



Rhydycar
West

April 2022

Foreword

The Rhydycar West development proposals seek to create the flagship indoor leisure resort in Wales – for “all year round”. It will be an exemplary and internationally recognised, sports, leisure and tourism destination able to offer a unique experience to both the people of South Wales and the UK as a whole.

Indoor snow sports are one of the anchor attractions at Rhydycar West. It will host the Welsh & UK National Centre of Excellence for snow sport and be the training headquarters for the Welsh and UK national and Olympic teams as well as offering world class recreational facilities. The resort will be home to a wide variety of indoor and outdoor pursuits including an indoor water park and indoor & outdoor activity centres. These facilities will be supported by a wide range of associated accommodation from the spa hotel to the sport & value hotel and woodland lodges – all able to cater for the long and short stay visitor.

The resort will also complement and enhance the existing sport, leisure and tourism offer currently thriving in the South Wales Valleys and Brecon Beacons such as Bike Park Wales and Zip World. Ideally situated and extremely well connected the development will strengthen Merthyr Tydfil’s regeneration and position as both a destination of choice in its own right and the gateway to the Brecon Beacons.

The proposal is the carefully considered outcome of a period of several years of engagement and understanding of the local and regional economy, ecology, history and heritage. Further details regarding the formulation of the scheme and the design process are set out in full in the Design & Access Statement and other reports and documents which are all available at: www.rhydycarwest.com/planning.

Combined Energy & Carbon, Utilities and Sustainability Report

APRIL 2022

PREPARED FOR MARVEL LIMITED BY HOARE LEA

Rhydyicar – Combined Energy, Emissions, Utilities and Sustainability Report

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1.0 Executive summary

1.1 Introduction.

- 1.1.1 This report presents the documents prepared in support of the early-stage design development for erection of a mixed leisure development comprising indoor snow-centre (up to 39,200 sq m), waterpark (up to 7,500 sq m), indoor activity centre (up to 9,000 sq m), external activity areas, hotel accommodation (up to 418 bedrooms), forest lodge accommodation (up to 30 units), car parking (up to 830 spaces) and associated earthworks, access, drainage, servicing and utilities connections/infrastructure on land situated at Rhydycar West, Merthyr Tydfil, Wales, (hereafter referred to as the Proposed Development)
- 1.1.2 Designing sympathetically to the surroundings is particularly important and has been considered in the project masterplan which seeks to preserve important and protected environmental elements, leaving over 85% of the Applicant’s overall landholding undeveloped. This will reduce its impacts and enable safe and secure interaction with nature for its workers and visitors.
- 1.1.3 The following topics are covered in this report:
 - Greenhouse gasses and climate change
 - Energy Strategy
 - Utilities
 - Sustainability Strategy
 - Sustainability Charter

1.2 Greenhouse Gasses and Climate Change.

- 1.2.1 The Greenhouse Gasses and Climate Change report outlines the outcome of the assessment of likely significant environmental effects arising from the Proposed Development in relation to greenhouse gas emissions (GHG) and climate change. This specifically includes embodied carbon, tree felling, traffic-related emissions and carbon dioxide emissions from the operation of the project. In addition, the assessment outlined the mitigation measures required to prevent, reduce or offset any potentially significant adverse effects.
- 1.2.2 All calculations were carried out in accordance with the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017. An estimate, by type and quantity, of expected GHG emissions, generated during the construction and operational phases, were produced based on the available environmental information and scientific knowledge for the following:
 - Impacts of the Proposed Development on the nature and magnitude of GHG emissions;
 - Impacts of the Proposed Development relevant to adaptation in a changing climate; and
 - Impacts of the Proposed Development associated with its vulnerability to climate change.
- 1.2.3 Where the effects resulting from any potential changes caused by the Proposed Development have been deemed to be significant, a description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment are laid out, in the context of the following:
 - Climate change mitigation (i.e. measures implemented in the design of the Proposed Development to avoid, prevent, reduce or offset GHG emissions); and
 - Climate change resilience & adaptation (i.e. measures implemented to future-proof the Proposed Development and adapt to the anticipated impacts of a changing climate).
- 1.2.4 To determine and measure the anticipated impacts of the Proposed Developments, they were measured against an existing baseline which was calculated using the Environmental Impact Assessment (EIA) method. From this comparison the following conclusions could be drawn:

Construction Phase Effects.

- 1.2.5 An appraisal of the anticipated carbon emissions associated with the product and construction stages of the development lifecycle has been completed. The study assessed carbon emissions associated with raw material extraction, manufacturing of the building materials, transporting these to site and erecting the buildings. This has been carried out based on the design information available to date which consists of area schedules, building types and building heights data to give indicative values at this outline stage. Typical materials used for these building types have been mapped to suit these attributes to generate materials quantities. The associated carbon intensities of these materials have then been computed to generate carbon footprints for each building, following a business-as-usual approach. The same model was used to estimate the emissions generated in the construction process stages, transport and site operations. The estimates generated with this approach are presented in Table 1.1.

Table 1.1: Embodied carbon breakdown across the construction lifecycle stages, for each building in the Proposed Development, total for an assumed 3 year construction period.

	Total Gross Floor Area (m ²)	Product stage (kg CO ₂ e)	Transport (kg CO ₂ e)	Site operations (kg CO ₂ e)
TOTAL	93,600	31,714,390	480,968	4,155,745

- 1.2.6 Measures which could potentially be explored further as additional mitigation for construction phase include:
 - Aim to design with a low form factor (where the surfaces through which detrimental heat gains in summer and heat losses in winter can pass are reduced) for any appropriate buildings;
 - Consider materials with a high albedo in the façade design to reduce overheating by reflecting radiation;
 - Look into the possibility of recessed window in balconies, horizontal shading on south façades and vertical shading on east/west façades;
 - Procure energy efficient plant reflecting the latest technology advances;
 - Monitoring of energy, water and waste data during the construction stage to encourage transparency and accountability;
 - All waste generated during construction to be diverted from landfill (where technically feasible);
 - Exploration of the potential for low carbon construction materials and techniques – such as timber frame and offsite manufacture;

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- Consideration of flexibility and adaptability in building design.

Operational Phase Effects.

1.2.7 The annual carbon emissions resulting from the combined operational phase effects of operational energy, operational traffic and repair and maintenance emissions (lifecycle stages B1 – B5) is currently estimated to be approximately 43,200 t CO₂e at a national level, 21,900 t CO₂e at regional level and 7.1 t CO₂e at local level, where the different levels come from apportioning journey contributions to the appropriate national, regional and local distances. The following breakdown shows the impact on the various baseline emissions and carbon budgets:

- 2.8% of local (Merthyr Tydfil 2019) baseline emissions;
- 17.64% of the annual Merthyr Tydfil budget (2023 – 2027);
- 0.092% of regional (Wales 2019) baseline emissions;
- 0.55% of the annual Wales budget (2023 – 2027);
- 0.028% annual proportion of the 4th national carbon budget (2023 - 2027) (40% share attributable to the built environment sector);
- 0.031% of annual proportion of the 5th national carbon budget (2028 - 2032) (40% share attributable to the built environment sector); and
- 0.056% annual proportion of the 6th national carbon budget (2033 – 2037) (40% share attributable to the built environment sector).

1.2.8 It is noted that annual operational transport emissions are currently estimated to be approximately 40,000 tCO₂e at national level, which accounts for > 90% of annual emissions during the operational phase, deeming them potentially significant. The operational traffic is calculated based on the estimated vehicle mix for the date of opening the Site (2026) and for the forecasted electric vehicle mix for 2030.

1.2.9 Mitigation measures could be implemented by reducing the number of private vehicle trips required to get people on the site which could be achieved by increasing the availability and uptake of more sustainable transport modes serving the Proposed Development, for example rail or bus. This is considered further in detail in the Travel Plan for the proposed development.

Considerations for emissions reduction.

Operation and construction emissions

1.2.10 The Applicant, in response to the climate emergency, seeks an approach to achieve net zero carbon for the Proposed Development for both embodied and operational emissions. Suitable methodologies will be reviewed and adopted, where appropriate, to achieve this. An example of this is the UK Green Building Council (UKGBC) Net Zero Carbon (NZC) Framework that is an industry recognised approach to achieve NZC for the built environment. The framework looks to reduce, mitigate and offset emissions for construction and operational energy separately, as shown in Figure 1.1 below.

1.2.11 The illustrative graph in Figure 1.1 provides an overview of whole life emissions associated with a building. Embodied carbon occurs during the construction period, i.e. before day 1 of operation, and then proceeds to have additional emissions where maintenance and/or replacement works are required. Whereas operational emissions occur from day 1 of occupancy to end of life. In the case of an all-electric building services strategy, like what is proposed for this site, the resultant emissions benefit from ongoing decarbonisation of the National Grid. Furthermore, if the building user procures an approved, green utility tariff, these emissions can be treated as carbon neutral in practice.

1.2.12 Therefore, there is a methodology and approach that could be adopted to allow the Proposed Development to achieve Net Zero Carbon Emissions in relation to the associated construction and building operation phases which will be reviewed further during the detailed design.

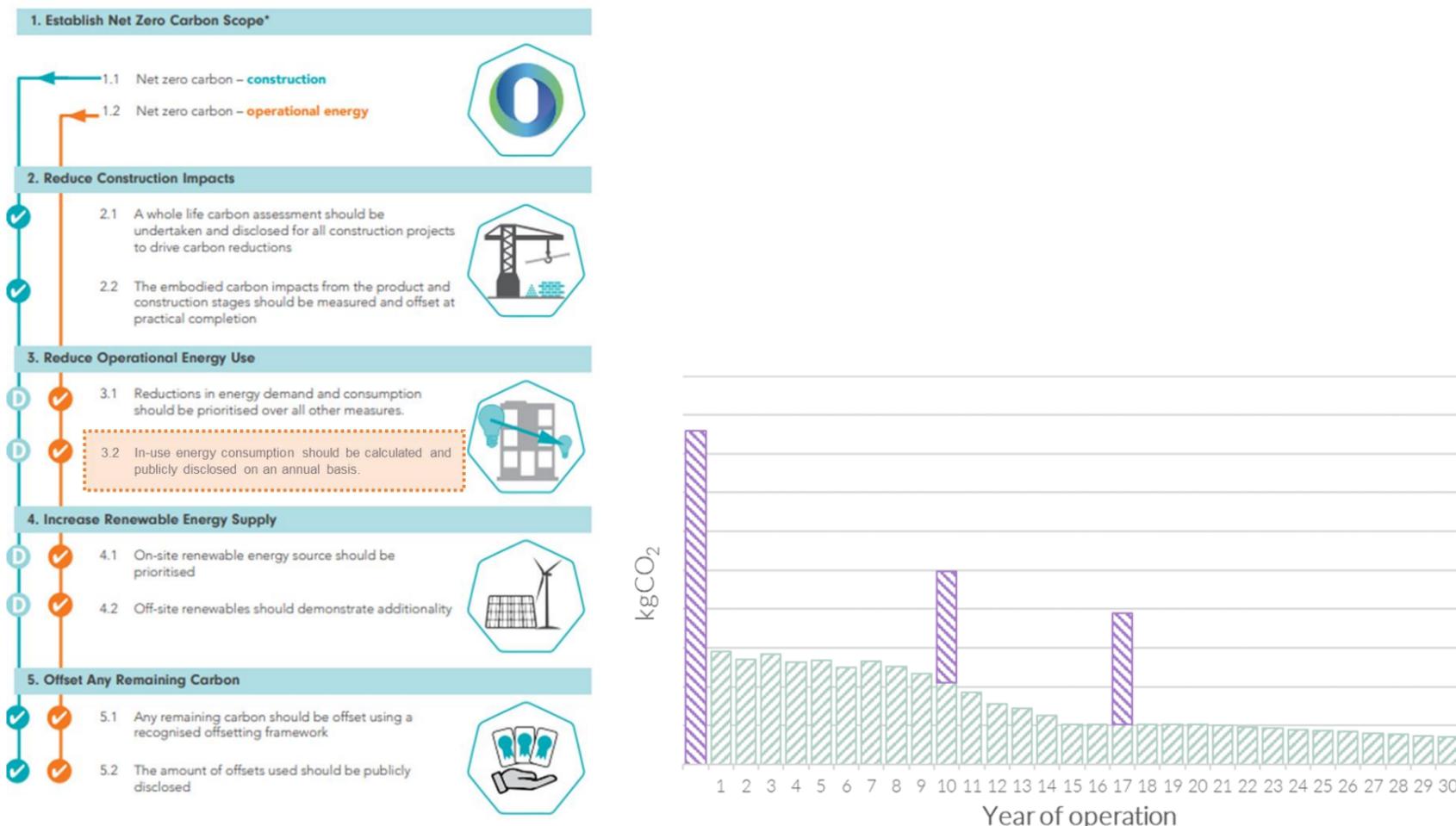


Figure 1.1: Approach to net zero carbon (source: UKGBC Net Zero Carbon: A Framework Definition)

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Transport in operation

- 1.2.13 As noted above and detailed within the main body of this report, the most significant source of emissions are associated with transport from building users visiting the site. This is primarily due to the proposed use of the site and anticipated journeys on a national scale. However, as required by the EIA methodology for GHG emission assessments, the worst-case scenario must be used in all cases. In the case of the Proposed Development, an assumption has been made in relation to the percentage of vehicles that are electric being used to travel to the site (i.e. 17% of vehicles will be electric).
- 1.2.14 This assumption is based on current commercial patterns and predicted uptake of electric vehicles at day-1 of operation (i.e. 2026). This said, it is anticipated that the proportion of electric vehicle users is to increase to 43% by the year 2030. Therefore, although it is not currently accounted for within the GHG ES chapter, it can be assumed that emissions associated with transport will reduce during the lifetime of the Proposed Development.
- 1.2.15 Furthermore, it can be estimated (if not quantified) that a proportion of building users will use this site as an alternative to travelling abroad, which requires aviation travel. The emissions associated with this mode of transport is significantly higher per person in comparison to private vehicle use. In addition, on a socio-economic level, the Proposed Development offers the opportunity for a more affordable opportunity for local, regional and national residents compared to travelling abroad for the same activity.
- 1.2.16 In summary, although transport is expected to be the dominant source of carbon emissions associated with the site, it is anticipated that these emissions will reduce over the life time of the building and will provide qualitative benefits to individuals that can be considered to offset this impact.

1.3 Energy Strategy.

- 1.3.1 The Energy Strategy provides recommendations regarding the approach to the reducing carbon dioxide (CO₂) emissions and optimising energy efficiency within the development. The Energy Strategy has been developed using a ‘fabric first’ approach, following the ‘Be Lean’, ‘Be Clean’, ‘Be Green’ energy hierarchy. This prioritises savings made to passive design and energy efficiency prior to consideration of low and zero carbon technologies.
- 1.3.2 The approach to Energy Strategy for the Proposed Development has been to provide an appraisal of the anticipated energy requirements and CO₂ emissions that could arise as a result of the Proposed Development through the use of energy data benchmarks of similar buildings. These building energy data benchmarks have been produced using Part L calculation methodology. The energy requirements for the indoor snow-centre component of the site have been estimated based on energy usage totals from similar existing facilities. The outdoor water park area has been scoped out of this assessment due to it not being a building that would be controlled by Part L.
- 1.3.3 The emerging strategy for the Proposed Development will be determined at reserved matters and will be in line with the building regulations enforced at that time. Therefore, the final CO₂ emissions performance estimate for the Proposed Development will be completed at reserved matters once designs as well as fabric and systems performance details are available at building level.
- 1.3.4 Part L calculation methodology should not be understood as a predictive assessment of likely future energy requirements or otherwise. Occupants may operate their systems differently, and / or the weather may be different from the assumptions made by Part L approved calculation methods, leading to differing energy requirements.

Energy strategy summary.

- 1.3.5 Passive design and energy efficiency measures will provide the cornerstone to the energy demand and CO₂ emission reduction achieved for the Proposed Development. An on-site heat sharing network will make use of the waste heat generated cooling the indoor snow-centre to heat the hotel accommodation and site wide hot water (including heated swimming pools). This will significantly the reduce heat waste and operational energy emissions of the Proposed Development.
- 1.3.6 Efficient thermal envelopes, on-site heat sharing networks and the implementation of low and zero carbon (LZC) technologies will minimise the energy usage of the Proposed Development.
- 1.3.7 This strategy has been prepared to demonstrate that at the planning stage, the Applicant and design team have given due consideration to the principles of sustainable energy principles, and how these could be implemented for the Proposed Development.
- 1.3.8 The following table provides a summary of the energy strategy for the Proposed Development, utilising Part L 2014 carbon factors.

Table 1.2: Energy strategy summary (site-wide).

Be lean	<p>Target of ~9.7% regulated carbon emission reduction against Part L baseline. High energy efficient building fabric and building services will be utilised to reduce carbon emissions and energy demand through good practice passive design measures.</p>
Be clean	<p>The benefit heat sharing is combined with the implementation of heat pumps at the Be Green stage of this Energy Strategy. Incorporation of a CHP system has been deemed to be unsuitable as it would offer no benefit to the Proposed Development. The implementation of a site-wide heat network is recommended, this should be assessed in detail at later design stages.</p>
Be green	<p>Target of ~54% sitewide regulated carbon emission reduction against Part L baseline via heat pumps and rooftop PV. Utilisation of high efficiency air source heat pumps with heat recovery is anticipated to significantly reduce energy consumption and carbon emissions for the Proposed Development. Rooftop PV is anticipated to further reduce emissions. Further LZC technologies are discussed and could be explored at later design stages</p>

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Results.

1.3.9 The following provides details on the percentage carbon reduction seen from the baseline case.

1.3.10 Through the measures outlined in this Energy Strategy, it is anticipated that overall, approximately a 54% reduction in CO2 emissions could be achieved beyond the 'gas boiler baseline', inclusive of all measures (Figure 1.2).

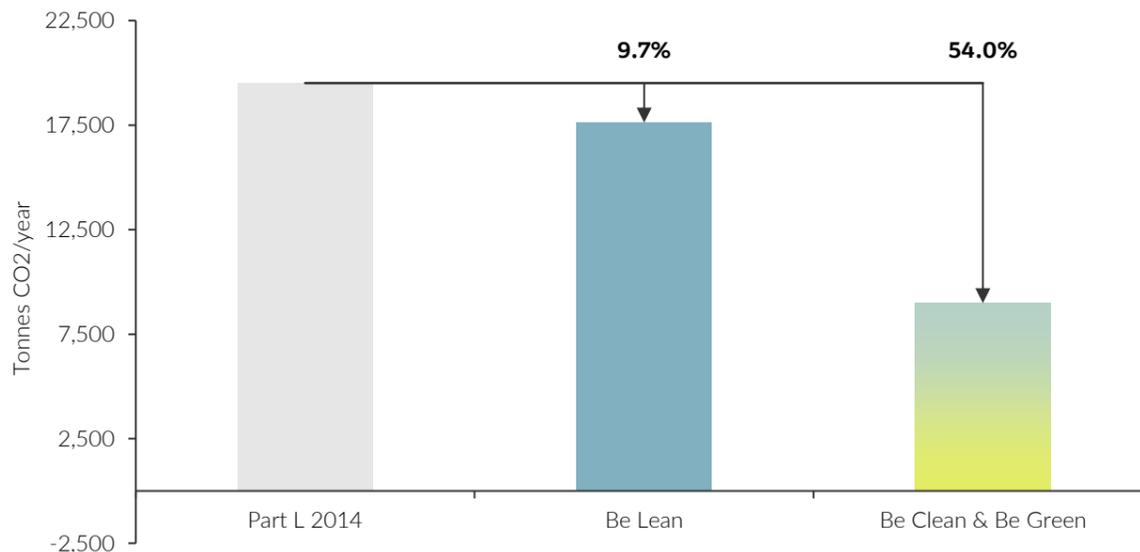


Figure 1.2: Sitewide regulated carbon emissions summary compared to the Part L 2014 baseline.

1.3.11 The decarbonisation of the UK grid is anticipated to mean that all-electric strategies will continue to provide increased benefit as the grid electricity carbon factor improves. A similar assessment has been done but using the most updated carbon factor (SAP10.1 carbon factors) which reflect the current performance of the electric grid. The result of the assessment are presented in Figure 1.3.

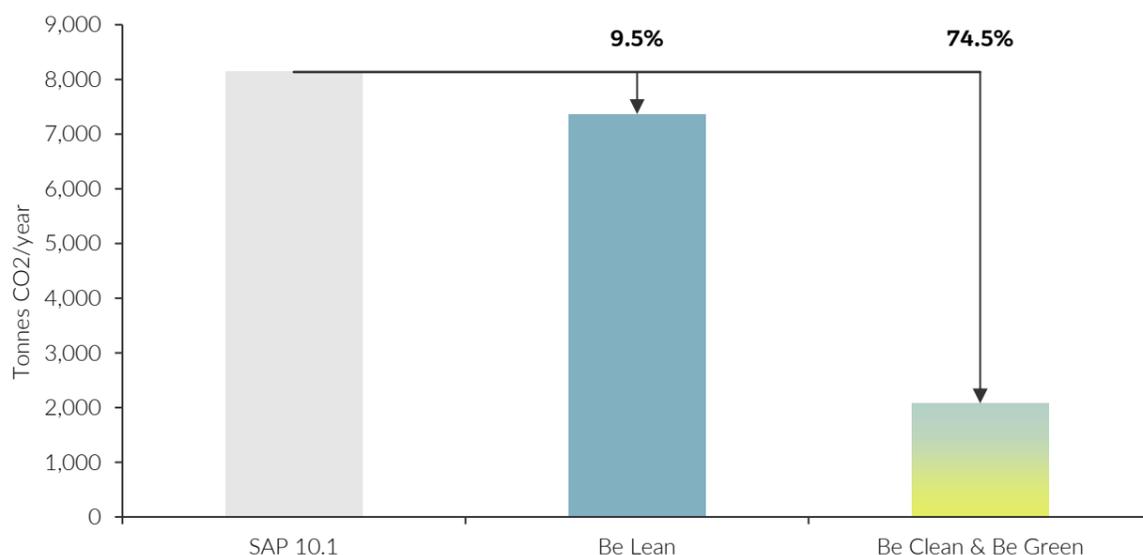


Figure 1.3: Sitewide regulated carbon emissions summary with proposed future carbon factors (SAP 10.1)

1.4 Utilities.

- 1.4.1 Consultations have been undertaken with both the local Electrical and Water statutory authorities, the results of which have identified that offsite routes will be required and that these will likely have negligible effect on the natural environment.
- 1.4.2 Welsh water have yet to define the point of connection or the extent of offsite works required; connection points are available. The specific connection point will be identified and modelled at the next design stage.
- 1.4.3 As the electrical Point of Connection (PoC) to the Merthyr East primary substation will be at 11kV (HV), there will not be a requirement for a primary substation to be located onsite. Rather, incoming 11kV cables would terminate within a ring main unit (RMU) at the site's boundary.
- 1.4.4 The 100% electric energy strategy has informed the overall load for the development and Hoare Lea have utilised this to identify the potential Point of Connection on WPD's network to deliver power to the site. WPD have been consulted and identified the Merthyr East primary substation as the POC. At the next design stage Hoare Lea will lodge a detailed application with respect to the POC.
- 1.4.5 All routes to site have been considered to have minimal environmental impact as they will likely be laid in the verge through the majority of their routes. Detailed route proving exercises will be undertaken at the detailed design stage in order to fully rationalise all routes to site, seeking to undertake combined trenching wherever possible in order to rationalise any excavation and further reducing any effects to the natural environment
- 1.4.6 The presence of both the overhead powerlines and the intermediate pressure gas main are considered to be negligible and unaffected by the proposed development and any new site entrances are unlikely to have any effect on existing utilities.

1.5 Sustainability Strategy.

1.5.1 The Sustainability Strategy for the Proposed Development has been informed by both national and local policy requirements and sustainable design and development guidance and frameworks, including, but not limited to:

- Building Regulations Part L2A
- Planning Policy Wales
- Well-being of Future Generations (Wales) Act 2015
- Merthyr Tydfil Local Development Plan 2016-2031
- Supplementary Planning Guidance Note 4 – Sustainable Design
- Supplementary Planning Guidance Note 5 – Nature and Development

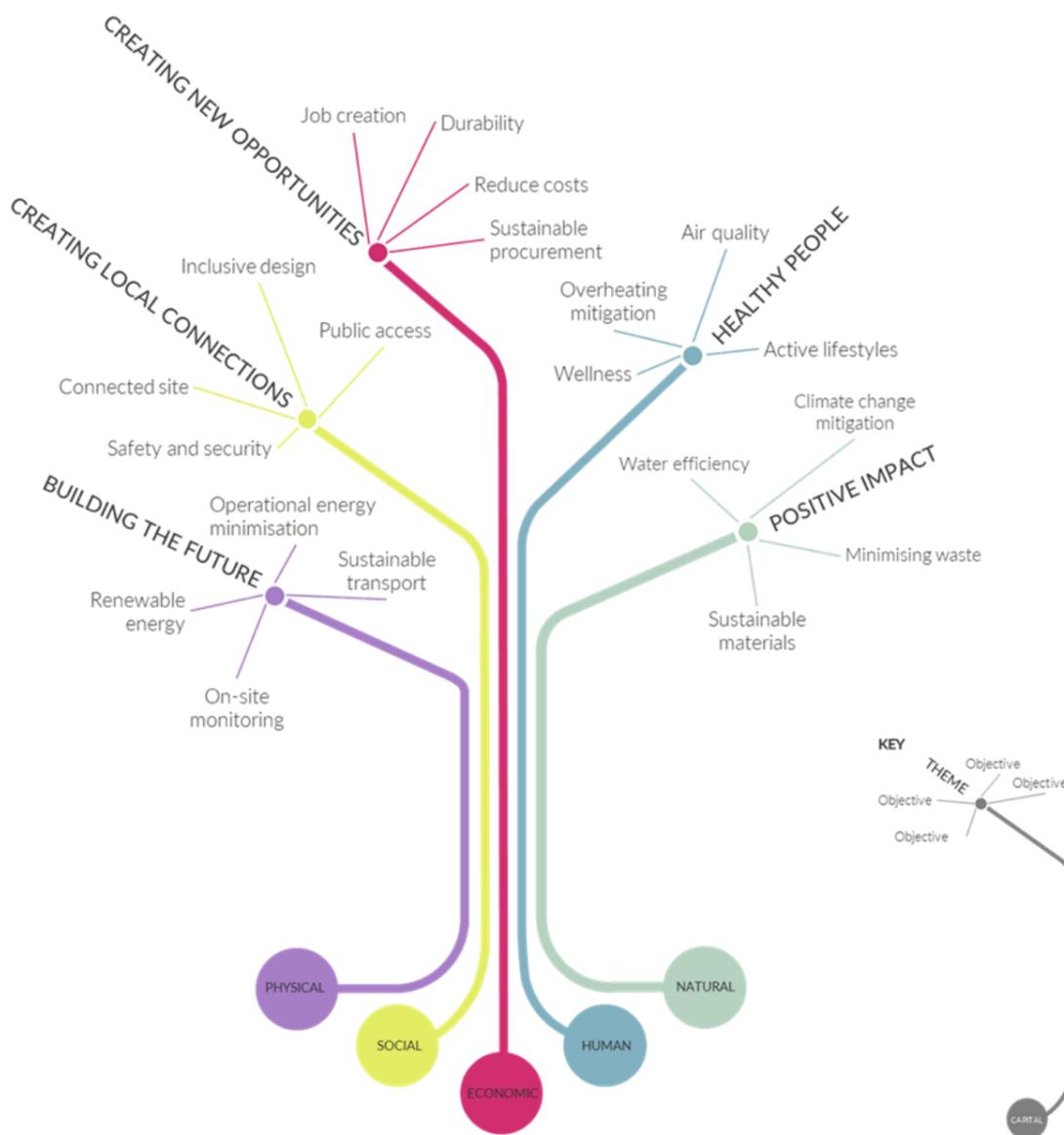


Figure 1.4: Approach to sustainability for Rhydyr West.

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1.6 Sustainability Charter.

- 1.6.1 The Sustainability Charter builds upon discussions with Marvel Limited (the Client) relating to the Sustainability Strategy for the development at Rhydyicar West. It is intended to be used to provide guidance to the various design teams and incorporates the legislative requirements with the Client's sustainability aspirations.

Sustainability charter and targets.

- 1.6.2 The sustainability charter has been developed with the aim of providing a holistic approach to embed sustainability within the development design and operation. The charter and targets have been developed to capture and respond to key challenges, i.e. climate, biodiversity and health and wellbeing. The charter is also informed by national and local policy requirements, United Nations (UN) sustainable development goals as well as the client vision for the development.
- 1.6.3 To capture the multi-faceted sustainability benefits and values that the Proposed Development can bring to the site, local community, surrounding businesses, and future building users, five defined factors – the people, the building, the social network, the natural environment, and the economic aspects – inform our proposed sustainability framework. These are summarised below:

Physical capital – “Building the future”

- The Proposed Development will offer an innovative approach to achieving energy efficiency, by kick starting innovation through a baseline that is future proofed for emerging technologies and policies. Combustion free services will be utilised to not only meet good practice standards but exceed these and deliver best practice. Furthermore, there will be a focus on designing in infrastructure to enable a sustainable and active development to be created.

Social capital – “Creating local connections”

- The Proposed Development seeks to encourage the access to outside space by providing a range of spaces for workers and visitors to interact with nature in a safe and secure manner. There will also be opportunities created for the local community to engage with the development.

Economic capital – “Creating new opportunities”

- The Proposed Development offers a significant employment opportunity for the local community both during construction and while in operation. The Proposed Development will also advocate for exemplary standards, conditions, and opportunities throughout the construction process.

Human capital – “Healthy People”

- The Proposed Development's user mental and physical health and wellbeing are at the centre of design and specification to ensure a comfortable indoor environment is created and make the Proposed Development a place where people want to work and visit – both now and in future climates.

Natural capital – “Positive impact”

- The Proposed Development aims to mitigate negative impacts on biodiversity as much as possible and smart design and conscientious operation measures will ensure the amount of waste produced both in construction and operation is kept to a minimum. The incorporation of biophilic design elements and sustainable drainage systems will ensure the site is future proofed against a changing climate.

2.0 Policy background

2.1 Greenhouse gasses, Energy and climate change policy.

Well-being of Future Generations (Wales) Act 2015

2.1.1 This act gives a legally binding common purpose – seven well-being goals – for national and local government as well as local health boards and other public bodies. One of these goals is ‘A resilient Wales’. It also sets out five ways of working (long-term thinking, prevention, collaboration, integration and involvement). It is through this act that Wales is set to make its contribution to the achievement of the 17 United Nations Sustainable Development Goals.

Planning Policy Wales (PPW) & Future Wales – The National Plan 2040

- 2.1.2 Together, the Planning Policy Wales (PPW) and Future Wales – The National Plan 2040 documents set out how the Welsh planning system at a national, regional and local level can assist in delivering their set requirements through the Strategic and Local Development Plans.
- 2.1.3 The purpose of the PPW is to set out land use policies to “ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental and cultural well-being of Wales, as required by the Planning (Wales) Act 2015, the Well-being of Future Generations (Wales) Act 2015 and other key legislation and resultant duties such as the Socio-economic Duty.”
- 2.1.4 The Future Wales – The National Plan 2040 sets the direction for development in Wales and contains a strategy for “addressing key national priorities through the planning system, including sustaining and developing a vibrant economy, achieving decarbonisation and climate-resilience, developing strong ecosystems and improving the health and well-being of our communities.” For the Proposed Development, a notable energy policy is Policy 16 ‘Heat Networks’. This states that large scale mixed-use development should, where feasible, have a heat network with a renewable / low carbon or waste heat energy source. Therefore, this policy is a main driver to evaluate the implementation of a district heat network on site.

Merthyr Tydfil policy

2.1.5 Merthyr Tydfil policy relating to GHG emissions and the environment are included below.

Table 2.1: A summary of Merthyr Tydfil policy relating to GHG emissions and climate change.

Sustainability Theme	Merthyr Tydfil Policy
<p>Building Performance</p> 	<p>Policy BW7: Sustainable design and placemaking</p> <p>The Council requires all new development to:</p> <ul style="list-style-type: none"> - minimise the demand for energy and, where appropriate, utilise renewable energy resource - adopt energy conservation/ efficiency measures <p>Policy TB7: Renewable Energy</p> <p>Development proposals that meet national and local renewable energy targets will be viewed favourably if:</p> <ul style="list-style-type: none"> - They do not have an acceptable impact on biodiversity and landscape including the setting of the Brecon Beacons National Park - For wind turbines, their capacity does not exceed 25 MW on urban and industrial brownfield, and 5MW elsewhere - They do not have an unacceptable impact on the amenity of residential areas
<p>Water & Drainage</p> 	<p>Policy BW7: Sustainable design and placemaking</p> <p>The Council requires all new development to:</p> <p>adopt water conservation/efficiency measures</p> <p>Policy BW8: Development and the water environment</p> <p>Proposal for development will only be permitted where:</p> <p>they do not have adverse effects on the quality and/or quantity of water surfaces or groundwater resources</p> <p>adequate water and sewerage systems exist or are reasonably accessible or capable of being provided prior to the development becoming operational</p> <p>Sustainable drainage systems (SuDS) are used for the disposal of surface water. Alternative methods only considered if SuDS proven inappropriate for practical or environmental reasons</p>
<p>Flood Risk</p> 	<p>Policy BW8: Development and the water environment</p> <p>Proposal for development will only be permitted where:</p> <p>identified river floodplains are avoided</p>

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<p>Waste</p> 	<p>Policy BW7: Sustainable design and placemaking</p> <p>The Council requires all new development to:</p> <p>Incorporate facilities for the segregation, recovery and recycling of waste</p>
<p>Materials</p> 	<p>Policy BW7: Sustainable design and placemaking</p> <p>The council requires all new developments to incorporate resource efficient/ adaptable buildings and layouts using sustainable design and construction techniques</p>
<p>Biodiversity</p> 	<p>Policy BW5: Natural Heritage</p> <p>In order to protect and support the enhancement of the County Borough's natural heritage, development proposals will only be permitted where they maintain, enhance and do not harm:</p> <ul style="list-style-type: none"> - Landscape character of the countryside - National and local nature conservation designations - Trees, woodlands and hedgerows that have natural heritage value <p>Other biodiversity interests such protected and priority species ad ecological networks</p>
<p>Transport</p> 	<p>Policy BW12: Development proposals and transport</p> <p>Where appropriate the Council will expect all development proposals to demonstrate how they will:</p> <ul style="list-style-type: none"> - Help reduce the need to travel - Encourage use of transport other than the private car - Avoid increasing traffic to unacceptable levels - Avoid causing or exacerbating highway safety problems

2.2 Utilities.

- 2.2.1 Upon review of the Merthyr Tydfil planning policy guidance notes, specifically the Local Development Plan and Supplementary Planning Guidance (note 5, nature and development), it is evident that the Historic and Natural Heritage of Merthyr Tydfil must be considered and this is considered in detail in other specific reports.
- 2.2.2 Section 8.5 of the 2006-2021 LDP states that 'biodiversity and landscape impacts do not always observe planning application site boundaries, and therefore, both immediate impacts and impacts remote from the development site will be considered'.
- 2.2.3 In respect to utilities, this will include the design routing of new cable and mains infrastructure both on and offsite, as well as the considered placement and location of associated infrastructure, such as substations, to ensure that the natural environment is protected where possible, and any that appropriate mitigation methods are identified and provided.

