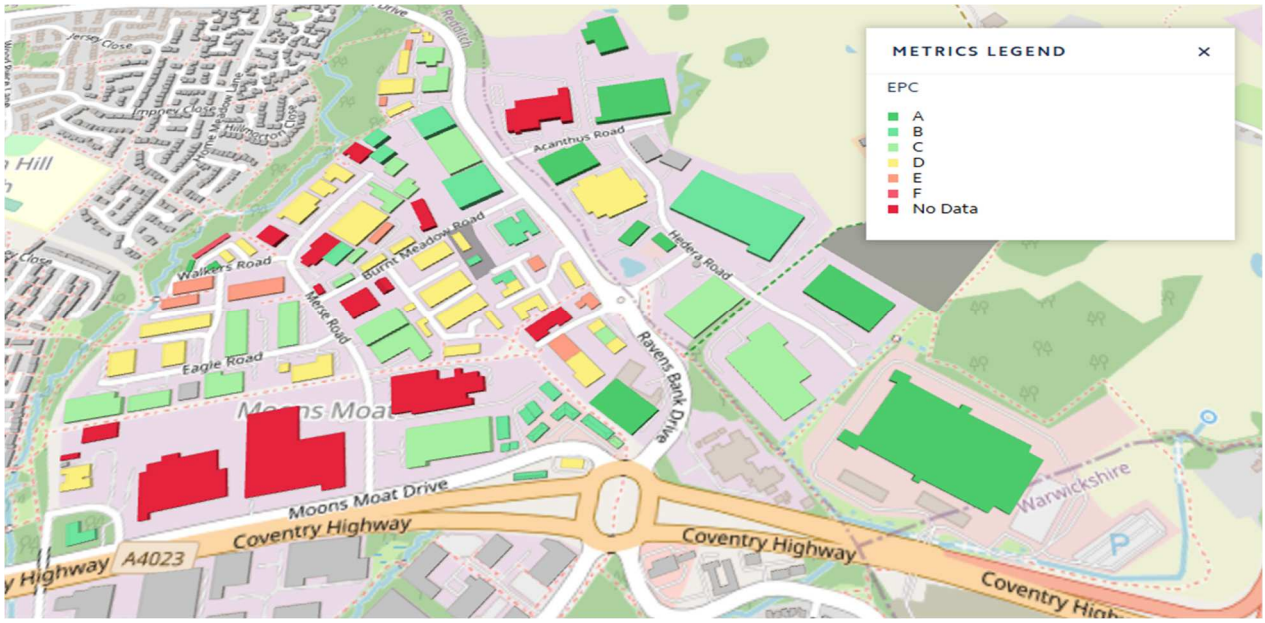


Figure 4: project zone by EPC rating

Energy & Carbon Modelling

Using IES iCD software we are able to run high level energy models. These are based on assumptions of HVAC systems related to function and age, and building fabric performance related to construction type and age.

There is a high uncertainty around a number of factors. Partially, relating to the assumptions above but more significantly they relate to the question of whether warehouses are conditioned or unconditioned.

Some of the buildings highlighted as having the highest space heating loads in Figure 5 may not even have heating systems serving the main warehouse areas.

There is also uncertainty around process energy, particularly within the manufacturing sector where an assumed process load of 50 W/m^2 has been applied.

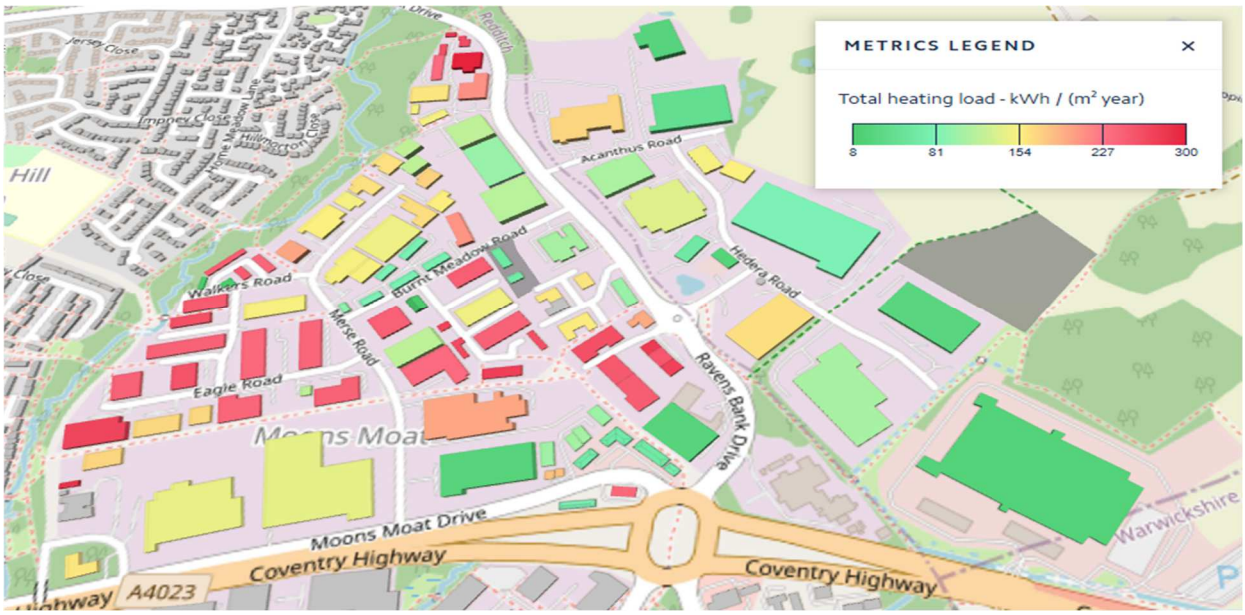


Figure 5: project zone by predicted space heating loads (kWh/m^2)

Site Energy Performance

An analysis of site energy performance has resulted in a relatively high estimate for Energy Use Intensity across a range of 139 to 531 kWh/m^2.yr. The diversity of building, size, age and function contribute to the expected wide range of results. Additional information from building managers is required to help to confirm the assumptions in the calculations at this point.

According to The Non-domestic National Energy Efficiency Data-Framework (https://assets.publishing.service.gov.uk/media/64e62d47db1c07000d22b345/nd-need-2023-report.pdf) the mean energy use intensity of a factory in the UK is circa 110 kWh/m^2, an office 250 kWh/m^2 and warehouse 100 kWh/m^2). Again, a wide diversity in results was reported within this large dataset.

We can conclude that results of our initial analysis are within the expected range, if a little on the higher side.

The results indicate approximately a third of the energy to heating, a third to lighting and auxiliary and a third to equipment and process energy.

Renewable Energy Generation

Analysis of planning consents and satellite imagery indicate that 4 significant solar PV arrays are present within the study area at Thorlux Lighting, Amazon Distribution, HSH Cold store and Heller Machine Tools. Combined these arrays have an estimate area of just under 20,000m^2.

From our analysis it can be observed that, due to seasonal variations in solar PV energy generated, there is likely to be an overall excess yield in the region of 272 GWh/yr. Obviously, the assumptions previously stated in terms of uncertainty around predicted energy demands need to be explored but our initial analysis indicates that there is likely an abundance of solar PV renewable energy currently being fed back into the national grid. There is potential that this energy could be utilised more efficiently within a local setting (around 10% of energy generated is lost within the national grid through transmission and distribution losses).

Carbon Emissions

If we look at the predicted baseline emissions, ignoring on site renewable energy generation for a moment, then emissions from gas are predicted to be 7,673 t.CO_2 per year and from electricity 32,202 t.CO_2.

The analysis in the iCD software looks at a site-level in terms of PV generation, however, we know that due to constraints with sharing energy across the site the four large existing PV arrays can only contribute to mitigating emissions on those dedicated buildings where they are located. The 4 significant buildings with PV arrays are likely to generate more than their demands across a year. Excluding these, we estimate a high-level carbon footprint for scope 1 & 2 emissions in the region of 32 kt.CO_2/year to a high uncertainty.

On average Scope 3 emissions contribute around 60% of a business's carbon footprint so the results from building level analysis are estimated to be around 40% of the total emissions. In some sectors, such as manufacturing, Scope 3 emissions may be even more significant contributors.

Therefore Scope 3 emissions are potentially in the region of 60 kt.CO_2/year, giving a total high-level estimate in the region of 92 kt.CO_2/year.

Opportunities

Alongside the obvious opportunities for demand reductions there is clear potential from this analysis for emissions reductions through application of local renewables to allow all businesses within the study area to benefit from locally generated renewable electricity.

Architypes

In order to dive into the data and analysis in more detail without making this unmanageable we have split the site into three architypes, each makes up roughly a third of the floor area of the area of interest and will have its own individual challenges and carbon emission profiles.

These architypes are shown in Figure 6 and are described as follows:

+ Mid/Big box logistics – these units are 5,000 m^2 and over utilised or a logistics/warehousing function
+ Mid/Big box manufacturing – these units are 5,000 m^2 and over utilised for a light industrial manufacturing function
+ Small-Diverse – these units are less than 5,000m^2 and have varied and diverse functions and tenancies

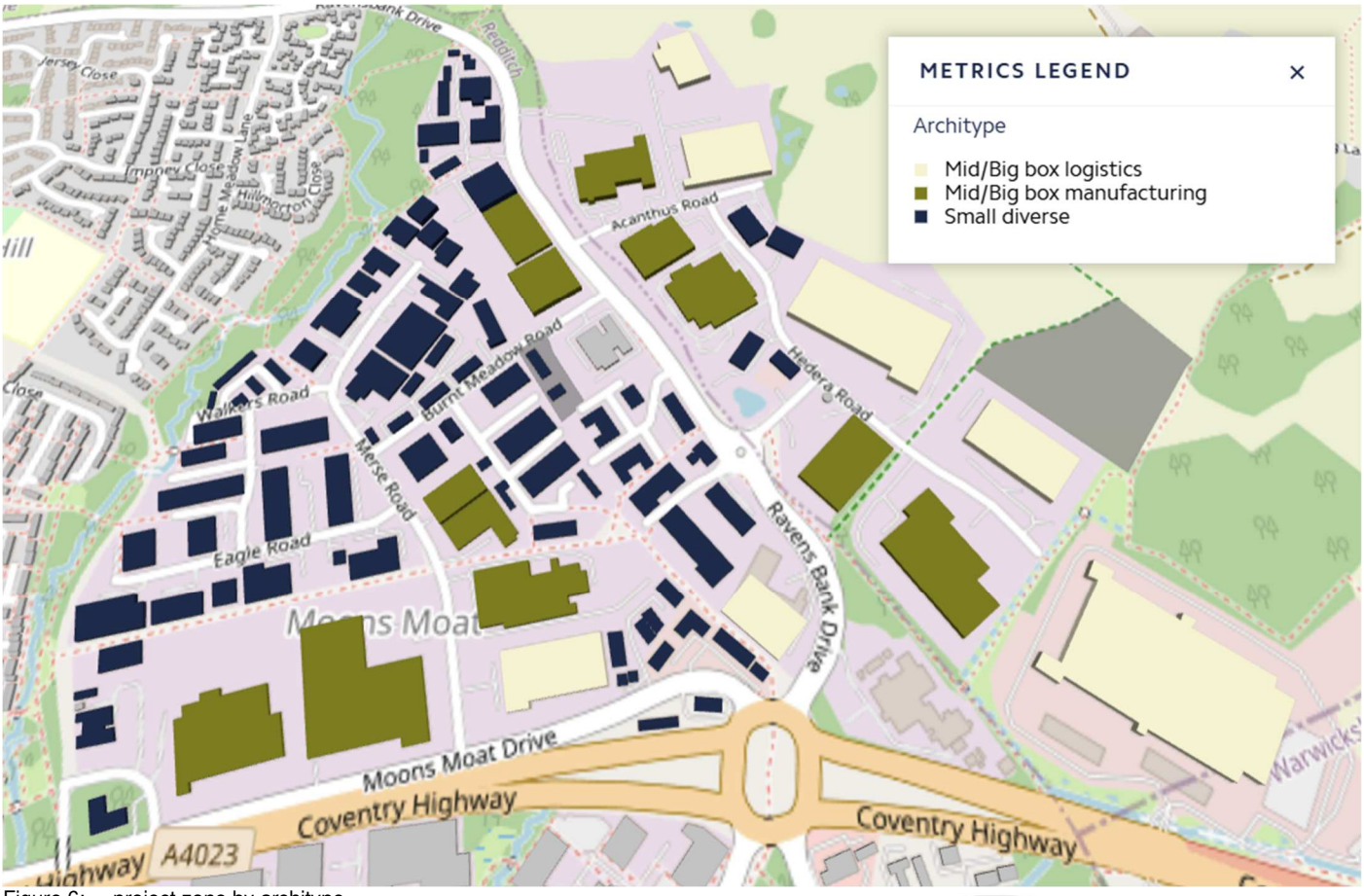


Figure 6: project zone by architype

All architypes will have aspects of transport, building and process impacts but certain areas will dominate in each one.

Transport is the most impactful for logistics due to the HGVs that transfer goods from warehouse to warehouse.

The manufacturing architypes are mostly impacted by process emissions due to the energy demands, particularly as some processes are difficult not to rely on fossil fuels.

The small, diverse units are more dominated by building performance due to the age and condition of their building fabric and HVAC systems.