3.0 Key Legislation

3.1 Greenhouse gasses, energy and climate change.

Climate Change Act (2008)

- 3.1.1 The Climate Change Act [1] established the context for government action to enable the UK to achieve its long-term carbon reduction goals. Through the Climate Change Act, the UK government has set a target to reduce UK GHG emissions by at least 80% by the year 2050, relative to 1990 levels, and outlined a path to get there.
- 3.1.2 The Act incorporates a requirement for the government to produce a UK Climate Change Risk Assessment (CCRA) every five years and to develop a National Adaptation Programme (NAP) to address the opportunities and risks arising from climate change.
- 3.1.3 The Act also further introduced a key institutional innovation in the form of legally-binding five-year ‘carbon budgets’ with distinct five-year targets to act as stepping stones towards the 2050 target. A carbon budget is essentially a cap on the amount of GHGs that are allowed to be emitted in the UK over a five-year period. The Act also established the Committee on Climate Change (CCC) to ensure that emissions targets are evidence-based and independently assessed.
- 3.1.4 The EIA Regulations [2] build on this effort and seek to examine the potential impacts of development projects on climate in greater detail. They require a description of ‘the impact of the Proposed Development on climate’, and ‘the vulnerability of the Proposed Development to climate change’ (Schedule 4, paragraph 5(f)).

The Climate Change Act 2008 (2050 Target Amendment) Order 2019

- 3.1.5 On 26th June 2019, the UK parliament passed the Climate Change Act 2008 (2050 Target Amendment) ("Order") [3] implementing the recommendations of the Committee on Climate Change committing the country to a new legally binding “net-zero” carbon target for 2050. This replaced the previous legally binding net GHG emissions reduction target of 80% relative to 1990 levels, introduced by the Climate Change Act, with the updated target of a 100% reduction when compared to the 1990 baseline. With this act the UK became the first G7 economy to introduce a legal obligation on its Government to achieve net zero emissions.
- 3.1.6 The Order was enacted following a recommendation made by the UK Committee on Climate Change that the UK should adopt a target of "net-zero" emissions by 2050 contained in a report which was published shortly after the UK Parliament had declared a climate change emergency.

The UK Climate Change Risk Assessment (2017)

- 3.1.7 The UK Government and the Adaptation Sub-Committee (part of the CCC) published the second five-year Climate Change Risk Assessment (CCRA) in January 2017 [4]. The CCRA draws upon the findings contained in the Adaptation Sub-Committee’s (ASC) independent evidence report for a range of potential impacts of climate change in a UK context.
- 3.1.8 The UK Government commissioned the ASC to produce an Evidence Report to inform the second CCRA (CCRA2). The full CCRA2 Evidence Report [5] comprises eight chapters written by leading academics, consultants and other experts in the public and private sectors and civil society representing organisations across Great Britain and Northern Ireland. It highlights priority risks across different sectors where additional action is recommended over the next five years to tackle current and future risks, and realise opportunities, arising for the UK from climate change.
- 3.1.9 The Welsh Government endorses the conclusions of the UK Climate Change Risk Assessment 2017 Evidence Report national summary for Wales. Some 49 risks and opportunities have been identified, with the most important risks to Wales summarised as follows:

Table 3.1: Summary of the most important risks to Wales from the 2017 CCRA [4].

Risks to infrastructure (from all sources of flooding)	More action needed
Risk to public water supplies from drought and low flows	
Risks from some land management practices exacerbating flood risk	
Risks to ecosystems and agriculture businesses from changes in climatic conditions	
Risks to communities from all sources of flooding and sea-level rise	Research priority
Risks to infrastructure, business and buildings from high river flows, erosion and extreme weather	
Risks and opportunities from changes to agriculture and forestry productivity	
Risks to people’s health and well-being and associated service delivery from high temperatures, flooding and extreme weather	

- 3.1.10 The Welsh Government’s actions on climate change adaptation are described in the Climate Change Strategy for Wales: Adaptation Delivery Plan (2010). The actions in this plan were reviewed in light of the new evidence, and a new version, Prosperity for all: A Climate conscious Wales was published in 2019.

Prosperity for all: A Climate conscious Wales

- 3.1.11 The ‘Prosperity for All: A climate Conscience Wales’ (2019) document focuses on how Wales will adapt to the impacts of climate change from 2020 - 2050. It communicates what actions have been taken to date as well as seeking to influence important actors to take action, raising awareness of climate adaptation and sharing knowledge and best practice. It aims to do this in a way which strengthens the economy and create a more equal society.
- 3.1.12 The policy determines that all new developments are to contribute towards climate change adaptation. These include the location of new development, the design of buildings, the strategic importance of green spaces and an approach to managing development in areas of flood risk. Collectively, these enable current and future generations to adapt more effectively to the threats and impacts of climate change. Furthermore, all new developments, homes and communities are required to be protected from flood risk, take climate risks into account, and encourage climate change adaptation.

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3.2 Utilities.

- 3.2.1 In response to the UK's commitment to achieving net zero carbon emissions by 2050 and in line with policy updates such as Part L 2021, the scheme is to adopt a 100% electric energy strategy to provide all heating, hot water, and small power loads. A connection to the gas grid will not therefore be made.
- 3.2.2 All utility works to be compliant with NRSWA; NJUG; ENA (Engineering Recommendation G81 Part 4 and Technical Specification 43-8); The Water Industry Act and Water Supply (water fittings) Regulations 1999; The Electricity at Work Regulations 1989, and The HSE. This list is not exhaustive and would include any other key legislation relating to the installation, survey, operation, and commissioning of utility infrastructure. All works to also be undertaken by qualified NERS and WIRS accredited personnel.

4.0 Highlighted Mitigation within the Submitted Design

4.1 Greenhouse Gasses and Climate Change.

- 4.1.1 A number of design principles and solutions have been 'built in' to or 'embedded' in the Proposed Development design to minimise GHG emissions. This is known as 'embedded' mitigation. Such measures are defined as 'modifications to the location or design of the development made during the pre-application phase that are an inherent part of the Proposed Development, and do not require additional action to be taken'. In arriving at the scale identified for the likely environmental effects, 'embedded' mitigation measures have been taken into consideration as inherent components of the Proposed Development.
- 4.1.2 Embedded mitigation sits at the top of mitigation hierarchy, with greater ability to avoid detrimental environmental impacts.
- 4.1.3 Embedded mitigation recommendations, evaluated as part of the construction phase assessment, are listed below.
- Detailed consideration on the placement of the Proposed Development in the Site to minimise its impact in the Site's ecology (discussed further in the accompanying Design and Access Statement).
 - Preference for local suppliers (within Merthyr Tydfil or Wales, will also be discussed in separate and specific strategic economic benefits reports) to shorten the supply chain and reduce its associated environmental footprint coupled with prioritisation of responsibly sourced goods and services where feasible whilst maximising the proportion of recycled content within materials used in construction;
 - Prioritising, wherever possible and feasible, the use of low embodied carbon materials;
 - Adoption of the circular economy principles within the design;
 - Position of the building and structure so to minimise the number of trees that need to be felled;
 - Key materials extracted as part of the enabling works to be re-used and/or recycled in accordance with the waste hierarchy giving priority to on-site uses where practical; and
 - Manage all waste materials during the construction phase in accordance with the construction waste management practices outlined in the Site Waste Management Plan. Facilitate this objective by providing training for site personnel regarding the correct disposal of materials.
- 4.1.4 Embedded mitigation recommendations, evaluated as part of the operational phase assessment, are listed below.
- Undertake operational energy modelling in compliance with the Part L requirements to determine key contributors to anticipated operational energy;
 - Implement highly energy efficient building fabric and building services to maximise the reduction in energy demand and associated carbon emissions through passive design measures (including mechanical ventilation with heat recovery to further reduce energy consumption and carbon emissions);
 - Specify suitable glazing ratios to reduce heating demand and overheating risk whilst maintaining light levels. A lower g-value assists with minimising the risk of overheating, but balanced with the need to capture beneficial solar gains in winter and a better visible light transmittance;
 - Production of a Framework Travel Plan to set out all relevant targets/measures in relation to encouraging more sustainable travel patterns and identify future monitoring and management arrangements (see submitted Travel Plan);
 - Create and enhance pedestrian accessibility by increasing the permeability and safety of the site;
 - Increase engagement with sustainable transport modes by carefully considering walking and cycling infrastructure and funding a shuttle bus between the site and various key destinations in Merthyr including the bus station and rail stations;
 - Design in an earth bund adjacent to the South elevation of the indoor snow-centre building to reduce solar gain;
 - Procure 100% renewable energy;
 - Make use of available rooftop areas for solar PV installation; and
 - Implement an all-electric, combustion-free operational energy strategy for on-site regulated energy demand utilising heat pumps where feasible to meet space heating, cooling and domestic hot water requirements as well as taking advantage of the rapid decarbonisation of the grid.
- 4.1.5 A full discussion of traffic mitigation see will be included in the specific transport reports.

4.2 Utilities.

- 4.2.1 By establishing a PoC to the 11kV HV network, a primary substation (33kV/11kV, external, 40m x 40m footprint) would not be required onsite.
- 4.2.2 As per NRSWA and NJUG guidelines, new utilities would run within the public footpath and verge of the existing road network. Where there is insufficient space within the footpath, the public highway would be used.
- 4.2.3 The indicative power routing design avoids running in Greenfield, private land, beneath the River Taff and Merthyr Railway. When crossing the River Taff and railway line, new utilities remain within the existing public footway, highway, or bridges as appropriate and do not run within Greenfield or underneath the River via directional drill or similar.

4.3 Energy.

- 4.3.1 The mitigation involved in lowering the demand for and emissions from Energy usage are discussed in detail in the Energy Strategy which is included as the following section.

5.0 ENERGY STRATEGY

5.1 Introduction.

- 5.1.1 This report has been produced in support of the early-stage design development of Rhydyicar West, near Merthyr Tydfil in Wales, hereafter referred to as the Proposed Development.
- 5.1.2 This Energy Strategy provides recommendations regarding the approach to the reducing carbon dioxide (CO₂) emissions and optimising energy efficiency within the development. The Energy Strategy has been developed using a 'fabric first' approach, following the 'Be Lean', 'Be Clean', 'Be Green' energy hierarchy. This prioritises savings made to passive design and energy efficiency prior to consideration of low and zero carbon technologies.

Benchmarking

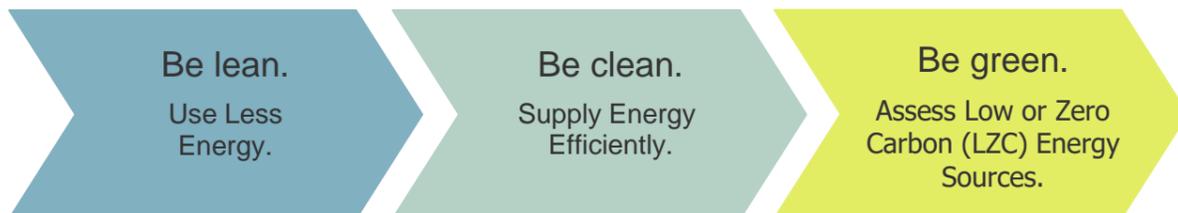


Figure 5.1: Energy hierarchy.

- 5.1.3 The calculations presented in this Energy Strategy have been benchmarked using existing gas boiler baseline project energy use data for similar buildings where available. The appraisals within this statement are based on Part L calculation methodology and should not be understood as a predictive assessment of future energy requirements or otherwise. Occupants may operate their systems differently, and / or the weather may be different from the assumptions made by Part L approved calculation methods. The energy requirements for the indoor snow-centre component of the site have been estimated based on energy usage totals from similar existing facilities having consulted with existing operators. The outdoor water park area has been scoped out of this assessment due to it not being an enclosed building hence it would not be subject to Part L. The final CO₂ emissions performance of the Proposed Development is subject to amendment once Part L modelling has been completed.

Drivers

- 5.1.4 A policy review has been undertaken and is outlined in the preceding chapter. As a summary, planning policy applicable to the Proposed Development include:

National drivers; Approved Document Part L of the Building Regulations

- 5.1.5 Part L of the Building Regulations is the mechanism by which the Welsh Government is driving reductions in the regulated CO₂ emissions from new buildings. The policy relevant to energy contained in Planning Policy Wales and Future Wales – The National Plan 2040.

Local drivers; Merthyr Tydfil Local Development Plan 2016 - 2031

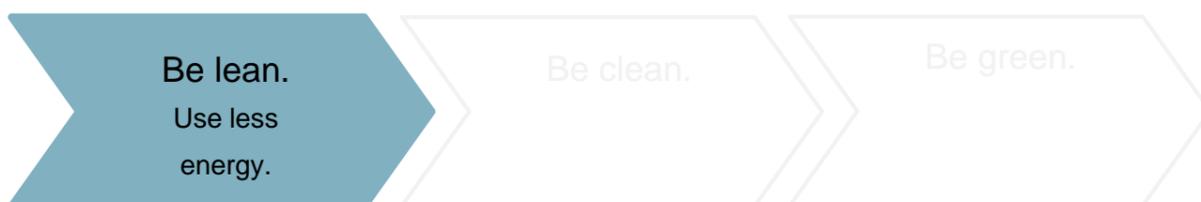
- 5.1.6 The Local development plan represents the local planning policies currently applied by the Council to inform the determination of planning applications in the Borough and enforce planning control. It was adopted by the council in January 2020, superseding the previously adopted 2016 Development Plan.

5.2 Energy strategy summary.

- 5.2.1 Passive design approach is based on all those passive measures that can bring a real benefit to the energy consumption without requiring active actions. Such measures include high performance for the façade (high u-values and optimised g-values), heat recovery from the mechanical ventilation system, bespoke external shading elements to reduce the solar gains during summer, bespoke fenestration design balancing thermal needs and daylighting opportunities. In conjunction with a passive design approach, energy efficiency measures will provide the cornerstone to the energy demand and CO₂ emission reduction achieved for the Proposed Development. An all-electric on-site strategy is also proposed with an embedded energy sharing network so to recover the waste heat (generated cooling the indoor snow-centre) to provide heat to the facilities located on the Site (including heated swimming pools). This will significantly reduce the heat waste and operational energy emissions of the Proposed Development.
- 5.2.2 An important factor to consider for the Energy Strategy is the decarbonisation of the UK grid. The UK grid is projected to continue to decarbonise in coming years, resulting in an improvement in grid electricity carbon factors which leads to less carbon emitted during the electricity generation process. An all-electric strategy, such as the one proposed here, will capitalise on this continue improvement and will help to continue to reduce the real life operational emissions.

5.3 Be Lean.

- 5.3.1 The initial stage of the analysis is mainly focused on the architectural layouts, façade composition and external thermal envelope. The scope of this stage is to optimise the shape of the new buildings based on internal parameters (i.e. daylighting requirement, function of the space, thermal characteristic of the space) but also external factors such as surrounding buildings, site morphology, and local weather data.
- 5.3.2 A second step within this analysis phase involves optimising the thermal performance of the building(s) envelope(s). This could be achieved through solutions such as targeting low U-values, air permeability and efficient glazing to minimise heat losses in winter and maximise cool air retention in summer months.
- 5.3.3 Passive design and energy efficiency measures form the basis for the reduction in overall energy demand and carbon emissions for the Proposed Development. This energy strategy aims reduce the energy demand initially by optimising the envelope and building services within the development.



Passive design and energy efficiency features.

- 5.3.4 Passive Design measures are those which reduce the demand for energy within buildings, without consuming energy in the process.
- 5.3.5 These are the most robust and effective measures for reducing CO2 emissions as the performance of the solutions, such as wall insulation, is unlikely to deteriorate significantly with time, or be subject to change by future property owners. In this sense, it is possible to have confidence that the benefits these measures will continue at a similar level for the duration of their installation.

Recommended measures:	
	<p>Fabric performance</p> <p>A 'fabric first' approach will be taken in order to reduce the energy demand and CO2 emissions from the Development. The overriding objective for the façade design of each new building will be to achieve the optimum balance between providing natural daylighting benefits to reduce the use of artificial lighting, the provision of passive solar heating to limit the need for space heating in winter and limiting summertime solar gains to reduce space cooling demands.</p> <p>Thermal Insulation</p> <p>The Proposed Development will seek to utilise efficient thermal envelopes. Typically, demand for space heating can be dominant in dwellings, whilst space heating is less dominant in commercial spaces such as office and retail. Heat losses and gains will be controlled by the optimisation of the fabric of each building, i.e. ensuring appropriate levels of glazing to control winter heat loss and summer heat gain. Reducing the thermal transmittance of the building envelope where appropriate will help to reduce both heating requirement and result in lower energy requirements.</p> <p>Insulation will be critical to the energy efficiency of the indoor snow-centre. The Proposed Development is seeking to use Passive House U values in the building fabric and further explore the use of the Passive House air tightness standards to minimise energy wasted on cooling.</p> <p>Glazing Energy & Light Transmittance</p> <p>Elevations for newly constructed dwellings will be developed with a suitable approach to fenestration and glazing specification (light transmission and solar control) to ensure an appropriate balance between the benefits of passive solar heating in winter months whilst limiting the likelihood of high internal temperatures in summer, as applicable to each building type.</p>
	<p>Mechanical ventilation</p> <p>It is anticipated that high-efficiency mechanical ventilation with heat recovery will be adopted for all buildings.</p> <p>Mechanical ventilation is an important addition to the building services to maintain good indoor air quality by providing fresh air and extracting vitiated air. Providing fresh air minimises the risk of stale and stagnant air and limits the risk of condensation and mould. Coupled to a heat exchanger, the warmth in extracted air can be recovered and delivered to the supply air. In this mode, the ventilation system reduces space heating and cooling demand.</p> <p>To reduce the electrical energy associated with fan usage, plant and systems will be optimised to achieve low specific fan powers. In residential areas, any mechanical ventilation with heat recovery (MVHR) units will be provided with a bypass function to avoid returning hot air to the dwellings in summer months.</p>
	<p>Domestic hot water (DHW) system</p> <p>To limit the demand for hot water, all spaces will include the use of water-efficient fixtures and fittings including WCs with low flush volume, flow reducers in the taps of wash hand basins and aerated shower heads, to limit overall water consumption in line with Building Regulations Part G.</p>
	<p>Natural daylight and lighting strategy</p> <p>All buildings will be provided with low-energy, efficient light fittings throughout, and external lighting for amenity and communal areas will also be low-energy efficient fittings and will be linked to daylight sensors and / or presence detectors to prevent unnecessary use.</p> <p>It is anticipated that the Proposed Development will be supplied by Light Emitting Diodes (LED) or similar low energy lamps. The lighting specification for the Proposed Development will be carried out in conjunction with lighting control systems incorporating daylight linkage and presence detection in suitable areas.</p> <p>As well as reduced energy requirement that will be achieved by implementing these strategies, the contribution to the cooling requirements and internal heat gains will be reduced. This will further reduce the total energy requirements and CO2 emissions of each building.</p>
	<p>Metering & controls</p> <p>Consider implementing building management, daylight link, zonal control, etc to minimise energy usage. Smart Building technology will also support an in-use energy management plan.</p>

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Site-wide energy requirement

5.3.6 The estimated regulated energy requirement and regulated CO₂ emissions calculated for the gas boiler baseline (before any improvements) are presented in Table 5.1.

Table 5.1: Regulated Energy Demand and CO₂ Emissions.

Stage	Regulated Energy Requirement (kWh/yr)	Regulated CO ₂ Emissions (t CO ₂ per annum)
Gas boiler baseline	48,668,377	19,508,489

Site-wide energy and carbon breakdown

5.3.7 The anticipated site-wide demand from each element are compared in the chart below. This shows that the dominant source of regulated energy demand is associated with cooling, hot water and space heating.

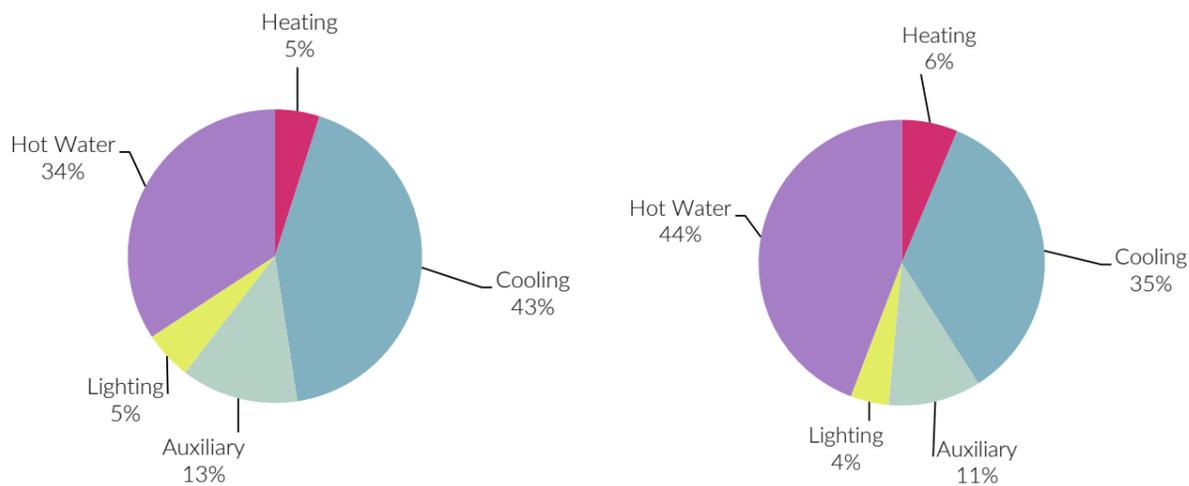


Figure 5.2: Sitewide regulated system side fuel requirement (left) and emissions breakdown (right).

Be Lean results.

5.3.8 Overall, the Proposed Development would be anticipated to approximately a 9.7% reduction in annual regulated CO₂ emissions via passive design and energy efficiency measures as described above (i.e. before any benefit from low or zero carbon technologies).

Table 5.2: 'Be lean' sitewide carbon performance.

Development baseline emission rate:	19,508,489 tCO ₂ /year
Target emission rate with Be Lean measures:	17,622,697 tCO ₂ /year
Percentage reduction:	~9.7%

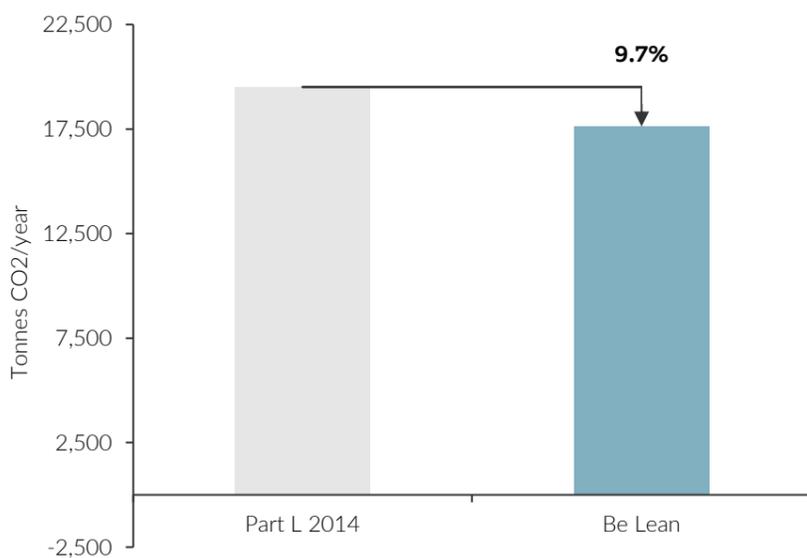


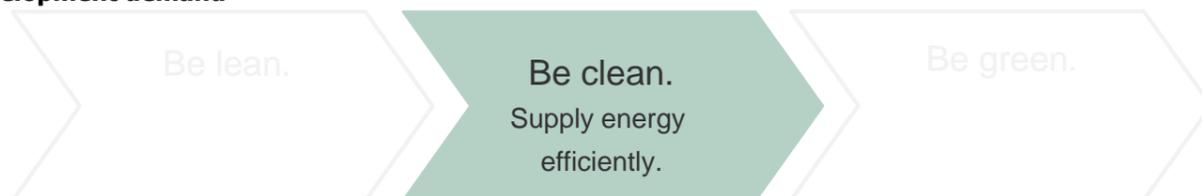
Figure 5.3: Sitewide regulated carbon emission reduction at the Be Lean stage.

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Be Clean.

- 5.3.9 The second step on the optimisation process is focused on exploring the most sustainable way to dispatch energy across the site. This analysis is done through the evaluation of alternative technologies to deliver the required energy for the specific project.
- 5.3.10 This stage of the energy hierarchy includes consideration of connection to available district heat networks, or the use of on-site heat networks and decentralised energy production such as Combined Heat and Power (CHP) in order to provide energy and reducing consumption from the national grid and gas networks, through the generation of electricity, heating and cooling on-site.

Development demand



5.3.11 The Proposed Development’s demand is anticipated to be dominated by thermal processes at 76% compared to 24% non-thermal energy demand.

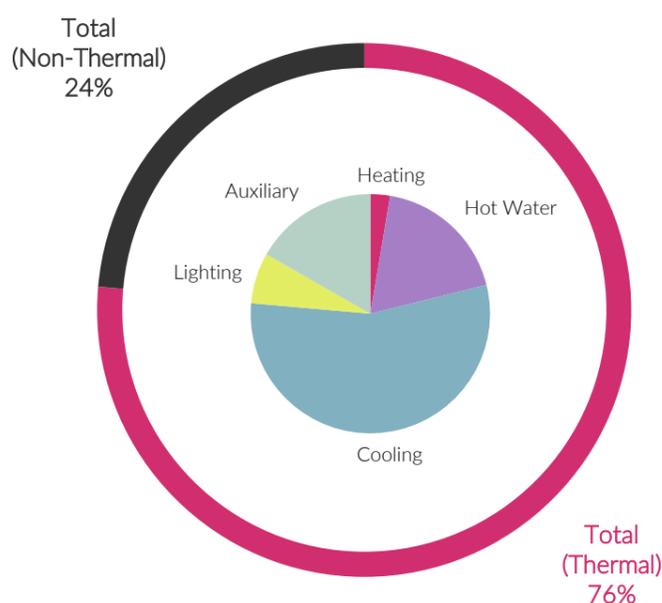


Figure 5.4: Sitewide emissions breakdown, showing the division between thermal and non-thermal.

Be clean: network and technologies

5.3.12 In line with policy aspirations, the following sections summarise the considerations of the low-carbon energy supply measures that have been considered, and those which will be implemented at the Proposed Development.

Recommended:	
	<p>Connection to or creation of a heat network</p> <p>5.3.13 There is not currently an established heat network within the vicinity of the Site. However, since heat networks can be beneficial where there is a source of waste heat present which can be uplifted at greater efficiency than generating heat locally, it is recommended to implement an on-site heat sharing system. With this system the excess heat generated by cooling the indoor snow-centre could be used to heat hotel rooms and swimming pools, thereby minimising wasted heat and energy and improving the coefficient of performance for all linked facilities. Distribution losses can be high in heat network systems, however the Proposed Development is designed around a single plaza, so all the buildings will be very close which drastically reduces the distribution system length and losses. Furthermore, the distribution system will work with a low temperature to further reduce the energy losses throughout the distribution system.</p> <p>5.3.14 The estimated benefit of such a system has been modelled as an uplift in the efficiency of the heat pumps on site and as such will be presented as a compound benefit in the following Be Green section.</p>
Not recommended:	
	<p>Combined heat and power (CHP)</p> <p>5.3.15 Changes to the carbon factor of grid electricity have meant that previously favoured systems such as Combined Heat and Power (CHP) are becoming much less carbon efficient. In fact, CHP systems are now expected to lead to greater carbon emissions than conventional gas-fired boilers due to their lower efficiency.</p>

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5.3.16	Due to the decarbonisation of the electricity grid, schemes using CHP engines for the delivery of heating energy at the Proposed Development leads to net increase carbon emissions (over the gas boiler baseline),
5.3.17	In contrast, electric systems are far more likely to achieve substantial carbon emission savings with future carbon factors. Further, CHP engines are an on-site source of particulate pollutants which will adversely affect local air quality.
5.3.18	In light of grid decarbonisation and increased focus on air quality, CHP is not proposed.

Be Clean summary

5.3.19 CHP is not proposed due to poor carbon reduction and adverse air quality impacts. An on-site heat sharing system is proposed to make use of waste heat generated due to the high cooling demand of the indoor snow-centre and balance the energy needs across the various facilities, as illustrated in Figure 5.5.

5.3.20 The potential to establish a site-wide heat network is recommended be assessed in detail at later design stages. The estimated benefit of implementing such a system in conjunction with air source and water to water heat pumps is presented as a compound benefit in the Be Green section.

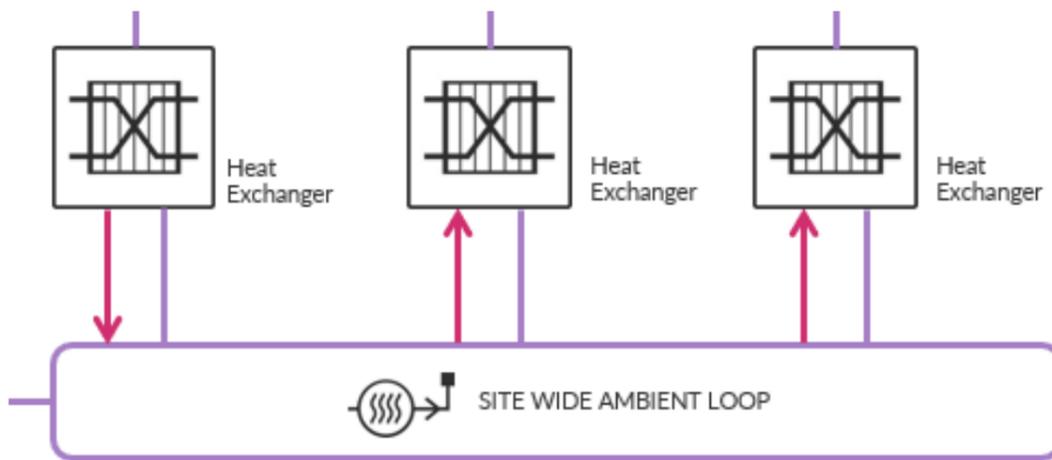
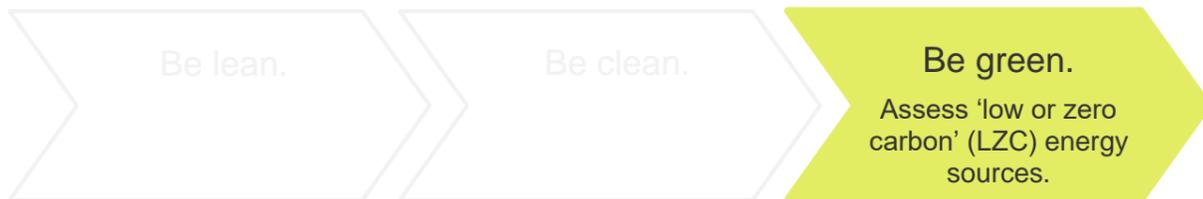


Figure 5.5: Schematic illustrating the site wide energy sharing scheme.

5.4 Be Green.

5.4.1 The final step of the energy hierarchy explores the feasibility of Low and Zero Carbon (LZC) technologies to allow for the production of renewable energy on-site in order to deliver further reduction in carbon emissions.



Low and zero carbon (LZC) technology assessment

5.4.2 A number of technologies were considered for feasibility to contribute towards offsetting carbon emissions of the Proposed Development. The following technologies are recommended in this section due to potential benefit and feasibility. A summary of the potential savings, if installed, is discussed in the table below.

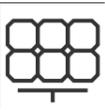
- **Photovoltaic panels:** Generate renewable energy on site.
- **Air Source Heat Pumps:** Practical solution for the Proposed Site and increasingly beneficial to heating and cooling efficiency in the long term, with grid decarbonation.

5.4.3 The following technologies were discounted in the current analysis prior to undertaking the calculations due to various constraints, including the nature and location of the Site. However, many could be explored further, and potentially implemented to beneficial effect.

- **Solar thermal:** Could potentially be explored for the site but this would require consideration of how solar thermal would work practically with the current proposed strategy.
- **Ground source heat pumps:** Due to the imbalance between cooling and heating could have limited benefit.

5.4.4 The following technologies were considered unsuitable for the Proposed Development and have been ruled out.

- **Biomass boilers:** Due to the potential to use the excess rejected heat from cooling the indoor snow-centre for heating, there is a low need for biomass boilers and they could result in an adverse effect on local air quality.
- **Wind turbines:** Considered acoustically and aesthetically inappropriate for the Proposed Development .

Included in calculations:	
	<p>Photovoltaic (PV) panels</p> <p>An appraisal of roof space available for photovoltaic (PV) panels has been undertaken.</p> <p>Suitability to Proposed Development:</p> <p>Provision has been made for PV system to be installed on-site. The system will be deployed across the site in order to maximise panels' exposition and efficiency. This allocation should be reviewed against the space requirements for MEP plant, ecology and other rooftop amenities when this information becomes available.</p>
	<p>Air source heat pumps</p> <p>Air source heat pumps (ASHP) use thermodynamic principles to convert heat from the air into useable heat within the building. Unlike some other sources of renewable energy, heat pumps do require energy (typically electricity or gas) to pump and compress refrigerant through the system. However, under the Renewable Energy Directive 2009/28/EC they are classified as renewable technologies provided that the final energy output significantly exceeds the primary energy input required to drive the heat pump. ASHP need to be located externally with access to the ambient air, typically at roof level.</p> <p>Suitability to Proposed Development:</p> <p>Due to grid decarbonisation, it is expected that ASHP technology will offer significant carbon emission reductions over the gas boiler baseline scenario.</p> <p>It is proposed that communal ASHP plant will be installed as part of the site-wide ambient loop to provide all space heating, cooling and hot water demand for the site.</p> <p>It is predicted that the use of ASHP in combination with an ambient loop distribution system for the entire site could provide an additional saving of ~41% at the Be Green stage.</p>

Not included in calculations, could be explored:	
	<p>Solar thermal</p> <p>Solar Thermal Panels are similar to PV Panels in that they harness energy from solar radiation. This technology however converts solar into thermal energy that can offset the demand on hot water generation systems.</p> <p>Suitability to proposed development:</p> <p>Solar thermal could potentially be explored for the Site, but this would require consideration of how this would work practically with the current proposed strategy. Since the proposed strategy utilises on-site heat sharing networks to redistribute waste heat & solar thermal technology also offsets heating demand, the benefit is assumed to be minimal.</p>

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	<p>Ground source heat pumps (GSHP)</p> <p>Ground Source systems work to extract heat or cooling energy from the ground. They are generally more efficient than air source systems, as the ground temperature is more constant throughout the course of the year relative to air temperature. There are four common varieties of ground source systems:</p> <ul style="list-style-type: none"> – Vertical, open loop, direct cooling (i.e. without heat pump) – Vertical, open loop, with heat pump – Horizontal, closed loop, with heat pump – Vertical, closed loop, with heat pump <p>Due to grid decarbonisation, it is expected that in general GSHPs will offer significant carbon emission reductions over the gas boiler baseline scenario. GSHP plant can be located in basements, with several boreholes connected to ground water. Implementing heat-pump technology brings the additional benefit of a shift towards combustion-free development, with the associated benefit to local air quality. However, the performance of this technology is not assured, therefore the predicted savings may not be achieved in reality.</p> <p>Suitability to Proposed Development:</p> <p>In the specific case of the Proposed Development, the cooling demand outweighs the heating demand, which would lead to an excess of rejected heat entering the GSHP system and reducing the efficiency of the system. In addition to this, to meet the thermal demand of the Proposed Development the area required for piling for GSHP could be large. Therefore, this technology is not currently considered appropriate for the Proposed Development but could be reconsidered once more detailed project information is available.</p> <p>The site has been used in the past as a mining area, which can create either benefits or issues for GSHPs. Surveys of the available underground areas would need to be undertaken to understand whether there were any suitable areas for the implementation of GSHPs.</p>
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Ruled out:	
	<p>Biomass</p> <p>Biomass boilers burn wood fuel or other bio-fuel sources to generate heat. These boilers can operate at high efficiencies, comparable to condensing gas boilers.</p> <p>Suitability to Proposed Development:</p> <p>Biomass boilers require a large fuel store to maintain continuous operation during the winter months. As such, area take for such plant is high. Fuel deliveries in rural locations should be feasible but adverse impacts on local air quality and security of fuel supply are also important considerations.</p> <p>Due to the proposed use of the excess rejected heat from cooling the site and the potential adverse effects of biomass boilers or other fossil fuel burning technologies have on local air quality, biomass boilers are not considered suitable for the Proposed Development.</p>
	<p>Wind turbines</p> <p>Wind turbine could generate renewable energy on-site.</p> <p>Suitability to Proposed Development:</p> <p>The natural, rural location of the Site means that wind turbines would stand out in the landscape and are considered acoustically and aesthetically inappropriate for the Proposed Development.</p>

Be green summary

5.4.5 Through the measures outlined in the Be Green stage, it is anticipated that a site wide reduction in CO₂ emissions of approximately 54% could be achieved beyond the 'gas boiler baseline'. This is inclusive of the heat pump based site-wide ambient loop and rooftop PV.

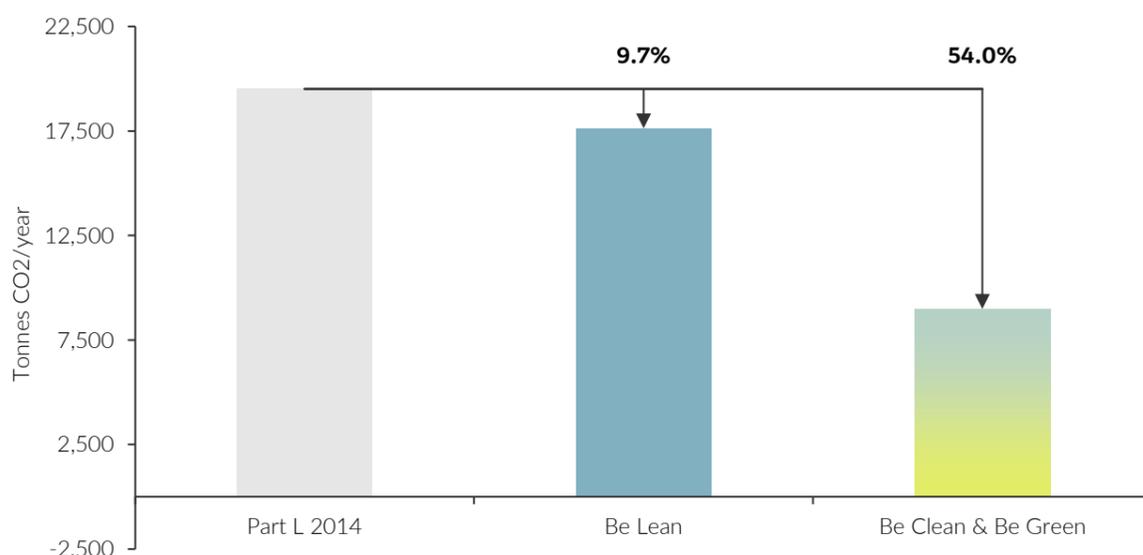


Figure 5.6: Sitewide regulated carbon emissions summary.

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5.5 Conclusion.

- 5.5.1 This strategy has shown that the Proposed Development would benefit from a highly energy efficient, combustion free, low-carbon scheme which utilises minimises waste energy and heat on-site.
- 5.5.2 Efficient thermal envelopes, on-site heat sharing networks and the implementation of low and zero carbon (LZC) technologies will minimise the energy usage of the Proposed Development.
- 5.5.3 This strategy has been prepared to demonstrate that at the planning stage, the Applicant and design team have given due consideration to the principles of sustainable energy principles, and how these could be implemented for the Proposed Development.

The energy strategy.

- 5.5.4 The strategy has been developed using the ‘Be Lean, Clean and Green’ energy hierarchy which utilises a fabric first approach to maximise reduction in energy through passive design measures before considering low and zero carbon (LZC).
- 5.5.5 The following table provides a summary of the energy strategy for the Proposed Development, utilising Part L 2014 carbon factors.

Table 5.3: Energy strategy summary (site-wide).

Be lean	<p>Target of ~9.7% regulated carbon emission reduction against Part L baseline.</p> <p>High energy efficient building fabric and building services will be utilised to reduce carbon emissions and energy demand through good practice passive design measures.</p>
Be clean	<p>The benefit heat sharing is combined with the implementation of heat pumps at the Be Green stage of this Energy Strategy.</p> <p>Incorporation of a CHP system has been deemed to be unsuitable as it would offer no benefit to the Proposed Development. The implementation of a site-wide heat network is recommended, this should be assessed in detail at later design stages.</p>
Be green	<p>Target of ~54% sitewide regulated carbon emission reduction against Part L baseline via heat pumps and rooftop PV.</p> <p>Utilisation of high efficiency air source heat pumps with heat recovery is anticipated to significantly reduce energy consumption and carbon emissions for the Proposed Development. Rooftop PV is anticipated to further reduce emissions. Further LZC technologies are discussed and could be explored at later design stages</p>

5.6 Results.

5.6.1 The following provides details on the percentage carbon reduction seen from the baseline case.

5.6.2 Through the measures outlined in this Energy Strategy, it is anticipated that overall, approximately a 54% reduction in CO2 emissions could be achieved beyond the 'gas boiler baseline', inclusive of all measures.

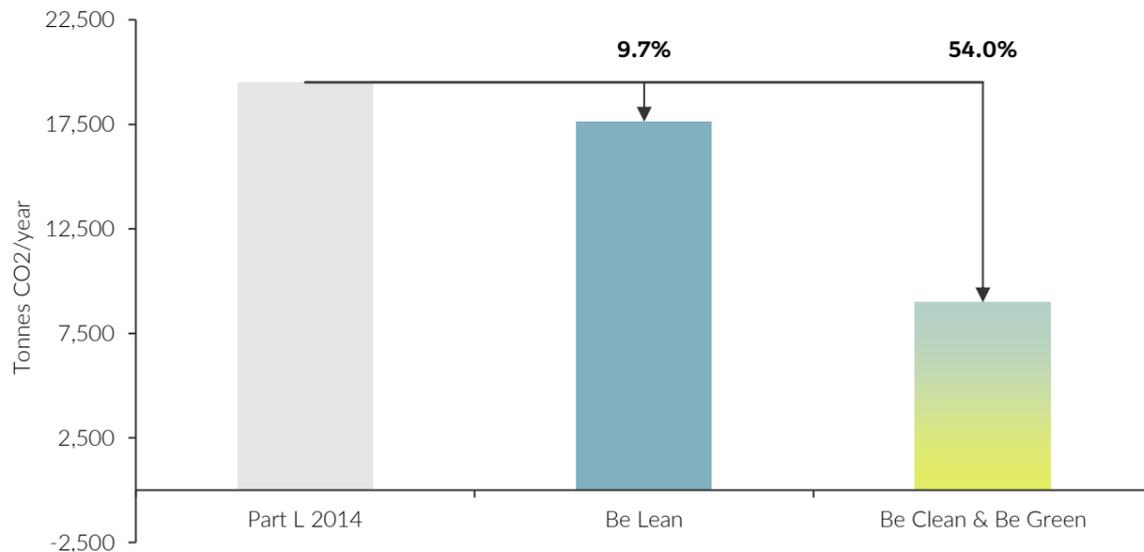


Figure 5.7: Sitewide regulated carbon emissions summary compared to the Part L 2014 baseline.

Decarbonisation of the electricity grid.

5.6.3 The carbon factor of the National Grid – the amount of carbon dioxide released per kilowatt hour of electricity generated and distributed – is recognised in current Building Regulations as being 0.519 kgCO2/kWh. However, the national mix of electricity generation methods is progressing towards greener solutions with renewable sources accounting for 39.3% of the electricity generated in the UK in 2021; up from 24.5% in 2016 [6].

5.6.4 As a consequence, the Building Regulations Part L 2014 value of the National Grid carbon factor has been shown to be substantially higher than how the grid is performing in reality. This severely impacts the calculated emissions produced by all heat raising plant which either use electricity directly or generate it to offset other emissions. The carbon emissions associated with electricity consumption are therefore much lower than reported in Building Regulations. This means that, under the Part L 2014 methodology the CO2 emissions associated with electrically-driven plant are being overestimated by over 200%.

Table 5.4: Part L 2013 and SAP 10.1 Carbon Factors.

Fuel	Part L 2014 Carbon Factors (kgCO2e/kWh)	SAP10.1 Carbon Factors (kgCO2e/kWh)
Mains Gas	0.216	0.210
Grid Electricity	0.519	0.136

5.6.5 Based on the decarbonisation of the electricity grid, it is anticipated that all-electric strategies will continue to provide increased benefit as the grid electricity carbon factor improves. A similar assessment has been done but using the most updated carbon factor (SAP10.1 carbon factors reported in Table 5.4) which reflect the current performance of the electric grid. The result of the assessment are presented in Figure 5.8.

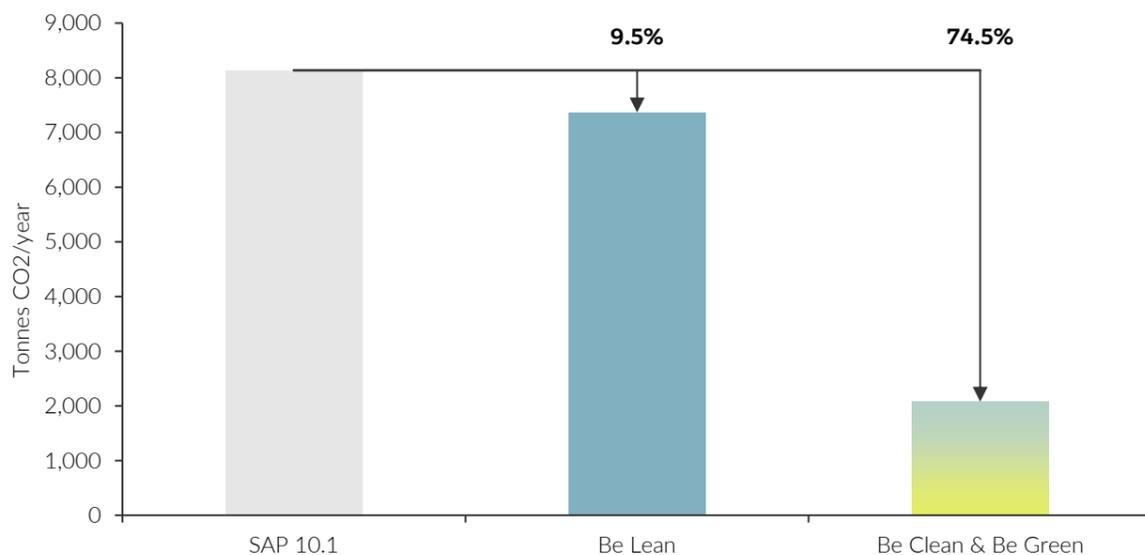


Figure 5.8: Sitewide regulated carbon emissions summary with proposed future carbon factors (SAP 10.1).

5.7 Differences between the Energy Strategy and GHG and CC Chapter energy calculations

5.7.1 For clarity, the differences in the methodology and estimates used in the Energy Strategy and GHG and CC sections of this report are outlined below.

- For the GHG and CC sections the outdoor water park and car park were included to give a realistic estimate of future energy usage. These were scoped out for the Energy Strategy calculations as they are not buildings controlled by Part L.

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- Benchmarking for the Energy Strategy was based on unmodified data from comparative projects where modelling was undertaken in line with Part L 2013 of the Building Regulations (Conservation of fuel and power). This was not available for the indoor snow-centre so estimated data was used, based on a reported total energy usage for a similar facility. For the GHG and CC sections of this report some of the benchmark Part L 2013 data was modified based on a combination of reported total energy usage for similar buildings and professional judgement with the aim to give a realistic estimate of future energy use for the building. The outdoor water park and car park were scoped in and modelled with a similar approach to the indoor snow-centre.
- Since the GHG and CC Chapter aims to give an estimate of future energy usage, comparisons against baseline emissions were made using SAP 10.1 carbon factors as proposed future carbon factors which better represent the real-life performance of the energy grid. Since the Energy Strategy pertains to Part L, the estimates for the reduction in energy that Proposed development can achieve are predominantly presented with Part L 2013 carbon factors, the reductions estimated with SAP 10.1 carbon factors are also included at the end of the Energy Strategy for informative comparison.

6.0 GREENHOUSE GASSES AND CLIMATE CHANGE

6.1 Introduction.

- 6.1.1 This chapter reports the outcome of the assessment of likely significant environmental effects arising from the proposed Rhydycar West development (from now on identified as the Proposed Development) in relation to greenhouse gas emissions (GHG) and climate change. This specifically includes embodied carbon, tree loss, traffic-related emissions and carbon dioxide emissions from the operation of the project. In addition, the assessment outlines the mitigation measures required to prevent, reduce or offset any potentially significant adverse effects. The assessment also includes the advised project approach to climate resilience and adaptation. The conclusions are provided both in terms of the residual effects and whether these are considered significant.
- 6.1.2 The GHG Protocol which was originally published in 2001, defines carbon dioxide equivalent (CO₂e) as the standard unit for measuring and reporting emissions [7]. The terms 'carbon dioxide (CO₂)' and 'greenhouse gas (GHG)' are used interchangeably in this chapter in accordance with the terminology of referenced documents. CO₂, methane (CH₄) and nitrous oxide (N₂O) are the main greenhouse gases of concern due to their high global warming potential (GWP) and/or concentration levels in the atmosphere.
- 6.1.3 In accordance with Regulation 17(3) of the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 [2], this report sets out the information relating to climate change outlined in Schedule 4 as follows:

An estimate, by type and quantity, of expected GHG emissions, generated during the construction and operational phases, produced on the basis of the available environmental information and scientific knowledge.

A description of the likely significant effects of the Proposed Development on the environment resulting from:

- Impacts of the Proposed Development on the nature and magnitude of GHG emissions;
- Impacts of the Proposed Development relevant to adaptation in a changing climate; and
- Impacts of the Proposed Development associated with its vulnerability to climate change.

Where the effects resulting from any potential changes caused by the Proposed Development are expected to be significant, a description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment in the context of the following:

- Climate change mitigation (i.e. measures implemented in the design of the Proposed Development to avoid, prevent, reduce or offset GHG emissions); and
- Climate change resilience & adaptation (i.e. measures implemented to future-proof the Proposed Development and adapt to the anticipated impacts of a changing climate).

The Proposed Development

- 6.1.4 In short, regarding the change in environment, the Proposed Development will comprise of establishing new leisure facilities on previously undeveloped land at Rhydycar West, near Merthyr Tydfil, South Wales. The new facilities include an indoor snow-centre facility, indoor and outdoor waterparks, multistorey hotels, lodges and indoor activity areas. The proposed Energy Strategy seeks to reduce emissions on the basis of an efficient design and thermal performance in conjunction with an all-electric strategy based on the using use of heat pump technology combined with an on-site heat sharing network and other renewable technologies such as photovoltaic panels. The all-electric approach will enable the Proposed Development to continue to reduce its operational emission following decarbonisation of the National Grid. The proposed strategy is based on an advanced heat recovery system which connects the heating and cooling network. This system is capable of moving the rejected heat from the cooling system back into the heating system so, at the same time, reducing the cooling and heating demand of the Site. This approach is based on the fact that a high cooling demand is expected from the indoor ski-slope which rejected heat can be repurposed within the site instead of being rejected in the environment.

6.2 Assessment Methodology.

Impact Assessment Methodology

- 6.2.1 The Climate Change and Resilience chapter aims to:
- Determine the existing sources of carbon emissions currently present at the site, and consider how these could change in the future;
 - Identify the likely sources of carbon emissions arising from the construction and operation of the Proposed Development, and measure them as far as practical; and
 - Review measures in which different alternatives (such as development type, construction methodology and operating mechanisms) can demonstrably reduce carbon emissions.
- 6.2.2 The carbon emissions assessment study area considers all carbon emissions arising over the lifecycle of the Proposed Development (subject to the limitations and assumptions listed below). The assessment of the Proposed Development's carbon footprint for the purpose of EIA provides an opportunity to identify the potential for effects to be designed out or reduced/offset through iterative design, and thereby maximise the Proposed Development's contribution towards a net zero carbon society.
- 6.2.3 Climate change is a pressing environmental issue. It is recognised that all new development produces carbon emissions that contribute towards global climatic change. In fact, IEMA (Institute of Environmental Management and Assessment) stipulates that all carbon emissions might be considered significant because "the GHG emissions from all projects will contribute to climate change...". However, we also recognise that new developments need to work within the constraints of a changing climate and have the potential to contribute positively towards a thriving, net zero carbon society.
- 6.2.4 The key anticipated carbon emission sources reviewed in this assessment are summarised in Table 6.1 below.

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Table 6.1: Anticipated key sources of carbon dioxide emissions.

Lifecycle Stage	Activity	Emissions Sources
Enabling Works and Construction	Raw material extraction and manufacturing of building materials	Embodied carbon in building materials as per lifecycle stages A1-A3 (EN 15978)
	Transportation of building materials	GHG emissions from construction traffic as per lifecycle stage A4 (EN 15978) and associated activities
	On-site construction activity	Fuel use in construction plant & associated facilities as per lifecycle stage A5 (EN 15978) Impact of removed trees for the enabling work and construction site.
Operation	Building operation	Regulated energy uses from buildings (Regulated energy is building energy consumption resulting from the specification of controlled, fixed building services and fittings, including space heating and cooling, hot water, ventilation, fans, pumps and lighting. Such energy uses are inherent in the design of a building.)
		Unregulated uses energy uses from buildings (Unregulated energy is building energy consumption resulting from a system or process that is not 'controlled', i.e. energy consumption from systems in the building on which the Building Regulations do not impose a requirement such as IT equipment, refrigeration systems etc.)
	User transportation	GHG emissions from operational traffic
	Repair and Maintenance	Fabric and component materials as per lifecycle stages B1-B5 (EN 15978)
End of life	Decommissioning	End of life lifecycle stages C1-C4 (EN 15978).
	The Proposed Development would be a highly utilised national attraction, therefore maintenance and refurbishment to extend the operational lifetime or reuse of the buildings would be considered before deconstruction. In light of these circumstances, it is considered likely that the Proposed Development would not be decommissioned at the end of the 60-year timeframe considered throughout this assessment (assumed life of building, RICS best practice guidance). Expected timescales for decommissioning are then so far into the future that there is insufficient certainty about the likelihood, type or scale of emissions activity to determine their likely magnitude, even if they take place at all. Therefore, end of life emissions sources will not be considered in this assessment.	

6.2.5 There is no standard methodology for identifying and assessing the significance of GHG emissions within the EIA process. This assessment has followed the recommendations and best practice contained within the IEMA Principles Series: Climate Change Mitigation & EIA (2010) [8], the IEMA Environmental Impact Assessment Guide to: Delivering Quality Development (2016) [9] and IEMA Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating Their Significance (2017) [10]. Key legislative instruments and national and local planning policy and related guidance have been reviewed to inform the approach.

Construction Phase

Embodied Carbon in Buildings

6.2.6 Embodied carbon is the total carbon emissions generated to produce a built asset. It is often defined as the 'carbon emissions associated with energy consumption (embodied energy) and chemical processes during the extraction, manufacture, transportation, assembly, replacement and deconstruction of construction materials or products.'

6.2.7 Embodied carbon assessment is an area which has undergone significant development in recent years. Traditionally the greatest impact on an asset's whole life carbon has been associated with its operational phase. With the ongoing decarbonisation of the UK electricity grid, this trend is

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expected to shift, and embodied carbon is expected to assume an ever-increasing significance in the overall carbon footprint of developments (made up of embodied and operational carbon emissions).

- 6.2.8 An appraisal of the anticipated carbon emissions associated with the product and construction stages of the development lifecycle has been completed, following the requirements of EN 15978. This assesses carbon emissions associated with raw material extraction, manufacturing of the building materials, transporting these to site and erecting the buildings.
- 6.2.9 An assessment of the impact of removing the trees for the construction site has been done and included within this analysis. This assessment includes the impact of removing the existing trees and the associated carbon emissions, but it also includes an estimation of the additional carbon emission associated with the reduced carbon sequestration of the Site due to the removal of the trees, although, to some degree, this will be offset by new planting.
- 6.2.10 This has been carried out based on the design information available to date which consists of area schedules, building types and building heights. Typical materials used for these building types have been mapped to suit these attributes to generate materials quantities. The associated carbon intensities of these materials have then been computed to generate carbon footprints for each building.

Fuel use in construction plant & associated facilities

- 6.2.11 An estimate for lifecycle stage A5 was also made using the model inputs described for embodied carbon above.

GHG emissions from construction traffic

- 6.2.12 Construction traffic was calculated alongside the materials and construction processes modelled with the embodied carbon approach described above.

Operational Phase

Regulated / Unregulated CO₂ Emissions from Buildings

- 6.2.13 The operational emissions associated with this Proposed Development have been evaluated using regulated and unregulated carbon emissions projected.
- 6.2.14 The assessment has reviewed the estimated total operational energy of the Proposed Development. This is made up of regulated components – including heating, cooling, hot water, fans, pumps and lighting – and unregulated ones, such as IT equipment, plug-in devices and catering facilities.
- 6.2.15 Regulated energy uses are inherent in the design of a building. Estimated carbon emissions from regulated operational energy uses of buildings have been calculated from benchmarks based on modelling undertaken in line with Part L 2014 of the Building Regulations (Conservation of fuel and power) where available. Where closely matching building were not available, modified cases of as-similar-as-possible buildings were used, these were modified based on a combination of reported total energy usage for similar buildings and professional judgement. For operational energy modelling purposes, the gross internal areas of all buildings was split based on use case. The total footprint of all buildings was used to give an estimate of roof area, which has been allocated as available for the deployment of a solar photovoltaics (PV) systems, enabling the energy usage estimate to include a feasible contribution from PV.
- 6.2.16 The unregulated operational emissions are typically mainly attributable to energy consumption associated with IT equipment, domestic appliances, plug-in devices and catering facilities. Unregulated carbon emissions have been calculated based on the benchmarks described above for regulated energy. Although unregulated carbon emissions are not included within Part L targets, an estimate of unregulated energy consumption is still an output produced as part of this methodology.

GHG Emissions from Operational Traffic

- 6.2.17 The anticipated GHG emissions from operational traffic associated with the Proposed Development have been estimated on the basis of traffic flow data provided by the transport consultant and an average distance of travel based on a projected visitor breakdown.

Carbon Emissions from Repair and Maintenance (Materials)

- 6.2.18 The carbon impacts of repair and maintenance of the fabric of the buildings have been calculated as part of the life cycle analysis process, following the requirements of EN 15978.

Assumptions and Limitations

- 6.2.19 To ensure transparency within the EIA process, the following limitations and assumptions have been identified.
- 6.2.20 It is currently assumed that the site baseline carbon emissions are zero.
- 6.2.21 The anticipated carbon emissions associated with the product and construction stages of the development lifecycle have been determined based on the design information available to date which consists of area schedules, building types and building heights. Typical materials used for these building types have been mapped to suit these attributes to generate materials quantities. The associated carbon intensities of these materials have then been computed to generate carbon footprints for each building. This approach to modelling the site was also used to generate estimates of construction energy usage and traffic, as well as embodied carbon estimates for the repair and maintenance of the building for a 60-year timeframe (assumed life of building, RICS best practice guidance). Since the design of the Proposed Development is currently early stage and is subject to change, the calculated values may not be wholly representative of the project at detailed design.
- 6.2.22 The estimated carbon emissions associated with the operational energy consumption are indicative values based on benchmark Part L data, previous experience for similar buildings and available Display Energy Certificates (DECs). Where closely matching buildings were not available, modified cases of as-similar-as-possible buildings were used, these were modified based on a combination of reported total energy usage for similar buildings and professional judgement. Calculations were made for different building types and indicative areas for different uses included in the Proposed Development. The Part L methodology uses standardised parameters, including operational profiles, ventilation rates, and heating and cooling setpoints, based on the building use, which may be different from how the buildings will operate in practice.
- 6.2.23 The anticipated GHG emissions from operational traffic associated with the Proposed Development have been estimated on the basis of estimated traffic flow changes and projected visitor breakdown data provided by the transport consultant.
- 6.2.24 In line with IEMA guidance, activities which account for under 5% of the energy usage and, therefore, do not have a significant contribution to the overall energy consumption, will be excluded from the assessment. These include:
- Temporary construction site accommodation;
 - Refuse collection from public bins; and
 - Street lighting, traffic signals and security cameras.

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Receptor Sensitivity

6.2.25 The following sensitive receptors have been identified and assessed within this chapter:

- **Global climate.**

6.2.26 The global climate has been identified as the 'sensitive receptor' for the purposes of the carbon impact assessment, which is highlighted in the IEMA GHG assessment guideline. In light of the extreme importance of limiting global warming to below 2°C and in the absence of published standard definition of receptor sensitivity of carbon emissions, this assessment asserts that the sensitivity of global climate to increases in carbon emissions is always considered to be 'high'.

Impact Magnitude

6.2.27 The magnitude of impact has been considered as the change experienced from the baseline conditions at the sensitive receptor. The assessment of magnitude is carried out taking account of any primary and tertiary mitigation that forms part of the Proposed Development. In the absence of clearly defined criteria for assessing magnitude in the context of GHG emissions, a robust, market-leading blended quantitative-qualitative assessment utilising professional judgement relying on standard GHG accounting and reporting principles has been conducted.

6.2.28 To provide context and to assist with determining the magnitude, the carbon emissions generated by the Proposed Development have been assessed in the context of emissions at a local scale (Merthyr Tydfil), regional scale (Wales), and national scale (the UK as a whole) reflecting the various levels where emissions may occur. Carbon emissions data at local and regional level have been sourced from UK national statistics collated by the Department for Business, Energy and Industrial Strategy [11]. The national-scale data is based on the five-year National Carbon Budgets produced by the Committee on Climate Change (CCC), which reflect the requirement to remain within agreed global emission limits.

6.2.29 This has been supplemented with the relevant local (Merthyr Tydfil) and regional (Wales) carbon budgets, to contextualise potential impacts of the Proposed Development on the globally sensitive climate receptor. Carbon budgets have been apportioned to reflect the contribution of the built environment towards the UK total carbon footprint, estimated to be nearly 40% [12]. This approach is consistent with Section 6.2 of the IEMA guidance to Assessing Greenhouse Gas Emissions and Evaluating Their Significance 2017 [10], which provides advice on contextualising a project's carbon footprint.

6.2.30 The Opening Year of the initial phase of the Proposed Development is expected to be 2026. Consequently, the 4th national carbon budget is deemed to be most applicable to both the construction and operational phase of the Proposed Development (refer to Table 6.2). No data is currently available post-2037 so it is not possible to assess the anticipated operational emissions against UK carbon emissions beyond this date. However, in light of the progressive national sustainability targets that the Welsh government is currently in the process of defining and legislating i.e. the accepted CCC target of a 95% reduction in emissions compared to 1990 levels for 2050 and the ambition to go further and set a Net Zero target if possible, it can be expected that the magnitude of operational emissions will only increase in significance as a proportion of the total national carbon budget as the size of those carbon budgets continues to decrease.

Table 6.2: UK National Carbon Budgets.

Budget	Carbon Budget Level	Reduction Below 1990 Levels
1 st carbon budget (2008 - 2012)	3,018 MtCO _{2e}	25%
2 nd carbon budget (2013 - 2017)	2,782 MtCO _{2e}	31%
3 rd carbon budget (2018 - 2022)	2,544 MtCO _{2e}	37% by 2020
4 th carbon budget (2023 - 2027)	1,950 MtCO _{2e}	51% by 2025
5 th carbon budget (2028 - 2032)	1,725 MtCO _{2e}	57% by 2030
6 th carbon budget (2033 – 2037)	965 MtCO _{2e}	78% by 2035

6.2.31 The proposed energy approach for the Site is based on a full electric strategy coupled with high efficient thermal envelope design and MEP system. The addition of Photovoltaic system and heat recovery (able to recover rejected heat from the cooling system) further improve the Site energy performance and present a top-of-the-art approach to the energy. Furthermore, the all-electric energy strategy for the Proposed Development will benefit from the incremental reductions in grid electricity carbon intensity between now and commencement of the operational development, and subsequently throughout its operational life. As discussed in the future energy subsection of the future baseline section below, the UK electricity grid has seen significant reductions in carbon intensity over the past 15 years as the contribution of renewables has increased and that of coal-fired power stations has decreased. Carbon intensity of electricity is projected to continue to decrease over coming years meaning current estimates of operational emission are likely to represent a worst-case scenario, and the Proposed Development will benefit from an energy strategy which makes most pragmatic use of national drivers towards a zero-carbon economy.

6.2.32 In GHG accounting, it is a widely accepted practice to exclude emission sources that do not have a material contribution to the overall carbon footprint on the basis of the De Minimis rule. ISO guidance on GHG reporting (ISO 14064-1) [13] states that 'the organisation may exclude from quantification direct or indirect GHG sources or sinks whose contribution to GHG emissions or removals is not material or whose quantification would not be technically feasible or cost effective'. In this context, multiple sources have introduced a 'materiality threshold'. PAS 2050 [14] for example, stipulates that in order to be considered 'material', the contribution from any one source of GHG emissions should be more than 1% of the anticipated total GHG emissions associated with the product being assessed.

6.2.33 The UK Emissions Trading System (UK ETS) replaced the EU Emissions Trading System (EU ETS) from 1st January 2021. It retains the provision for small installations [15], which states that small installations whose emissions do not exceed a threshold of 25,000 t CO_{2e} per annum and, where they carry out combustion activities, have a rated thermal input below 35 MW, excluding emissions from biomass, can opt out from the scheme.

6.2.34 Additionally, as part of its public reporting under the Task Force on Climate-related Financial Disclosures framework (IFC Performance Standard 3: Resource Efficiency and Pollution Prevention [16]), the International Finance Corporation (IFC) discloses emissions of projects with estimated annual emissions over 25,000 metric tons of carbon dioxide equivalent through the Environmental and Social Review Summary for each project.

6.2.35 In line with the above, a 1% materiality threshold has been implemented in this assessment when determining magnitude of the relevant change in carbon emissions. To ensure a robust approach, a second reference point has been included, i.e. 25,000 tCO_{2e} annual emission maximum level. It is, therefore, assumed that any annual carbon emissions quantum <1% of the (proportional value) of the relevant carbon budget(s) and < 25,000 tCO_{2e} would not be considered to have a 'material' contribution to the relevant UK GHG inventory. More details are provided in Table 6.3 and Table 6.6 below.

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Table 6.3: Criteria for determining magnitude of impact – national baseline.

Magnitude of Impact	Criteria for Determining Impact
Substantial	Annual difference in carbon emissions represents a contribution equal to or higher than 1% of the national baseline emissions and/ or annual proportion of the relevant UK national carbon budget's share attributable to the built environment sector; and Annual difference in carbon emissions is higher than 25,000 t CO2e in any year.
Moderate	Annual difference in carbon emissions represents a contribution lower than 1% of the national baseline emissions and/ or annual proportion of the relevant UK national carbon budget's share attributable to the built environment sector; and Annual difference in carbon emissions is higher than 25,000 t CO2e in any year.
Slight	Annual difference in carbon emissions represents a contribution lower than 1% of the national baseline emissions and/ or annual proportion of the relevant UK national carbon budget's share attributable to the built environment sector; and Annual difference in carbon emissions is lower than 25,000 t CO2e in any year.

6.2.36 The above approach has been followed when analysing the Proposed Development. Due to the small scale of the local area (Merthyr Tydfil) and to the level and importance of the Proposed Development, the 1% threshold can provide a restrictive view on the overall impact in the local area. The results of the quantitative approach are reported within this document for information.

Table 6.4: Criteria for determining magnitude of impact – against local/regional baseline.

Receptor Sensitivity to Change	Impact Magnitude	Magnitude Criteria
High	High (Major)	Annual difference in carbon emissions represents a contribution higher than 1% of the local/regional baseline emissions share attributable to the built environment sector; AND Annual difference in carbon emissions represents a contribution higher than 1% of the relevant local/regional carbon budget's share attributable to the built environment sector.
	Medium (Moderate)	Annual difference in carbon emissions represents a contribution lower than 1% of the local/regional baseline emissions share attributable to the built environment sector; OR Annual difference in carbon emissions represents a contribution higher than 1% of the relevant local/regional carbon Budget's share attributable to the built environment sector.
	Low (Minor)	Additional annual carbon emissions represent a contribution lower than 1% of the local/regional baseline emissions share attributable to the built environment sector; AND Additional annual carbon emissions represent a contribution lower than 1% of the relevant local/regional carbon Budget's share attributable to the built environment sector.

Table 6.5: Impact Magnitude Criteria (1% Carbon Emissions Threshold) – Merthyr Tydfil carbon budget [17].

Merthyr Tydfil budget period	Merthyr Tydfil Carbon Budget (Mt CO2e)	Years	Built environment share – 40% (Mt CO2e)	Annual built environment share (Mt CO2e)	Magnitude criteria (1%) (Mt CO2e)
2018 - 2022	1.1	5	0.44	0.088	0.00088
2023 - 2027	0.5	5	0.20	0.040	0.00040
2028 - 2032	0.3	5	0.12	0.024	0.00024
2033 - 2037	0.1	5	0.04	0.008	0.00008
2038 - 2042	0.1	5	0.04	0.008	0.00008
2043 - 2047	0.0	5	0.00	0.000	0.00000
2048 - 2100	0.0	53	0.00	0.000	0.00000

Table 6.5: Impact Magnitude Criteria (1% Carbon Emissions Threshold) – Wales carbon budget [17].

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Wales budget period	Wales Carbon Budget (Mt CO2e)	Years	Built environment share – 40% (Mt CO2e)	Annual built environment share (Mt CO2e)	Magnitude criteria (1%) (Mt CO2e)
2018 - 2022	99.7	5	39.88	7.976	0.07976
2023 - 2027	49.6	5	19.84	3.968	0.03968
2028 - 2032	24.0	5	9.600	1.920	0.01920
2033 - 2037	11.6	5	4.640	0.928	0.00928
2038 - 2042	5.60	5	2.240	0.448	0.00448
2043 - 2047	2.70	5	1.080	0.216	0.00216
2048 - 2100	2.50	53	1.000	0.019	0.00019

- 6.2.37 While the emission thresholds outlined above have been used to provide context, it is important to recognise that the application of professional judgement is a critical additional component, as recognised by IEMA guidance [10] which may result in a different overall conclusion than the one suggested by quantitative criteria alone based on a percentage increase/decrease relative to the baseline.
- 6.2.38 For the majority of development projects, the individual contribution to total GHG emissions (from local through to global scale) will be very small; however, the IEMA guidance recognises that the contribution of GHG emissions to climate change is a cumulative global issue, and as such it is important for developments of all scales to acknowledge the significance of any increases in GHG emissions, and that the EIA should ensure the project addresses their occurrence by taking mitigating action.
- 6.2.39 IEMA recommends that mitigation should in the first instance seek to avoid GHG emissions. Where GHG emissions cannot be avoided, the development should aim to reduce a project’s residual emissions at all stages. Where additional GHG emissions remain but cannot be further reduced at source, approaches should be considered that compensate the project’s remaining emissions, for example offsetting.