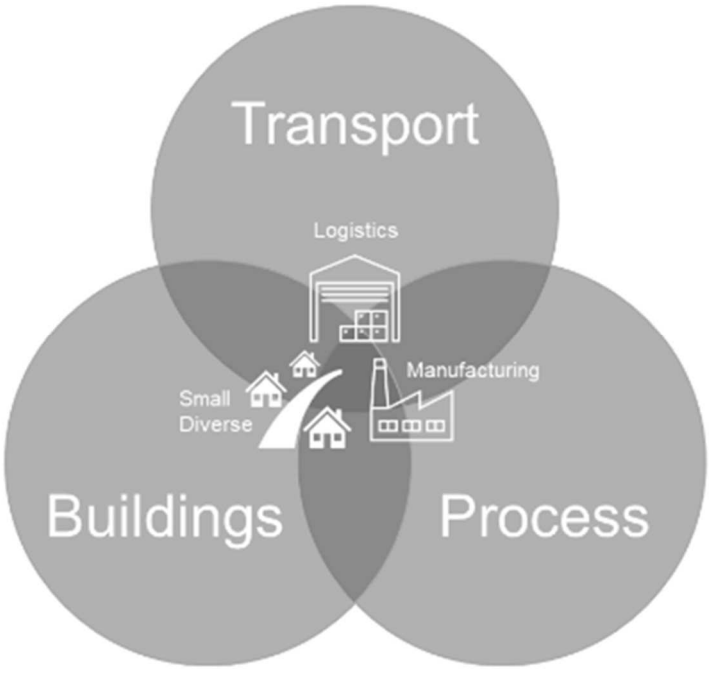


Figure 7: Emissions that impact each architype

Climate Risks & Adaptation

Introduction to Climate Risks

In 2009, the UK Climate Impacts Programme (UKCIP) produced the UK Climate Projections (UKCP09) which set out probabilistic projections of levels of future climate change in the UK employing a methodology designed by The Met Office Hadley Centre. Projected seasonal and annual changes are set out under an assumed medium emissions scenario by the 2080s and include:

+ Summers will be warmer
+ Summers will be drier with reduced precipitation
+ Winters will be milder (as all areas of the UK are to become warmer)
+ Winters will be wetter (potentially a significant percentage increase in precipitation)

There are other variables where it was not possible for probabilistic projections of future changes to be provided in UKCP09 (i.e. soil moisture, latent heat flux and snowfall rate). Alternative sources of projections are provided for these variables in UKCP09 and for the purposes of defining potential future changes for hazard identification, it is assumed that:

+ Soils will be drier on average
+ Storms / extreme winds and heavy rainfall events will generally increase in frequency
+ Snowfall and very cold events will generally decrease

The key likely resulting risks of the above climate changes are increased risks of overheating and increased risk of flooding and storm damage.

Overheating Risks

Our analysis of space cooling at a building level doesn't flag up any risks, however, this isn't a foolproof methodology as in large buildings there could be key areas of limited size (e.g. office space) where there is a significant risk but no risks at a building level.

Therefore, we'd recommend further building level consideration by zone and engagement with occupiers to understand whether these are significant risks that require interventions to manage.

Flood Risk

Considering risks of flooding is another key metric to assess. Risks from flooding of watercourses are assessed under flood planning zones, with Zone 1 being low risk through to Zone 3 high risk.

Although a watercourse bounds the area of interest to the west only a small number of buildings are impacted by Flood Zone 2 (medium risk) in the Manorside Estate.

However, where we consider surface water flooding impacts become more significant across the whole study area. Figures 8 to 10 show surface water flooding in a 1 in 30-year, 1 in 100-year and 1 in 1000-year rain event. As more extreme weather events are likely to occur in a changing climate the place-based decarbonisation strategy should consider mitigation of surface water run off to ensure resilience to the businesses within the study area moving forwards.

Figure 8: surface water flooding from a 1 in 30-year rain event

Figure 9: surface water flooding from a 1 in 100-year rain event

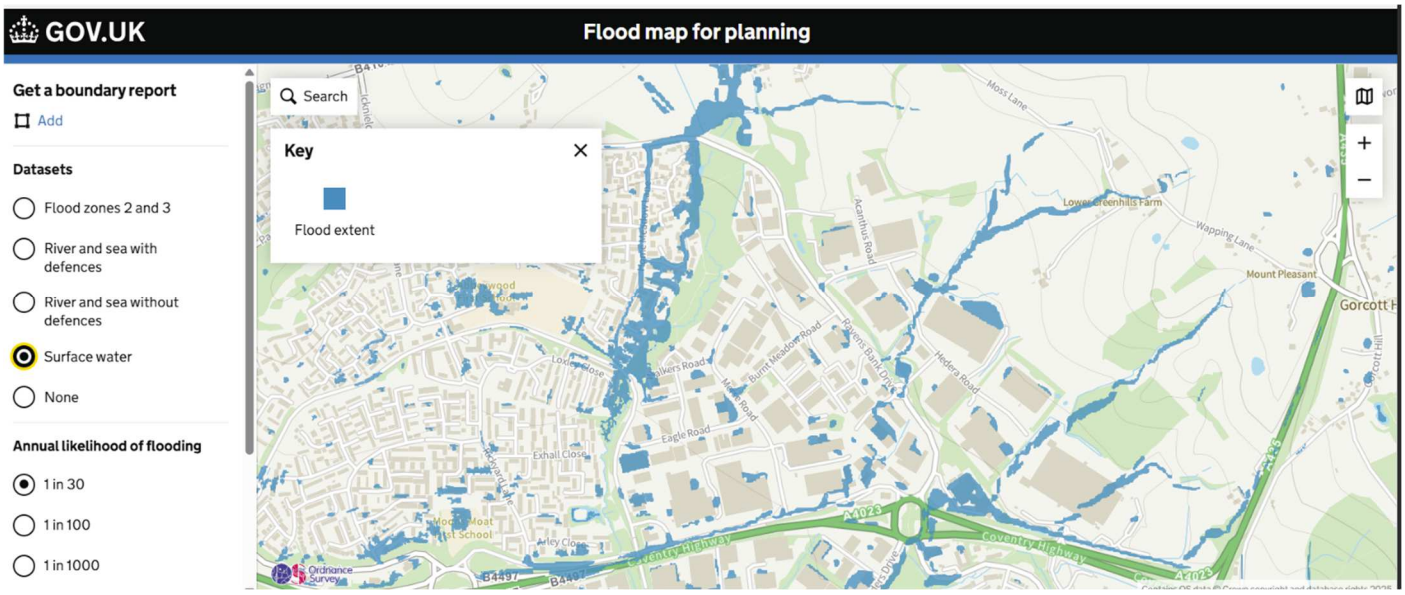
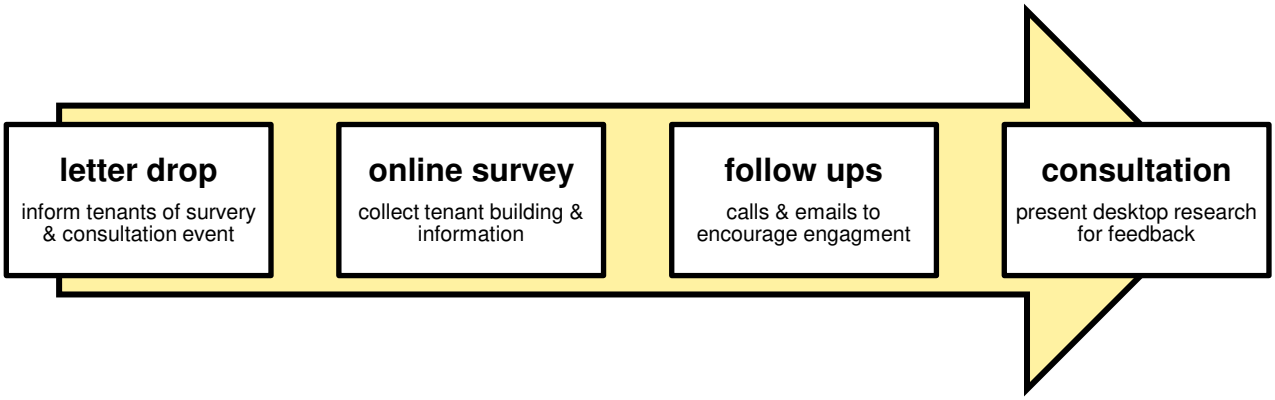


Figure 10: surface water flooding from a 1 in 1000-year rain event

Stakeholder Consultation Analysis

Event Summary

A stakeholder engagement plan was outlined and followed leading up to an in-person consultation.



The in-person consultation event provided a key opportunity for seeking input from tenants into where they see barriers and opportunities for implementing decarbonisation measures. During this event we presented information boards detailing:

+ Vision & Approach
+ Global & UK context
+ Site Analysis
+ Case Studies

Participation was encouraged in a workshop that presented the proposed decarbonisation methods based on initial desktop studies. The following points were made by stakeholders during the workshop:

Opportunities:
+ There is a chance to create a resource sharing scheme, such as heat and electricity, using surplus solar PV generation and waste resources from manufacturing processes.
+ Having a central growth hub would create a zone for knowledge sharing, innovation and bespoke net zero carbon business advice.
+ Shared EV charging infrastructure would be beneficial for those that are implementing electric vehicles, as well as site users using their personal electric cars to commute to and from work.
+ Due to the location of the council owned site on the perimeter being next to agricultural land, an anaerobic digestion plant could be used to transform organic waste into a low carbon fuel for HGVs.

Challenges:
+ The main challenge is the upfront cost of implementing the measures.
+ What would the time scales be to see a return on investment for the long-term measures?
+ Most properties on site are leased. There will be conditions within each tenure that act as constraints to development for net zero carbon.

Attendance levels at the event were low signifying the challenge we have faced with engagement from businesses in the scheme. With such a small sample area, it is important to note that these opportunities and challenges do not represent the site as a whole. A better engagement level would allow us to develop more bespoke strategies, with ideas and constraints from a wide range of tenants on site providing an improved understanding of stakeholder needs.

Figures 11 to 14 present a sample of the boards that were displayed at the consultation, and figure 15 shows how they were used in the activity.

North Moons Moat Industrial Estate
Place-Based Decarbonisation

Vision

North Moons Moat Industrial Estate will lead the way in creating a connected, forward-looking industrial community that embraces net zero. Through innovation, collaboration, and practical action, it will demonstrate how diverse businesses can dercarbonise together and provide a model for sustainable industrial zones across the Midlands and beyond.

Approach

Conversations about decarbonisation often focus on individual buildings or national strategies. But somewhere in between lies a powerful opportunity: place-based decarbonisation. This approach looks beyond isolated interventions and considers the wider context on how buildings, infrastructure, transport, energy, land use and communities interact in a specific location.

AEW Architects are working on behalf of Redditch Borough Council on a, Midlands Net Zero Hub–funded, place-based decarbonisation plan for North Moons Moat Industrial Estate. The project will combine data modelling, 3D visualisation, and stakeholder engagement to identify cost-effective measures in energy, heating, and transport, creating a transferable model for other zones. With industrial activity driving nearly 30% of Redditch's emissions, the plan aims to harness shared infrastructure, early adopters, and coordinated action to cut carbon, boost resilience, and deliver wider economic and community benefits.

Our initial high-level estimates for carbon emissions indicate that Scope 3 emissions are higher than Scope 1 & 2 emissions under current use.

Global Context

Decarbonisation of industrial and commercial buildings is a global priority, driven by climate change commitments and international agreements, to 'meet the needs of the present without compromising the ability of future generations to meet their own needs' (United Nations, 1987).

Paris Agreement (2015): Nearly 200 countries committed to limiting global warming to well below 2°C, with efforts to stay below 1.5°C, requiring rapid decarbonisation of energy-intensive sectors.

International Energy Agency (IEA) Net Zero by 2050 Roadmap: Highlights the need for deep energy efficiency improvements, electrification, and low-carbon heat in buildings worldwide.

EU & International Standards: Many UK industrial partners and supply chains are influenced by EU regulations and international ESG reporting frameworks, creating pressure for early adoption of sustainable practices.

UK Context

Decarbonisation in the UK is shaped by statutory targets, regulatory standards, market mechanisms, and financial support programmes, which collectively drive industrial and commercial energy efficiency and low-carbon transition.

Climate Change Act 2008: Establishes the UK's legally binding Net Zero by 2050 target, delivered via 5-year carbon budgets.

Energy Act 2023: Strengthens rules on heat networks, energy data, and low-carbon infrastructure.

At a local level Redditch Borough Council declared a climate emergency in 2019. On declaration of a climate emergency, a Local Authority is affirming that it will place the climate Emergency at the centre of its decisions-making process.

Redditch aims to reduce our carbon emission by 50% by 2030 and achieve Net Zero by 2040.

North Moons Moat Industrial Estate
Place-Based Decarbonisation

Place-based decarbonisation looks beyond site boundaries to explore how communities can collaborate to collectively reduce their emissions.

Consultation Information

Welcome to the public consultation for North Moons Moat Industrial Estate, Redditch. Thank you for making the time to attend. We hope you've had the opportunity to view the proposals in the information leaflet. Should you have any further questions, please speak with a member of our team today.

We value your input and have various channels available for sharing your thoughts on our proposals.

We encourage your participation in our workshop today.
Following the workshop, you may wish to complete our survey which is accessed by scanning the QR code.

Alternatively, comments can be made anonymously via email to pbarley@aewarchitects.com

All feedback will be recorded.

Thank you!

Action

North Moons Moat Industrial Estate
Place-Based Decarbonisation

Site Analysis

Moons Moat industrial estate in Redditch is located within easy reach of the M42 via the A435 direct to Junction 3. The estate is sub-divided into a number of multi-unit sub-estates and individual units.

The earliest constructions on the estate are from the 1980's, with half of the buildings from this era. The estate has been added to or redeveloped to some extent in every decade since, the more recent Ravensbank Estate being a notable significant example of a more recent addition.

Most of the constructions on site are steel frame with metal cladding, although there are a number of masonry constructions, particularly in the smaller sized units. Most buildings have a relatively low glazed area, although rooflights are present in many cases.

The total floor area of buildings within the project zone is approximately 338,300 m². The primary function of buildings in the area of interest are predominantly light industrial, office and warehouse. In terms of floor area this is dominated by larger logistics units making up 34%, smaller warehouse and light industrial units 30%, larger manufacturing 29% and office and other buildings around 8%.

In order to dive into the data and analysis of the existing buildings, we have split the site into three archetypes as detailed in the figure and table below.