Effect Significance

- 6.2.40 The significance level attributed to each effect has been assessed based on the sensitivity/value of the affected receptor(s) and the magnitude of change arising from the Proposed Development, as well as a number of other factors that will be outlined in more detail in other chapters of the provided EIA document. The sensitivity of the affected receptor is assessed on a scale of very high, high, medium or low and the magnitude of impact is assessed on a scale of substantial, moderate or slight.
- 6.2.41 The approach to defining likely significant effects has been carried out in three steps:
- The first step is to compare the Proposed Development’s GHG emissions in the opening year to the baseline GHG emissions to determine whether there is a net increase or decrease in GHG emissions as a result of the development;
 - The second step is to compare the calculated change in emissions to local GHG emissions for context; and
 - The third step applies expert judgment on the significance of those emissions taking into account the changes in emissions, their contribution to local and regional GHG emissions, their consistency with relevant policy, and an evaluation of the mitigation measures proposed to avoid, reduce and compensate GHG emissions.
- 6.2.42 In categorising whether an effect is significant or not, due consideration has also been given to the nature, duration and geographical scale of the effect in question (e.g. direct/indirect, temporary / permanent, short / medium-term, etc).
- 6.2.43 For the purposes of this assessment, the geographical scope of the identified likely significant effects has been assumed to be ‘international’ in all cases due to the global nature of climate change and its transnational ramifications. Furthermore, in view of the findings of the Intergovernmental Panel on Climate Change (IPCC) [18] Special Report on the effects of global warming of 1.5 °C that some effects from climate change may be long-lasting, the duration of all effects assessed in this chapter is assumed to be long-term and permanent.
- 6.2.44 The effects are categorised as either adverse or beneficial in order to allow easy comparison between impacts. These terms are defined as follows:
- **Adverse** – Detrimental or negative effects to an environmental / socio-economic resource or receptor. The quality of the environment is diminished or harmed; or
 - **Beneficial** – Advantageous or positive effect to an environmental / socio-economic resource or receptor. The quality of the environment is enhanced.

Table 6.6: Scale and significance of effects.

Magnitude of Impact	Receptor Sensitivity	Effect Scale	Definition
Substantial	High	Major	The Proposed Development is likely to cause a considerable change from the baseline conditions and the receptor has limited adaptability, tolerance or recoverability or is of the highest sensitivity. This effect is considered to be ‘Significant’.
Moderate		Intermediate	The Proposed Development is likely to cause either a considerable change from the baseline conditions at a receptor which has a degree of adaptability, tolerance or recoverability or a less than considerable change at a receptor that has limited adaptability, tolerance or recoverability. This effect is considered more likely to be ‘Significant’ but will be subject to professional judgement.

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Magnitude of Impact	Receptor Sensitivity	Effect Scale	Definition
Slight		Minor	The Proposed Development is likely to cause a small, but noticeable change from the baseline conditions on a receptor which has limited adaptability, tolerance or recoverability or is of the highest sensitivity; or where the Proposed Development is likely to cause a considerable change from the baseline conditions at a receptor which can adapt, is tolerant of the change or/and can recover from the change. This effect is considered less likely to be 'Significant' but will be subject to professional judgement.

Categorising Likely Significant Effects

6.2.45 Effects that are identified as being intermediate or major adverse / beneficial are more likely to be classified as significant effects, with minor effects being subject to the impact of magnitude and professional judgement. However, as stated earlier in this chapter, a blended quantitative-qualitative approach relying on standard GHG accounting and reporting principles has been applied so the effect categorisation will also be subject to professional judgment.

6.3 Baseline Environment.

Existing baseline

Site

- 6.3.1 The Proposed Development consists of new buildings and infrastructure on undeveloped land. A significant portion of the Rhydycar West site is considered ecologically rich, with parts being designated as SSSI (Site of Special Scientific Interest) and the whole site designated as SINCC (Site of Importance for Nature Conservation).
- 6.3.2 With this local context, designing sympathetically to the surroundings is particularly important and has been considered in the project masterplan. Key activities to support this consideration include:
 - Surveying the site to understand the environment. Surveys have been undertaken on habitats and plant species, birds (winter and spring/summer), amphibians and reptiles, dormice, bats, badgers and invertebrates including butterflies. The known importance of various parts of the site for grassland fungi (such as waxcaps) has also been assessed by specialist surveys;
 - Seeking to retain important and protected environmental elements by sensitively locating development components and leaving over 85% of the owned land undeveloped; and
 - Mitigating or compensating for unavoidable damage.
- 6.3.3 The ecologist report and surveys have been taken into account for the baseline performance of the Site. The current carbon emission associated with the trees proposed to be felled and the impact of removing the trees over the course of 60 years has been considered.
- 6.3.4 Baseline transport emissions associated with the Proposed Development's adjacent roads, is based on AADT data provided by the transport consultant.

Local, Regional and National Baseline

Local - Merthyr Tydfil

- 6.3.5 The latest available BEIS annual CO₂ emissions data for Merthyr Tydfil from 2019 were 255.6 kt CO₂ [19].
- 6.3.6 The data show emissions allocated on an 'end-user' basis where emissions are distributed according to the point of energy consumption (or point of emission if not energy related). Except for the energy industry, emissions from the production of goods are assigned to where the production takes place. Therefore, emissions from the production of goods which are exported are included, and emissions from the production of goods which are imported are excluded.
- 6.3.7 In order to help understand the trends in carbon emissions at a local level, a breakdown of total carbon emissions from three main sources (industry & commercial, domestic and transport) has been provided for Merthyr Tydfil. The BEIS national statistics data from the UK government are available for the period 2005-2019, an extract of the full dataset for Merthyr Tydfil is shown in Table 6.7 [19]. The 'Grand Total' values also include a contribution from Land use, land-use change and forestry which is not shown here, this contribution can be negative if it represents a CO₂ sink which is removing CO₂ from the atmosphere.

Table 6.7: Carbon emissions within Merthyr Tydfil 2005-2019 (source: <https://www.gov.uk/government/statistics/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics-2005-to-2019> [19])

Year	Industry & Commercial Total (kt CO ₂)	Domestic Total (kt CO ₂)	Transport Total (kt CO ₂)	Grand Total (kt CO ₂)	Population ('000s, mid-year estimate)	Per Capita Emissions (t)
2005	122.7	147.5	96.6	389.2	56.3	6.9
2006	126.7	149	96.9	395.6	56.6	7
2007	116	141.7	100.8	377.6	57.2	6.6
2008	115.4	144.7	97.2	377.1	57.7	6.5
2009	93.9	130.5	95.9	335.1	58.2	5.8

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Year	Industry & Commercial Total (kt CO ₂)	Domestic Total (kt CO ₂)	Transport Total (kt CO ₂)	Grand Total (kt CO ₂)	Population ('000s, mid-year estimate)	Per Capita Emissions (t)
2010	96.2	138	95.6	345.6	58.5	5.9
2011	88	120	92.9	314.5	58.9	5.3
2012	94.3	128.4	92.5	333.9	58.9	5.7
2013	86.3	126.6	91.4	321	59	5.4
2014	75.6	105.9	89.9	284.3	59.1	4.8
2015	73.7	103.2	94.4	284.2	59.2	4.8
2016	82.9	98.1	96	291.6	59.7	4.9
2017	73.8	92.9	89	266.9	60	4.5
2018	75.4	93.4	88.5	269.1	60.2	4.5
2019	68.1	92.8	85.3	255.6	60.3	4.2

Regional – Wales

The latest available BEIS annual CO₂ emissions data for Wales from 2019 were 23,807 kt CO₂ [19].

A breakdown of total carbon emissions has also been provided for Wales in Table 6.8 [19]. Technical details are as described for Table 6.7 above.

Table 6.8: Carbon emissions within Wales 2005-2019 (source: <https://www.gov.uk/government/statistics/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics-2005-to-2019> [19])

Year	Industry & Commercial Total (kt CO ₂)	Domestic Total (kt CO ₂)	Transport Total (kt CO ₂)	Grand Total (kt CO ₂)	Population ('000s, mid-year estimate)	Per Capita Emissions (t)
2005	17,715.33	7,840.60	6,648.00	33,353.30	2,969.30	11.2
2006	18,092.60	7,919.30	6,688.40	33,736.10	2,985.70	11.3
2007	18,149.20	7,505.00	6,799.50	33,347.80	3,006.30	11.1
2008	17,177.86	7,663.70	6,556.90	32,268.50	3,025.90	10.7
2009	13,987.08	6,983.40	6,331.80	27,981.40	3,038.90	9.2
2010	16,502.35	7,465.90	6,236.80	30,963.10	3,050.00	10.2
2011	14,870.33	6,462.80	6,112.50	28,081.20	3,063.80	9.2
2012	13,563.91	6,884.30	6,042.60	27,462.80	3,074.10	8.9
2013	16,282.76	6,725.00	6,017.50	29,929.40	3,082.40	9.7
2014	15,968.53	5,721.50	6,098.70	28,509.40	3,092.00	9.2
2015	14,605.76	5,489.30	6,254.50	27,004.80	3,099.10	8.7
2016	13,122.07	5,229.50	6,426.60	25,337.20	3,113.20	8.1
2017	13,182.24	4,942.70	6,403.00	24,942.00	3,125.20	8
2018	12,311.04	4,946.70	6,396.30	24,064.50	3,138.60	7.7
2019	12424.693	4,839.50	6,256.30	23,807.80	3,152.90	7.6

National - United Kingdom

6.3.8 The latest BEIS data available for the UK was published in 2021 and relates to the year 2019 [19]. The total CO₂ emissions generated in the UK in 2019 amount to 344,512 kt CO₂. According to a report by the World Resources Institute, the UK demonstrates one of the largest declines in CO₂ emissions, with a 20% reduction in the period 2000-2014 [20]. This is one of the biggest percentage reductions in CO₂ emissions of all large economies.

6.3.9 In line with this trend, the statistics for Wales demonstrate a continuing downward trend over the 2005-2019 period, whereby the per capita CO₂ emissions have decreased by approximately 32%. Total emissions have also gone down by nearly 29% over the studied period despite the observed population growth.

6.3.10 The main reductions are observed in industry and commercial emissions followed by domestic emissions in line with an overall downward trend for the whole of the UK. In comparison, the reduction observed in the transport sector for the region is considerably smaller, at approximately 5%.

6.3.11 A study conducted by analysts Carbon Brief [21] reveals that the decline in industry, commercial and domestic emissions is driven by a combination of the introduction of a low- and zero-carbon electricity mix based on gas and renewables instead of coal and reduced non-electric energy

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consumption in the industrial and residential sectors. The latter is explained mainly by improvements in energy efficiency and switching to lower-carbon fuels. A structural movement towards a less carbon-intensive mix of industrial output, with some energy-intensive industry moving to other countries and UK industry increasingly focusing on higher-value manufacturing with lower energy intensity is also considered to have been a significant factor in the case of industry-related emissions.

Climate Change.

- 6.3.12 The climate is changing. Even with strong efforts to limit the impacts of climate change, there is an overwhelming consensus that further changes are unavoidable. Therefore, it is essential to have up-to-date information on climate change to support decision-making and effectively manage the increasing risks associated with climate change.
- 6.3.13 The UKCP18 [22] national climate projections for the United Kingdom provide the latest scientific evidence on projected climate changes. Adopting a conservative approach, a future scenario of global mean warming of 2°C has been utilised to inform this assessment and help articulate suitable additional mitigation and enhancement measures.
- 6.3.14 Over land the projected general trends of climate change in the 21st century are similar to UKCP09, with a move towards warmer, wetter winters and hotter, drier summers. However, natural variations mean that some cold winters, some dry winters, some cool summers and some wet summers will still occur.
- 6.3.15 The UKCP18 projections show that there are likely to be changes to the average weather conditions in the future. Not all years will fit a clear trend of change, leading to a variable and unpredictable climate. The projections do, however, enable the identification of the likely effects of climate change, and inform appropriate recommendations for changes to design, construction and maintenance policies, standards and practices.
- 6.3.16 UKCP18 uses scenarios for future greenhouse gases called the representative concentration pathways (RCPs) which were designed to cover a more up to date range of assumptions around future population, economic development and to explicitly include the possibility of mitigation of greenhouse gas emissions towards international targets (Moss et al, 2010).
- 6.3.17 The RCPs are expressed for future radiative forcing targets in 2100 of 2.6, 4.5, 6.0 and 8.5 watts per square metre ($W m^{-2}$), and these targets are incorporated into the names of the RCPs; RCP2.6, RCP4.5, RCP6.0 and RCP8.5 pathways. Each pathway drives a different range of projected global mean temperature increases over the 21st century, taking account of uncertainty in aspects such as the transient climate response and rate of ocean heat uptake. The RCP pathways lead to a broad range of climate outcomes but are neither forecasts nor policy recommendations.
- 6.3.18 RCP2.6 represents a future in which the world aims for and is able to implement sizeable reductions in emissions of greenhouse gases. Many studies show that following this scenario gives a sizeable chance of limiting global average warming to near 2°C above pre-industrial levels. Some simulations in the published literature also suggest the RCP2.6 scenario could produce a response as low as the more ambitious target in the Paris climate agreement, which includes provision to aim for limiting warming to below 1.5°C.
- 6.3.19 RCP8.5 represents a world in which global greenhouse gas emissions continue to rise. It is a potential future where the nations of the world choose not to switch to a low-carbon future. The temperature increases associated with this are much higher than RCP2.6. A comparison of predicted annual temperature changes in the UK with RCP2.6 and RCP8.5 is shown in Figure 6.1.

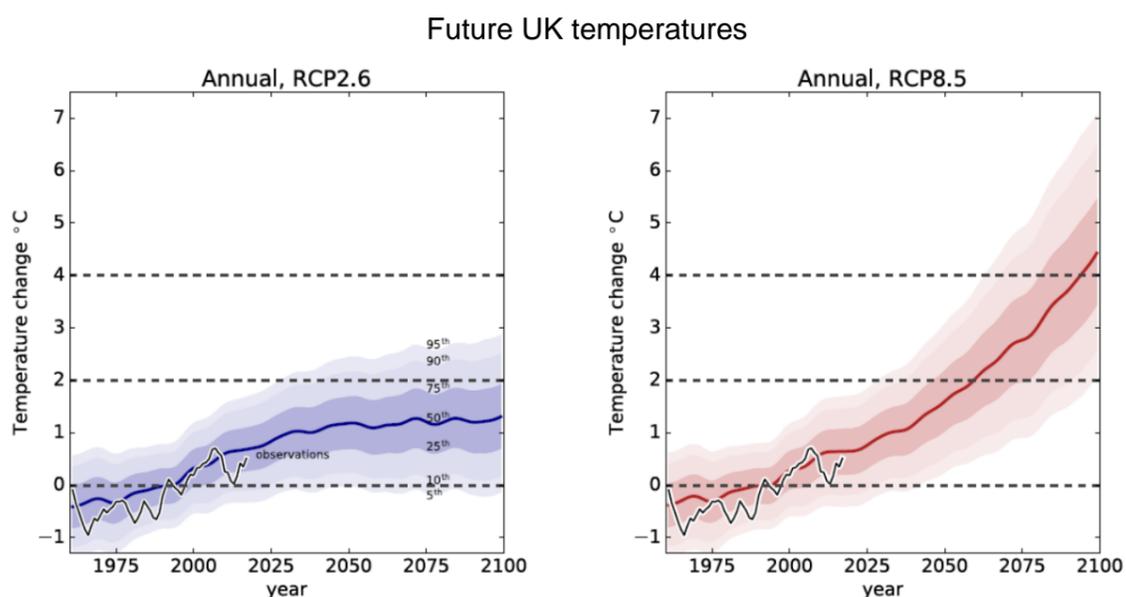


Figure 6.1: Comparison of the predicted future annual temperature change in the UK according to RCP2.6 and RCP8.5 of the UKCP18 National Climate Projections [27].

- 6.3.20 At 2°C of global mean warming [23]:
- For temperature:
 - The largest warming in the UK will be in the Southeast where summer temperatures may increase another 3 to 4°C relative to present day (1981-2000);
 - Median warming will be at least 1 to 2°C throughout the year across the whole of the UK;
 - Winter cool days will warm by 1 to 1.5°C across the country, whilst temperatures on warmer winter days increase by less than 1°C;
 - In summer both hot and cool days warm by 1 to 1.5°C across Scotland and 1.5 to 2°C across England.
 - For precipitation:
 - Changes are uncertain, but suggest slightly wetter winters and drier summers, with summer drying more in the South;
 - Dry days in summer have 30% less precipitation in parts of the South West.
- 6.3.21 The example predictions above come from the Met Office reporting referenced within the figures overleaf which considers the UK as a whole, rather than regional. Therefore, there are no specific prediction examples for Wales that can be reported at this time.

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6.3.22 Visualisations of the UKCP18 projected changes in temperature are included in Figure 6.3 and precipitation in Figure 6.2. Please note these maps are taken from a Met Office report and are included as examples.

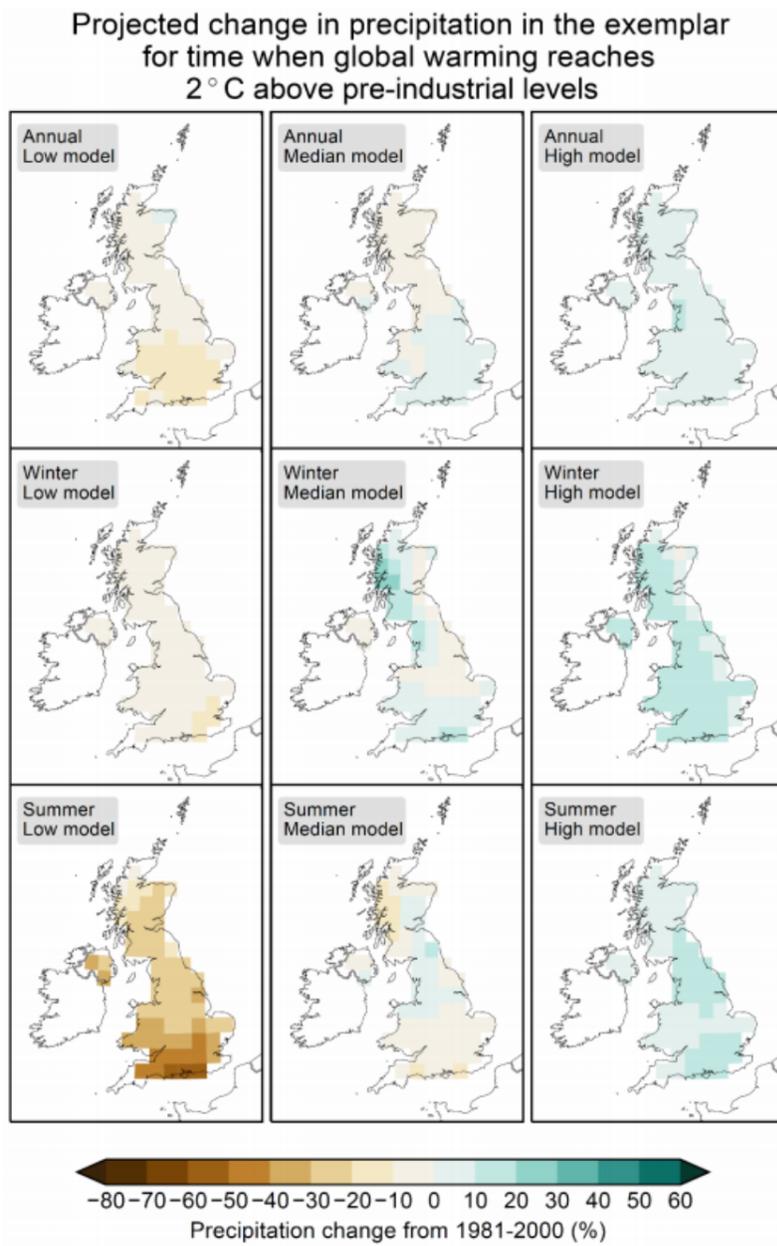


Figure 6.2: Projected changes in UK precipitation at a global mean warming of 2°C (GWL2) above pre-industrial (1850-1900). Changes are shown relative to present day (1981-2000). Rows show annual (top), winter (December-February; middle) and summer (June-August; bottom) changes. Columns shows maps for the model projection with a UK mean precipitation changes which are relatively low (left), high (right) or median (centre) [28].

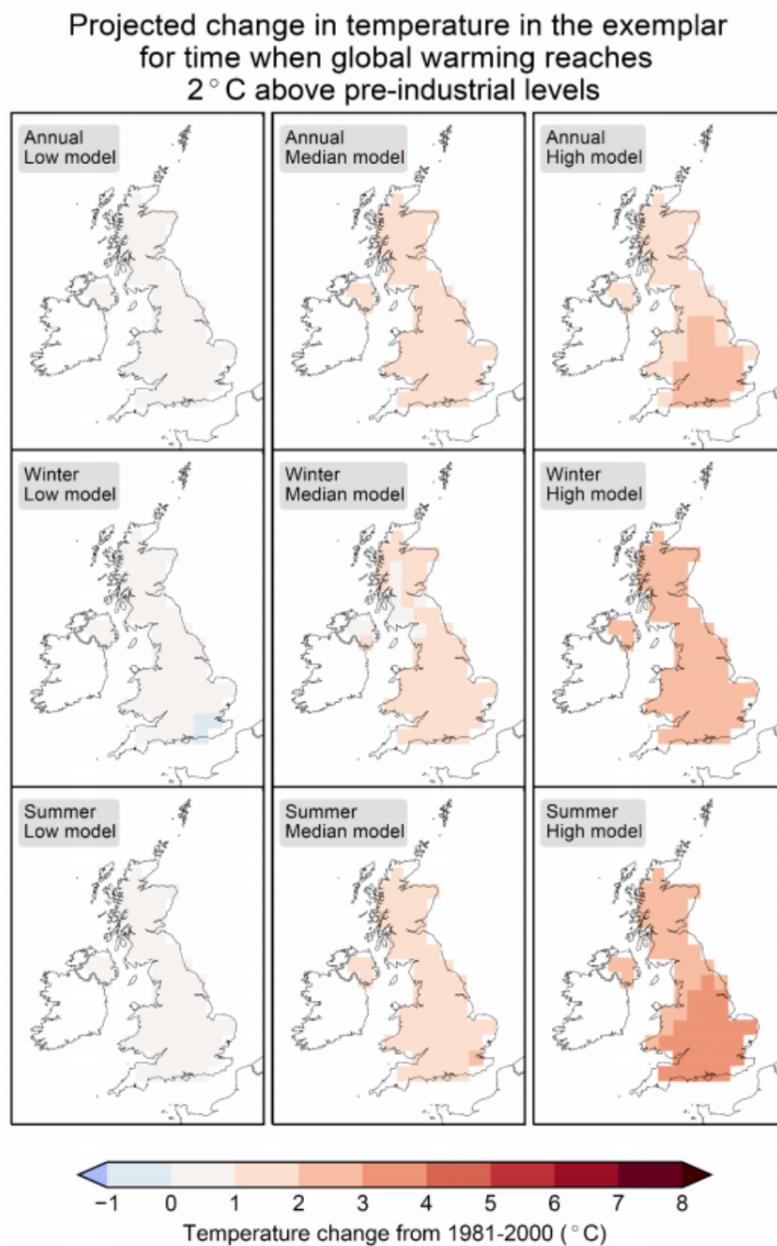


Figure 6.3: Projected changes in UK temperatures at a global mean warming of 4°C (GWL4) above pre-industrial (1850-1900). Changes are shown relative to present day (1981-2000). Rows show annual (top), winter (December-February; middle) and summer (June-August; bottom) changes. Columns shows maps for the model projection with a UK mean temperature changes which are relatively low (left), high (right) or median (centre) [28].

- 6.3.23 It is projected that average sea levels will continue to rise in the future, increasing the risk of coastal flooding and erosion, but the pattern of sea level rise is not uniform across the UK. Extreme coastal water levels driven mainly by increases in mean sea level rise are expected. For example, for Cardiff, sea level rise by the end of the century (when compared to 1981-2000), for the low emission scenario is very likely to be in the range 0.27 m to 0.69 m. For a high emission scenario, the range is very likely to be 0.51 m to 1.13 m [24]. This, combined with a predicted increase in storm surges, will lead to a significantly increased risk of flooding.
- 6.3.24 There are several primary mitigation measures recommended to be incorporated into the design to ensure the Proposed Development avoids, prevents or reduces carbon emissions to the extent possible. These have been set out in the Section 4.0 with further detail available in the Energy Strategy.
- 6.3.25 This analysis has concluded that with the only exclusion of the operational traffic, all the other reviewed sources of carbon emissions are likely to result in minor adverse effects, as relative to the defined effect significance criteria.
- 6.3.26 It is also known that the Welsh Government has developed plans to improve the connections within the Wales region, including the Merthyr Tydfil local area. Furthermore, Merthyr Tydfil and other local authorities are developing plans to support a more sustainable way of travelling. The current known plans include the opening of additional cycle routes nearby the Site and the enhancement and upgrade of the current train connection to Merthyr Tydfil. These measures will have a significant impact in reducing the car traffic generated by the Proposed Development and is estimated to be a significant factor in reducing the operational traffic emissions.
- 6.3.27 Additional mitigation and adaptation measures are discussed for all effects in order to identify further opportunities for reducing any potential adverse impacts of the Proposed Development. For operational traffic in particular, which is considered a significant effect, these measures could be implemented to reduce the magnitude of impact. The proposed mitigation measures will be considered further during the detailed design stages.
- 6.3.28 'Additional' or 'secondary' mitigation refers to measures that require additional action beyond the core function of the development, which can be proposed at any point within the EIA process, including during the decision-making process. Such interventions tend to operate in the middle of the mitigation hierarchy, focusing on reducing the significance or likelihood of adverse effects.
- 6.3.29 The following section sets out the key additional mitigation measures proposed to further strengthen the Proposed Development and minimise any potential impacts on the environment.

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Future baseline

6.3.30 In the absence of the Proposed Development, the potential use of the land is assumed to remain as it is. If the land use remains unchanged, in this case undeveloped, it should be assumed that there are no GHG emissions associated with embodied carbon or operation. The impact of the removal of trees from the construction site has been also considered.

Future Energy

Decarbonisation of the electricity grid.

- 6.3.31 The carbon factor of the National Grid – the amount of carbon dioxide released per kilowatt hour of electricity generated and distributed – is recognised in current Building Regulations as being 0.519 kgCO₂/kWh [25]. However, the national mix of electricity generation methods is progressing towards greener solutions with renewable sources accounting for 39.3% of the electricity generated in the UK in 2021; up from 24.5% in 2016 [6].
- 6.3.32 Consequently, the Building Regulations Part L 2014 value of the National Grid carbon factor has been shown to be substantially higher than how the grid is performing in reality. This severely impacts the calculated emissions produced by all heat raising plant which either use electricity directly or generate it to offset other emissions. Figure 6.4 shows how the grid carbon factor (affected by the mix of generation techniques serving the National Grid), has varied over the past fifteen years. The carbon intensity of the grid has reduced to below a third of its original value between 2012 and 2020 – to 0.159 kgCO₂/kWh [26]. The carbon emissions associated with electricity consumption are therefore much lower than reported in Building Regulations. This means that, under the Part L 2014 methodology the CO₂ emissions associated with electrically driven plant are being overestimated by over 200%. Based on the above, a full electric strategy has been developed for the Site to take full advantage of the current decarbonisation process. This also entails that the operational energy usage for the Site will steadily decrease in the future years following the same improvement the national grid will deliver.

Future Projections

- 6.3.33 The Future Energy Scenarios (FES) document, produced by the National Grid, discusses how the UK’s energy landscape is changing. The latest version, FES 2021 [27], discusses these projections in four scenarios and Figure 6.4 combines these future trajectories with the actual carbon intensity of the National Grid over the past 15 years. The reported emissions associated with electricity generation have fallen steeply since 2012 and in all four cases, the grid decarbonises further by 2050. The rate of decarbonisation differs between scenarios depending on the modelled consumer behaviour, technology developments and generation mix. The trajectories presented here do not include the negative emissions benefit of Bio Energy Carbon Capture and Storage (BECCS) because these will be needed to offset hard-to-abate sectors such as aviation, shipping and agriculture in future. In order for the UK as a nation to meet net zero carbon by 2050. It is important to note that carbon capture and storage technology is not currently commercially demonstrated at a large scale, but the FES 2020 studies are useful as future scenarios.
- 6.3.34 This projected decarbonisation of the grid has been considered and has informed the proposed all-electric Energy Strategy.

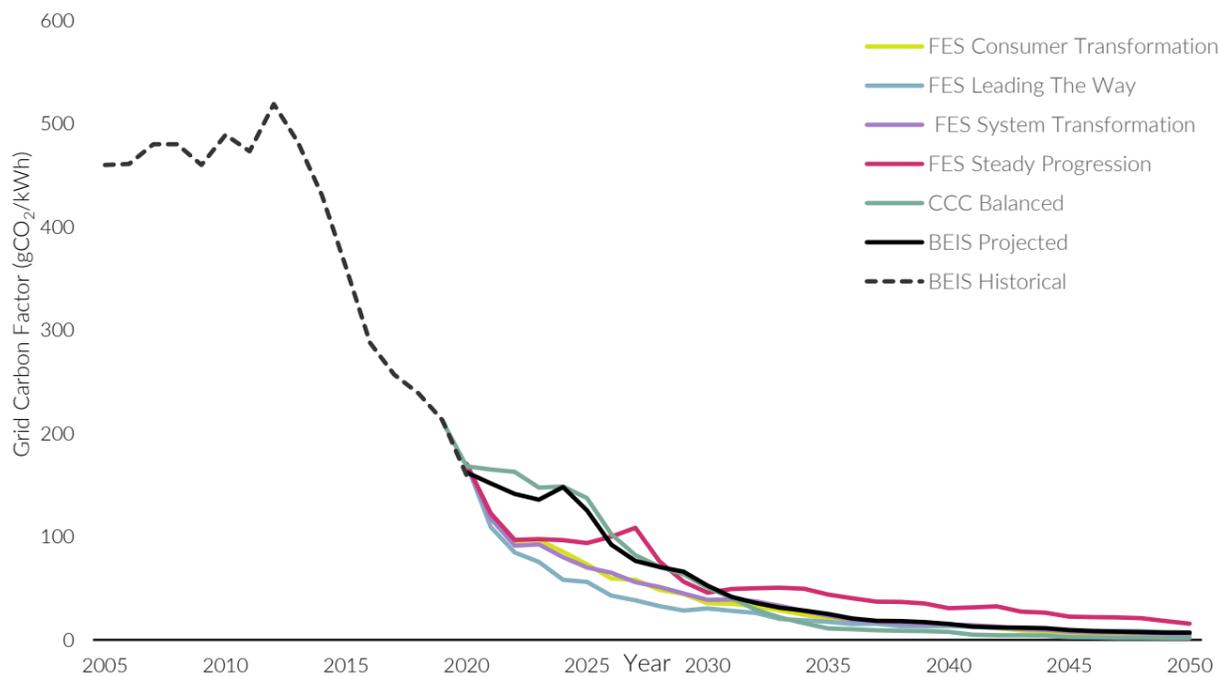


Figure 6.4: Historic and future projected carbon factor for the National Grid. Sources: BEIS Green Book (historic carbon factors); National Grid Future Energy Scenarios (FES) 2021 (future projected carbon factors). Source: Hoare Lea infographic.

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6.4 Greenhouse gasses and climate assessment.

Considerations for emissions reduction.

Operation and construction emissions

- 6.4.1 The Applicant, in response to the climate emergency, seeks an approach to achieve net zero carbon for the Proposed Development for both embodied and operational emissions. Suitable methodologies will be reviewed and adopted, where appropriate, to achieve this. An example of this is the UK Green Building Council (UKGBC) Net Zero Carbon (NZC) Framework that is an industry recognised approach to achieve NZC for the built environment. The framework looks to reduce, mitigate and offset emissions for construction and operational energy separately, as shown in Figure 6.5 below.
- 6.4.2 The illustrative graph in Figure 6.5 provides an overview of whole life emissions associated with a building. Embodied carbon occurs during the construction period, i.e. before day 1 of operation, and then proceeds to have additional emissions where maintenance and/or replacement works are required. Whereas operational emissions occur from day 1 of occupancy to end of life. In the case of an all-electric building services strategy, like what is proposed for this site, the resultant emissions benefit from ongoing decarbonisation of the National Grid. Furthermore, if the building user procures an approved, green utility tariff, these emissions can be treated as carbon neutral in practice.
- 6.4.3 Therefore, there is a methodology and approach that could be adopted to allow the Proposed Development to achieve Net Zero Carbon Emissions in relation to the associated construction and building operation phases which will be reviewed further during the detailed design.

6.4.4



Mitigation within the submitted design is highlighted in Section 4.0 above.

BREEAM 2018 Summary

- 6.4.5 Gleeds has been appointed separately by the client as the BREEAM Advisor. The project team understand that the Rhydycar West project is unique and that careful guidance is needed to enable the project to achieve its potential BREEAM aspiration.
- 6.4.6 The Rhydycar West project has undergone a BREEAM 2018 pre-assessment to highlight the likely score and tangible credits available for the project. The outcome of this consultative exercise with the appointed professional project team has concluded that a possible score of circa 76% is likely, with a further 9% of potential credits highlighted. Based on the current status of the design proposals and information prepared to date, a BREEAM Excellent score is therefore a viable target.
- 6.4.7 To begin to facilitate the BREEAM process, Gleeds undertook the BREEAM pre-assessment and produced focused BREEAM Early Action lists, which clearly highlight key credits to be addressed prior to completion of RIBA Stage 2. The BREEAM Early Action lists have been distributed to each applicable member of the project team, to enable each party to satisfactorily address the pre-identified key credits, via an evidence based approach.
- 6.4.8 Subject to a successful planning approval, the Rhydycar West Project BREEAM plan will be further developed and secured during the remaining design development phase through RIBA Stages 3 and 4 respectively, prior to commencement on site and subsequent operation in use.

Construction

Embodied Carbon & construction traffic

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- 6.4.9 Traditionally the greatest impact on an asset’s whole life carbon has been associated with its operational phase. As discussed above, this trend is shifting due to the ongoing decarbonisation of the UK electricity grid and increasing adoption of all electric solutions for new developments, as demonstrated by the Proposed Development. In accordance with this, the embodied carbon of the Proposed Development is expected to be a considerable source of carbon emissions at construction phase.
- 6.4.10 An appraisal of the anticipated carbon emissions associated with the product and construction stages of the development lifecycle has been completed, following the requirements of EN 15978. This study assesses carbon emissions associated with raw material extraction, manufacturing of the building materials, transporting these to site and erecting the buildings. The lifecycle stages are shown as part of the project timeline in Figure 6.6.
- 6.4.11 This has been carried out based on the design information available to date which consists of area schedules, building types and building heights using OneClick DesignBuilder: Integrated Life Cycle Assessment which uses RICS benchmark data to give indicative values at this outline stage. Typical materials used for these building types have been mapped to suit these attributes to generate materials quantities. The associated carbon intensities of these materials have then been computed to generate carbon footprints for each building, following a business-as-usual approach. The same model was used to estimate the emissions generated in the construction process stages, A4 transport and A5 site operations. The estimates generated with this approach are presented in Table 6.9.
- 6.4.12 The key assumptions used in these calculations were as follows:
 - Construction is assumed to last for 3 years.
 - Calculated for 60-year time frame (assumed life of building, RICS best practice guidance).
 - All buildings assumed steel frame construction.
 - Used max scenarios for building width/depth.