Archetype	Description	No. of Units	Construction Date	EPC Rating
mid/ big box logistics	> 5000m² utilised for a logistics/ warehouse function	7	since 2000	A-C
mid/ big box manufacturing	> 5000m² utilised for a light industrial manufacturing function	11	~ half since 2000, ~ half original 1980s & 1990s development	> half are A-C, ~ one third don't have an EPC
small-diverse	< 5000m² utilised for varied and diverse functions and tenancies	90	mostly 1980s	< half are A-C, > half are B-E

North Moons Moat Industrial Estate
Place-Based Decarbonisation

Participatory Workshop

Proposed Decarbonisation Measures:

- implementation of green travel plans and active travel infrastructure
- upgrading HVAC systems and lighting (e.g. LED conversion)
- retrofitting building fabric to enhance thermal performance
- improving process efficiency
- development of a district heat network
- deployment of heat pump technologies
- installation of EV charging infrastructure
- adoption of hydrogen fuel for transport
- degassing processes for carbon-intensive systems
- generation of renewable energy (e.g. solar, wind)

Action

Please take a pen and a post-it note to share your thoughts on our proposed decarbonisation measures.

OPPORTUNITIES

CONSTRAINTS

Where do you see potential to collaborate with other local business to share resources for decarbonisation?

Figure 11 to 14: Consultation boards shown at stakeholder consultation event

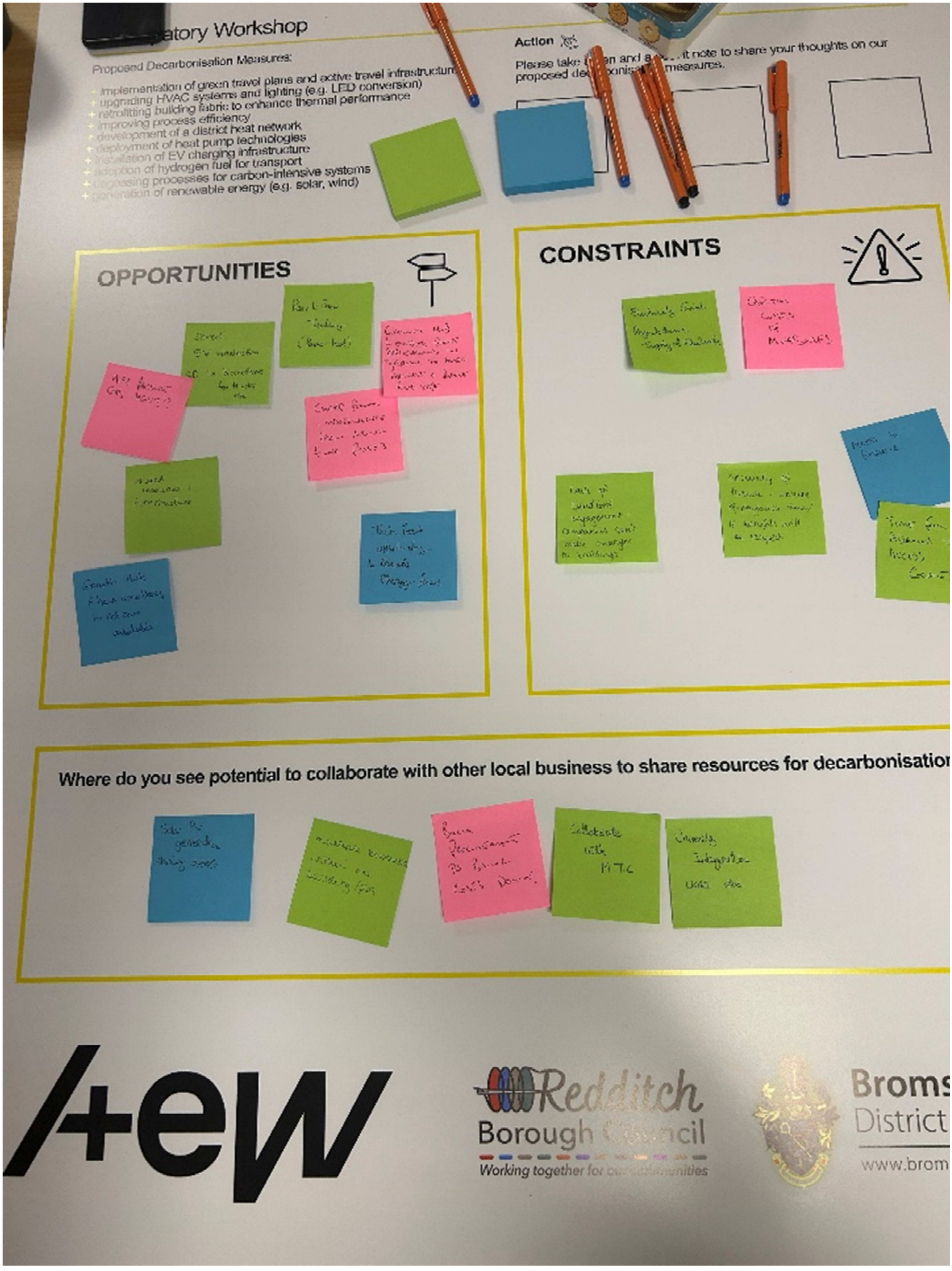


Figure 15: Post-It note activity with stakeholders at the consultation event.

Survey

The letter drops informed tenants on site about a survey they could fill in to help advise the research process. The survey collected building and business information as well as carbon reduction measures and plans in place. Questions on staff transportation, energy usage, process resources and scope 3 emissions were also included.

While a strong survey engagement rate is typically above 20%, our response rate was only around 5%. This highlights the challenge of encouraging participation. Among respondents, 20% were from logistics, 40% from manufacturing, and 40% from the small/diverse category.

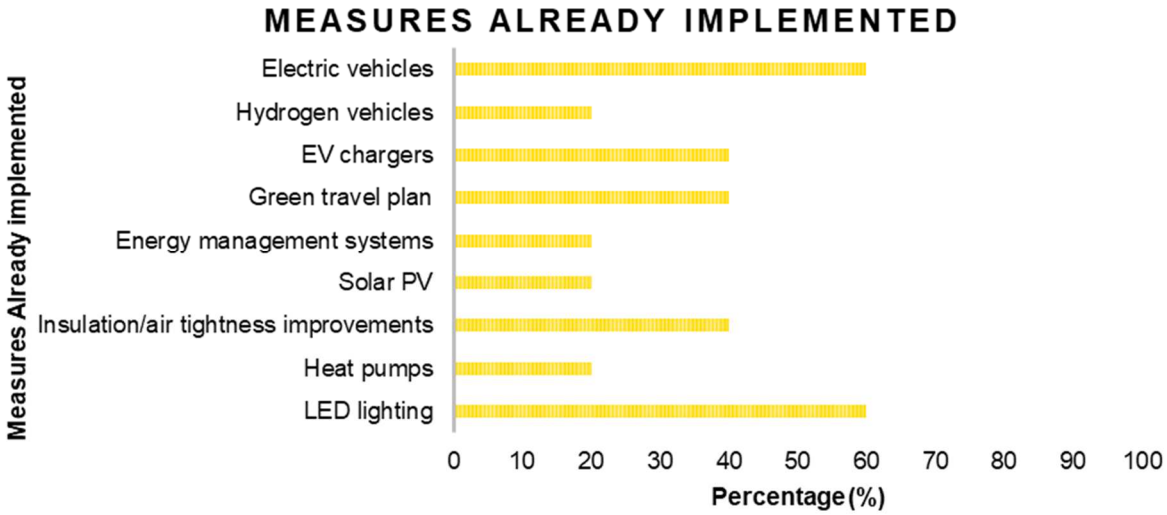


Figure 16: Measures already implemented by tenants

Currently 60% of participants have implemented LED lighting and electric vehicles. LED lighting is a quick and low-cost measure that lowers electricity demands and therefore costs, which explains its widespread adoption. Electric vehicles are primarily used in the manufacturing and logistics sectors, however only 40% of participants have adequate EV charging facilities. This gap represents an opportunity to develop shared EV charging infrastructure.

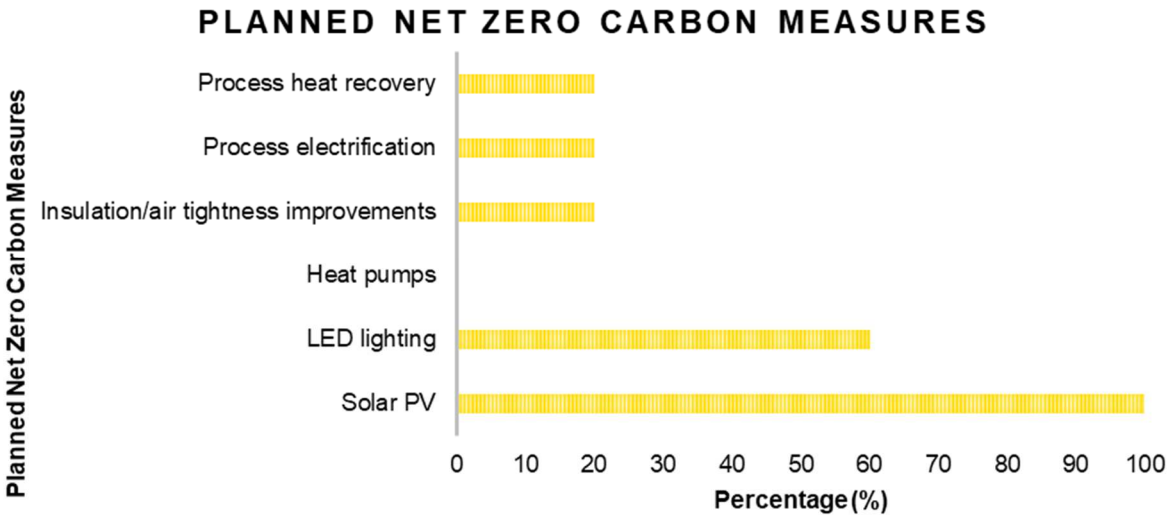


Figure 17: Planned measures to be implemented by tenants

Data indicates that companies are prioritizing solar PV and LED lighting as key areas for future decarbonisation interventions. Retrofitting lighting offers a low-cost, small-scale approach that provides a head start in the decarbonisation process. Solar PV can be deployed strategically so that all buildings on-site benefit from the renewable energy generated. The diversity of strategies already implemented or planned to be demonstrates a strong commitment among businesses at North Moons Moat to reducing carbon emissions, which is encouraging. However, the results may misrepresent the true decarbonisation efforts of tenants on the site, as those that took part in the survey are more likely to be the most enthusiastic about getting involved in the scheme.

Taking two case studies from the survey, we examined staff commuting patterns to understand the current demand for EV charging infrastructure and active travel initiatives. Both Thorlux Lighting and Lighting Consultants Limited operate as manufacturing companies on site. Thorlux has a building footprint of 16,275m^2 with 526 employees, while Lighting Consultants Limited has a floor area of 8,500m^2 and employs only 15 members of staff. Figure 16 shows the proportion of staff commuting my petrol/diesel vehicles, electric vehicles or alternative methods such as walking, cycling or public transport.

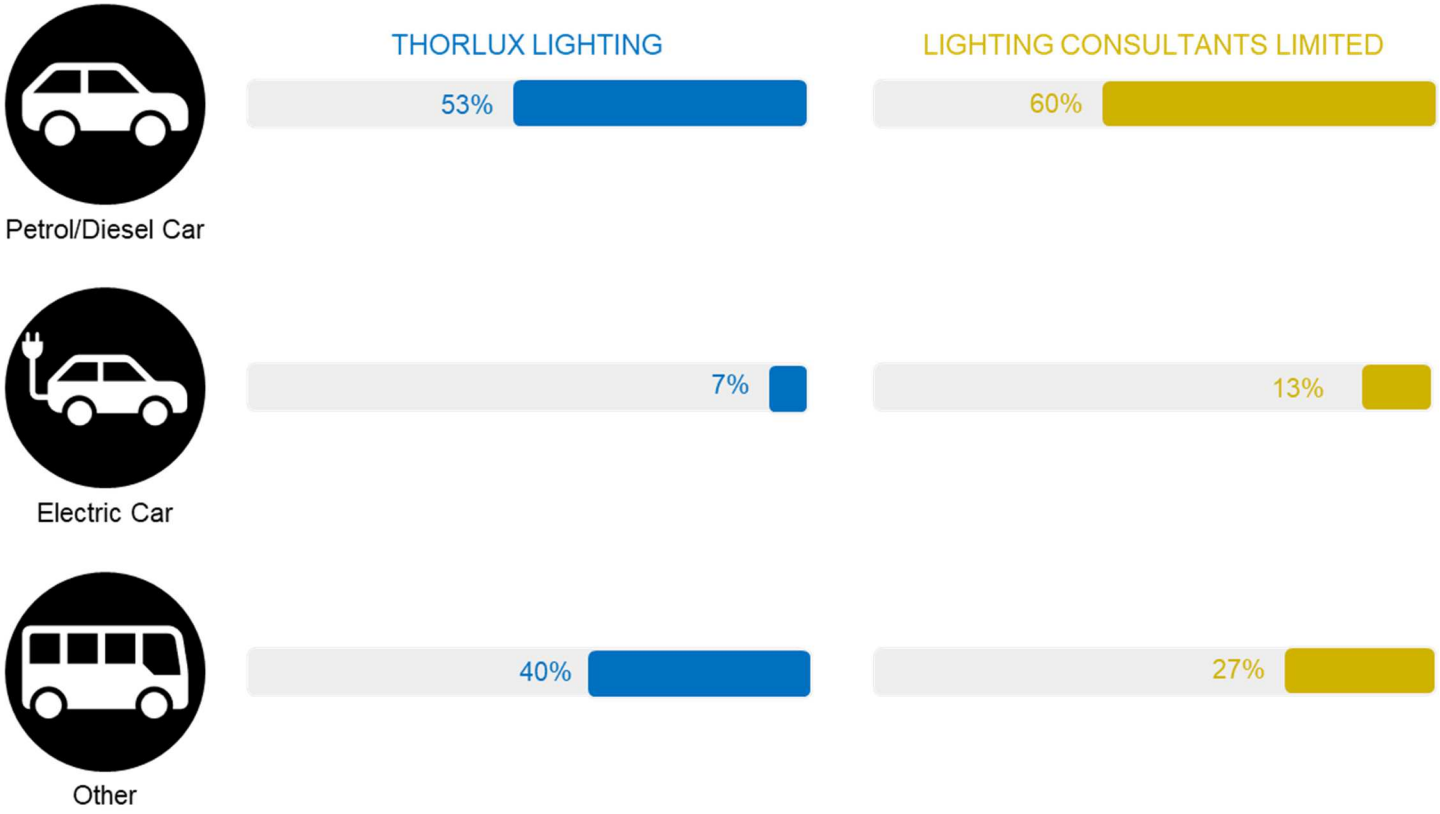


Figure 18: Staff commuting methods for Thorlux Lighting and Lighting Consultants Limited

Although the two companies differ significantly in size, their commuting patterns remain broadly similar. Thorlux Lighting has EV charging infrastructure on site, yet the proportion of employees that drive electric vehicles is lower than that at Lighting Consultants Limited, which lacks such facilities. This indicates that external factors, such as cost, continue to limit the adoption of EV. While it is important to provide future provision for EV charging, greater emphasis should be placed on active travel plans to increase the number of employees that walk, cycle or use public transport to commute.