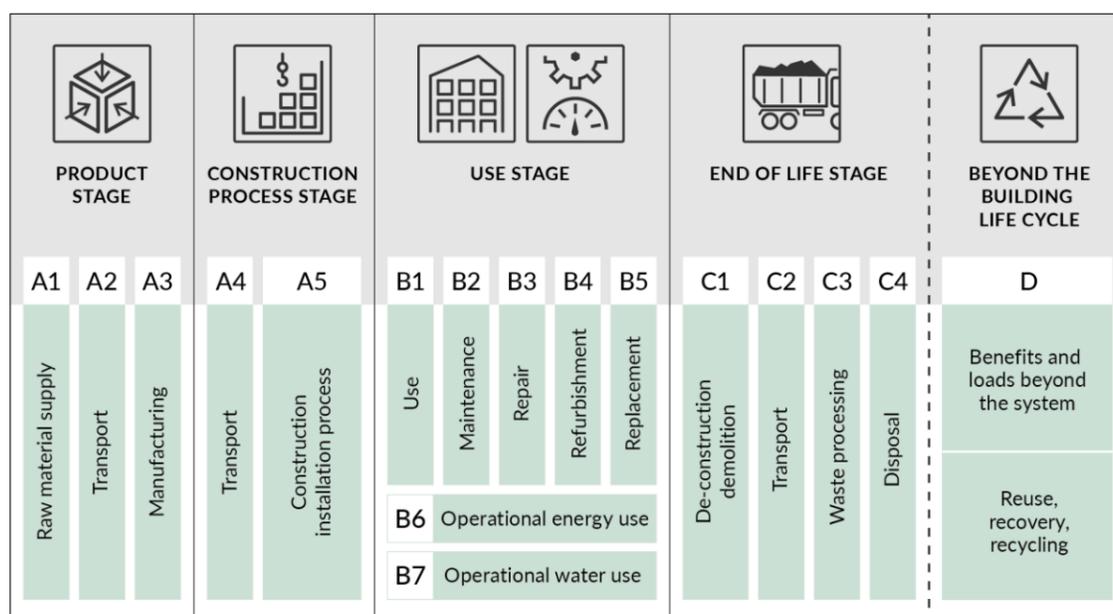


Figure 6.6: Lifecycle modules as determined in EN 15978. Source: Hoare Lea infographic.

Table 6.9: Embodied carbon breakdown across the construction lifecycle stages, for each building in the Proposed Development, total for an assumed 3 year construction period.

Building	Total Gross Floor Area (m ²)	A1-A3 (kg CO ₂ e)	A4 Transport (kg CO ₂ e)	A5 Site operations (kg CO ₂ e)
A Snow Centre	25,900	8,060,883	114,386	1,105,528
B Water Park	7,500	3,604,680	58,555	387,738
C Indoor Activity Centre	22,000	7,970,214	148,520	1,021,604
D Hotel Accommodation	15,500	4,898,910	59,307	689,608
E Hotel Accommodation	7,000	2,365,781	26,831	304,424
F Hotel Accommodation	4,900	1,722,928	21,103	215,799
G Lodge Accommodation	2,300	974,540	17,769	114,568
P2 Multi-Storey Parking and Ancillary	8,500	2,116,453	34,497	316,475
TOTAL	93,600	31,714,390	480,968	4,155,745

Operational Phase

Carbon Emissions from Regulated & Unregulated Operational Energy Use

- 6.4.13 Carbon emissions generated by the use of the Proposed Development are the key source of carbon emissions during the operational phase.
- 6.4.14 An estimate of operational energy usage was made using the submitted outline masterplan, schedule of accommodation and gross external area schedule supplied by Holder Mathias architects.
- 6.4.15 Estimated carbon emissions from regulated operational energy uses of buildings have been calculated from benchmarks based on modelling undertaken in line with Part L 2014 of the Building Regulations (Conservation of fuel and power), previous experience for similar buildings and available Display Energy Certificates (DECs). Where closely matching buildings were not available, for example the indoor snow centre and outdoor

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waterpark, modified cases of as-similar-as-possible buildings were used, these were modified based on a combination of reported total energy usage for similar buildings and professional judgement. For operational energy modelling purposes, the gross internal areas of all buildings was split based on use case. Unregulated energy estimates were made using the same model.

- 6.4.16 With this approach it was estimated that, for the gas boiler baseline approach used to assess Part L compliance, the Proposed Development would have a regulated energy requirement of approximately 55,500,000 kWh/year and an unregulated requirement of 5,400,000 kWh/year.
- 6.4.17 A provision for solar photovoltaic (PV) panels was made for the Site, enabling the energy usage estimate to include a feasible contribution from PV. The estimates presented below account for this contribution as well as the implementation of connected air source heat pumps and water to water heat pumps on site for heating, cooling and hot water.
- 6.4.18 The proposed energy strategy is based on a heat networks that can benefit from the waste heat to reduce the Site heat demand. With this system, the excess heat generated by cooling the indoor snow-centre could be used to heat hotel rooms and swimming pools, thereby minimising wasted heat and energy and improving the coefficient of performance for all linked facilities. As described in the Energy Strategy, the proposed strategy involves implementing an on-site heat sharing network to make use of the waste heat from cooling the indoor snow-centre to heat other parts of the facility. This has been modelled as an uplift in the coefficient in performance of the connected heat pumps. Please refer to the appended Energy Strategy for full detail.

Future Building Regulations Part L

- 6.4.19 Updates to the Building Regulations Part L are due to be implemented in Wales in 2022. Specific details of the proposed amendments are unconfirmed at this stage but could include the following for non-residential buildings, i.e. Building Regulations Part L2A include:
- Update to carbon factors (refer to Table 6.10).
 - Introduction of a Primary Energy metric alongside CO₂ emissions calculations.
- 6.4.20 In October 2019, the BRE released an update to the Standard Assessment Procedure (SAP) – used to assess domestic buildings' compliance with Building Regulations Part L1A – for consultation. The proposed update is called SAP10.1. The important proposed change to the SAP methodology is the carbon factors to be used to calculate CO₂ emissions.
- 6.4.21 Whilst SAP is related to dwellings, it is expected that proposed changes to carbon factors within this methodology will also be applied to non-residential buildings and Part L2A.
- 6.4.22 As shown in Table 6.10, there is significant reduction in emissions factor for electricity expected, recognising recent decarbonisation of the UK electricity grid.

Table 6.10: Current (SAP 2012) and proposed (SAP10) carbon factors for grid-supplied electricity.

Fuel	SAP 2012 Carbon Factor (kgCO ₂ /kWh)	SAP 10.1 Carbon Factor (kgCO ₂ /kWh)
Electricity	0.519	0.136

- 6.4.23 To demonstrate the effect of the likely changes to Part L carbon factors, the emissions estimate was made using both the current Part L 2014 and SAP 10.1 values as proposed updated carbon factors. A comparison of the emissions estimate with Part L 2014 and SAP 10.1 carbon factors is presented in Table 6.11.

Table 6.11: Operational energy estimates.

INITIAL ESTIMATES	Regulated	Unregulated	Total
System side energy demand [kWh/year]	20,800,000	5,000,000	25,800,000
Part L 2014 carbon factors (old carbon factors)			
CO ₂ emissions [kgCO ₂ /year]	10,800,000	2,600,000	13,400,000
SAP 10.1 carbon factors (proposed future carbon factors)			
CO ₂ emissions [kgCO ₂ /year]	2,500,000	690,000	3,200,000

- 6.4.24 All estimates in Table 6.11 account for a provision for PV systems and the implementation of the on-site heat network described above and in the Energy Strategy.
- 6.4.25 The estimates with the new updated carbon factors (SAP10.1) are used in all comparisons with baseline emissions in the effects sections which follow.

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GHG Emissions from Operational Traffic

6.4.26 The anticipated GHG emissions from operational traffic associated with the Proposed Development have been estimated on the basis of traffic flow data provided by the transport consultant and an average distance of travel based on a projected visitor breakdown. The total distance travelled by all vehicles estimated in this way was converted to greenhouse gas emissions in kg CO₂e using the Department for Business, Energy & Industrial Strategy greenhouse gas reporting 2021 conversion factors [28]. The annual carbon emissions resulting from operational traffic are compared to baseline emissions and budgets below.

Table 6.12: Operational traffic estimation.

	AADT			Average distance (km)	Carbon Factor (kg CO ₂ e/km)			Annual emissions (t CO ₂ e)			TOTAL annual emissions (t CO ₂ e)
	HGV	LGV electric	LGV other		All vehicles (from visitor breakdown)	HGV all diesel, average laden	Battery Electric Vehicle, Average car	Average petrol car	HGV	LGV electric	
2026 traffic (~15% EVs)											
Just site access: National (UK)	285	612	3470	148.6	0.86407	0.05031	0.17431	5,109*	1,671	32,812	39,591
Just site access: Regional (Wales)	285	612	3470	56.8	0.86407	0.05031	0.17431	5,109	639	12,549	18,297
Just site access: Local (Merthyr Tydfil)	285	612	3470	11.1	0.86407	0.05031	0.17431	995	124	2,443	3,562
2031 traffic (~43% EV)											
Just site access: National (UK)	285	1755	2327	148.6	0.86407	0.05031	0.17431	5,109*	4,791	22,003	31,903
Just site access: Regional (Wales)	285	1755	2327	56.8	0.86407	0.05031	0.17431	5,109	1,832	8,415	15,356
Just site access: Local (Merthyr Tydfil)	285	1755	2327	11.1	0.86407	0.05031	0.17431	995	357	1,638	2,990

* HGVs considered on the national scale are assumed to travel the average distance specified for Wales, to account for local supply preference.

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Table 6.13: Operational traffic comparison.

Operational traffic emissions	% of baseline or budget	emissions (kt CO ₂)
2026 (15% EV)		
National (UK) operational traffic emissions estimate kt CO₂	39.59	
% of annual proportion of the 4th national carbon budget (2023 - 2027)*	0.0254%	156000
Regional (Wales) operational traffic emissions estimate kt CO₂	18.30	
% of regional (Wales) baseline emissions (2019)	0.0769%	23,807.80
% of annual proportion of Wales budget (2023 - 2027)*	0.461%	3968
Local (Merthyr Tydfil) operational traffic emissions estimate kt CO₂	3.56	
% of local (Merthyr Tydfil) baseline emissions (2019)	1.394%	255.6
% of annual proportion of Merthyr Tydfil budget (2023 - 2027)*	8.91%	40
2030 (43% EV)		
National (UK) operational traffic emissions estimate kt CO₂	31.90	
% of annual proportion of the 5th national carbon budget (2028 - 2032)*	0.0231%	138000
Regional (Wales) operational traffic emissions estimate kt CO₂	15.36	
% of regional (Wales) baseline emissions (2019)	0.064%	23807.8
% of annual proportion of Wales budget (2028 - 2032)*	0.800%	1920
Local (Merthyr Tydfil) operational traffic emissions estimate kt CO₂	2.99	
% of local (Merthyr Tydfil) baseline emissions (2019)	1.170%	255.6
% of annual proportion of Merthyr Tydfil budget (2028 - 2032)*	12.5%	24

* all budgets are presented as the 40% share attributable to the built environment sector.

- 6.4.27 In view of the findings of the recent IPCC Special Report on the effects of global warming of 1.5 °C that some effects from climate change may be long-lasting or irreversible [29], the duration of all effects assessed in this Chapter is assumed to be long-term and permanent.
- 6.4.28 While the emission benchmarks outlined above have been used to provide context, it is important to recognise that the application of professional judgement is a critical additional component, as recognised by IEMA guidance. In the context that traffic vehicles are required to decarbonise in the coming years and that there are nationwide efforts to reduce car usage, the professional judgement has therefore taken into account that a significant proportion of emissions will be further reduced in future.

Carbon Emissions from Repair and Maintenance B1-B5 (Materials)

- 6.4.29 The carbon impacts of repair and maintenance of the fabric of the buildings have been calculated as part of the life cycle analysis process, following the requirements of EN 15978.
- 6.4.30 These impacts relate to the replacement of materials/components during a projected 60-year lifespan of the buildings. For example, external windows may be expected to require replacement after 30 years, internal finishes as soon as 10 years. The service lives used are determined from Environmental Product Declaration (EPD) certificate data. The carbon impacts of these replacements are presented in Table 6.14 below.

Table 6.14: Carbon impacts for the In-Use stage (total for an assumed 60-year lifetime) of the development lifecycle for each building.

Building	B1-B5 Replacement (kg CO ₂ e)
A Snow Centre	6,155,753
B Water Park	2,040,329
C Indoor Activity Centre	3,668,940
D Hotel Accommodation	2,649,364
E Hotel Accommodation	1,261,277
F Hotel Accommodation	922,370
G Lodge Accommodation	393,641
P2 Multi-Storey Parking and Ancillary	1,161,511
TOTAL	18,253,186

6.5 Likely Environmental Effects of the Scheme.

Construction Phase Effects

- 6.5.1 The annual carbon emissions resulting from the combined construction lifecycle stages A1 – A3 (product stages), A4 (transport) and A5 (site operations) is currently estimated to be approximately 12,300 t CO₂e per year. This is less than 25,000 tCO₂e and accounts proportionally for:
- 4.7% of local (Merthyr Tydfil 2019) baseline emissions;
 - 30.29% of the annual Merthyr Tydfil budget (2023 – 2027);

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- 0.051% of regional (Wales 2019) baseline emissions;
- 0.31% of the annual Wales budget (2023 – 2027);
- 0.0078% annual proportion of the 4th national carbon budget (2023 - 2027) (40% share attributable to the built environment sector);
- 0.0088% of annual proportion of the 5th national carbon budget (2028 - 2032) (40% share attributable to the built environment sector); and
- 0.0157% annual proportion of the 6th national carbon budget (2033 – 2037) (40% share attributable to the built environment sector).

6.5.2 This analysis has concluded that there are no likely significant effects that will result from the construction phase at a national and regional level. Due to the small size of Merthyr Tydfil, at local level, the impact of the construction stage can be relevant.

6.5.3 Considering the nature of the Site and the National and Regional relevance it can have, the overall impact is considered to be minor, with no likely significant effects.

Operational Phase Effects

6.5.4 The annual carbon emissions resulting from the combined operational phase effects of operational energy, operational traffic and repair and maintenance emissions (lifecycle stages B1 – B5) is currently estimated to be approximately 43,200 t CO₂e at a national level, 21,900 t CO₂e at regional level and 7.1 t CO₂e at local level. When looking at the reported carbon emissions at national level, the reported figure is more than 25,000 tCO₂e. The following breakdown shows the impact on the various baseline emissions and carbon budgets:

- 2.8% of local (Merthyr Tydfil 2019) baseline emissions;
- 17.64% of the annual Merthyr Tydfil budget (2023 – 2027);
- 0.092% of regional (Wales 2019) baseline emissions;
- 0.55% of the annual Wales budget (2023 – 2027);
- 0.028% annual proportion of the 4th national carbon budget (2023 - 2027) (40% share attributable to the built environment sector);
- 0.031% of annual proportion of the 5th national carbon budget (2028 - 2032) (40% share attributable to the built environment sector); and
- 0.056% annual proportion of the 6th national carbon budget (2033 – 2037) (40% share attributable to the built environment sector).

6.5.5 This analysis has concluded that the operational emissions are a likely to have an intermediate adverse effect at a national level, but no likely significant effect at regional or local level. This is still determined as a likely significant effect of the Proposed Development.

6.5.6 Looking at the breakdown of these emissions, it is noted that annual operational transport emissions are currently estimated to be approximately 40,000 tCO₂e at national level, which accounts for > 90% of annual emissions during the operational phase. The operational traffic is calculated based on the estimated vehicle mix for the date of opening the Site (2026) and for the forecasted electric vehicle mix for the 2030. For the 2026 scenario, a 15% of Electric Vehicles allowance has been done. For the 2030 scenario, a 43% of EV vehicles has been considered based on the latest UK Carbon Budget “The Sixth Carbon Budget: The UK’s Path to Net Zero, December 2020”. For this study, electric vehicles have been intended as battery electric car, plug-in hybrid and hybrid electric vehicles.

6.5.7 When calculating the impact on the local and regional scale, the traffic generated within those areas has been considered. For the above assessment, it has been estimated an average distance of 149km at national level. This reflects the nature of the development attracting visitors from all over the UK. The traffic data have been also used to assess average distance travelled by the cars at regional and local level (being 57km at regional level and 11km at local level).

6.5.8 Additional mitigation which could reduce the impact of the operational traffic emissions will also be discussed below.

6.6 Additional Mitigation, Compensation and Enhancement Measures.

Construction Phase

6.6.1 Measures which can provide additional mitigation for the construction phase:

- Aim to design with a low form factor (practical for high rise developments) for any appropriate buildings, which minimises the surface area to volume of the building, the surfaces through which detrimental heat gains in summer and heat losses in winter can pass are reduced. In winter, this reduces energy consumption and heating bills, in summer it helps to mitigate the risk of overheating and the need for mechanical cooling;
- Consider materials with a high albedo in the façade design, these would reflect a higher level of incident radiation away from the building rather than absorbing to reduce surface temperatures, avoiding exacerbating the overheating risk.
- Look into the possibility of recessed window in balconies, horizontal shading on south façades and vertical shading on east/west façades help to mitigate direct solar gain in the summer when the sun is high in the sky and thus, minimize overheating risk and reduce the need for mechanical cooling.
- Procure energy efficient plant reflecting the latest technology advances.
- Monitoring of energy, water and waste data during the construction stage to encourage transparency and accountability.
- All waste generated during construction to be diverted from landfill (where technically feasible).
- Exploration of the potential for low carbon construction materials and techniques – such as timber frame and offsite manufacture – which can help reduce the embodied impact of construction.
- Consideration of flexibility and adaptability in building design, allowing buildings to evolve to meet future demands and needs.

6.6.2 These potential interventions have not been relied upon when reaching conclusions around the significance of anticipated effects.

Operational Phase

6.6.3 A number of design solutions have already been built into the Proposed Development design to avoid, prevent or reduce carbon emissions associated with the energy usage and transportation during the operational phase.

6.6.4 In addition to these inherent design principles, this chapter suggests the following measures that could be adopted to effectively manage and further reduce the significance of carbon emissions expected to be generated through the operational stage of the scheme:

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- Installation of smart meters and/or sub-meters to monitor operational consumption more accurately.
- Additional detailed modelling will be further explored to investigate operational energy usage.
- Suitable space for waste storage and management facilities to be factored into the design to enable adequate waste segregation for optimal collection and subsequent treatment.
- Design in cross-ventilation where possible to create temperature differences which generate pressure differentials which draws external air into the space. Look into specifying opening windows in on-site accommodation for purge ventilation.
- The use of certified green energy tariff to offset any remaining emissions such that the site operates as a net-zero carbon site.

6.6.5 Specifically relating to operational traffic which is considered to be a potentially significant effect:

- Liaise with local and Welsh government on improving the public transport infrastructure serving the site.
- Implement a shuttle bus to local transport nodes e.g. Merthyr main station.

6.6.6 As with the additional mitigation suggested for the 'During Construction' emissions, these potential interventions have not been relied upon when reaching conclusions around the significance of anticipated effects.

6.7 Assessment Summary and Likely Significant Residual Environmental Effects.

Construction Phase

6.7.1 No initial significant effects were found.

Operational Phase

6.7.2 Operational traffic could be reduced to a minor adverse impact if the proportion of people using sustainable transport modes could be increased. This would require improved public transport access to the site. Please refer to the submitted Travel Plan for further detail on the proposed measures and resultant impacts.

6.8 Cumulative impacts.

6.8.1 It is acknowledged that there is a need to apply a systematic, coordinated approach to climate change mitigation and adaptation on a scale beyond that of individual projects. An overarching principle of the IEMA guidelines is that the greenhouse gas emissions from all projects cumulatively contribute to climate change and affect all projects, thus making climate change by its very nature a cumulative effect. As such, the cumulative effects from the Proposed Development when considered alongside other committed development schemes in proximity to the Site have been addressed inherently within the greenhouse gasses and climate change assessments and are not duplicated here.

6.9 Climate change Adaptation.

6.9.1 Climate change adaptation will be addressed in individual assessments, notably Water Resources and Flood Risk and Biodiversity, these are also summarised below for ease of reference.

6.9.2 'Adaptation' means anticipating the adverse effects of climate change and taking appropriate action to prevent or minimise the damage they can cause or taking advantage of opportunities that may arise. Examples include:

- using water resources efficiently;
- ensuring buildings are designed to be resilient to changing climate and extreme weather events;
- designing water courses to allow for future flood levels;
- choosing appropriate tree species;
- and incorporating land corridors to help species migrate.

6.10 Summary.

6.10.1 Although not the purpose of this chapter, the Proposed Development must be also be considered in light of its potential to deliver social / economic value to the community. This would be a multi-purpose facility with the potential to bring tourism to the area and therefore income to local businesses. The Proposed Development would also create local employment and opportunities for sporting development, further discussion on this topic will be included in Chapter 5 of the EIA report, Socio Economics.

6.10.2 Additional mitigation and adaptation measures are discussed for all effects in order to identify further opportunities for reducing any potential adverse impacts of the Proposed Development. For operational traffic in particular, which is considered a significant effect of intermediate adverse nature, these measures could be implemented to reduce the magnitude of impact. The proposed mitigation measures should be considered further during the detailed design stages.

6.10.3 This analysis has concluded that apart from operational traffic, all reviewed sources of carbon emissions are likely to result in minor adverse effects, in the context of the Welsh emissions and UK national carbon budgets (apportioned to reflect the contribution of the built environment's estimated share).

6.10.4 The IEMA's overarching principles on Climate Change Mitigation & EIA acknowledge that the carbon emissions from all projects will contribute to climate change. For that reason, this assessment has outlined a range of mitigation and adaptation measures proposed for the scheme to avoid, prevent and reduce emissions generation and boost its resilience to the anticipated impacts of climate change to the extent possible.

6.10.5 The ongoing electrification of the transport sector and continuous decarbonisation of the national electricity grid are expected to further reduce the annual emissions of the Proposed Development at the operational stages.

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Table 6.15: Assessment Summary and Residual Environmental Effects

Summary description of the identified impact	Sensitivity of Receptor	Impact Magnitude	Significance and Nature of Effect	Additional Mitigation	Residual Impact Magnitude	Residual Significance and Nature of Effect
Embodied carbon Construction traffic	High (Global Climate)	Slight	Minor adverse, not significant	<ul style="list-style-type: none"> • Aim to design with a low form factor. • Consider materials with a high albedo in the façade design. • Look into the possibility shade conditions to minimise overheating risk and reduce the need for mechanical cooling. • Procure energy efficient plant reflecting the latest technology advances. • Monitoring of energy, water and waste data during the construction stage to encourage transparency and accountability. • All waste generated during construction to be diverted from landfill (where technically feasible). • Exploration of the potential for low carbon construction materials and techniques – such as timber frame and offsite manufacture – which can help reduce the embodied impact of construction. • Consideration of flexibility and adaptability in building design, allowing buildings to evolve to meet future demands and needs. 	Slight	Minor adverse, not significant
Regulated and unregulated energy Repair and maintenance	High (Global Climate)	Slight	Minor adverse, not significant	<ul style="list-style-type: none"> • Installation of smart meters and/or sub-meters to monitor operational consumption more accurately. • Additional detailed modelling will be further explored to investigate operational energy usage. • Suitable space for waste storage and management facilities to be factored into the design to enable adequate waste segregation for optimal collection and subsequent treatment. • Design in cross-ventilation where possible, look into specifying opening windows in on-site accommodation for purge ventilation. • The use of certified green energy tariff to offset any remaining emissions such that the site operates as a net-zero carbon site. 	Slight	Minor adverse, not significant
Operational traffic	High (Global Climate)	Moderate	Intermediate adverse, significant	<ul style="list-style-type: none"> • Liaise with local and Welsh government on improving the public transport infrastructure serving the site. • Implement a shuttle bus to local transport nodes e.g. Merthyr main station. 	Slight	Minor adverse, not significant

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Table 6.16: Means by which Additional Mitigation Measure may be Secured

Identified Effect where additional mitigation (Not design mitigation) has been identified	Type of mitigation measures (avoidance, reduction, compensation, enhancement)	Means by which mitigation measure may be secured
Construction		
n/a		
Operation		
Operational traffic emissions	Improve sustainable transport infrastructure.	Collaborate with local and Welsh Government about increasing the availability of public transport serving the Proposed Development. Implement a shuttle bus between the site and existing public transport nodes e.g. Merthyr main station.

6.11 Summary

6.11.1 The only effect deemed to be significant was the operational traffic emissions, this could be addressed by reducing the number of private vehicle trips required to get people to the site. Which could be achieved by increasing the availability and uptake of more sustainable transport modes serving the Proposed Development, for example rail and bus.

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6.12 Glossary

Term	Definition
Embodied carbon	The total carbon emissions generated to produce a built asset. It is often defined as the carbon emissions associated with energy consumption (embodied energy) and chemical processes during the extraction, manufacture, transportation, assembly, replacement and deconstruction of construction materials or products.
Climate change mitigation	Measures implemented in the design of the Proposed Development to avoid, prevent, reduce or offset GHG emissions.
Primary / inherent / embedded design mitigation	Modifications to the location or design of the development made during the pre-application phase that are an inherent part of the project, and do not require additional action to be taken. This type of mitigation encompasses design principles and solutions which have been 'embedded' or 'built in' the Proposed Development design to minimise climate-related risks.
Secondary / additional mitigation	Actions that will require further activity in order to achieve the anticipated outcome. These may be imposed as part of the planning consent, or through inclusion in the ES. This type of mitigation refers to measures that require additional action beyond the core function of the development, which can be proposed at any point within the EIA process, including during the decision-making process.
Climate change resilience & adaptation	Measures implemented to future-proof the Proposed Development and adapt to the anticipated impacts of a changing climate.
Regulated carbon emissions	Emissions associated with the regulated energy uses, i.e. uses that are inherent in the design of a building and, therefore, relate to the 'quality' of the building itself.
Unregulated carbon emissions	Emissions associated with unregulated energy uses within a building including small power electricity use, such as IT equipment, plug in devices and catering facilities.

7.0 UTILITIES.

7.1 Introduction.

- 7.1.1 A utilities assessment has been undertaken to determine the impact of providing new utility infrastructure to the site. The investigations undertaken focus on establishing the feasibility of capacity and connectivity for power, comms, and water; as well as identifying any environmental impacts that should be considered when bringing new services to the proposed development.
- 7.1.2 The geographical scope for the study area extends outside of the site's immediate redline boundary due to the locations of the various utility points of connection. For power, this extends to Pen-y-Darren, some 4-6km from the site boundary, depending on routing.
- 7.1.3 The site and surrounding site geography each present areas of consideration for utilities. Namely the area of SSSI and SINC within the redline boundary, the nearby River Taff and Merthyr Railway, and various 'A' roads between Pen-y-Darren and the site.
- 7.1.4 Mitigation within the submitted design is highlighted in Section 4.0 above.

7.2 Methodology and Scope.

Assessment Methodology

- 7.2.1 Hoare Lea has undertaken formal consultation with Western Power Distribution (WPD) to understand the feasibility of providing a large new connection from their local HV and/or EHV network, with a view to establish a viable point of connection (PoC) for the site.
- 7.2.2 The feedback from WPD was used to assess the most appropriate PoC for the scheme and to identify the subsequent routing options for bringing new cabling to the site.
- 7.2.3 As a result of the assessment, WPD confirmed that the local substation, Pentrebach, located in close proximity to the site, is a small 33kV/11kV primary that cannot be extended or replaced due to the site being landlocked and surrounded by third party land (owned by Zanussi). This substation could not therefore offer a PoC to the site.
- 7.2.4 The Swansea Road substation, also in close proximity to the site, has been confirmed as being an even smaller site that is locked between a retail park, allotments, and Council-owned buildings, and too cannot be extended to accommodate additional equipment enabling a large power connection to be made.
- 7.2.5 As a result, the Merthyr East primary substation, located c.5km away in Pen-y-Darren, was assessed, and found to have the capacity available to enable a new power supply sufficient in size to serve the site. WPD have established this substation as the sites PoC.
- 7.2.6 As the PoC to the Merthyr East primary substation will be at 11kV (HV), there will not be a requirement for a primary substation to be located onsite. Rather, incoming 11kV cables would terminate within a ring main unit (RMU) at the site's boundary.
- 7.2.7 From here, 11kV cable would run within the new pedestrianised areas of the site and into a series of 11kV/LV distribution substations to provide low voltage (LV) [230V/400V] supplies to the site buildings and infrastructure.
- 7.2.8 The onsite cable routing would seek to avoid running within the SSSI and SINC. The placement of the cable intake room (housing the RMU) and the site's associated 11kV/LV distribution substations would also follow the same principle, seeking to minimise impact to the natural environment. This could be achieved by the substations being building-integrated where possible, and cabling and mains located in areas of new public realm (i.e. areas already being disturbed during the construction process).
- 7.2.9 Where DNO/IDNO electrical equipment is installed within a customer building, it would be required to comply with the Building Regulations and BS-9999 (Fire safety in the Design, Management and Use of Buildings – Code of Practice.)
- 7.2.10 Offsite, there are various routes for the new cabling to run from the Merthyr East substation to the site. Currently WPD have provided one option which runs through Merthyr itself (but note that there are many alternatives). Hoare Lea has provided an alternative, more direct route, which avoids running in local neighbourhoods where possible.
- 7.2.11 See drawings 2929400-HL-LB-DR-U-900-0001 'Initial Utilities Assessment – Coordinated Drawing' and 2929400-HL-LB-DR-U-900-0002 'Initial Utilities Assessment – New Power Supply Routing Options'.
- 7.2.12 As mentioned in the Policy Background section, the Historic and Natural Heritage of Merthyr Tydfil should be maintained, and therefore not negatively impacted by new development, in this case via the installation of new utility infrastructure.
- 7.2.13 The routing options to site therefore consider the location of existing trees and landscaping; the presence of ecology and wildlife; the location of listed buildings and culturally significant infrastructure; and the impact to the general surrounding environment.
- 7.2.14 As per NRSWA and NJUG guidelines, this means that where possible, new utilities would run within the public footpath and verge of the existing road network. Where there is insufficient space within the footpath, the public highway would be used to route new cabling.
- 7.2.15 From the Merthyr East substation, new cabling would be able to run in this arrangement given the extensive surrounding existing highway infrastructure.
- 7.2.16 When crossing the River Taff and Merthyr Railway, new utilities would remain within the existing public footway, highway, or bridges as appropriate and not run underneath via directional drill or similar.

7.3 Receptor Sensitivity.

Effect Magnitude

- 7.3.1 Running new utility infrastructure within the existing public realm is typical for new development projects, and as such, the routing and installation of utility infrastructure is deemed to have a negligible impact to the development or surrounding natural environment.
- 7.3.2 Both on and offsite utility pipes and cabling would be buried beneath existing/new footway, verges, or highway, and where possible, associated infrastructure such as substations would be located internally to the new buildings. The routing and placement of new utility infrastructure would also be designed in coordination with the new and existing landscape.

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- 7.3.3 In terms of environmental impact, the new power, telecoms cabling, and water pipes would not emit any emissions in use, produce harmful or hazardous material, require waste management or specialist treatment or be a risk to the natural environment and public safety. The only expected output from such installations would be excess heat from substations, which is managed via natural ventilation.

Limitations of the Assessment

- 7.3.4 Dwr Cymru Welsh Water have reported that the site is located in an area where there are potential water supply constraints and that no local network improvements to the distribution network are planned within the current Capital Investment Plan. This means that to connect to the local distribution network, reinforcement (upgrades to key sections of existing pipework, or alternatively new pipework) may likely to be required.
- 7.3.5 To establish the extent of potential offsite works required, and to identify a PoC for the development, Welsh Water have stated the need to undertake a hydraulic modelling assessment, which will identify the location of the point of connection for the supply of water.
- 7.3.6 Upon receipt of the Dwr Cymru asset records however, 3no Trunk Water mains have been identified in close proximity to the site. As Trunk Water mains are used to convey water from the source to a reservoir (or similar), they are typically large pipes carrying significant volumes of water.
- 7.3.7 A 600mm Trunk Main is shown to cross the roundabout of the proposed site entrance, with a 24" (600mm) and a 27" (675mm) Trunk main running adjacent to each other parallel to the A470.
- 7.3.8 Welsh Water have been asked to confirm whether any of these mains would be suitable to establish a large diameter connection from. At the reporting however, Welsh Waters response is currently pending.
- 7.3.9 Based on previous project experience, connecting to Trunk Water mains is a viable option. Should this be agreeable to Dwr Cymru, then a Point of Connection would be established from the most suitable main and a new pipe ran to site. The routing of the new infrastructure would follow the existing footpaths and highway, crossing the roundabout and entering site via the proposed vehicular entrance.
- 7.3.10 Should a connection to the Distribution network be required, then upgrades (if required) would be undertaken at key sections upstream of the network, rather than via running new extensive dedicated mains to the site (as with the power for example). It is not therefore currently envisaged that lengthily offsite works would be required to service the site in either scenario.
- 7.3.11 When laying any new infrastructure, Welsh Water would not seek to run within Greenfield or private land, nor beneath the waterway and/or railway. Infrastructure upgrades (if required) and the Point of Connection are therefore anticipated to be within the existing public footway/highway only.
- 7.3.12 The location of utilities shown within drawing 2929400-HL-LB-DR-U-900-0001 are currently taken from asset records only. A PAS128 utility survey, including trial holes where necessary, would be undertaken as required and ahead of any excavation works.
- 7.3.13 A detailed route-proving exercise for the new offsite cabling has not currently been undertaken. This would be undertaken ahead of installation of the cabling and mains at a later project design stage. Currently, a desktop review and local knowledge of the area (via the dedicated Merthyr Tydfil WPD engineering team and local developer/Client team) has been used to establish the provisional routing options for power to the site. See drawing 2929400-HL-LB-DR-U-900-0002.
- 7.3.14 As part of the route proving exercise, utility asset records would be procured across the entire offsite route and a walk-over survey undertaken to identify any possible engineering complexities across the route. A PAS128 utility survey, including trial holes where necessary, would be undertaken ahead of any excavation works.

7.4 Baseline Environment.

Existing baseline

- 7.4.1 There are existing overhead National Grid power lines that are shown to cross the southern boundary of the site. These can be seen at ground level and will be retained onsite.
- 7.4.2 There is a buried Intermediate Pressure gas main also present onsite, shown crossing the south-east corner. This main is not anticipated to be impacted by development due to its depth and location.
- 7.4.3 Offsite, there is an extensive network of existing utility infrastructure present within the public footpaths and highways.
- 7.4.4 The new site entrances will not conflict with existing utilities, and as such diversionary work is not required.
- 7.4.5 Subject to the agreed routing of the new offsite cabling and water pipe, existing utilities may be affected by the installation of additional infrastructure.

7.5 Likely Significant Environmental Effects of the Scheme.

- 7.5.1 In regard to utilities, minor environmental effects of the scheme are anticipated. All offsite works can be undertaken within the public footpath/highway using standard practises. Onsite installations are to be sympathetic to the surroundings, with considered placement, minimising their impact.
- 7.5.2 In terms of the operational energy itself, changes to Part L and the introduction of SAP 10.1 mean that by committing to an all-electric approach, there will be a significant reduction in the sites carbon footprint from operational energy when compared to a traditional or CHP gas-fired system for heating and hot water. *See Greenhouse Gases and Climate Change chapter for further detail.*

7.6 Additional Mitigation, Compensation and Enhancement Measures.

- 7.6.1 Coordination of the on and offsite routing of the new power cables, telecoms cables and water pipe to ensure that a shared utility corridor is used, where possible, to minimise excavation and materials for reinstatement.