During further conversations with Thorlux Lighting, it was mentioned that staff had complained about the lack of paved footpaths to the food and drinks facilities on site. Sufficient walking access to these facilities is important, as employees will visit during lunch hours. An active travel plan will help reduce the need for people to drive to get their lunch, and in turn reduce scope 3 emissions.

Although the data collected from the survey is useful, we would need a larger sample size to gauge a true understanding on the type of measures that would be applicable to North Moons Moat. Encouraging engagement should be a top priority, as early stakeholder involvement and trust are crucial to delivering a successful scheme.

Desktop Analysis

To address the challenges of direct engagement with companies, we supplemented the survey with an in-depth desktop study of the largest companies on site, ranked by floor area and a number of focused one to one interviews with Thorlux Lighting and Sustainable Development Goals Ltd (SDG Ltd). The analysis captured their short- and long-term net zero carbon goals, as well as the measures they have already implemented to achieve these targets. Data was taken from net zero carbon statements (or their lack of) on company websites.

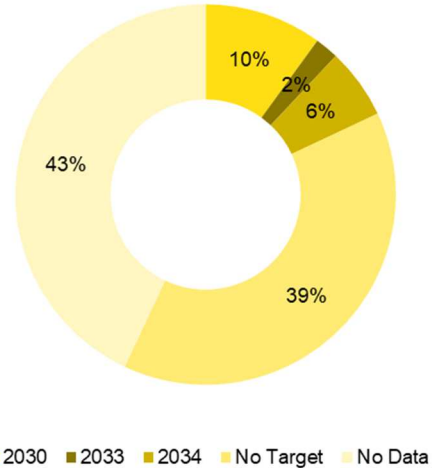


Figure 19: Near-term net zero targets by floor area

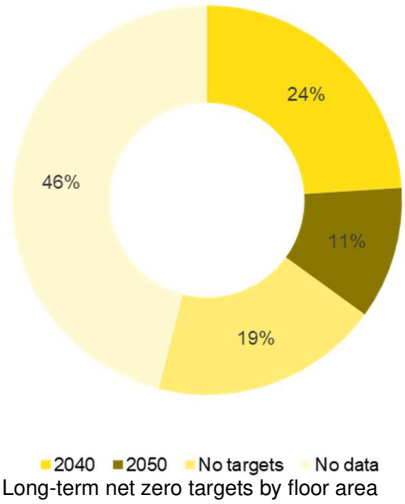


Figure 20: Long-term net zero targets by floor area

According to the data collected, only 43% of the largest companies have near and/or long-term net zero carbon targets in place. Those without have basic environmental policies, ISO14001, PAS2060, SBTi Commitment, Ecovardis or nothing at all. Based on figures 19 and 20, we can see that at least 18% of the floor area occupied by a company have near-term net zero targets, and at least 35% have long term net zero targets. Of those companies, 66% have their decarbonisation strategies independently verified. This demonstrates the fact that there is already some interest in decarbonisation. It is therefore essential to develop strategies that will engage a wider range of tenants to ensure the success of the scheme.

Through the desktop study, we also established some of the actions that the largest companies on site were taking towards reducing their carbon emissions:

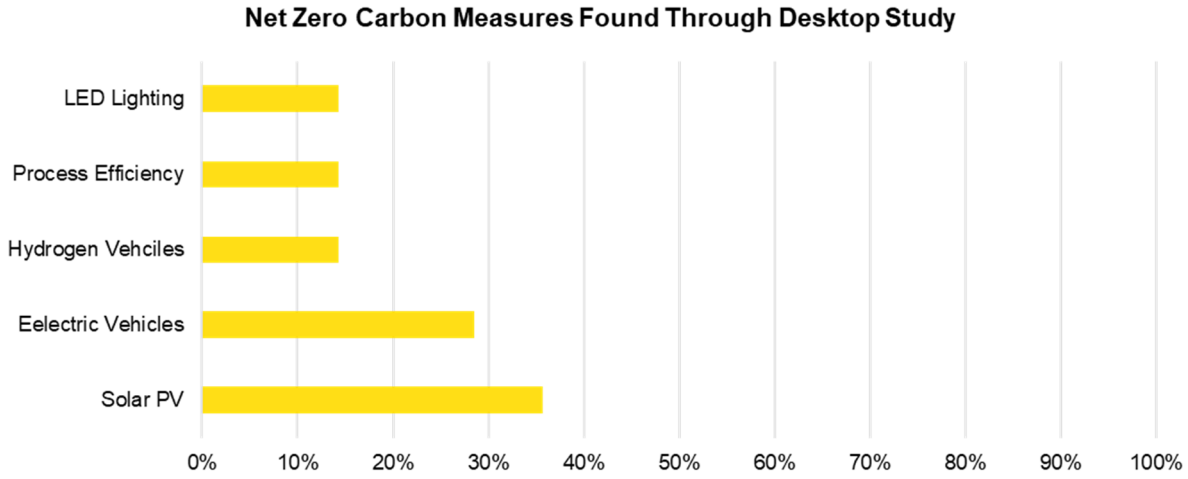
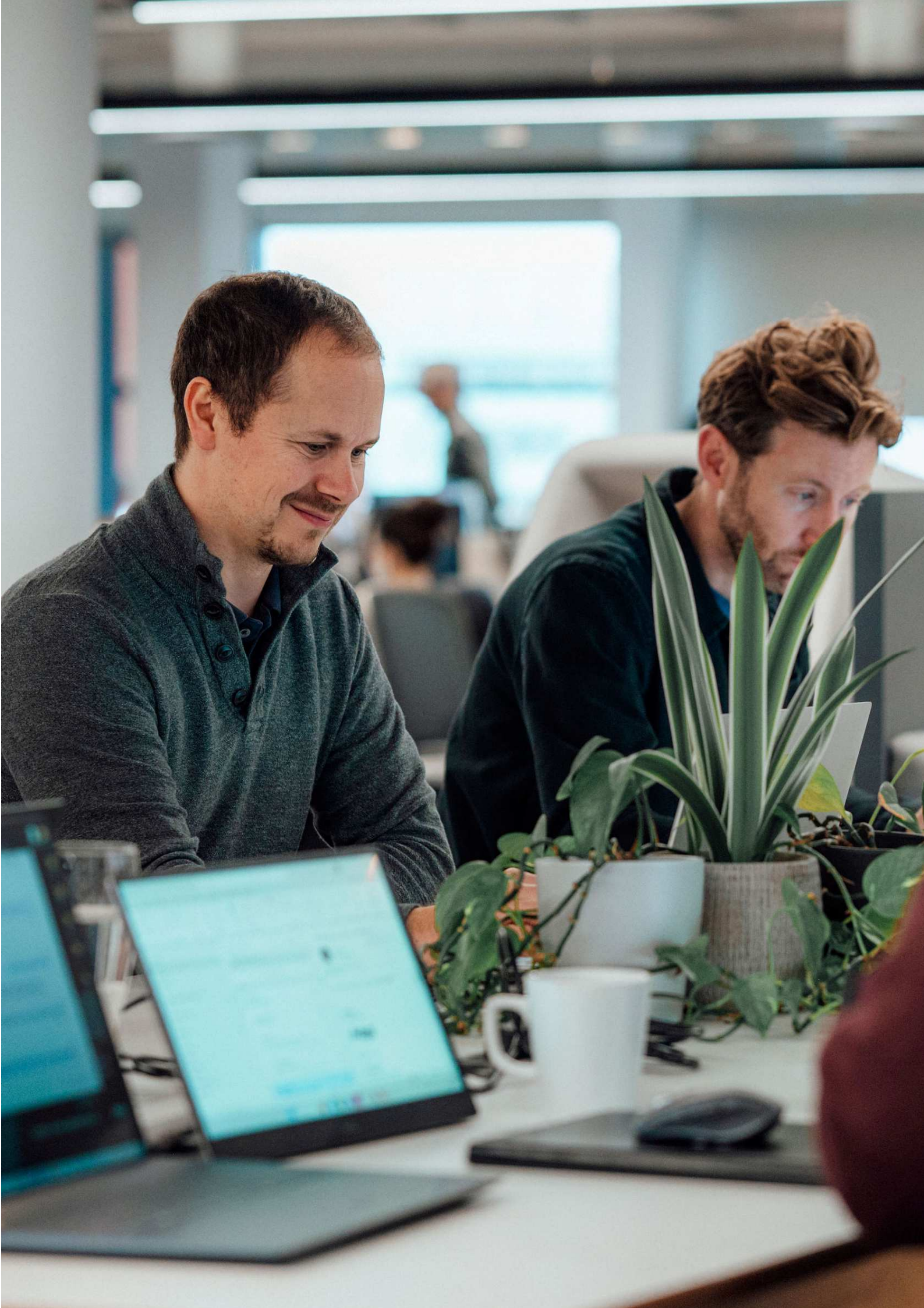


Figure 21: Net zero carbon emissions found through desktop study

The main focus was on solar PV and introducing electric vehicles (EV). These results, along with the data from the survey, show the difference between the demand for EV HGVs and employee commuting EVs. A number of logistics and manufacturing companies on site are implementing electric HGVs into their strategy, so sufficient charging infrastructure will need to be available to ensure this is feasible. However, as the survey shows, EV charging infrastructure is of a much smaller demand in staff carparks, although future provision should be provided. This is one example of how carbon mitigation measures can affect the architypes to different extents.



Potential Decarbonising Measures

Through the results of our desktop analysis and stakeholder engagement measures, we evaluated the feasibility of a number of decarbonisation strategies. Rather than focusing on individual buildings, our approach considered the site as an integrated system, exploring how buildings could interact to enable place-based decarbonisation. Each architype has a different carbon profile that is shaped by factors such as number of staff, occupation hours, size, building fabric and internal activity. Consequently, some measures are better suited to specific architypes, while others can be scaled across the whole site to support the wider scheme.

Figure 23 illustrates the range of measures assessed for feasibility, informed by stakeholder input and desktop research. These acted as a guide for us to develop 4 place-based decarbonisation solutions for North Moons Moat Industrial Park.

Testing the feasibility of measures

Buildings:

+ Retrofitting buildings improves the efficiency of their building fabric and HVAC systems which in turn reduces heating/cooling loads and the operational carbon. There is a large proportion of the small/diverse architypes that were built before 2000 and so would benefit from retrofitting.

+ Installing LED lighting into all buildings will decrease lighting loads, subsequently reducing cooling loads due to less waste heat energy.

+ Heat pumps work by using electricity to provide heating and cooling to buildings by transferring heat from outside. These are well suited to buildings with improved airtightness, as the heat transfer process is more efficient.

Process and Energy:

+ The annual heat demand is unlikely to be sufficient enough to introduce a District Heat Network, as there are no large heat sources nearby that could act as an anchor load for a network that could serve the adjacent residential areas.

+ Manufacturing stakeholders are interested in process efficiency and degassing improvements. This is hard to apply across the whole site as a more detailed analysis would need to be undertaken, providing details of each individual process and the resources they use/produce.

+ Wind and hydro are not feasible due to a lack of a water source with a strong current for hydro and large buildings acting as an obstacle for wind energy.

+ Solar PV was mentioned by every stakeholder in the consultation process and so is definitely worth implementing into the site. Solar PV provides more return on investment at a larger scale, which is a bigger incentive for tenants to get involved with this strategy.

Transport:

+ Green hydrogen refuelling stations are usually closer to the coast near largescale wind farms. The nearest hydrogen refuelling station to North Moons Moat Industrial Estate is 14 miles away at Tyseley Energy Park.

+ Improvements can be made to the current public footpaths on site to encourage more staff to use active transport methods to commute to and from work.

+ The site suffers from increasing surface water flooding risks, and so Sustainable Urban Drainage Systems (SuDS) could be implemented to strengthen resilience and improve habitats for biodiversity.

Figure 22 shows how each measure aligns with each architype. While some can be applied across all three, there are a number of strategies that work better for individual building types due to a number of factors including building fabric, internal activity, number of occupants and more.

	Solar PV	LED Lighting	Retrofitting	Heat Pumps	Green Travel Plans	EV Charging	Electric Vehicles	Biofuel/Hydrogen Vehicles	Process decarbonisation
Logistics									
Manufacturing									
Small/Diverse									

Figure 22: Feasibility of each measure for each architype

Figure 22 demonstrates the impact that each measure is likely to have on the different architypes. Green has a strong impact, amber medium, and red is likely to be low. Logistics building are typically newer so building fabric, lighting and HVAC systems are more efficient due to better building standards. Retrofit, therefore, will have low impacts on this architype. Process decarbonisation will have the largest impact on the manufacturing architypes that specifically have high heat intensity processes. Logistics warehouses tend to be for storage, and the small, diverse buildings are majority offices and food establishments, so this measure is unlikely to have an impact.

The majority of the other measures, however, will have an impact on reducing carbon emissions for each architype, emphasising the potential of place-based decarbonisation schemes.

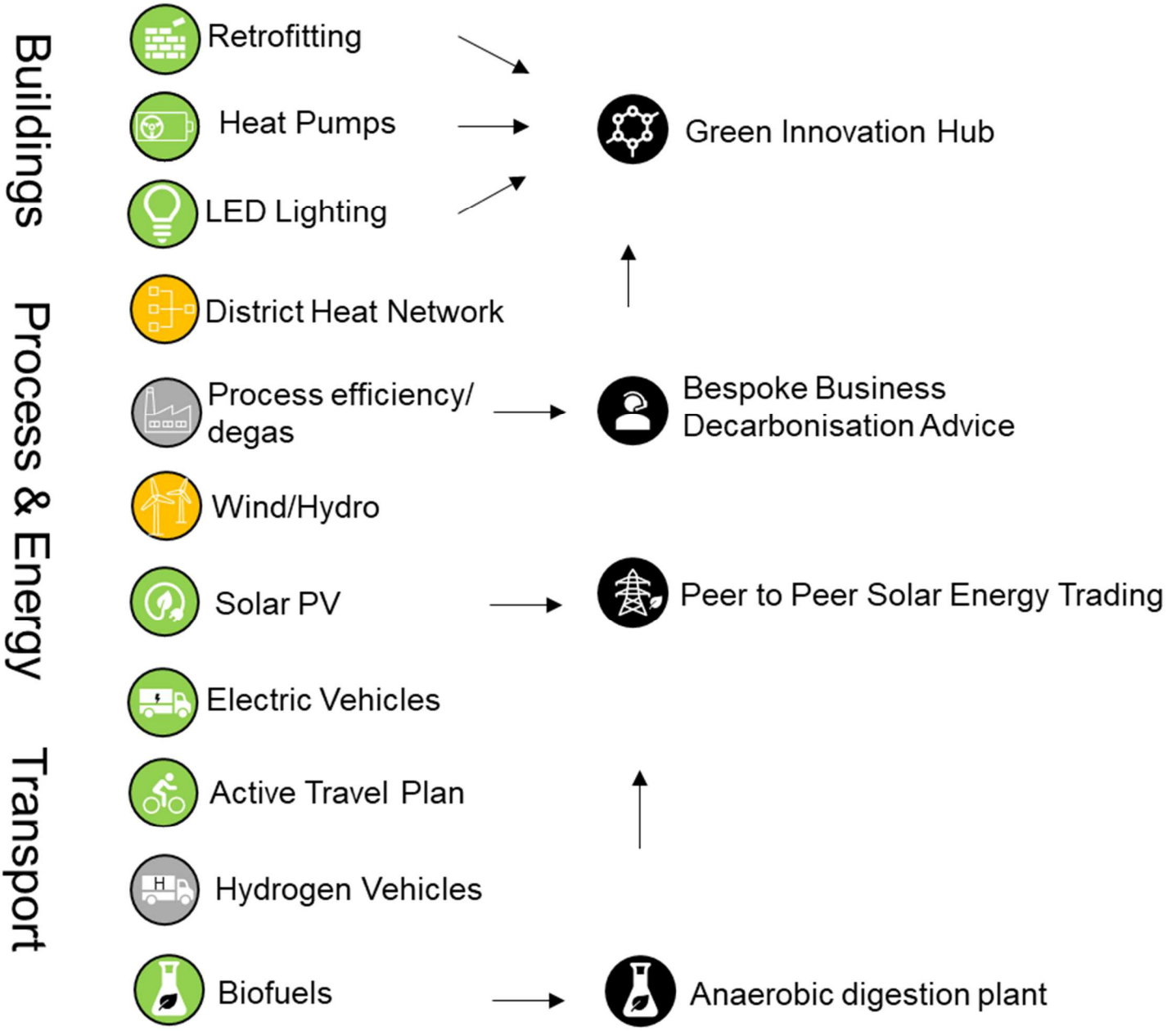


Figure 23: Measures feasibility

Proposals

Developing the proposals

Establishing a Green Innovation Hub

With stakeholder engagement being a crucial factor of a successful scheme, creating a central space where they can collaborate and learn about net zero strategies would be a great way to encourage this. When considering potential locations for this to be established, we looked at Oak Tree Park, the council owned plot of land in the centre of North Moons Moat. The site has two existing office buildings that could be used as retrofitting prototypes.

Figure 24: Location of Oak Tree Park site

There are a number of different stages of retrofit that can be implemented on a building. These include:

+ **Optimisation:** this means replacing Building Management Systems (BMS) to improve energy efficiency, as well as reducing tenant equipment loads.

+ **Light retrofit** introducing LED lighting, solar shading and mix mode ventilation systems, along with carrying out night purges during unoccupied hours.

+ **Deep retrofit:** this is improvements to airtightness, wall and roof insulation, external cladding and glazing. New HVAC systems are also introduced, including heat pumps, domestic hot water & cooling and mechanical ventilation heat recovery.

+ **Renewables:** installing solar PV to reduce the need for electricity derived from fossil fuels.

Which stages are implemented onto each building at Oak Tre Park will depend on their current condition. There could be opportunity to carry out a light retrofit and optimisation on the larger office building, and a deep retrofit and renewables on the smallest of the two, for example. This will all be determined when the buildings are surveyed.

Throughout the process, site visits and 'lessons learnt' workshops could be held for companies situated in the industrial estate, encouraging them to apply some of the retrofitting techniques to their own buildings. As the small/diverse architypes take up approximately one third of the total floor area of moons moat, a mass retrofit movement would drastically reduce the electricity needed for heating and cooling these building, and therefore the operational carbon.

Once the hub is established, small sustainability consultants that are already located within the study area, such as Sustainable Development Goals Limited and Pro Enviro, could move in and provide businesses on site with decarbonisation advice. This service would help manufacturing companies looking to implement process degassing/electrification measures, further contributing to the decarbonisation of the industrial park.

Co-ordinating an Active Travel Plan

Following consultation findings indicating that the addition of EV chargers doesn't necessarily correlate to an increased use of electric vehicles, we decided to shift our focus to promoting methods of active travel. This could help in reducing scope 3 emissions caused by employees commuting in petrol/diesel vehicles. The best way to achieve this is by enhancing public footpaths throughout the site and introducing cycle lanes. The Redditch Local Cycle and Walking

Infrastructure Plan (LCWIP) proposes a >7km cycle route that runs along Church Hill Way on the western site boundary (Route 6 in figure 25). This route reaches a vast area of residential zones and could be incorporated into the plan to promote cycling to work to staff from these areas.
The LCWIP also includes an engagement exercise that identifies new or altered cycle routes suggested by the public. One proposal includes the footpath that intersects the site, running from Church Hill Way to Merse Road and beyond, indicating existing demand. Enhancing this route into a green corridor would significantly help towards increasing the number of people walking or cycling to work.

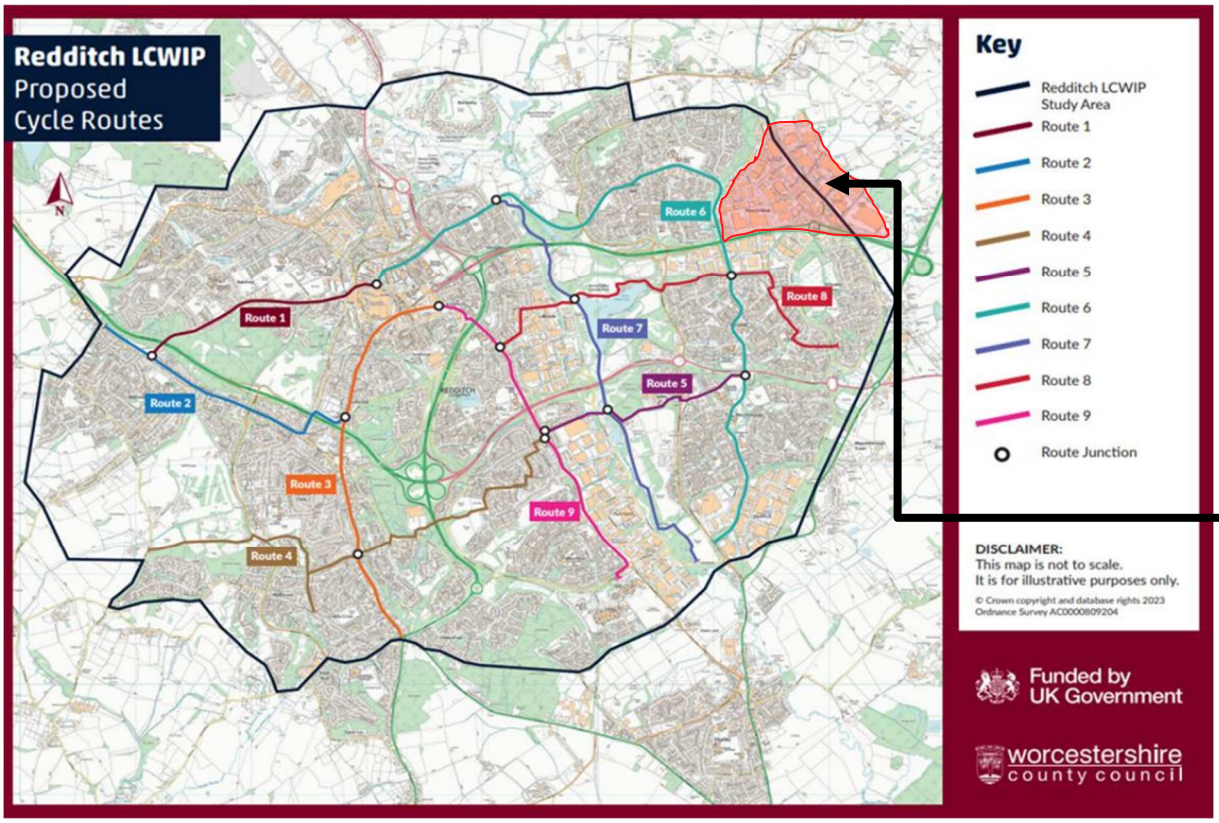


Figure 25: Redditch LCWIP cycle routes

As a part of enhancing footpaths and green space, SuDS could be implemented to help improve resilience against surface water flooding. These could be in the form of swales, rain gardens, etc and could create habitats for local wildlife, contributing to biodiversity net gain.

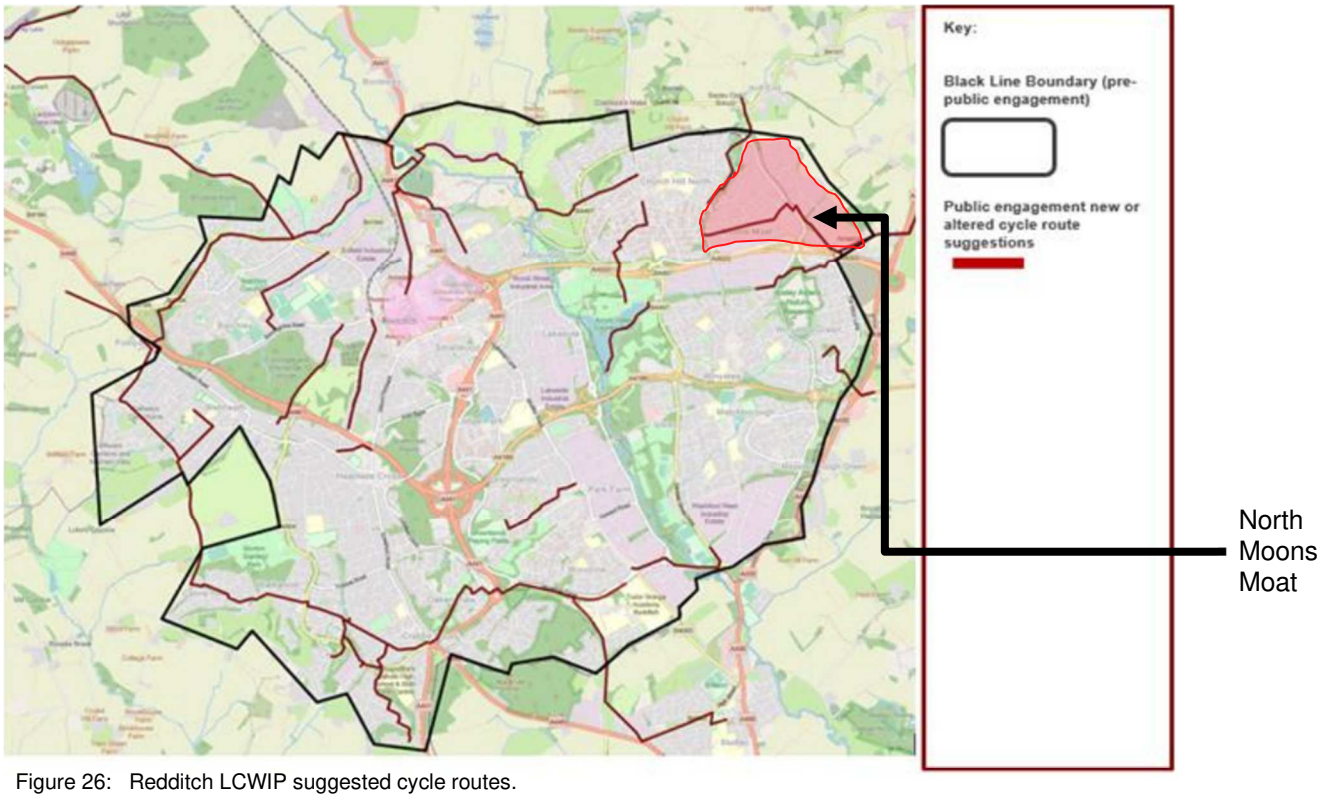


Figure 26: Redditch LCWIP suggested cycle routes.

Peer-to-Peer Solar PV Energy Trading Scheme

Consultation feedback shows that solar PV is the most widely adopted or planned measure among the companies on site. Taking inspiration from the Kalundborg Symbiosis case study, an opportunity for a peer-to-peer renewable energy trading system is created. By encouraging large logistics and manufacturing warehouses to install solar PV arrays, surplus energy that is generated can be captured and distributed to other buildings on site through a digital trading platform. This would allow businesses to buy and sell green electricity at competitive prices compared to the National Grid.

The digital system would optimise energy usage by smoothing demand peaks, reducing waste and maximising savings. Decentralising energy generation makes it easier to introduce and use renewable energy sources. This creates resilient, local energy communities.

Implementation would follow a phased approach, starting with landlords and businesses installing solar PV where feasible. Once operational, the peer-to-peer technology can be introduced allowing energy trading to begin. As cost savings and revenue grow, more tenants and landlords are likely to join, accelerating carbon reductions.