7.7 Summary.

- 7.7.1 Consultation with the statutory utility authorities in the area has demonstrated feasibility in terms of connectivity to the local utility networks and effects on the surrounding natural environment are expected to be low. Although the full extent of the offsite works required for all services is not currently fully established, due to the location of the infrastructure being within the existing built environment (and public realm), is not anticipated that new installations following this principle would negatively impact the ecology or historic heritage of Merthyr Tydfil.
- 7.7.2 The existing onsite overhead National Grid power lines, and Intermediate Pressure gas main, will remain in situ and therefore avoid the requirement for substantial diversionary works to be undertaken.
- 7.7.3 New utility installations will avoid running within the areas of SSSI and SINCE where possible. Should utilities be required to run within these zones (and outside of any onsite walkways for example), reinstatement of the excavations back to the existing natural baseline would be advised.

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- 7.7.4 The onsite electrical infrastructure required to support the Rhydycar West development can be provided via 2no new 11kV cables terminating in 1no main intake room (located internally to a building or standalone/external). A series of smaller standard size 1MVA distribution substations would then supply the various buildings across the development. These assets can also be located within a building footprint, reducing any impact to the surrounding environment.

8.0 SUSTAINABILITY DOCUMENTS

8.1.1 The following documents are appended to this report:

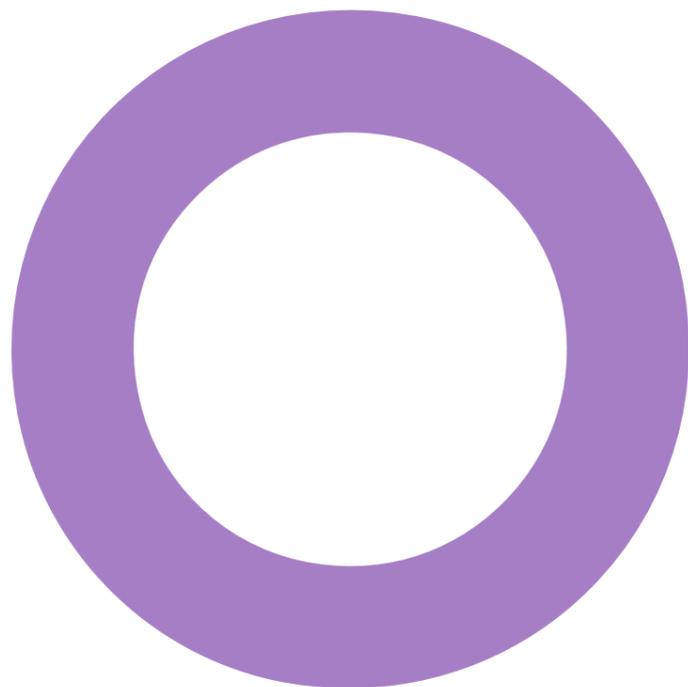
8.2 Sustainability strategy.

8.3 Sustainability charter.

**Rhydycar West.
Merthyr Tydfil.
Marvel Limited.**

SUSTAINABILITY
SUSTAINABILITY STRATEGY

REVISION 01 - 26 APRIL 2022



Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
00	07/12/2021	Draft issue for comment	S. Kamal	A. Gallotta	T. Brown
01	26/04/2022	PAC issue	R. Ayers	E. Jolly	G. Jones

This document has been prepared for Kier only and solely for the purposes expressly defined herein. We owe no duty of care to any third parties in respect of its content. Therefore, unless expressly agreed by us in signed writing, we hereby exclude all liability to third parties, including liability for negligence, save only for liabilities that cannot be so excluded by operation of applicable law. The consequences of climate change and the effects of future changes in climatic conditions cannot be accurately predicted. This report has been based solely on the specific design assumptions and criteria stated herein.

Project number: 23/24021

Document reference: REP-2324021-5A-SK-20211207-Sustainability Strategy-Rev01.docx

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Forward.

Starting with sustainability.

No longer simply ticking boxes, today sustainability is about making real-term impacts. Increasingly, it has become the starting point – and the heart – of ambitious projects. On each and every project, we take an exciting journey together with clients and project teams to help shape a more sustainable world.

A sustainability framework.

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

Stakeholder engagement.

Working with the project team we actively engage with the planning authorities, local community groups and the general public throughout the planning process. We collaborate with the client and project team as well as key stakeholders to create informed innovative strategies. Each strategy responds to the five elements of our framework, and we make sure we articulate it in an accessible and engaging way no matter the complexity.

Ahead of the industry.

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

Purpose of this report

This Sustainability Strategy has been prepared on behalf of Marvel Limited (hereafter referred to as the 'Applicant') in support of the planning application for the proposed development of Rhydycar West (hereafter referred to as the 'Proposed Development').

The Applicant is preparing proposals for the development of new leisure facilities including an indoor ski facility, hotels, lodges, and an indoor bike park on a site near Merthyr Tydfil, South Wales.

Executive Summary.

This document presents the Sustainability Strategy for the Proposed Development which has been informed by both national and local policy requirements and sustainable design and development guidance and frameworks, including, but not limited to:

- Building Regulations Part L2A
- Planning Policy Wales
- Well-being of Future Generations (Wales) Act 2015
- Merthyr Tydfil Local Development Plan 2016-2031
- Supplementary Planning Guidance Note 4 – Sustainable Design
- Supplementary Planning Guidance Note 5 – Nature and Development

The Merthyr Tydfil Local Development Plan was adopted in January 2020, superseding the previously adopted 2016 Development Plan and represents the local planning policies currently applied by the Council to inform planning applications and to enforce planning control. The Development Plan sets out the strategy to promote high quality, sustainable, and inclusive design and support measures which mitigate the predicted effects of climate change.

A number of Supplementary Planning Guidance (SPG) notes have been produced to provide further specific guidance on a number of policy and topic areas. The Sustainable Design SPG expands upon the sustainable design and development policies outlined in the Local Development Plan while the Nature and Development SPG outlines detailed guidance on ecology and biodiversity. Key themes covered in these SPGs include:

- Reducing Energy Demand
- Low and Zero Carbon Technologies
- Water Conservation and Sustainable Drainage
- Ecological Conversation

To capture the multi-faceted sustainability benefits and values that the Proposed Development can bring to the site, local community, surrounding businesses, and future building users, five defined factors – the people, the building, the social network, the natural environment, and the economic aspects – inform our proposed sustainability framework. These are summarised below:

Physical capital – “Building the future”

The Proposed Development will offer an innovative approach to achieving energy efficiency, by kick starting innovation through a baseline that is future proofed for emerging technologies and policies. Combustion free services will be utilised to not only meet good practice standards but exceed these and deliver best practice. Furthermore, there will be a focus on designing in infrastructure to enable a sustainable and active development to be created.

Social capital – “Creating local connections”

The Proposed Development seeks to encourage the access to outside space by providing a range of spaces for workers and visitors to interact with nature in a safe and secure manner. There will also be opportunities created for the local community to engage with the development.

Economic capital – “Creating new opportunities”

The Proposed Development offers a significant employment opportunity for the local community both during construction and while in operation. The Proposed Development will also advocate for exemplary standards, conditions, and opportunities throughout the construction process.

Human capital – “Healthy People”

The Proposed Development’s user mental and physical health and wellbeing are at the centre of design and specification to ensure a comfortable indoor environment is created and make the Proposed Development a place where people want to work and visit – both now and in future climates.

Natural capital – “Positive impact”

The Proposed Development aims to mitigate negative impacts on biodiversity as much as possible and smart design and conscientious operation measures will ensure the amount of waste produced both in construction and operation is kept to a minimum. The incorporation of biophilic design elements and sustainable drainage systems will ensure the site is future-proofed against a changing climate.

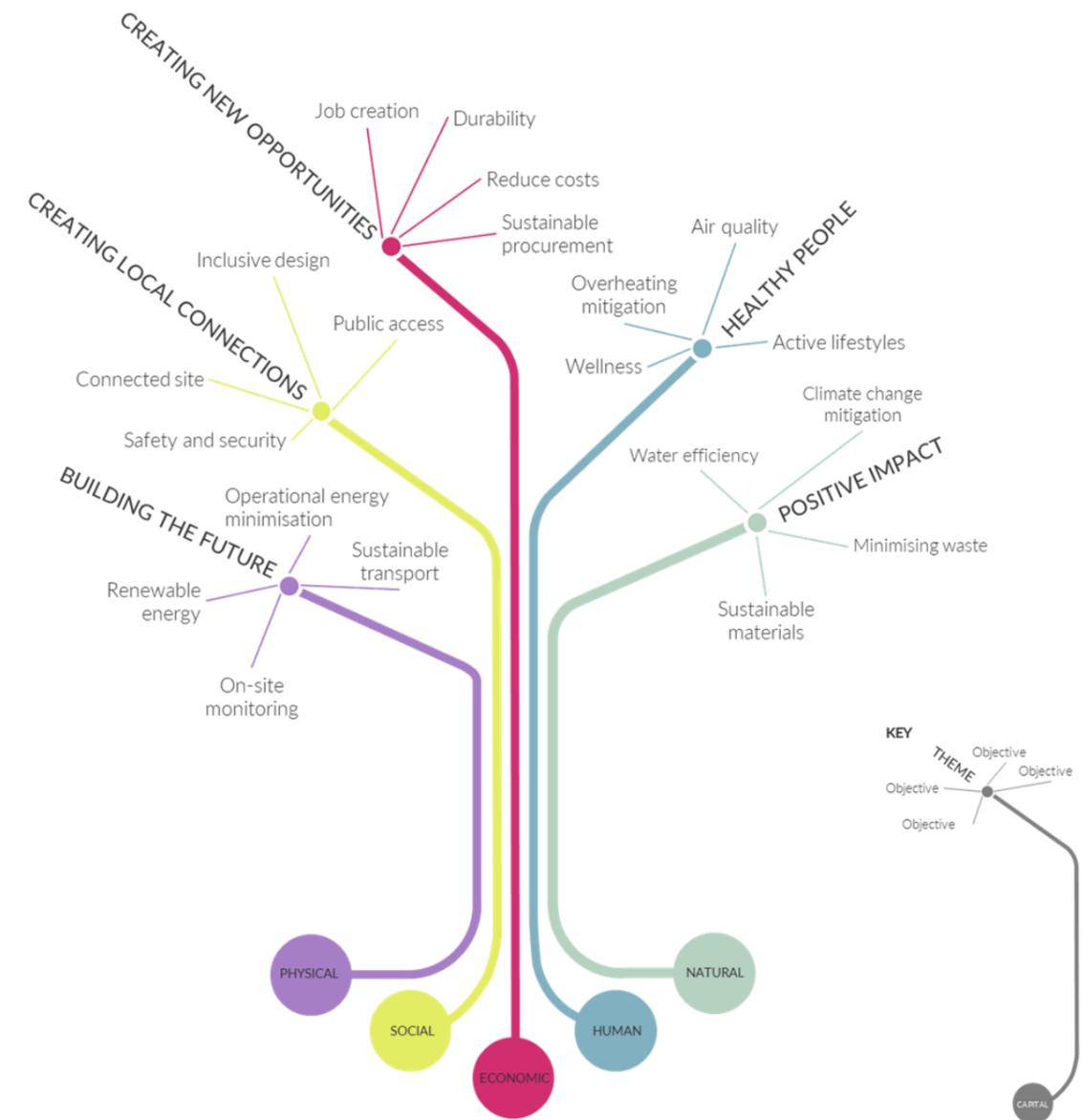


Figure 1: Approach to sustainability for Rhydyrcar West.

1. Introduction.

1.1 Purpose of this report.

This document has been prepared on behalf of the Applicant in support of the planning application with all matters reserved for subsequent approval, for the development of new leisure facilities, hereafter referred to as the 'Proposed Development', on a site near Merthyr Tydfil, South Wales.

The Sustainability Strategy summarises the pertinent regulatory and planning policies applicable to the Proposed Development and sets out how the Proposed Development addresses the relevant policy requirements.

This report outlines the proposed approach to sustainability. Refer to:

- Appendix A: for a detailed review of the relevant planning policy requirements.

1.2 Description of the development.

The Applicant is preparing proposals for the development of Rhydycar West, a new leisure facility comprising of an indoor ski facility, waterpark, two hotels, lodges, and an indoor bike park, located near Merthyr Tydfil, South Wales.

2. Overview of Policies and Drivers.

A review of the pertinent policy and sustainability drivers related to the development has been undertaken and the key findings are outlined below. National and local policies have been reviewed.

2.1 Relevant national and local policies.

Merthyr Tydfil Local Development Plan 2016-2031

The Local Development Plan represents the local planning policies currently applied by the Council to inform the determination of planning applications in the borough and enforce planning control. It was adopted by the council in January 2020, superseding the previously adopted 2016 Development Plan. Amongst other things, the Local Development Plan sets out the strategy to promote high quality, sustainable and inclusive design and support measures which mitigate the predicted effects of climate change.

In addition to the Local Development Plan, there are a number of Supplementary Planning Guidance (SPG) notes that have been issued by the Council. Of particular relevance are SPGs 4 and 5, which cover Sustainable Design and Nature and Development respectively.

Building Regulations Part L

The Proposed Development is being assessed against the Building Regulations Part L2A 2014: for use in Wales. Part L has five key criteria which must be satisfied as follows:

- **Criterion 1** - Achieving the Target Emission Rate (TER) and Target Primary Energy Consumption (TPEC).
- **Criterion 2** - Limits on design flexibility.
- **Criterion 3** - Limiting the effects of solar gains in summer.
- **Criterion 4** - Building performance consistent with the Building Emission Rate (BER).
- **Criterion 5** - Provision for energy efficient operation of the building.

An update to Part L is due in summer 2022, with Part L2021 being adopted as an interim uplift of standards until the full adoption of the Future Homes Standard and the Future Buildings Standard in 2025.

Well-being of Future Generations (Wales) Act 2015

The Act, which received Royal Assent on the 29th April 2015, requires public bodies to consider the long term; to work more effectively with people, communities and each other; to look at problem prevention and to take a more joined-up approach. It gives a legally binding common purpose – seven well-being goals – for national and local government as well as local health boards and other public bodies. These seven goals are:

- A prosperous Wales
- A resilient Wales
- A healthier Wales
- A more equal Wales
- A Wales of cohesive communities
- A Wales of vibrant culture and thriving Welsh language
- A globally-responsible Wales.

Planning Policy Wales

Planning Policy Wales (PPW) sets out the planning policies for the Welsh Government. PPW together with a series of Technical Advice Notes, Welsh Government Circulars, and policy clarification letters provide the national planning policy framework for Wales.

The purpose of the PPW is to ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental and cultural well-being of Wales, as required by the Planning (Wales) Act 2015, the Well-being of Future Generations (Wales) Act 2015 and other key legislation and resultant duties such as the Socio-economic Duty.

Future Wales – The National Plan 2040

Future Wales – The National Plan 2040 sets the direction for development in Wales and contains a strategy for addressing key national priorities through the planning system, including sustaining and developing a vibrant economy, achieving decarbonisation and climate-resilience, developing strong ecosystems and improving the health and well-being of our communities.

Future Wales supports:

- Places which are decarbonised and climate-resilient
- Delivering renewable and low carbon energy
- Sustainable travel
- Strengthening ecosystems and biodiversity
- Healthier places
- Vibrant rural areas
- Sustainable development choices
- Green infrastructure
- Thriving Welsh language

3. Approach to Sustainability.

The following strategy addresses a wide range of sustainability subject areas and covers various headline sustainability categories. The strategy confirms the applicable policies and measures of sustainability that will be implemented at the Proposed Development.

The design of the Proposed Development is based on sustainable design and construction principles as informed by planning requirements and industry best practice. It is on this basis that we are utilising a sustainability framework based on five defined factors; i.e., the people, the buildings, the social network, the natural environment, and the economic aspects as illustrated in Figure 3 to capture the multi-faceted sustainability benefits and values that the proposed development could bring to the:

- Application Site,
- Local community,
- Surrounding businesses, and
- Future building users.

The original idea for the five capitals was introduced by Forum for the Future and it was designed to assist organisations to develop a vision of what sustainability looks like for their operations, products, and services. We have embraced this approach as it promotes a holistic, interdisciplinary approach to sustainability which is aligned with our understanding of sustainable development. Our strategy is based on the concept of realising real term social, economic, and environmental benefits to all stakeholders and investors and thereby generating value and wealth in the communities we create.

The Delivery Framework

Working with all key stakeholders, an overall vision for the development has been defined. Workshops have been held in collaboration with the client and project team to help create a charter including innovative initiatives and key objectives to be delivered as a result of the project. As illustrated in Figure 2 and Figure 3 the strategy responds to the five elements of our defined framework; and is intended that the agreed objectives are tracked and monitored throughout project delivery and operational phases.

Environmental Assessment

In line with local policy drivers and the Applicant’s sustainability aspirations, a BREEAM New Construction pre-assessment has been produced, highlighting how the office spaces of the Proposed Development intend to achieve BREEAM ‘Excellent’. Please refer to Appendix B for summary pre-assessment report with a schedule of the targeted credits and anticipated performance score.

Health and Wellbeing Assessment

The Proposed Development seeks to deliver a healthy indoor and outdoor environment in order to promote physical and mental health.

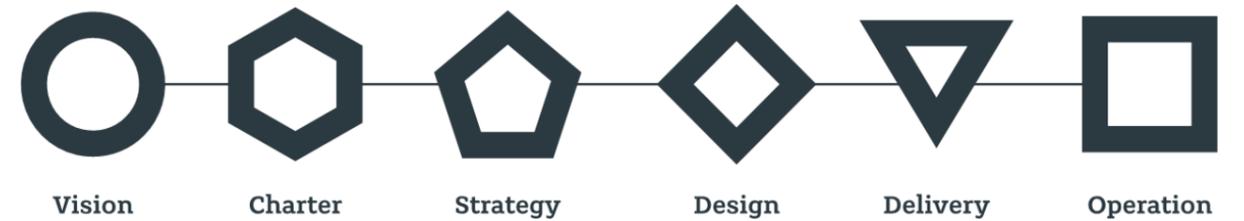


Figure 2: Sustainability strategy – Delivery phase (inception to completion).

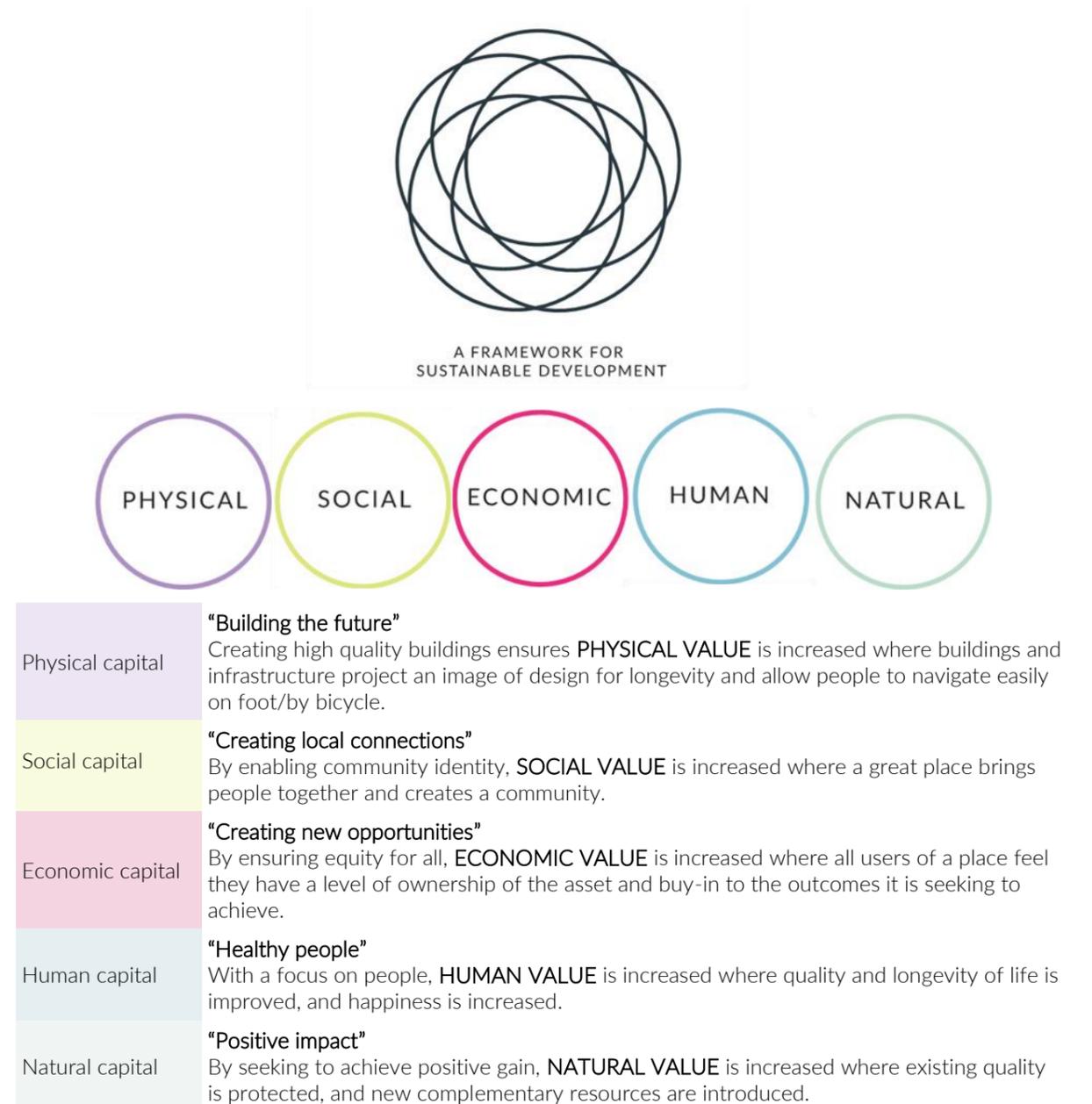


Figure 3: Proposed framework for sustainability – Creating value.

4. Sustainability Strategy.

The design of the Proposed Development is based on high sustainability aspirations and is compliant with industry best practice. In addition, it also attempts to push the boundaries of conventional construction by deploying innovative methods and approaches during design and construction. The strategy for the Proposed Development addresses key sustainability challenges and opportunities, responds to the requirements of the applicable policies, and implements the Applicant's aspirations.

It embraces the Five Capitals framework, responding to the challenges of climate, biodiversity and health and wellbeing, UN sustainable development goals and Applicant vision, aiming to create long term value and generate a flow of environmental, social, and economic benefits. Each Capital has been contextualised to the specific needs, challenges and opportunities arising from the Proposed Development, resulting in five themes as follows:

- Physical capital - Building the future
- Social capital - Creating local connections
- Economic capital - Creating new opportunities
- Human capital - Healthy people
- Natural capital - Having a positive impact

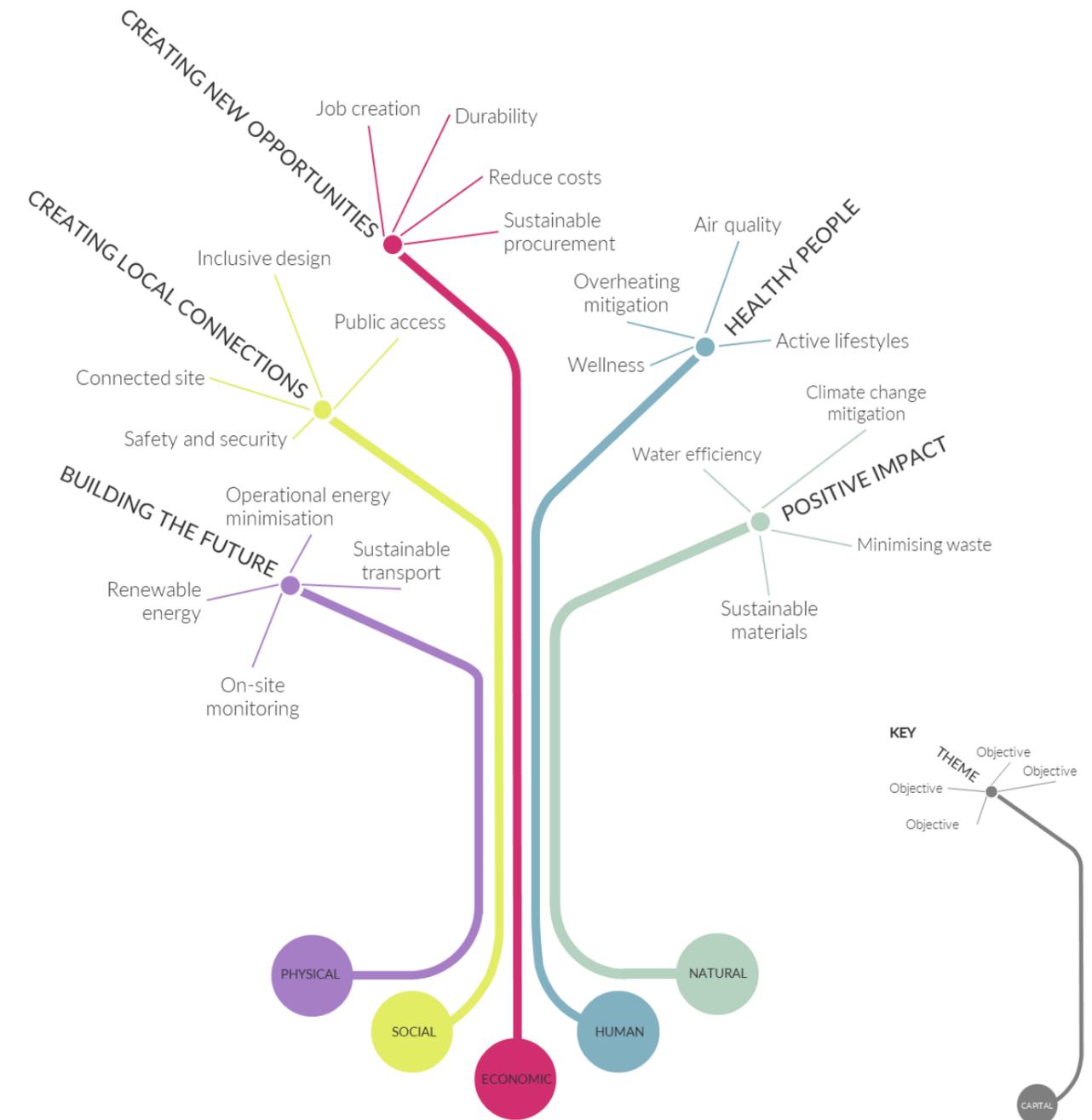
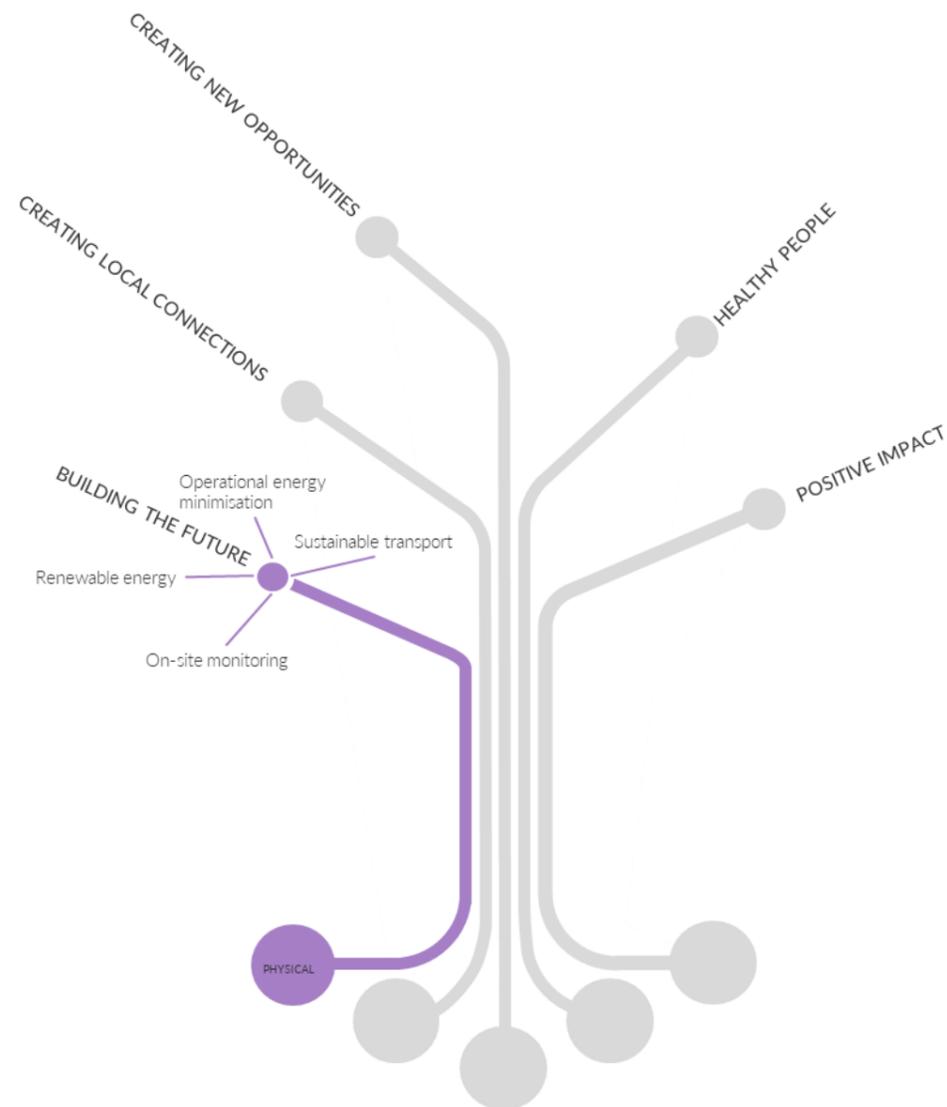


Figure 4: Illustration of the sustainability strategy highlighting key themes and areas.

4.1 Physical capital – “Building the future”.



On-site monitoring

Effective energy metering will be enabled by the provision of suitable infrastructure within the buildings services systems. This will enable energy usage of the systems to be monitored, and the system performance optimised. Electrical and thermal meters will be provided on the main systems, providing data on plant energy consumption throughout the year.

This is in line with Merthyr Tydfil County Borough Council Local Development Plan Policy SW11 and the Sustainable Design SPG Section 4 and 5.

Renewable energy

The use of renewable energy and innovative technologies, such as the installation of PV panels will be maximised in the Proposed Development. Utilising a range of renewable energy solutions will facilitate a significant reduction in CO₂ emissions, which not only mitigates the impact on climate change but also feeds into the wider net carbon zero strategy.

This is in line with Merthyr Tydfil County Borough Council Local Development Plan Policy SW11 and EcW8 and the Sustainable Design SPG Section 5.

Sustainable travel

The Proposed Development will be developed to enable and encourage sustainable modes of transport to and from the site. Infrastructure such as secure cycle storage and dedicated pedestrian footpaths will be designed in to ensure the uptake of active and healthy modes of travel.

A proportion of car parking spaces will have electric vehicle charging points in anticipation of the uptake of electric personal vehicle ownership in the future.

This is in line with Merthyr Tydfil County Borough Council Local Development Plan Policy SW12 and the Sustainable Design SPG Section 6.

Considerations towards Net Zero Carbon

Considering the continued decarbonisation projected for the UK electricity grid, the discrepancy between building regulations and reality is set only to worsen. With an update planned to Part L, it is important for developers and designers to design not only for compliance, but for future decarbonisation.

This drives us towards electrical servicing strategies. With the carbon factor for electricity being significantly lower than natural gas and the gap set to widen, an electric servicing strategy offers reduced carbon emissions both now and, in the future, particularly if using an efficient heating system such as a heat pump.

Electric strategies also provide the only feasible route to net zero emissions. With the carbon factor for electricity set to reduce to below 100 gCO₂/kWh by 2035, through demand reduction and renewable generation, it will be possible to completely offset the operational emissions of a future building.

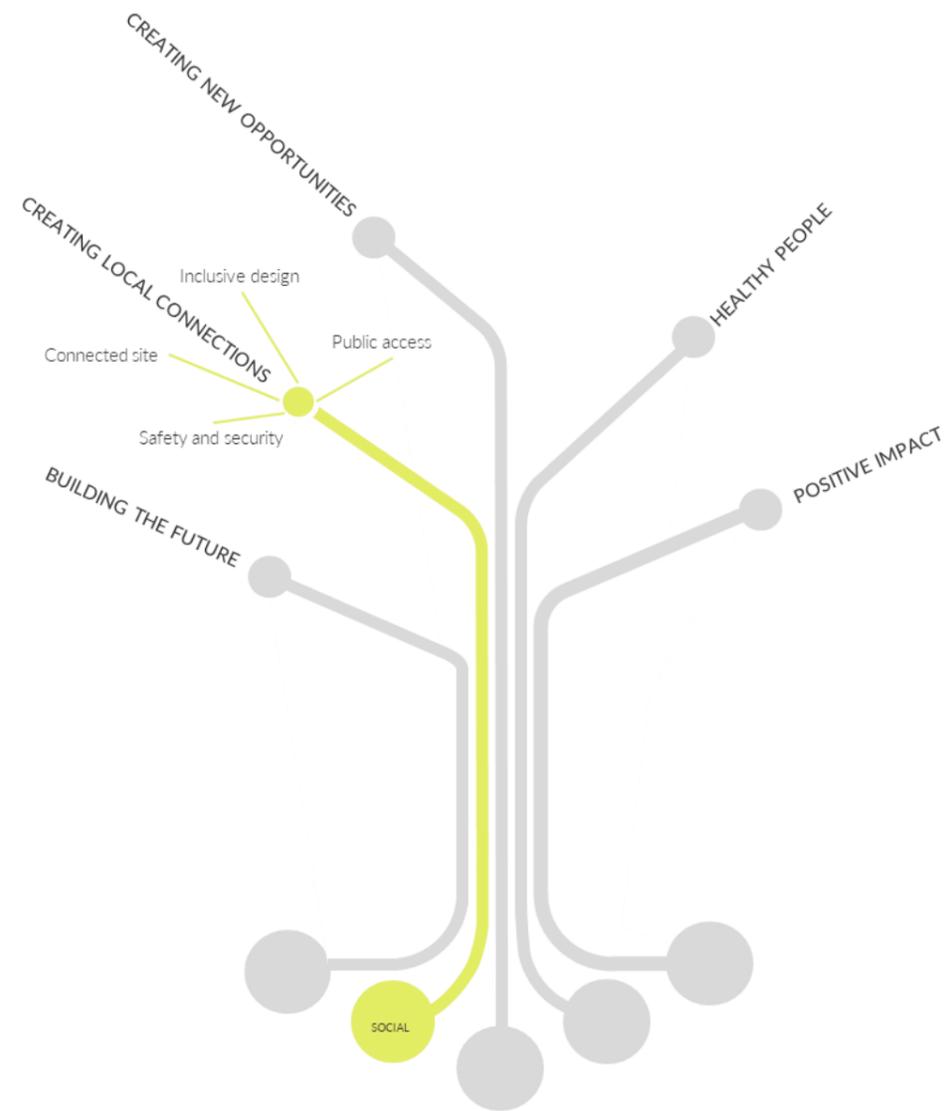
This is in line with Merthyr Tydfil County Borough Council Local Development Plan Policy SW11 and EcW8 and the Sustainable Design SPG Section 5.

Energy Efficiency

The Proposed Development seeks to achieve energy efficiency, through the design of a good fabric performance. To achieve this, the u-value of key fabric elements will be looked at closely and improved as far as possible. In addition, the air permeability of the building will be kept to a minimum through careful design of the different junctions. This, together with careful design and specification of systems will ensure lower energy consumption related to heating, cooling and ventilation and therefore reduce the carbon emissions of the building.

This is in line with Merthyr Tydfil County Borough Council Local Development Plan Policy SW11 and the Sustainable Design SPG Section 4.

4.2 Social capital – “Creating local connections”.



Connected site

The Proposed Development seeks to not only enhance the connectivity to the existing site, but also to the wider community and natural area. Footpaths and bicycle paths will be incorporated to ensure access to nature and outside space.

This is in line with Merthyr Tydfil County Borough Council Local Development Plan Policy SW12 and the Sustainable Design SPG Section 6.

Safety and security

Safety and security will be at the heart of the design in order to create spaces that take into account security needs to ensure occupants safety and wellbeing. Safe access to the site for pedestrians and cyclists will be ensured through the provision of dedicated and safe cycle paths and footpaths on and around the site. These will provide suitable links from the site entrance or the car parks to the building entrances. Pedestrian drop off areas will be designed off, or adjoining to, the access road and will provide direct access to other footpaths. Finally, special attention will be paid to ensuring that vehicle delivery access does not cross or share pedestrian and cyclist paths or outside amenity areas accessible to building users and general public.

This is in line with Merthyr Tydfil County Borough Council Local Development Plan Policy SW11.

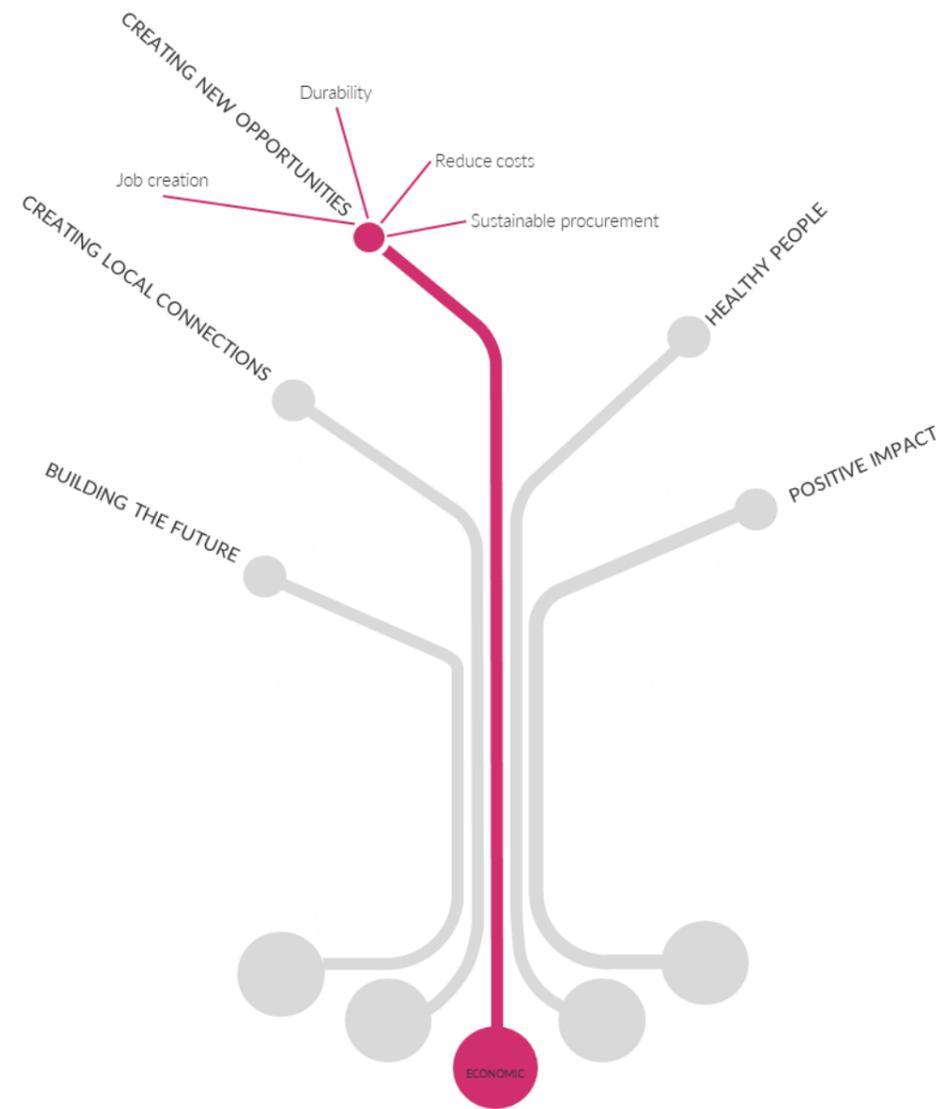
Inclusive design

The Proposed Development seeks to enable community identity and social cohesion through placemaking. This includes design decisions enabling the integration of people with different needs and abilities such as wheelchair and pushchair access, highly visible doors, and automatic doors. Moreover, the project introduces flexible spaces that provide a human scale layout. The transformation of the existing site into a modern complex is designed to bring life into the space for the benefit of its immediate users and the surrounding area.

The scheme will add value to the local community, its activities and economic outputs by taking a holistic view on the short- and long-term needs of occupants and the wider community.

This is in line with Merthyr Tydfil County Borough Council Local Development Plan Policy SW11 and SW12.

4.3 Economic capital – “Creating new opportunities”.



Creation of jobs

The Proposed Development is expected to enable sustainable growth for the local area and the surrounding region, through the creation of new full-time equivalent jobs during construction and other opportunities for harnessing local talent.

Moreover, the Proposed Development is expected to act as a significant employer, with the creation of jobs when in operation, which includes opportunities at all levels including apprentices and placements.

This is in line with Merthyr Tydfil County Borough Council Local Development Plan Policy EcW7.

Durability

The design of the Proposed Development will aim at optimising the use of materials during all stages of the project which will result in reducing environmental impacts. The Proposed Development will incorporate durable materials with suitable protections, preventing damage and limiting degradation due to environmental factors such as climate change. This in turn will mean there will be less of a need for long term maintenance and replacement, leading to lower running costs and maximised material optimisation.

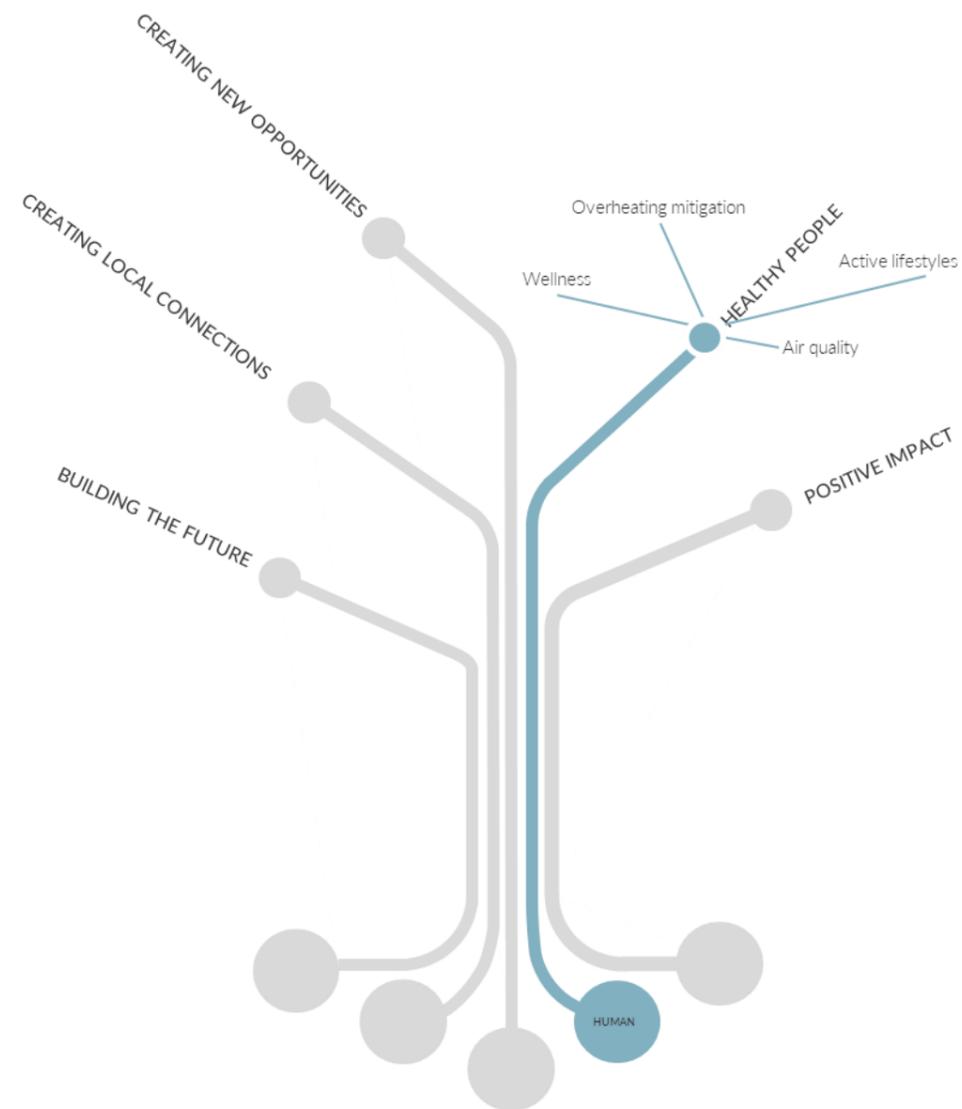
This is in line with Merthyr Tydfil County Borough Council Local Development Plan Policy SW11.

Local procurement

To deliver whole life value and promote economic sustainability, the use of local workforce and local suppliers during construction and operation will be encouraged. More specifically, the Proposed Development will prioritise local suppliers, where possible. Apart from the obvious benefit of supporting local business, local procurement offers a wide range of other potential advantages including greater control over the supply chain, higher levels of flexibility and predictability, lower environmental footprint, and reduced supply chain cost.

This is in line with Merthyr Tydfil County Borough Council Local Development Plan Policy SW11.

4.4 Human capital – “Healthy people”.



Active design

The natural environment will be incorporated into the design of the Proposed Development, both internally and externally, and building users will have safe access to green spaces through the innovative design of paths and accessways. This will promote walking and cycling around the site while enjoying the local community and open spaces which benefits health and wellbeing. Sufficient cycle storage will be provided on site as well as cyclists facilities such as lockers, showers, changing rooms, etc, for all users in order to encourage activity, which is known to be beneficial for both physical and mental health.

This is in line with Merthyr Tydfil County Borough Council Local Development Plan Policy SW10 and SW12 and the Sustainable Design SPG Section 6.

Human-Centric Design

Human capital incorporates a wide range of considerations relating to health, knowledge, skills, intellectual outputs, motivation and capacity for relationships of the individual. The Proposed Development aims to create a positive and healthy place that actively promotes the wellbeing and productivity of its building users.

Excellent levels of thermal comfort will be achieved by designing and testing key areas at risk of overheating and levels of daylight will be designed with the building’s users’ visual comfort in mind.

The Proposed Development will achieve the appropriate acoustic performance standards and testing requirements criteria for the acoustic principles of sound insulation, indoor ambient noise level and reverberation times. A noise impact assessment will be undertaken to ensure a comfortable environment for building users allowing for productivity and wellbeing.

Acceptable access to daylight will be ensured through design, and the risk of glare will be designed out through the implementation of a glare control strategy. Areas identified as presenting a risk of glare, that could be a potential burden for building users, will have mitigation steps taken where necessary and appropriate.

A healthy environment will also be provided through good indoor air quality. This will be achieved by specifying low VOC level products for interior finishes such as paints and coatings, flooring materials, ceiling, walls and acoustic and thermal insulation materials, adhesives and sealants, wood-based products, etc. The formaldehyde and VOCs concentration in indoor air will also be measured post construction in order to ensure that maximum levels specified by the World Health Organization guidelines for indoor air quality: Selected pollutants, 2010 are not exceeded.

This is in line with Merthyr Tydfil County Borough Council Local Development Plan Policy SW11.

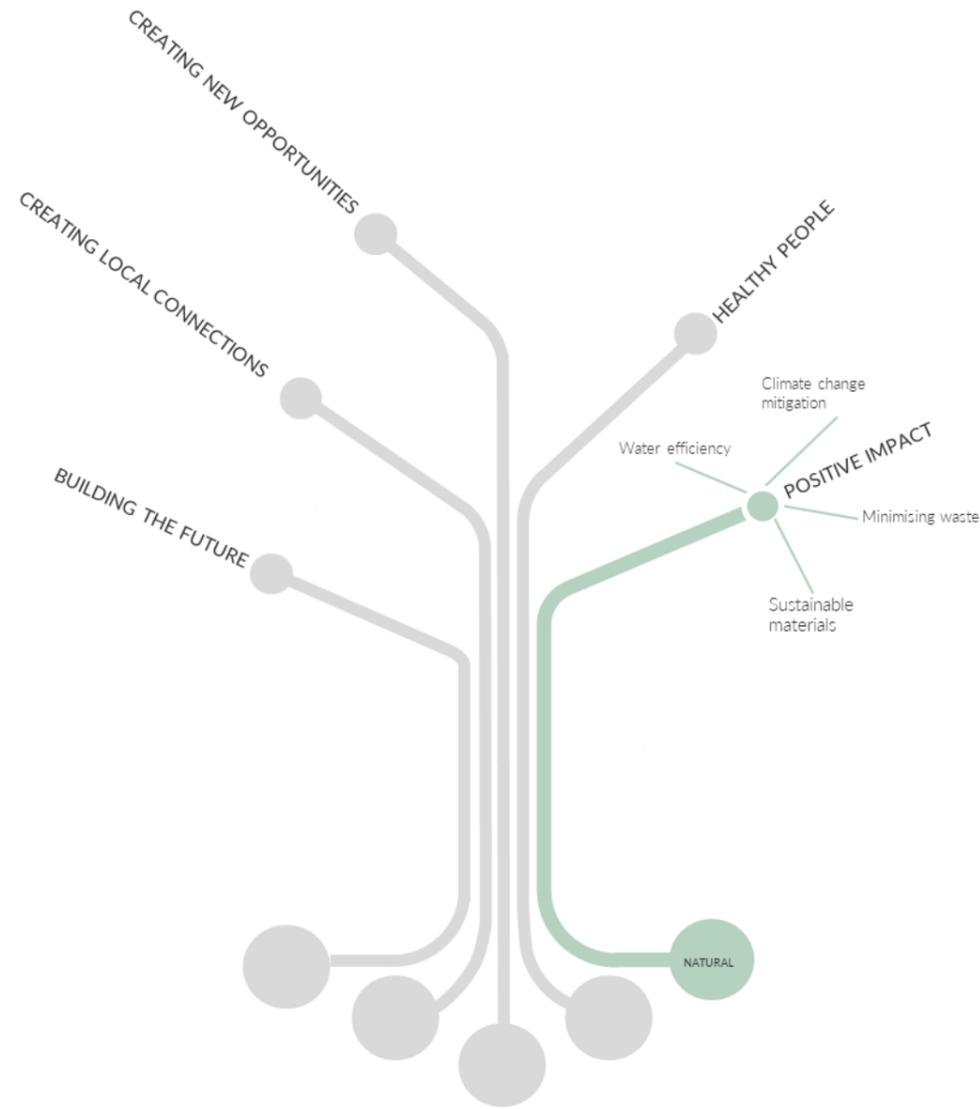
User wellness

The Proposed Development will seek to provide a positive user experience through continuous monitoring of the building performance and the building users experience will be enhanced through the provision of controls, allowing them to adapt their environment to their needs.

Additionally, mental health awareness, support, and access to mental health first aiders will be provided to all employees of the Proposed Development.

This is in line with Merthyr Tydfil County Borough Council Local Development Plan Policy SW11.

4.5 Natural capital – “Positive impact”.



Waste prevention and mitigation

Sustainable design and construction practices will be implemented to reduce the impact the construction process has on the environment, and to minimise the amount of waste produced.

This is in line with Merthyr Tydfil County Borough Council Local Development Plan Policy SW11 and EcW10 and the Sustainable Design SPG Section 9.

Biodiversity

The Proposed Development will aim to create a distinctive space which integrates the built and natural environment, seamlessly bridging the gap between people and nature. Negative impacts on biodiversity will be mitigated as much as possible during the construction process whereby a biodiversity net gain will be proposed as additional target, and aspects of nature and biophilia will be incorporated internally within the buildings.

This is in line with Merthyr Tydfil County Borough Council Local Development Plan Policy EnW1, EnW2, EnW3 and EnW4, the Sustainable Design SPG Section 10, and the Nature and Development SPG.

Sustainable materials

The use of reused and recycled materials and sustainable procurement practices will be promoted during the construction process. This not only helps to reduce material demand but also reduces the amount of waste produced. The Circular Economy principles will be also considered during both the design and construction stages.

The diversion of waste from landfill will be encouraged through the construction process and the use of sustainably and responsibly sourced timber products will be encouraged.

This is in line with Merthyr Tydfil County Borough Council Local Development Plan Policy SW11 and EcW10 and the Sustainable Design SPG Section 8 and 9.

Water efficiency

Reducing the consumption of water, both in use and during construction will be a key focus of the design. Rainwater/greywater harvesting and recycling will be implemented across the Proposed Development and the consumption of water will be reduced through the specification of sanitaryware.

A Flood Risk Assessment of the site will be carried out to better inform planning decisions. Additionally, the use of permeable paving in parking areas is being considered, to be confirmed based on the findings from the drainage report.

This is in line with Merthyr Tydfil County Borough Council Local Development Plan Policy EnW1 and EnW4 and the Sustainable Design SPG Section 7 and 10.

5. Conclusion.

This report presents the Sustainability Strategy for the Proposed Development which has been informed by national and local policy requirements, the Applicant’s vision and sustainable design and development guidance and frameworks including, but not limited to:

- Building Regulations Part L2A
- Planning Policy Wales
- Well-being of Future Generations (Wales) Act 2015
- Merthyr Tydfil Local Development Plan 2016-2031
- Supplementary Planning Guidance Note 4 – Sustainable Design
- Supplementary Planning Guidance Note 5 – Nature and Development

To capture the multi-faceted sustainability benefits and values that the proposed development can bring to the site, local community, surrounding businesses, and future building users, five defined factors – the people, the building, the social network, the natural environment, and the economic aspects – inform our proposed sustainability framework. These are summarised below:

Physical capital	<ul style="list-style-type: none"> – Implement fabric first approach and maximising the use of renewable energy. – Enhancement of walking and cycling facilities around the site.
Social capital	<ul style="list-style-type: none"> – Designs which encourage access to outside space and nature. – Create opportunities for the local community to engage with the development – Create spaces that take into account security needs to ensure occupants safety and wellbeing.
Economic capital	<ul style="list-style-type: none"> – An employment opportunity providing jobs for local people and companies. – Promote and enhance exemplary standards, conditions, and opportunities. – Create jobs and opportunities for local people during the construction stage.
Human capital	<ul style="list-style-type: none"> – Create a healthy environment for people to visit and work. – Design in infrastructure to enable active and healthy lifestyles. – Support mental health and wellbeing of employees on site.
Natural capital	<ul style="list-style-type: none"> – Minimising waste during construction and operation. – Mitigate negative impacts on biodiversity and the natural environment. – Utilise design to future proof against the impacts of climate change.

Appendix A – Policy Context.

National Policy

This section covers nationwide policy for the UK and specifically Wales. Both the UK and Welsh Governments have declared a climate emergency.

Building Regulations Part L.

The building is being assessed against the Building Regulations Part L2A 2014: for use in Wales. Part L has five key criteria which must be satisfied as follows:

- **Criterion 1** - Achieving the Target Emission Rate (TER) and Target Primary Energy Consumption (TPEC).
- **Criterion 2** - Limits on design flexibility.
- **Criterion 3** - Limiting the effects of solar gains in summer.
- **Criterion 4** - Building performance consistent with the Building Emission Rate (BER).
- **Criterion 5** - Provision for energy efficient operation of the building.

Criterion 1 of the Building Regulations Part L 2014: for use in Wales requires that the building as designed is not anticipated to generate CO₂ emissions in excess of that set by a Target Emission Rate (TER) calculated in accordance with the approved the National Calculation Methodology (NCM) 2013 for non-dwellings. Furthermore, the Proposed Building BPEC (Building Primary Energy Consumption) needs to be lower than the TPEC (Target Primary Energy Consumption).

Criterion 2 places upper limits on the efficiency of controlled fittings and services.

Criterion 3 requires that zones in commercial buildings are not subject to excessive solar gains. This is demonstrated using the National Calculation Methodology (NCM) 2013.

Proposed changes to Part L.

Part L2021 is due to be adopted in June 2022 as an interim uplift of standards en route to the adoption of the Future Homes Standard and Future Buildings Standard.

A transitional period will be available for 12 months from this date that will allow continued use of Part L2013 but will require commencement works and submission of initial building notice by June 2022 for this to be enabled. For the purpose of this issue, commencement works include:

- Drainage works
- Excavation / trench foundations
- Digging out and prep for raft foundations
- Piling, boring or piles or pile driving.

Unlike previous transitional periods associated with changes to Part L, for June 2022-June 2023, this only applied on a building level rather than site level.

The Future Homes Standard and Future Building Standard will then be adopted in 2025.

Well- Being of Future Generations (Wales) Act 2015

The Act, which received Royal Assent on the 29th April 2015, requires public bodies to consider the long term; to work more effectively with people, communities and each other; to look at problem prevention and to take a more joined-up approach. It gives a legally binding common purpose – seven well-being goals – for national and local government as well as local health boards and other public bodies. These seven goals are:

- A prosperous Wales
- A resilient Wales
- A healthier Wales
- A more equal Wales
- A Wales of cohesive communities
- A Wales of vibrant culture and thriving Welsh language

- A globally- responsible wales.

It is through this act that Wales is set to make its contribution to the achievement of the 17 United Nations Sustainable Development Goals.

Planning Policy Wales.

Planning Policy Wales (PPW) sets out the planning policies for the Welsh Government. The PPW together with a series of Technical Advice Notes, Welsh Government Circulars, and policy clarification letters provide the national planning policy framework for Wales.

The purpose of the PPW is to “ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental and cultural well-being of Wales, as required by the Planning (Wales) Act 2015, the Well-being of Future Generations (Wales) Act 2015 and other key legislation and resultant duties such as the Socio-economic Duty.”

Relevant key information to note:

Everyone engaged with the planning system in Wales should make placemaking decisions which create sustainable places and improve wellbeing. Goals are:

- To create places which are “attractive, sociable, accessible, active, secure, welcoming, healthy and friendly.” With the aim to bring people together and improve well-being for all.
- To choose locations which encourage sustainable and active travel
- To respect the local landscape and culture

Planned developments should factor in making a sustainable contribution to the local area and play their role in tackling the climate emergency, to achieve this, plans should:

- Enhance biodiversity, minimise pollution, minimise emissions and protect the local environment
- Use renewable and low carbon energy sources and reduce energy demand wherever possible
- Maintain and advance green infrastructure
- Sustainably manage the use of local resources including water, take design decisions to reduce waste, reuse and recycle waste wherever possible

Plans should also be resilient to the effects of climate change and future challenges such as:

- Flooding, land contamination and instability, coastal change

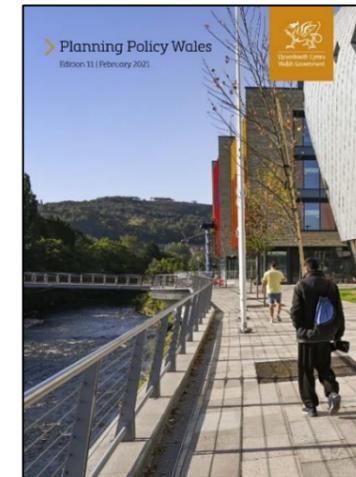


Figure 5: Planning Policy Wales

Future Wales – The National Plan 2040.

Future Wales – The National Plan 2040 sets the direction for development in Wales and contains a strategy for “addressing key national priorities through the planning system, including sustaining and developing a vibrant economy, achieving decarbonisation and climate-resilience, developing strong ecosystems and improving the health and well-being of our communities.”

Future Wales supports:

- Places which are decarbonised and climate-resilient
- Delivering renewable and low carbon energy
- Sustainable travel
- Strengthening ecosystems and biodiversity
- Healthier places
- Vibrant rural areas
- Sustainable development choices
- Green infrastructure
- Thriving Welsh language



Figure 6: Future Wales - The National Plan 2040

Local Policy

Merthyr Tydfil Local Development Plan 2016 - 2031

The Local development plan represents the local planning policies currently applied by the Council to inform the determination of planning applications in the Borough and enforce planning control. It was adopted by the council in January 2020, superseding the previously adopted 2016 Development Plan.

This section summarises the local and national planning policy relating to energy and sustainability. The following documents have been reviewed:

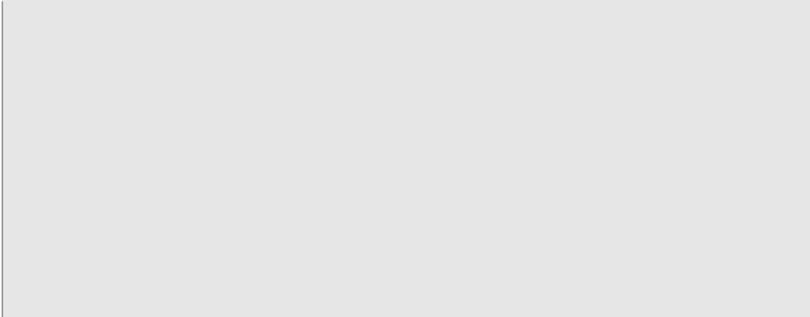
- Merthyr Tydfil Local Development Plan 2006-2021 (adopted in 2011)
- The Environment (Wales) Act, 2016
- Planning Policy Wales (Edition 11)
- Well-being of Future Generations (Wales) Act, 2015
- Welsh Government Part L2A

Table 1: Policy Context Review

Sustainability Theme	Policy Document		
	Merthyr Tydfil Local Development Plan	The Environment (Wales) Act, 2016, Planning Policy Wales (Edition 10), Well-being of Future Generations (Wales) Act, 2015	Welsh Government Part L2A
Building Performance 	<p>Policy BW7: Sustainable design and placemaking The Council requires all new development to:</p> <ul style="list-style-type: none"> - minimise the demand for energy and, where appropriate, utilise renewable energy resource - adopt energy conservation/ efficiency measures <p>Policy TB7: Renewable Energy Development proposals that meet national and local renewable energy targets will be viewed favourably if:</p> <ul style="list-style-type: none"> - They do not have an acceptable impact on biodiversity and landscape including the setting of the Brecon Beacons National Park - For wind turbines, their capacity does not exceed 25 MW on urban and industrial brownfield, and 5MW elsewhere - They do not have an unacceptable impact on the amenity of residential areas 	<p>The Environment (Wales) Act, 2016 The Act received Royal Assent on 21st March 2016, providing new legislation to manage the natural resources of Wales proactively and sustainably. The Act also tasks Welsh Ministers with setting targets to reduce greenhouse emissions and the setting of carbon budgets.</p>	<p>Section 3 – Criterion 1</p> <p>Regulation 26 CO₂ emissions rates (Building Primary Energy Consumption (BPEC) and Building CO₂ Emissions Rate (BER)) for new buildings are not to exceed targets (TBEC and TER) set out in regulation 25. These are both to be calculated and expressed in accordance to regulation 24.</p> <p>Regulation 25A Before construction, technical, environmental and economic feasibility of high-efficiency alternative systems must be considered, including:</p> <ul style="list-style-type: none"> - Decentralised energy supply based on renewables - Cogeneration - District or block heating and cooling - Heat pumps <p>The person carrying out the work must submit notice to the local authority which detail and document these considerations to allow for official verification and inspection.</p> <p>Section 4 – Criterion 2 Limits on design flexibility Reasonable provisions should be made for the conservation of fuel and power in buildings by:</p> <ul style="list-style-type: none"> - Limiting heat gains and losses <ul style="list-style-type: none"> - Through thermal elements and building fabric - From pipes, ducts and vessels used for heating, cooling and hot water services - Providing fixed building services which <ul style="list-style-type: none"> - Are energy efficient - Have effective controls to enable achievement of reasonable standards - energy meters should be installed so that occupier can assign at least 90% of estimated annual energy consumption to a fuel. - Are commissioned by testing and adjusting for only necessary fuel and power consumptions

			<p>Approved software tools should be used to produce list of specifications and highlight the features of the design critical to achieving compliance, alongside BPEC/TPEC and BER/TER figures.</p> <p>SECTION 5 – Criterion 3 Reasonable provisions should be made to limit overheating in new buildings from solar and other heat gains.</p> <p>Section 6 – Criterion 4 In order to keep construction consistent with the BPEC and BER, it should be demonstrated with evidence that:</p> <ul style="list-style-type: none"> - Thermal bypasses are limited - Insulation is reasonably continuous over the whole building - Air permeability is within reasonable limits. To be in compliance, air permeability should be no worse than $10m^3/(h.m^2)$ at 50 Pa. <p>All non-domestic building should be pressure tested unless the building is less than 500 m^2 total useful floor area, a factory-made modular building, large extensions or large complex building.</p>
<p>Water & Drainage</p> 	<p>Policy BW7: Sustainable design and placemaking The Council requires all new development to:</p> <ul style="list-style-type: none"> - adopt water conservation/efficiency measures <p>Policy BW8: Development and the water environment Proposal for development will only be permitted where:</p> <ul style="list-style-type: none"> - they do not have adverse effects on the quality and/or quantity of water surfaces or groundwater resources - adequate water and sewerage systems exist or are reasonably accessible or capable of being provided prior to the development becoming operational - Sustainable drainage systems (SuDS) are used for the disposal of surface water. Alternative methods only considered if SuDS proven inappropriate for practical or environmental reasons 		
<p>Flood Risk</p> 	<p>Policy BW8: Development and the water environment Proposal for development will only be permitted where:</p> <ul style="list-style-type: none"> - identified river floodplains are avoided 		
<p>Waste</p> 	<p>Policy BW7: Sustainable design and placemaking The Council requires all new development to:</p> <ul style="list-style-type: none"> - Incorporate facilities for the segregation, recovery and recycling of waste 	<p>Planning Policy Wales (Edition 11) There have been several updated, amended or wholly new Technical Advice Notes (TANs) affiliated with PPW, including:</p> <ul style="list-style-type: none"> - TAN 21: Waste (February 2017) <p>The new and/or updated TANs, in addition to the updated PPW, will require substantial consideration throughout the revision process, in order to ensure that any revised LDP is compliant with national planning policy.</p>	

<p>Materials</p> 	<p>Policy BW7: Sustainable design and placemaking The council requires all new developments to incorporate resource efficient/ adaptable buildings and layouts using sustainable design and construction techniques</p>	<p>The Environment (Wales) Act, 2016 The Act received Royal Assent on 21st March 2016, providing new legislation to manage the natural resources of Wales proactively and sustainably... It further introduces new powers to increase the amount of materials for recycling, as well as improving the quality of materials to be recycled.</p>	
<p>Biodiversity</p> 	<p>Policy BW5: Natural Heritage In order to protect and support the enhancement of the County Borough's natural heritage, development proposals will only be permitted where they maintain, enhance and do not harm:</p> <ul style="list-style-type: none"> - Landscape character of the countryside - National and local nature conservation designations - Trees, woodlands and hedgerows that have natural heritage value - Other biodiversity interests such protected and priority species ad ecological networks 	<p>The Environment (Wales) Act, 2016 The Act received Royal Assent on 21st March 2016, providing new legislation to manage the natural resources of Wales proactively and sustainably. The Act includes a new biodiversity duty that aims to aid the reversal of decline and secure the long-term resilience and future of biodiversity in Wales.</p> <p>Well-being of Future Generations (Wales) Act, 2015 Under the act developments must support a resilient Wales described as a nation which maintains and enhances a biodiverse natural environment with healthy functioning eco systems.</p>	
<p>Transport</p> 	<p>Policy BW12: Development proposals and transport Where appropriate the Council will expect all development proposals to demonstrate how they will:</p> <ul style="list-style-type: none"> - Help reduce the need to travel - Encourage use of transport other than the private car - Avoid increasing traffic to unacceptable levels - Avoid causing or exacerbating highway safety problems 	<p>Planning Policy Wales The sustainable transport hierarchy must be used for new developments. This prioritises walking, cycling and public transport ahead of the private car.</p>	
<p>Health & Wellbeing</p> 	<p>Policy BW7: Sustainable design and place making The council require new developments to contribute to the provision useable open and outdoor play space, ensuring its accessibility and connectivity to other green infrastructure, footpaths and cycleways</p>	<p>Well-being of Future Generations (Wales) Act, 2015 Under the Act, Local Authorities are required to publish a 'Well-being Statement' when preparing their well-being objectives in order to explain how said objectives will accomplish their goals, and how the sustainable development principle has been applied. Each year, an 'Annual Report' must also be produced to highlight the progress made in achieving the stated objectives.</p> <p>It will be appropriate moving forward to consider how a revised LDP and its policies will respond to each of the 'Well-being Goals' and the Council's own 'Well-being Objectives'.</p>	
<p>Pollution</p> 		<p>See The Environment (Wales) Act, 2016 excerpt included in the building performance row of this column.</p>	

<p>Community</p> 	<p>Policy BW7: Sustainable design and place making The council will require all new developments to:</p> <ul style="list-style-type: none">- Foster inclusive design to ensure the development allows access to for the widest range of people possible- Provide a safe environment by addressing issues if security and crime prevention in the design of building as well as surrounding space and routes- Not result in unacceptable impact on local amenity in terms of visual impact, loss of light or privacy, disturbance and traffic movement.	<p>Planning Policy Wales (Edition 11) As part of cultural considerations for development, it will be considered how far the proposal supports the conditions that allow for the use of the Welsh language</p> <p>Some relevant points in Well-being of Future Generations (Wales) Act, 2015, shown in the Health & Well-being row of this column.</p>	
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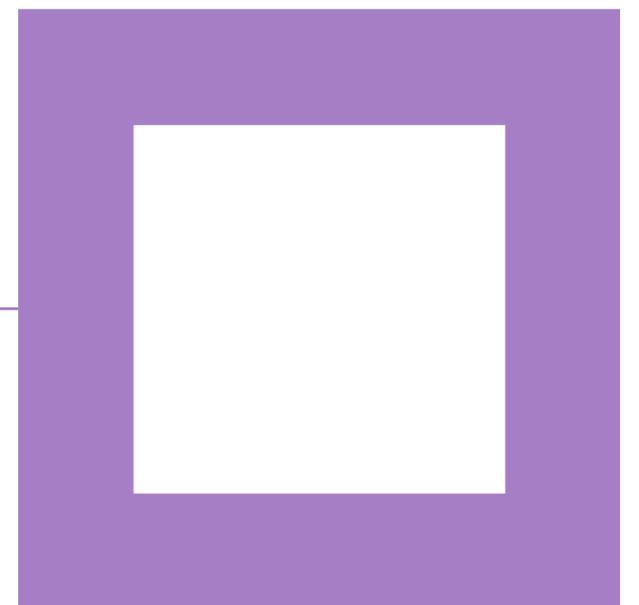


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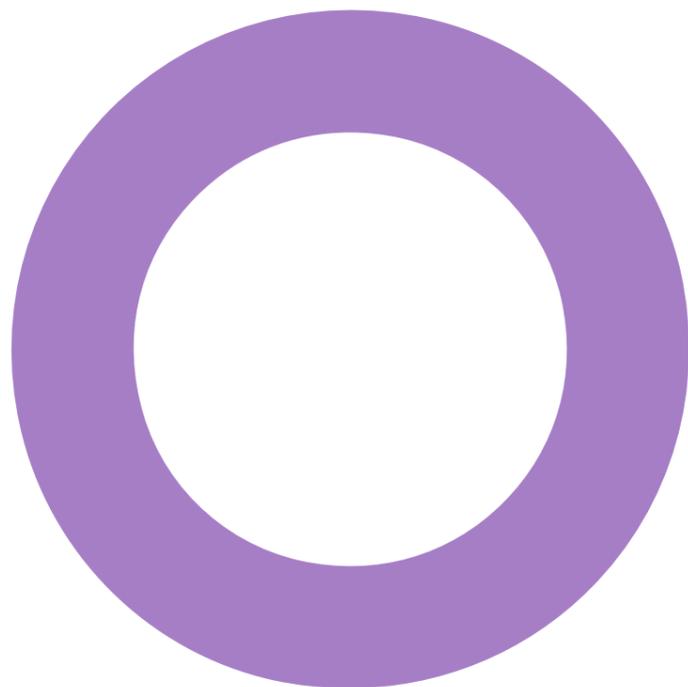
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**Rhydycar West.
Merthyr Tydfil.
Marvel Limited.**

SUSTAINABILITY
SUSTAINABILITY CHARTER

REVISION 01 - 26 APRIL 2022



Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
00	07/12/2021	Draft issue for comment	S. Kamal	A. Gallotta	T. Brown
01	26/04/2022	PAC issue	R. Ayers	E. Jolly	G. Jones

This document has been prepared for Kier only and solely for the purposes expressly defined herein. We owe no duty of care to any third parties in respect of its content. Therefore, unless expressly agreed by us in signed writing, we hereby exclude all liability to third parties, including liability for negligence, save only for liabilities that cannot be so excluded by operation of applicable law. The consequences of climate change and the effects of future changes in climatic conditions cannot be accurately predicted. This report has been based solely on the specific design assumptions and criteria stated herein.