Developing an Anaerobic Digestion Plant

Looking at the demand of logistics companies using low carbon alternatives to diesel HGVs, the opportunity to create a low carbon fuel on site could be carried out in the form of an anaerobic digestion (AD) plant. The council owned land to the east of the site is ideally located between the logistics warehouses and agricultural land. Organic waste material can be taken from the neighbouring farms (as well as domestic waste from surrounding residential areas) and used in the AD plant to produce biogas. Purification processes turn this into biomethane, a low carbon alternative to diesel. This can then be sold to logistics companies in a refuelling station on the same plot of land.

Figure 27: Council owned land for proposed AD plant.

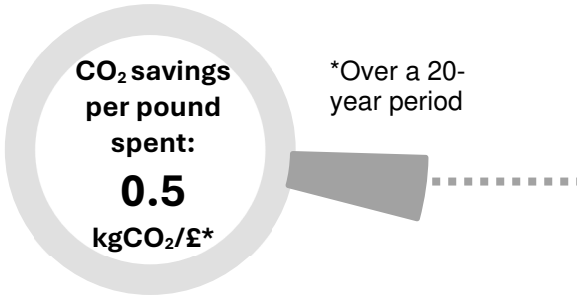
Biogas is a renewable energy source, and so there is an opportunity for this to generate additional renewable energy for the peer-to-peer scheme. The electricity could be connected to the digital system and sold onto those that are connected. There is also opportunities for it to be sold to the manufacturers that struggle to electrify specific high heat intensity processes.

Green Innovation Hub

What?

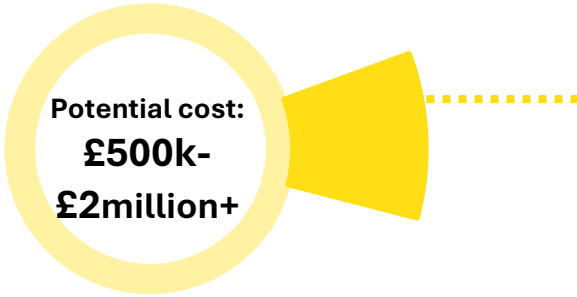
Establishing a central hub where stakeholders and staff can learn, collaborate, and access tailored business decarbonisation advice will be key to building trust and driving engagement with the scheme. Oak Tree Park, a council-owned site, offers an ideal location due to its central position within North Moons Moat Industrial Estate and its existing buildings suitable for retrofit.

Delivery can happen in a phased manner, combining 'lessons learnt' workshops with site visits to maintain stakeholder involvement. Small sustainability consultants such as Sustainable Development Goals Limited and Pro Enviro could move into the hub, providing companies on site with bespoke business decarbonisation advice.



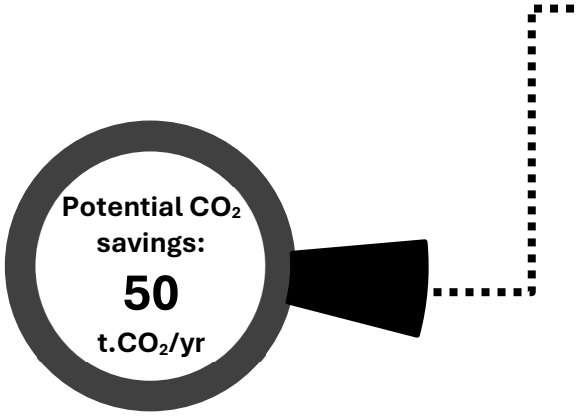
Business Case:

Investment Needed
The cost of retrofitting both of the Oak Tree Park buildings could vary depending on how the project was approached and the level of retrofitting that each would need. If, for example, the larger of the two buildings underwent optimisation, light retrofit and adoption of renewable energy then this could be anywhere around £500k. If a deep retrofit was needed however, this could increase costs to around £2 million or more. These estimates are based on a case study from the UK GBC 'Building the Case for Net Zero: Retrofitting Office Buildings' document.



Grants/Funding
There aren't currently any funding opportunities for retrofitting buildings. However, as the hub would be acting as a prototype for the latest net zero technology, there is an opportunity to collaborate with net zero tech companies to showcase their products for a subsidised cost.

Return on Investment
The green innovation hub would bring both direct income opportunities and indirect cost savings. Working with sustainability consultants to provide a decarbonisation advice service adds a commercial element to the proposal, while the retrofit work will reduce energy bills due to lower heating/cooling loads.



In terms of the impact on carbon reduction, the Energy Use Intensity (EUI) of a building can be reduced by up to 65% with a deep retrofit. For Oak Tree Park, this would mean a total of **50 $t.CO_2$** saved annually over both buildings due to reduced heating/cooling loads. There will also be wider site benefits as other tenants are encouraged to use some of the same retrofitting techniques on their own buildings.

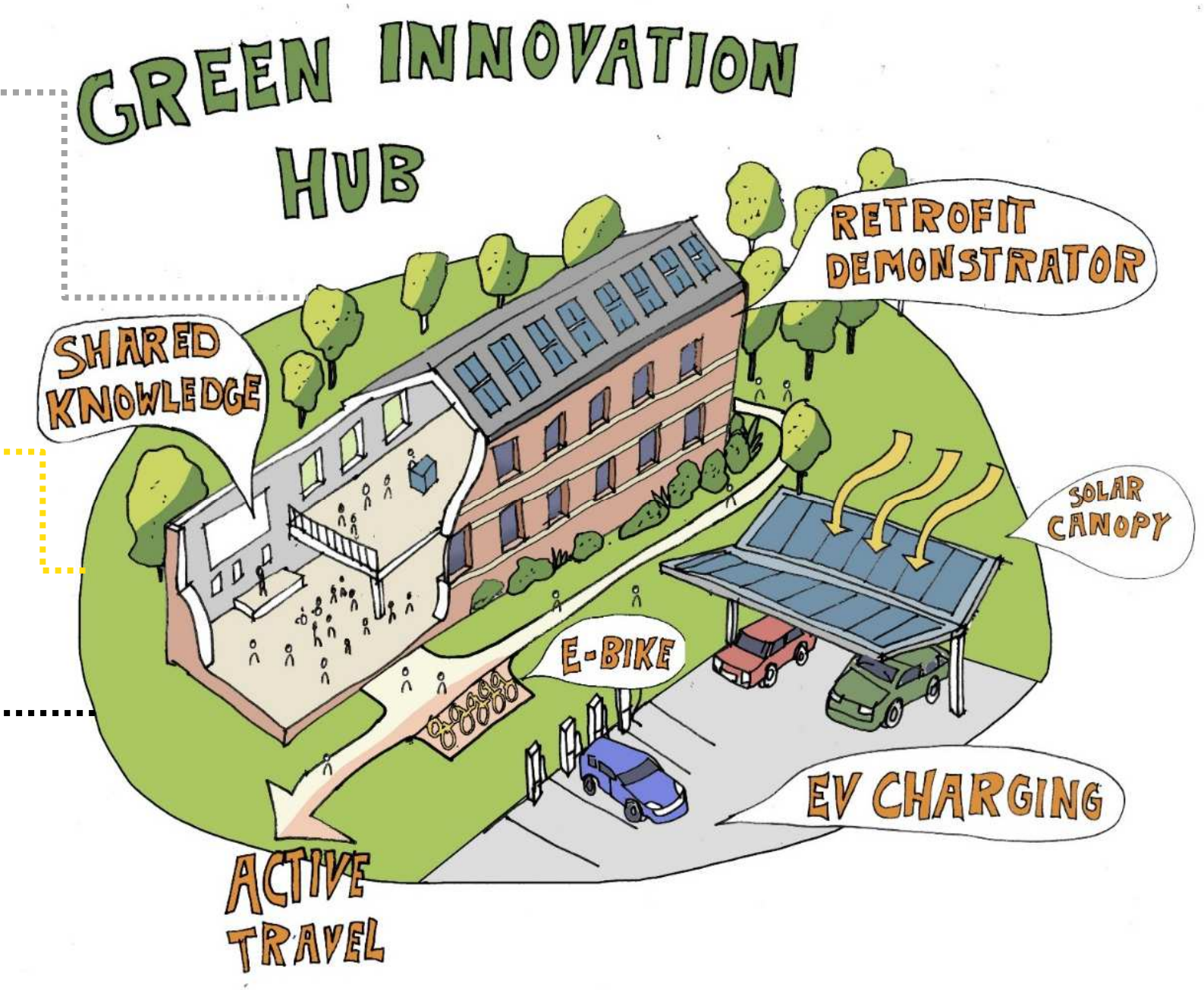


Figure 28: Green innovation hub

Active Travel Plan and SuDS

What?

Introducing an active travel plan to site will work towards reducing scope 3 emissions caused by commuters in petrol/diesel vehicles. This will involve creating green corridors through the site, enhancing public footpaths and introducing cycle lanes. There is already public demand for the path running between Church Hill Way and Merse Road to become a cycle route, providing confidence that these improvements will increase the uptake in active travel. Installing SuDS will increase resilience against surface water flooding, whilst also supporting biodiversity net gain.

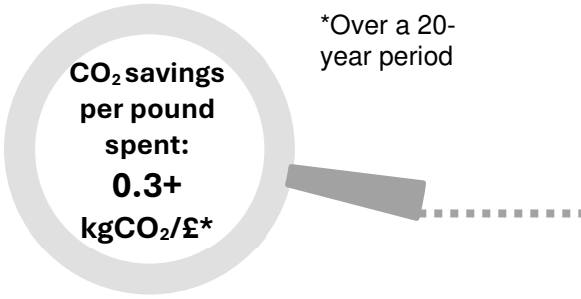
Business Case:

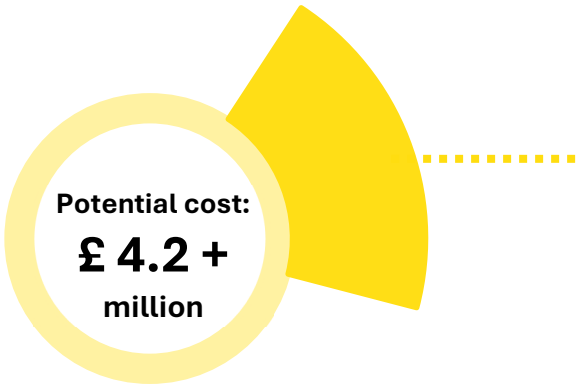
Investment Needed
Enhancing green spaces on site by introducing cycle lanes, improving public footpaths and installing SuDS such as swales could cost over £4 million. This is based on costing figures from the Typical Costs of Cycling Interventions (2017) and the Cost Estimation for SuDS – Summary of Evidence (2015) documents. This estimate may change once a robust active travel plan is developed, and specialist SuDS teams have been consulted. Costs of cycle storage and signage will also need to be considered.

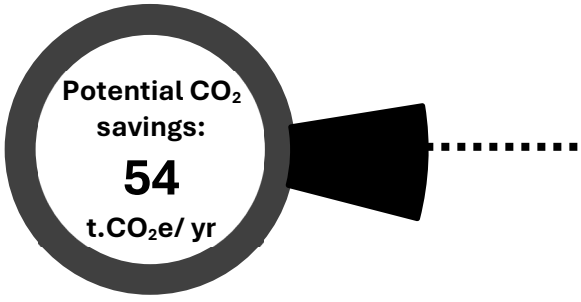
Grants/Funding
Active Travel UK is providing nearly £300 million funding across the UK to support active travel enhancements, with Worchester County Council receiving £361,405. There could also be an opportunity to collaborate with local bus companies to create a new shuttle service from the surrounding residential zones. This partnership could provide revenue that could be used towards the maintenance and upkeep of the green corridors on site.

Return on Investment
Promoting active transport methods across site is a great way to reduce scope 3 emissions. Assuming the active travel plan reduces the number of private petrol/diesel vehicles on site by 10%, it is estimated that a total of 54 t.CO_2e of carbon could be saved. This is based on commuting data from a Thorlux Lighting, with a 3-mile commute for 5 days a week, 48 weeks a year.

For every £1 spent on active travel, £6 is generated in economic benefits making this an indirect income potential. Providing safe, well-lit footpaths to and from the residential zone adjacent to the industrial park is essential to encouraging staff to reduce their private vehicle usage. If more people walk and cycle, congestion emissions from petrol/diesel cars will decrease which in turn improves the air quality on site.







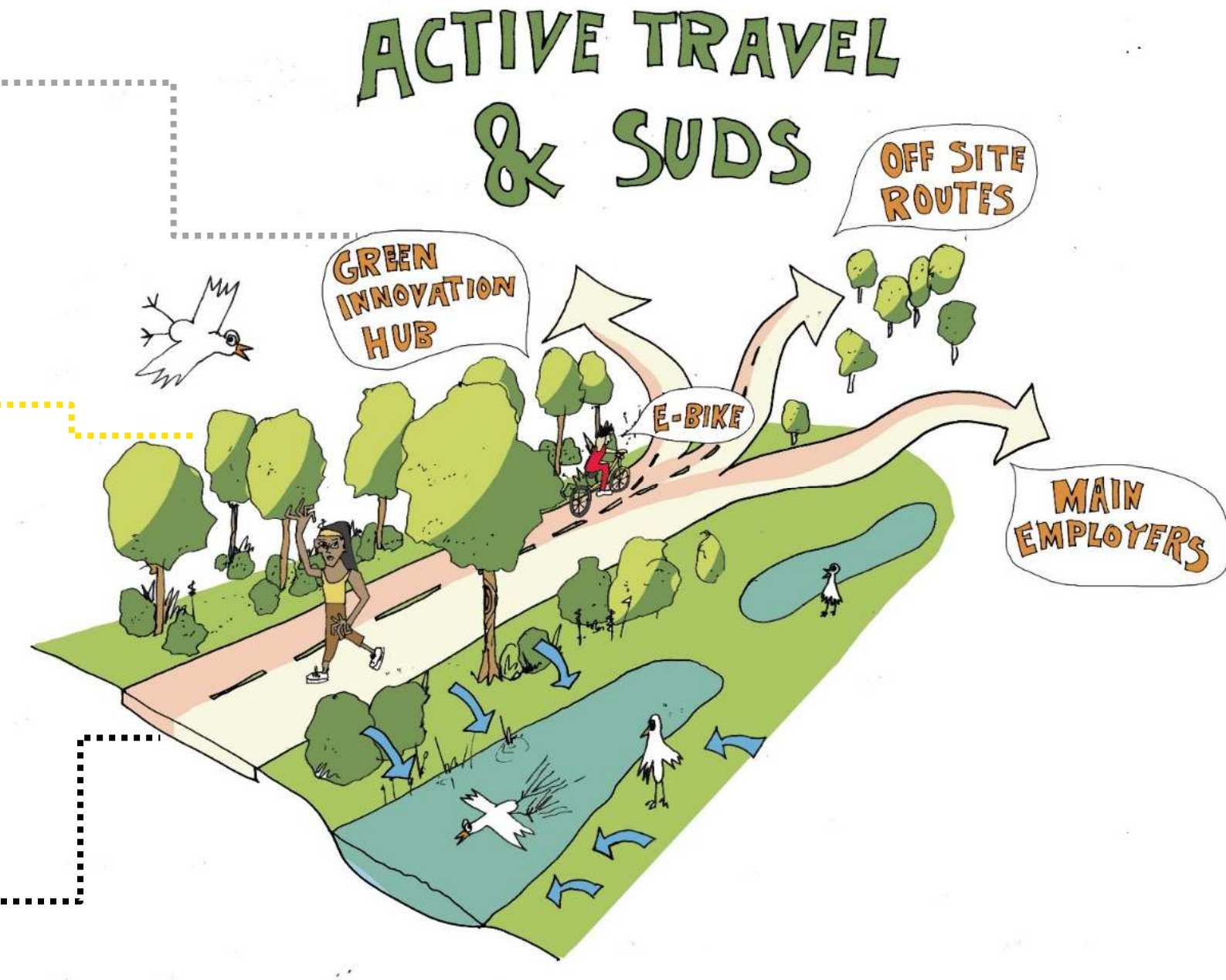


Figure 29: Active travel plan and SuDS

Peer to Peer Energy Trading Scheme

What?

Development of a peer-to-peer renewable energy trading system between the buildings on site to reduce scope 2 carbon emissions. This involves installing solar PV on suitable rooftops, generating electricity for the tenants within the building. Surplus energy is distributed through a digital optimisation platform to other members of the local energy community. There is an opportunity to integrate the scheme to the Colmore Energy Community in Birmingham.

Business Case:

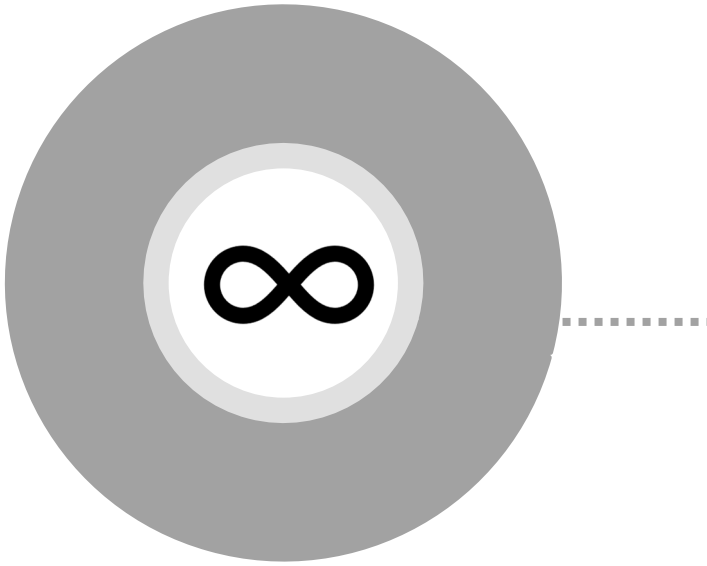
Investment Needed
Companies such as Consensus Power provide the planning and installation of the infrastructure for free, meaning no capital costs for those that chose to participate. They run a shared stakeholder model, meaning the profits made from selling electricity at a lower price compared to the National Grid are shared proportionally between investors, landlords and the local community.

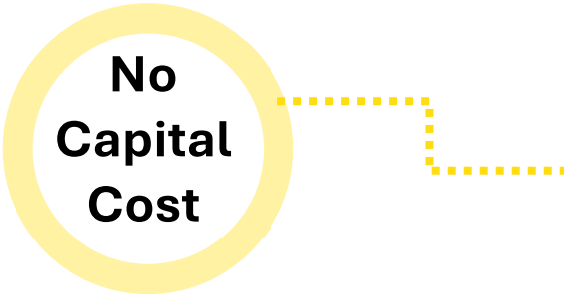
Grants/Funding
Consensus Power's business model is financially dependent on crowdfunding from the local community. Their Norwich Solar System scheme saw £2 million raised by the local community within a short period of time. Collaberating with the Redditch BID could help push this fundraising.

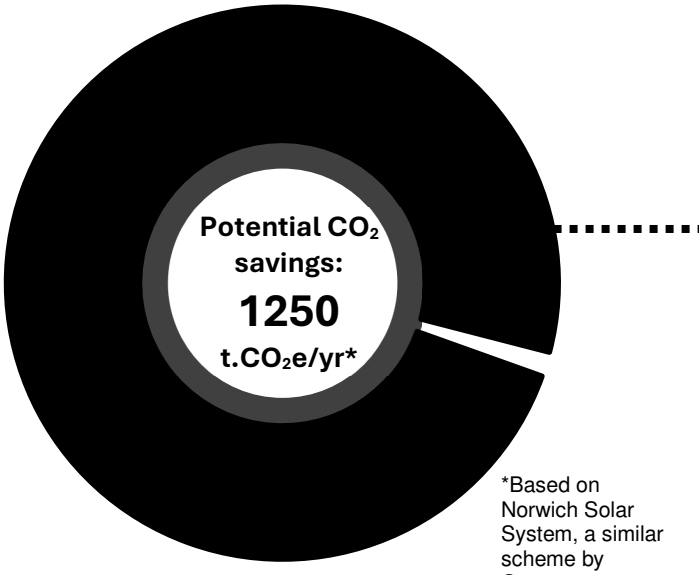
Return on Investment
Using Consensus Power's shared stakeholder model serves as a direct source of income and cost savings for a range of different groups. Landlords that have solar panels installed on their building earn a commission on every kWh that is produced through their infrastructure, whilst also improving EPC ratings and therefore asset value. Those that invest into the scheme through crowdfunding also receive a proportional share of the profits made. Consensus Power also donate £2/MWh produced to local charities, helping towards enhancing the local community.

Cost savings come to those that are using the solar electricity that is generated. Compared to the National Grid, electricity prices can have a 30-50% discount. The scheme also inhibits suppliers from being able to wrongly raise prices during world events, ensuring stable electricity bills all year long.

The scheme can save up to 25,000 t.CO_2e over the entire project's lifetime. In the future there is opportunity to expand into the surrounding residential areas and into the town beyond.







*Based on Norwich Solar System, a similar scheme by Consensus Power.

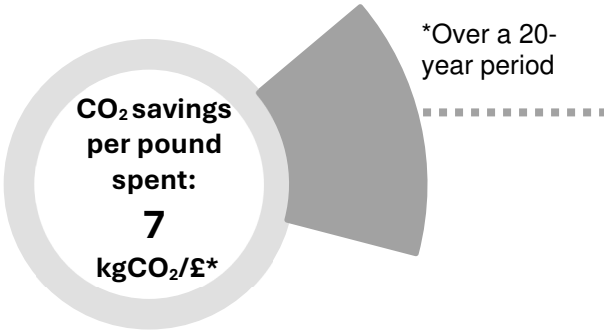
Figure 30: Peer-to-peer energy trading

Anaerobic Digestion Biofuel Plant

What?

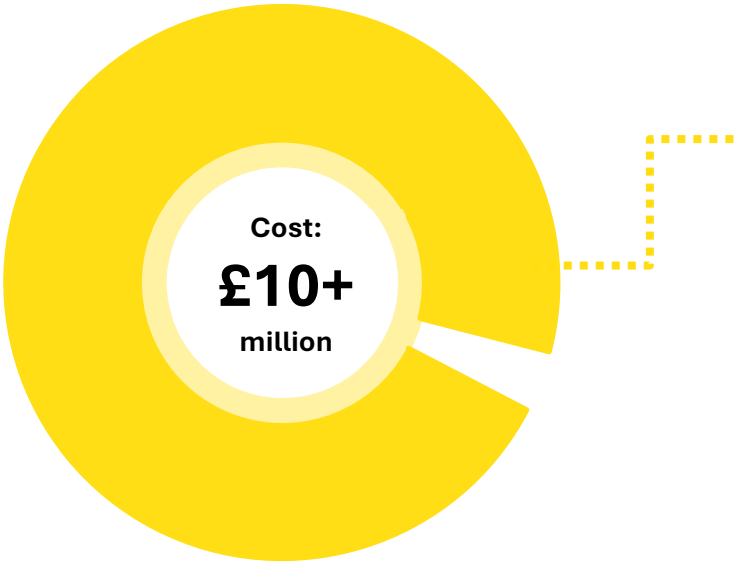
Situated between the logistics zone and adjacent agricultural land, an anaerobic digestion (AD) plant could convert domestic and agricultural waste into biomethane fuel. This is a low-carbon alternative to diesel for logistics HGVs. Incorporating an on-site refuelling station would enhance operational efficiency by reducing travel distance, fuel consumption, and downtime for refuelling.

Additionally, the plant could generate biogas as a renewable energy source for on-site use or export to the local grid.



Business Case:

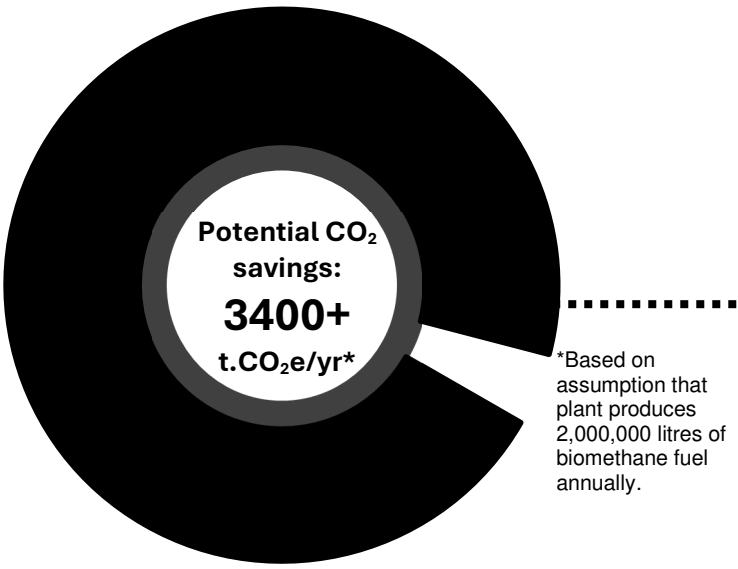
Investment Needed
Based on a similar case study in Northern Ireland, the AD could cost upwards of £10 million. This figure will change once more research and planning has been undertaken, as it will be dependent on scale and planning complexities. The council could also rent the land out to a private anaerobic digestion company, reducing the financial risk element.



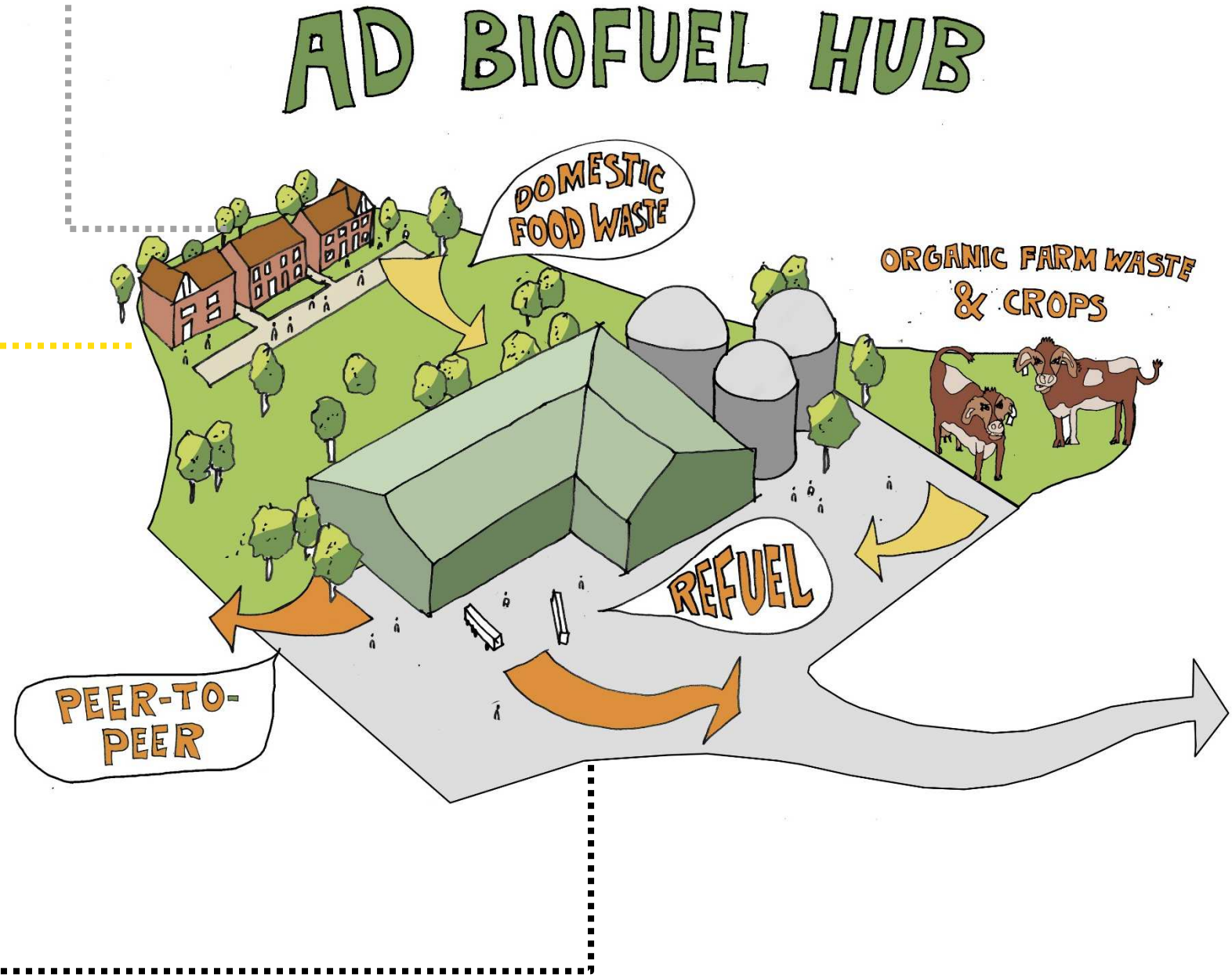
Grants/Funding
There are a number of government schemes that can help towards funding an AD plant, including the Green Gas Support Scheme (GGSS). Recently extended to March 2028, the GGSS offers financial aid to new AD biomethane plants with the goal of increasing the percentage of green gas representation in the gas grid. Participants receive quarterly payments over a 15-year period, and the amount received is dependent on the quantity of eligible biomethane that the participant introduces into the gas grid.

The Green Investment Group (GIG) offers capital investment to renewable energy projects, with Energy from Waste being a priority area. Investment opportunities can be discussed with the waste and bioenergy team.

If the plant is also used for generating power, Contracts for Difference (CfD) is another scheme that operates around a “strike price” system. If the “strike price” is higher than the market price then the CfD counterparty must pay the difference to the renewable generator, and vice versa.



Return on Investment
A plant of this size has the capacity to produce around 2,000,000 litres of biofuel annually. This is enough to provide biomethane fuel for over **1,000 HGVs**, based on average annual mileage. Selling the biofuel to the logistics companies on site, as well as the opportunity to sell biogas to the local grid, energy creates direct income potential.


AD BIOFUEL HUB
DOMESTIC FOOD WASTE
ORGANIC FARM WASTE & CROPS
REFUEL
PEER-TO-PEER

Next Steps

We have collaborated with a number of other organisations in developing this strategy who could help to make it a reality.

Consensus Power

Specialising in peer-to-peer renewable energy trading schemes, Consensus Power are a group that look to benefit communities through their work. They provide free feasibility studies, surveys, planning and installation of solar PV for people that want to be a part of their local energy communities, meaning there are no capital costs for the participant.

Their model is crowdfunded by local communities, with investors each receiving a proportionate share of profits and electricity generated and £2/MWh is donated to local charities.

Their scheme works by installing solar PV onto suitable roofs in a study area. The energy that is generated is initially given to those within the building at a 30-50% discounted rate. Any energy that is not used immediately then goes to the digital peer-to-peer system and is distributed to those that are connected to the local energy community. They also incorporate green energy from large scale renewable generation plants (solar, wind, anaerobic digestion) to support the energy supply.

Collaborating with Consensus Power to develop the business case for both the peer-to-peer and AD plant would be the recommended next steps.

Sustainability Development Goals Limited (SDG)

SDG are a small sustainability consultancy that work with SMEs to provide business decarbonisation advice. Already having an office in the West Midlands, they could act as good anchor tenants to help bring the innovation hub to life. SDG are experts in biofuel and can link up logistics businesses with a supply chain of lower carbon fuels for their HGVs. They already have a presence at North Moons Moat working with AMCO, one of the largest logistics companies on site.

Pro Enviro

Another sustainability consultancy, Pro Enviro carries out detailed data analysis of a buildings energy usage to deliver decarbonisation solutions for a business. Collaborating with them could be a way of engaging with more tenants and receiving more data to carry out feasibility studies of the proposals.

Pro Enviro deliver a Business Energy Advice Service (BEAS) program to both energy intensive and non-energy intensive organisations. This includes a comprehensive energy audit, identifying cost-saving measure and embedding a low-carbon strategy into process operations. Once the audit is carried out, companies can apply for a grant of up to £100,000 to help implement the net zero carbon measures.

While the physical green innovation hub is being developed, Pro Enviro could provide a virtual hub for tenants to immediately receive the decarbonisation advice they are seeking.

Thorlux Lighting

Thorlux Lighting, part of FW Thorpe Group, is one of the largest manufacturing companies on site. Based on the stakeholder consultation activities, Thorlux proved to be very engaged in the scheme, delivering valuable data to help us with our study. This is explained by their clear commitments to reaching net zero carbon by 2040.

Thorlux Lighting can serve as a valuable source of best-practice insights, given their advanced progress on their decarbonisation journey.


Embodied Carbon
health & wellbeing
Design Principles
Build for the future
Engage
Build Less
Upfront Embodied Carbon
Whole Life Emb
BREEAM OUTSTANDING
LEED PLATINUM

Key Considerations

+ **Is Oak Tree Park a feasible site for the green innovation hub?**

Understanding the current leases within the building will dictate the approach and project timescales for the green innovation hub. After conversations with the representative responsible for managing the Oak Tree Park site, we found out that all of the units are occupied with a range of short- and long-term leases. Unit 2 and 4 both have the shortest leases of 5 years; there are however a number of very long-term leases where cooperation with the tenants would be necessary.

This presents a potential constraint to the proposals if tenants were not agreeable then rather than a building by building approach, individual units could be considered once they became vacant, but this would constrain the scale of retrofit interventions that could be applied. Potential solutions in this instance are considering a standalone new-build hub in any underutilised car park areas or combining the green innovation hub concept with the AD facility and providing a new-build hub as part of this development, this provision could be a condition of the lease agreement with the AD developer/operator.

+ **Who is given ownership over the active travel plan?**

In order to develop an active travel plan for the whole site, discussions with the landlords of each individual business park are essential to forming an organised scheme. Conversations with National Highways and Active Travel England will provide guidance on how best to implement an active travel plan on North Moons Moat Industrial Estate. Giving someone ownership over the plan could also make this proposal more feasible, as coordinating such a wide range of stakeholders with no one taking charge will be difficult. Worcestershire County Council was awarded £1.5 million in funding to improve active travel across the county in February 2025, and so contacting the active travel team there could also be useful.

+ **How can we phase the delivery of a peer-to-peer trading scheme?**

The peer-to-peer scheme can be phased by first focusing on those buildings that already have solar PV installed. These can be connected to the digital trading system, allowing the peer-to-peer scheme to begin immediately. The next steps are carrying out roof feasibility studies, which will be done by the platform operator, such as Consensus Power. The first phase of this is likely to be focused on the manufacturing and logistics facilities, due to their flat, large roof footprints. Those that have roofs that meet the criteria will have solar PV installed and will also be connected to the trading platform. Feasibility studies of the small, diverse architypes will also happen; however, the timescale may be longer due to potential deep retrofit works involving upgrades to roof insulation.

It is likely that the number of people that join the local energy community will grow with the number of people that have solar PV installed. The more people that are engaged in the scheme, the more successful it will become.

+ **How do we build a business case for this?**

All of the four strategic opportunity areas have elements of developing a business case such that they are financially sustainable over the long term.

The most complex of which is probably active travel, and SUDs as many aspects of financial benefit are indirect savings on wider resources such as the NHS and drainage systems. Alot of this hard work on understanding the externalities has been done, and grant funding is often available to assist with the upfront costs of these measures.

The business case for the green innovation hub is more straight forward, with investment in the project recouped through energy savings, however economic value added by supporting start up business and increased asset value also need to be considered.

With respect to the peer-to-peer solar PV opportunity, a lot of the hard work has already been done by the peer-to-peer platform operator, such as Consensus Power, they have the framework for the business case already established and take on the risks of raising capital and establishing the scheme.

There is a strong potential business case for the Anaerobic Digestion Plant, with a high value fuel and energy source generated across the project lifespan to pay back on what is a large up-front capital investment. There can also be a value in the waste disposal services provided by such a facility. Construction and operation of an AD plant is a highly specialised area, but there are a number of commercial operators successfully delivering and operating these facilities across the country.

In order to set the scheme in motion, there are a number of steps that can be taken to achieve early, easy wins. Starting with these should increase stakeholder engagement into the scheme, which in turn increases the chances of success.

+ Collaborate with a local sustainability consultancy, such as Pro Enviro or Sustainable Development Goals, to create an online Business Energy Advice Service (BEAS). Barriers to achieving net zero are not always financial. Timescales and lack of knowledge can also be reasons why some companies have not yet implemented decarbonisation strategies. Having an online portal where they can receive this information is sometimes all it takes for a business to understand how to achieve these targets, as well as both the financial and environmental impacts it will have.

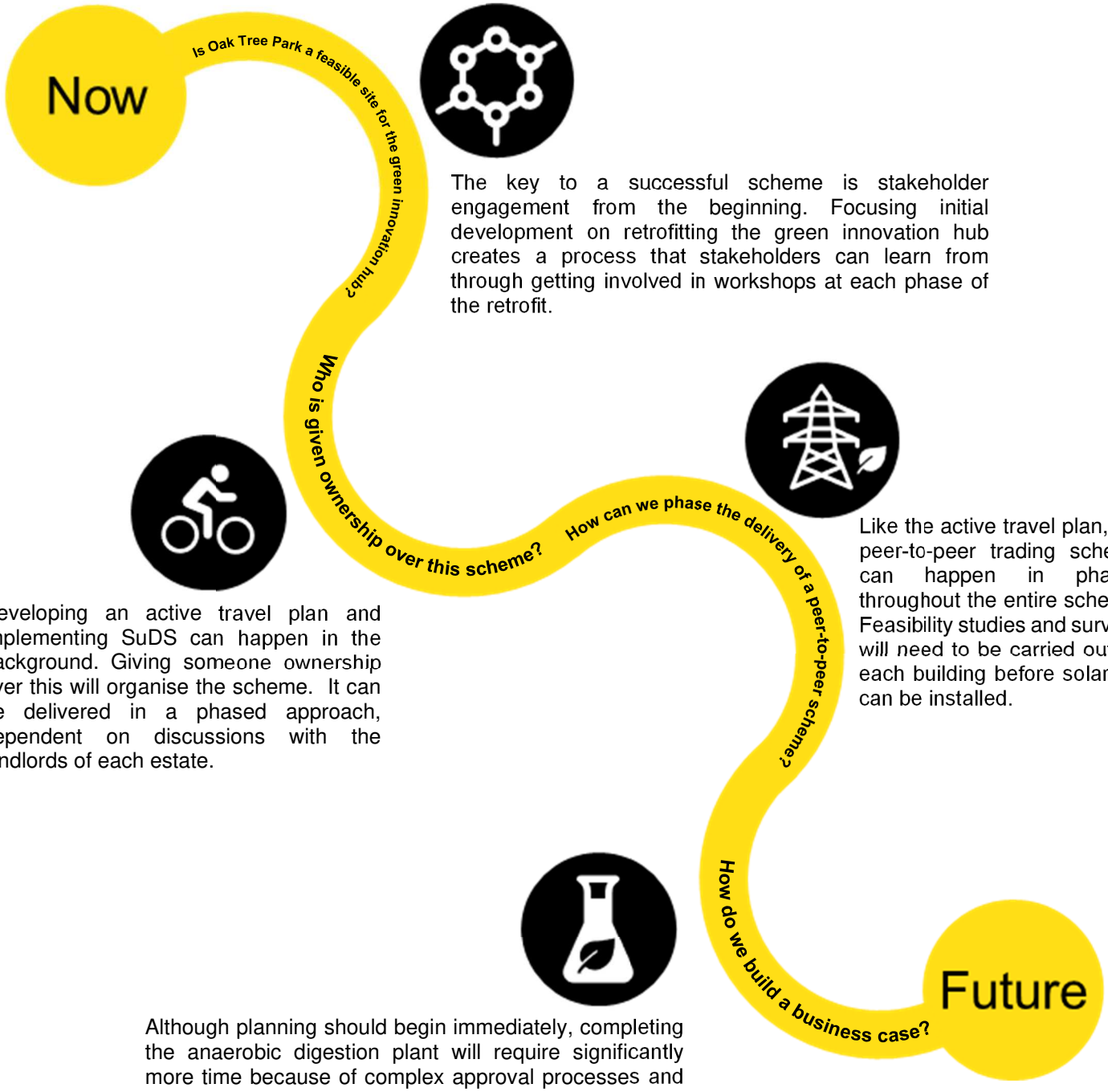
+ Existing business support networks such as Redditch BID, the Growth Hub and potentially even Chamber of Commerce Networks could be utilised to support businesses within the study area to apply for grants and funding to assist their decarbonisation journey. Services such as the GM Growth Hub Journey to Zero scheme have been very effective at upskilling organisations and helping them to develop their own net zero plan and access resources to turn this plan into a reality.

+ In order to develop a more detailed solution, additional in-depth research and energy usage data needs to be collected. There's potential to collaborate with the University of Birmingham or Worcester to carry out this research, as well as Pro Enviro, another organisation that specialises in collecting this kind of information. This information will help to provide a more detailed underpinning on the synergies in process decarbonisations that may exist and to help support the case for a peer-to-peer solar PV network.

+ From a Local Authority perspective there is a potential long-term return by agreeing a lease to an AD operator to construct and operate the plant over its lifecycle. An initial bid to seek collaboration with an established operator or specialist consultant in this field would field a detailed feasibility and business plan for the project.

+ Additional bids through Midlands Net Zero hub could support more detailed feasibility studies and implementation plans across each of the strategic opportunity areas.

+ Implementing SuDS will require working with specialists to survey the site and discover the optimal location/type of SuDS to combat surface water flooding. Coordinating with Highways and other relevant Council departments would be a key first step.



The key to a successful scheme is stakeholder engagement from the beginning. Focusing initial development on retrofitting the green innovation hub creates a process that stakeholders can learn from through getting involved in workshops at each phase of the retrofit.

Developing an active travel plan and implementing SuDS can happen in the background. Giving someone ownership over this will organise the scheme. It can be delivered in a phased approach, dependent on discussions with the landlords of each estate.

Like the active travel plan, the peer-to-peer trading scheme can happen in phases throughout the entire scheme. Feasibility studies and surveys will need to be carried out on each building before solar PV can be installed.

Although planning should begin immediately, completing the anaerobic digestion plant will require significantly more time because of complex approval processes and substantial capital investment. It is therefore positioned as the final strategy within the scheme.

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