Project number: 23/24021
Document reference: REP-2324021-5A-SK-20211207-Sustainability Charter-Rev01.docx

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Executive summary

This document builds upon discussions with Marvel Limited (the Client) relating to the sustainability strategy for the development at Rhydykar West. This document is intended to be used to provide guidance to the various design teams and incorporates the legislative requirements with the Client's sustainability aspirations.

Sustainability charter and targets.

This sustainability charter has been developed with the aim of providing a holistic approach to embed sustainability within the development design and operation. The charter and targets have been developed to capture and respond to key challenges, i.e. climate, biodiversity and health and wellbeing. The charter is also informed by national and local policy requirements, United Nations (UN) sustainable development goals as well as the client vision for the development.

By starting with a charter, we ensure we are all aligned and working towards an exemplar development that is built for the future, creates connections between people and the surroundings, creates new opportunities for local people, provide an environment that enhances healthy living and working activities and has a positive environmental impact as a result of the development works and ongoing operation.

The approach to the charter is to follow the five capitals model of sustainability. The following 'straplines' capture the 'why' behind the theme, objectives and targets defined under each capital:

- **Social: Creating local opportunities** – By enabling community spirit, **SOCIAL VALUE** is increased where the development and the great place it creates brings people together.
- **Human: Healthy people** – With a focus on people, **HUMAN VALUE** is increased where quality and longevity of life is improved, and happiness is increased.
- **Physical: Building the future** – Creating a high-quality place ensures **PHYSICAL VALUE** is increased where the development kick starts innovation through a baseline that is future-proofed for emerging technologies and policies.
- **Natural: Positive impact** – By seeking to achieve positive gain, **NATURAL VALUE** is increased where existing quality is protected, and new complimentary resources are introduced.
- **Economic: Creating new opportunities** – By focusing on regional prosperity, **ECONOMIC VALUE** is increased, and the value of the development extends beyond the site, to communities across the city and region.

The charter is split into:

- **Baseline targets** i.e. planning obligations and good practice measures.
- **Aspirational targets** i.e. building upon the baseline targets to help the development meet aspirations for sustainable development and wider sustainability goals.

1. Introduction.

This document provides a sustainability charter for the proposed Rhydykar West development located near Merthyr Tydfil, South Wales.

1.1 Policy Context.

A review of pertinent policy and sustainability drivers relating to the development has been undertaken and the key findings are outlined below. Further details can be found in Appendix A.

Merthyr Tydfil Local Development Plan 2016-2031

The Local Development Plan represents the local planning policies currently applied by the Council to inform the determination of planning applications in the borough and enforce planning control. It was adopted by the council in January 2020, superseding the previously adopted 2016 Development Plan. Amongst other things, the Local Development Plan sets out the strategy to promote high quality, sustainable and inclusive design and support measures which mitigate the predicted effects of climate change.

In addition to the Local Development Plan, there are a number of Supplementary Planning Guidance (SPG) notes that have been issued by the Council. Of particular relevance are SPGs 4 and 5, which cover Sustainable Design and Nature and Development respectively.

1.2 Approach to sustainability.

The overall sustainability objectives and targets for the development will be encapsulated within our sustainability framework which is based on five defined capitals; i.e., the people, the building, the social network, the natural environment, and the economic aspects. This approach is focussed on creating value with the aim to realise real term and tangible benefits.

This charter is structured as follows:

- **Baseline targets** i.e. planning obligations and good practice measures.
- **Aspirational targets** i.e. building upon the baseline targets to help the development meet aspirations for sustainable development and wider sustainability goals.

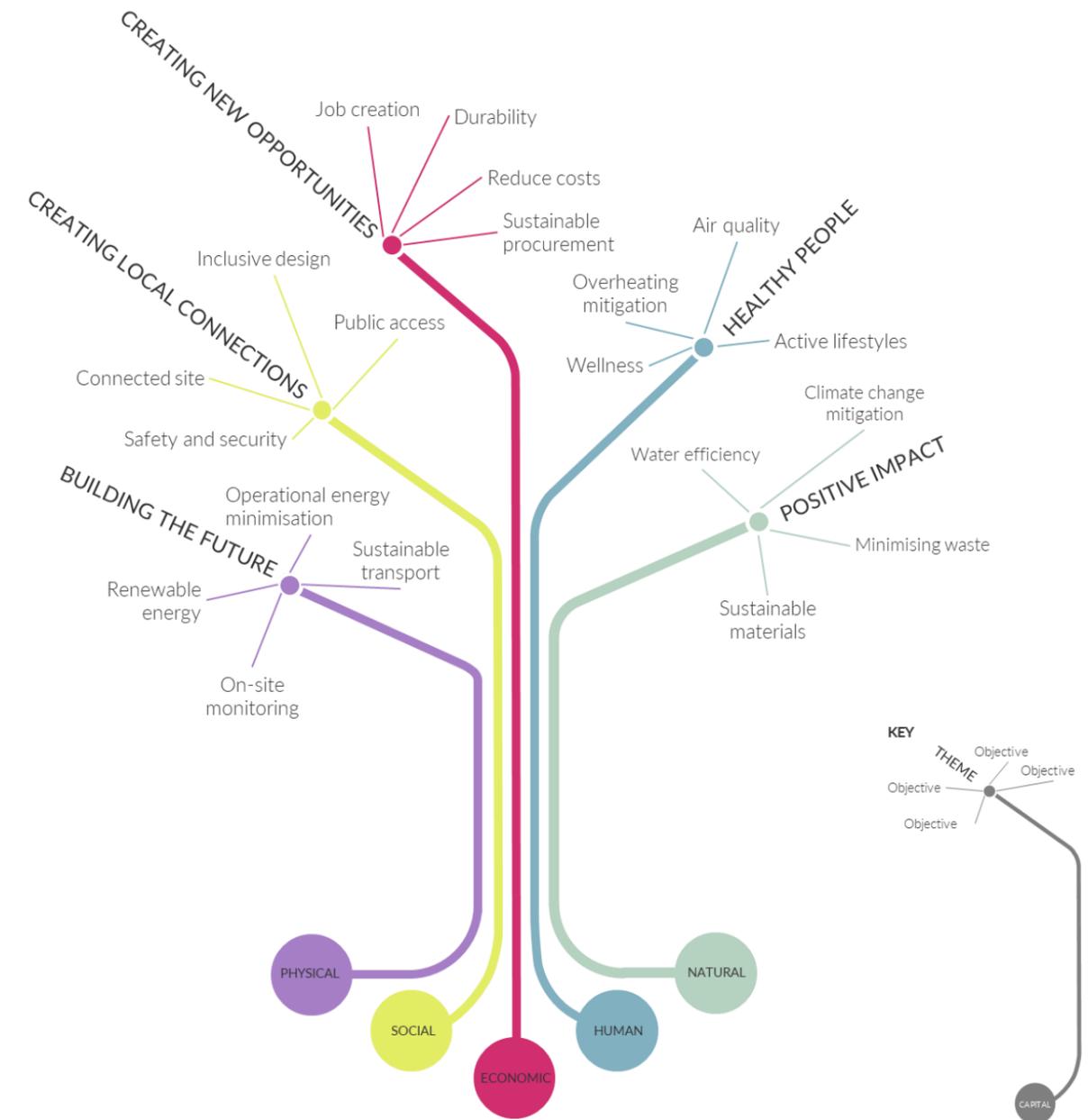


Figure 1: Approach to sustainability for Rhydykar West.

2. Pathway to sustainable development.

Sustainability for the development will be defined via a pathway to sustainable development that encompasses a collective remit of:

- Challenges, including climate, biodiversity and health and wellbeing.
- United Nations (UN) sustainable development goals.
- National and local policy.
- Client vision.

The targets are then subsequently presented in line with the five capitals model of sustainability.

This approach is summarised in Figure 2.

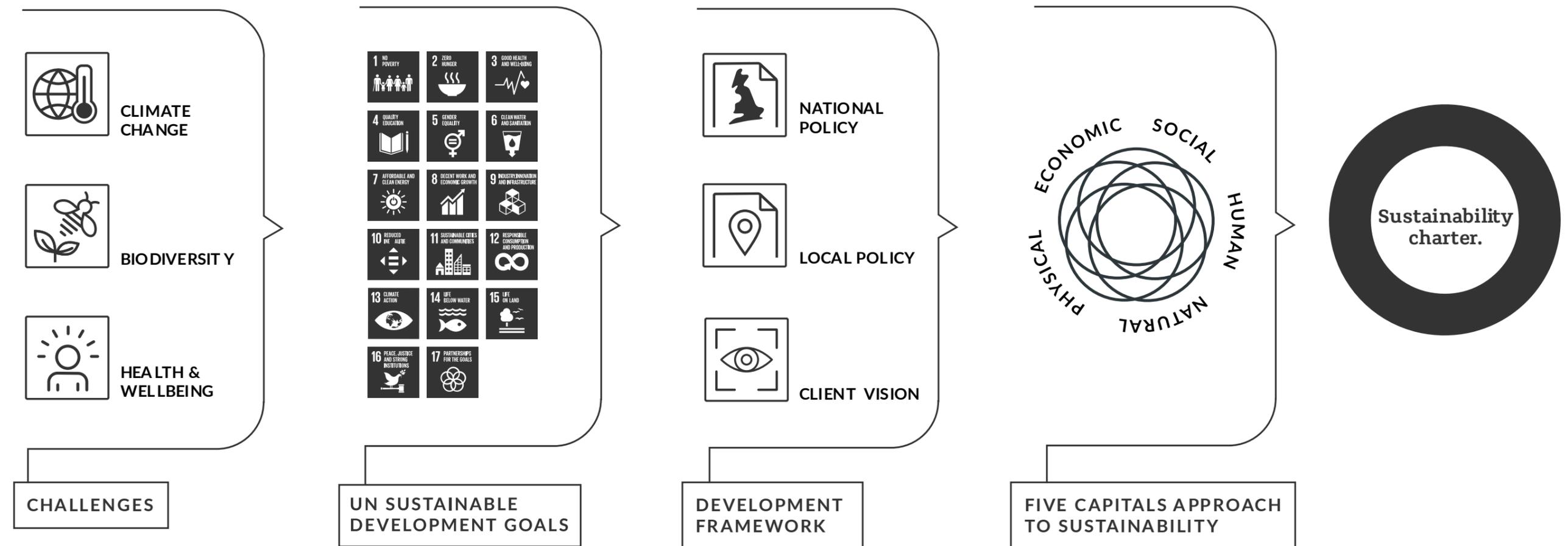
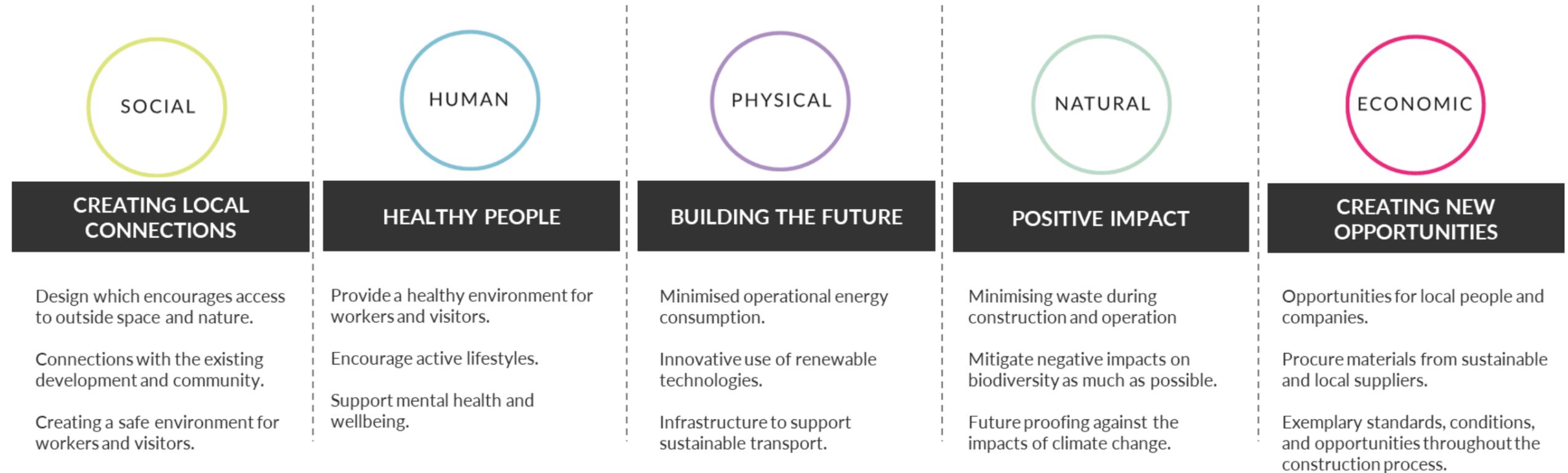


Figure 2: Pathway to sustainable development.

3. Sustainability charter.

The following sustainability charter defines a range of sustainability objectives for the development. See Section 4 overleaf for proposed sustainability targets for the development. The baseline targets are based on the requirements outlined above with aspirational targets included which build upon the baselines by drawing on best-practice key performance indicators from a range of sustainability design standards and which have been selected based on our understanding of the project at this stage. It is expected that the targets will be refined as the design develops.



Why:

This sustainability charter is a clear and defined pathway to bring together the project aims under the structured approach of our five capitals model of sustainability, whilst collectively responding to the challenges of climate change, health and wellbeing and biodiversity as well as addressing as many of the UN Sustainable Development Goals as is appropriate.

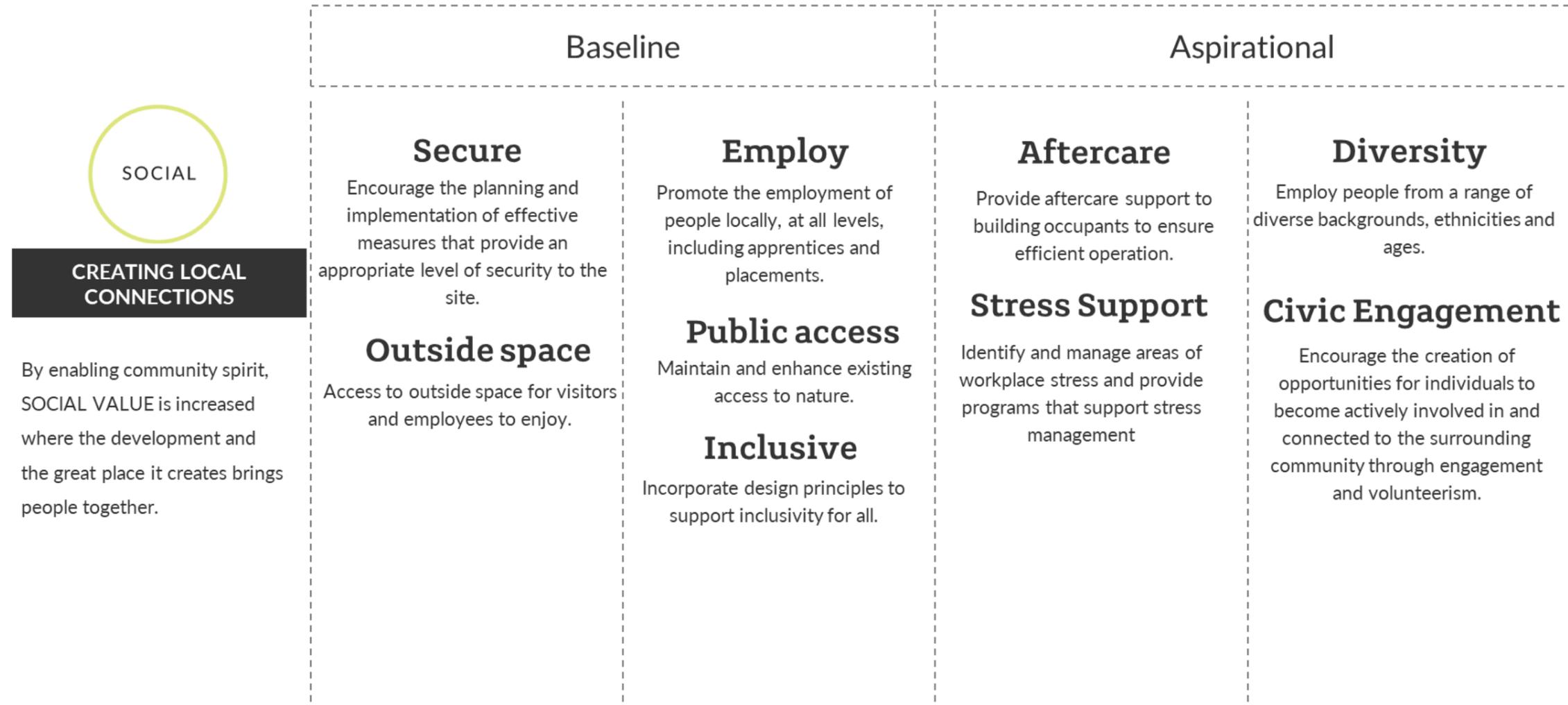
It's a document we use to unite design teams – something we can return to time and time again to ensure everything we do leads back to these goals.

By starting with a charter, we ensure we are all aligned and working towards a best practice development that is built for the future, creates local connections and opportunities, has a healthy environment and has positive impact on the environment.

4. Sustainability targets.

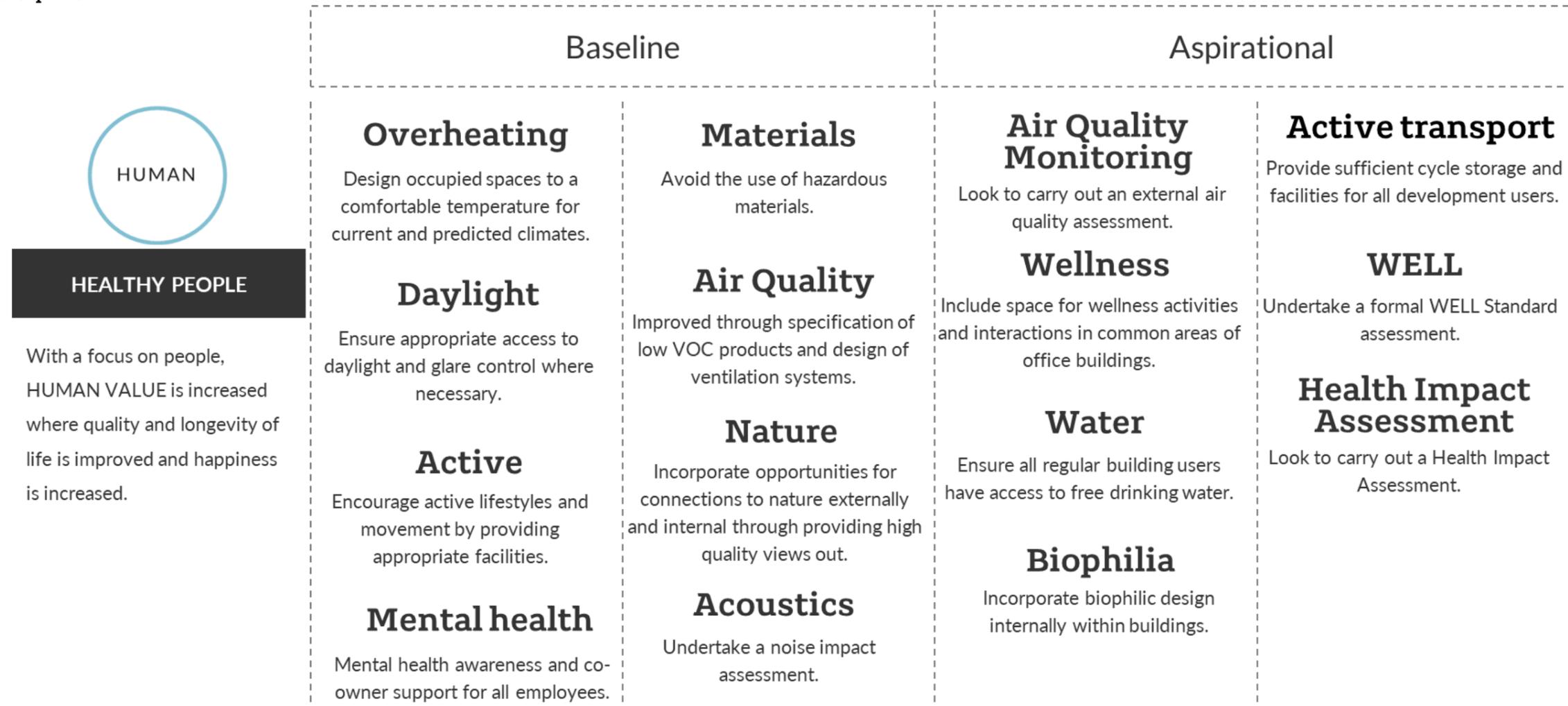
The following sections provide indicative sustainability targets for the development, that respond to the UN SDGs and five capitals.

4.1 Social capital.



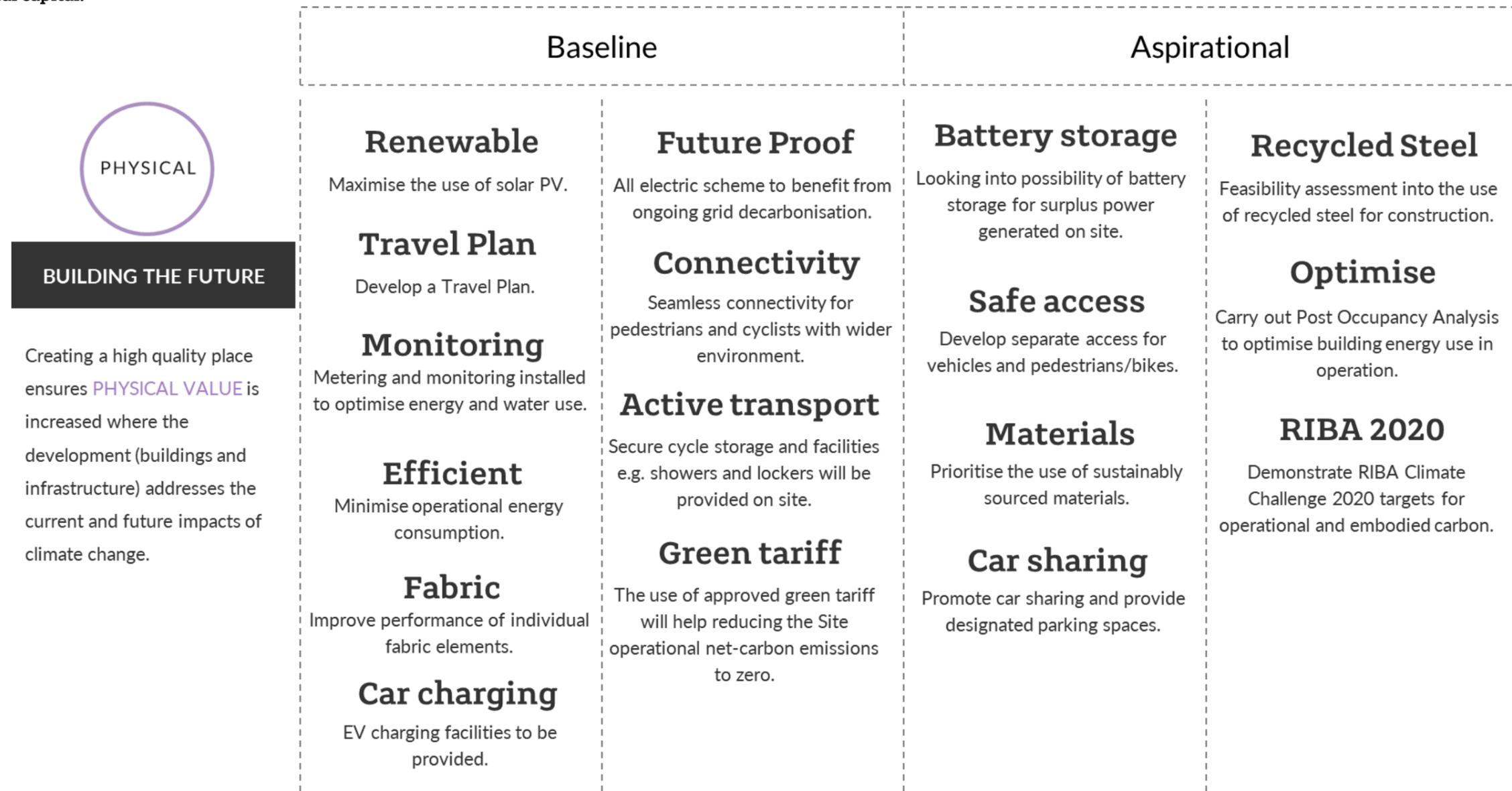
Why:
A development is only as strong as its people and communities, and social value is all about opening opportunities for them to thrive. A theme for the development is to enhance the existing communities and connections and provide opportunities to involve local stakeholders to be part of the journey.
When a project embraces this unique local identity – one that considers the full diverse range of value that the community both offers and could benefit from – you create a place for the people... a place that becomes more than its bricks and mortar and delivers an immeasurable long-term legacy, showing that together we are stronger.

4.2 Human capital.



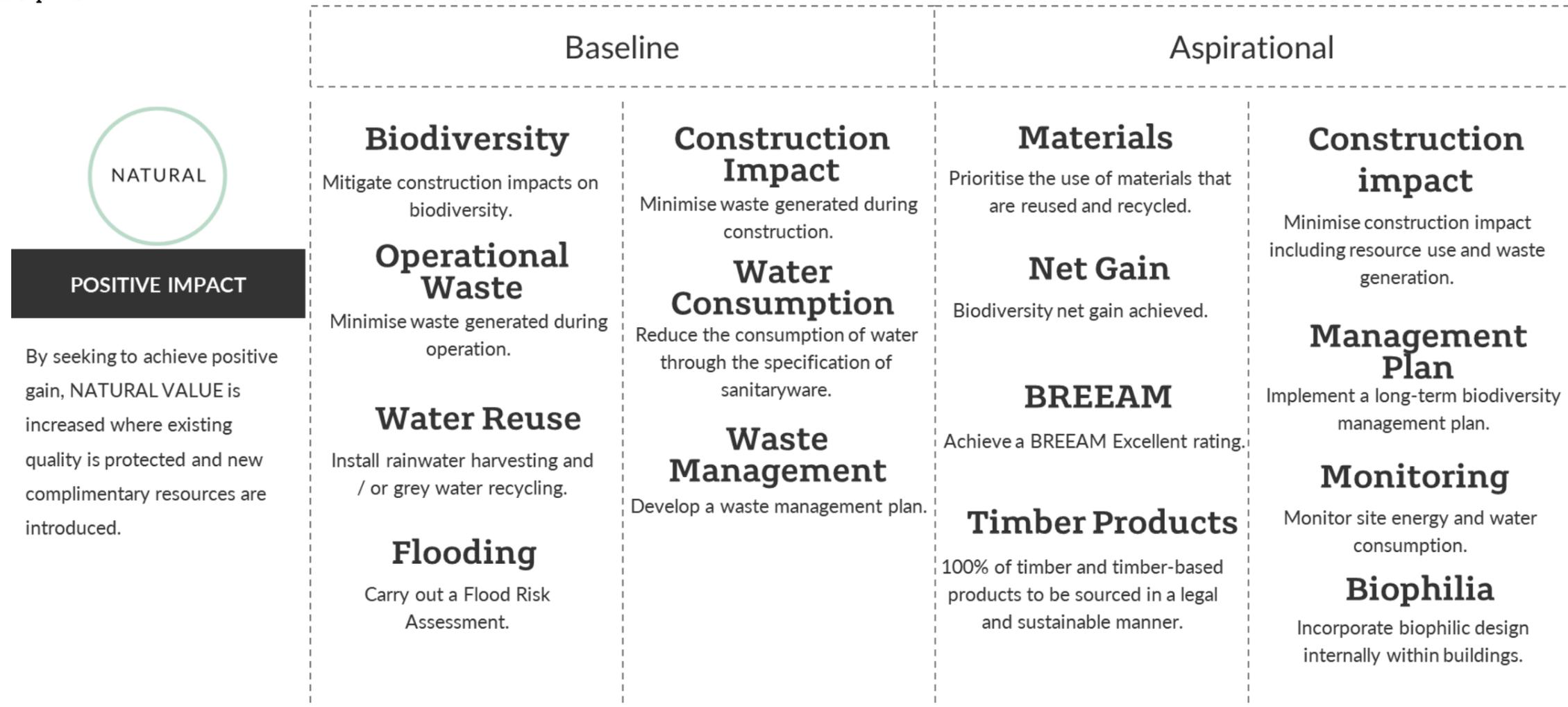
Why:
We know that people are happier and healthier when they feel safe and supported, and their senses and basic requirements have been considered.
This human-centric approach is about looking at both individual and collective needs throughout the life cycle of the development, not just during operation– considering the diversity of human experiences, as well as the factors that bring us together to create a culture of inclusivity and balance.
Putting people at the heart of the design process and ensuring everyone that lives, works and visits the development feels valued is integral to human capital.

4.3 Physical capital.



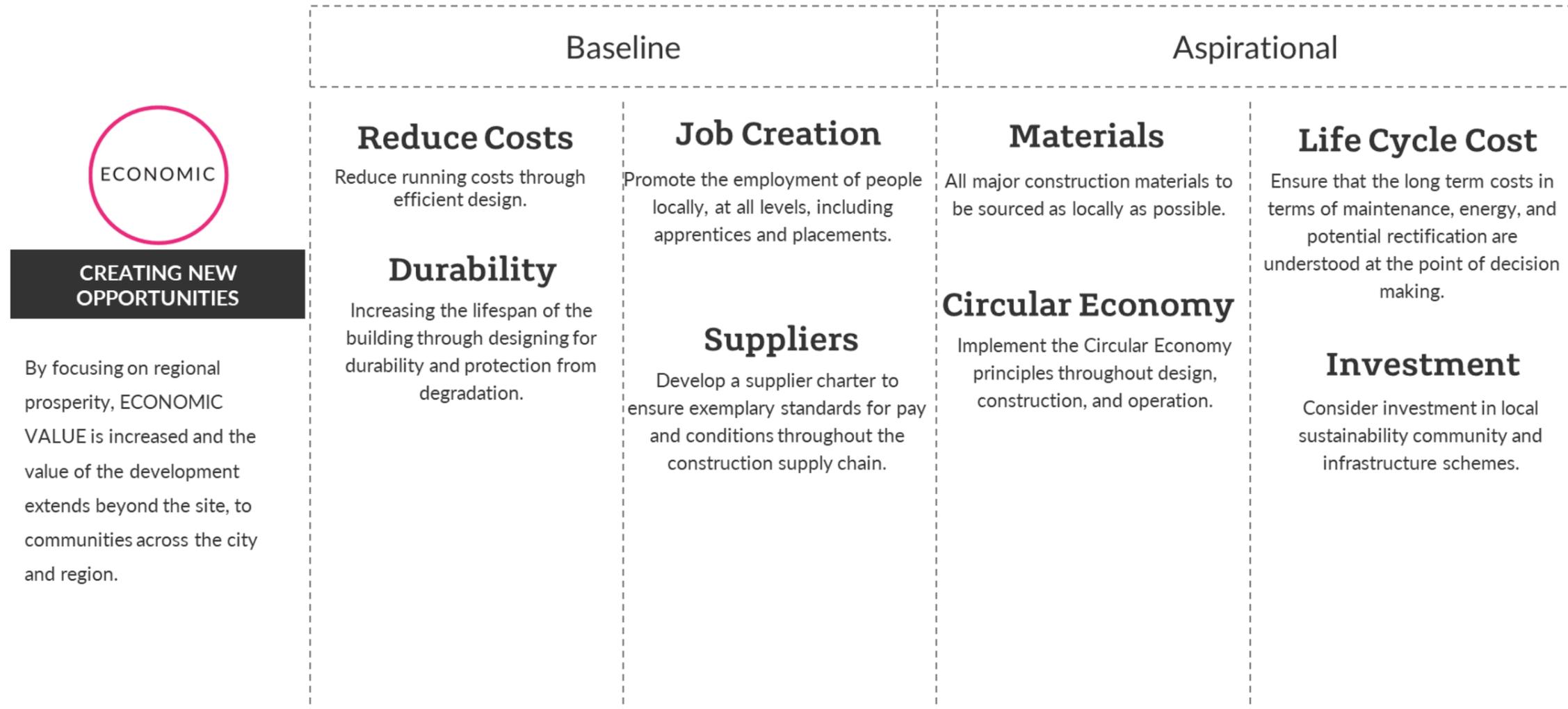
Why:
Physical value is all about creating an exemplar environment where people can live, work and visit.
Future focused flexibility, strategic and resilient energy solutions, optimised infrastructure and low-carbon design measures all make for a building that is not only the best it can be from day one but has true longevity.

4.4 Natural capital.



Why:
Enhancing the environment is a key responsibility for the development, both within the local context and through contributing to wider climate and biodiversity challenges. The built environment is a powerful influence on our natural world, and when considering how we add value we have to take a bold and ambitious approach that considers both what we can remove (in terms of negative impact) and what we can add (in terms of transforming an environment for the better). Ultimately, with the right approach, the built environment can exist and enhance our natural world in harmony. The defined targets will ensure that design and operation contribute to environmental sustainability through enhancement of ecological assets and sustainable and responsible resource management.

4.5 Economic capital.



Why:
Focusing on the location, the development provides an opportunity to act as a major employer in the region, and offers prime locations for local businesses to flourish and enhance the regions existing heritage and culture. These economic outcomes are a way to unite stakeholders and demonstrate how design and tangible lasting outcomes are interlinked.

Approach and responding to challenges

The figure below captures the approach to sustainability for the development, following the five capitals model and includes key overarching themes and objectives for each capital and demonstrate how the targets from the charter map against the three challenges, i.e. health and wellbeing, biodiversity and climate change.

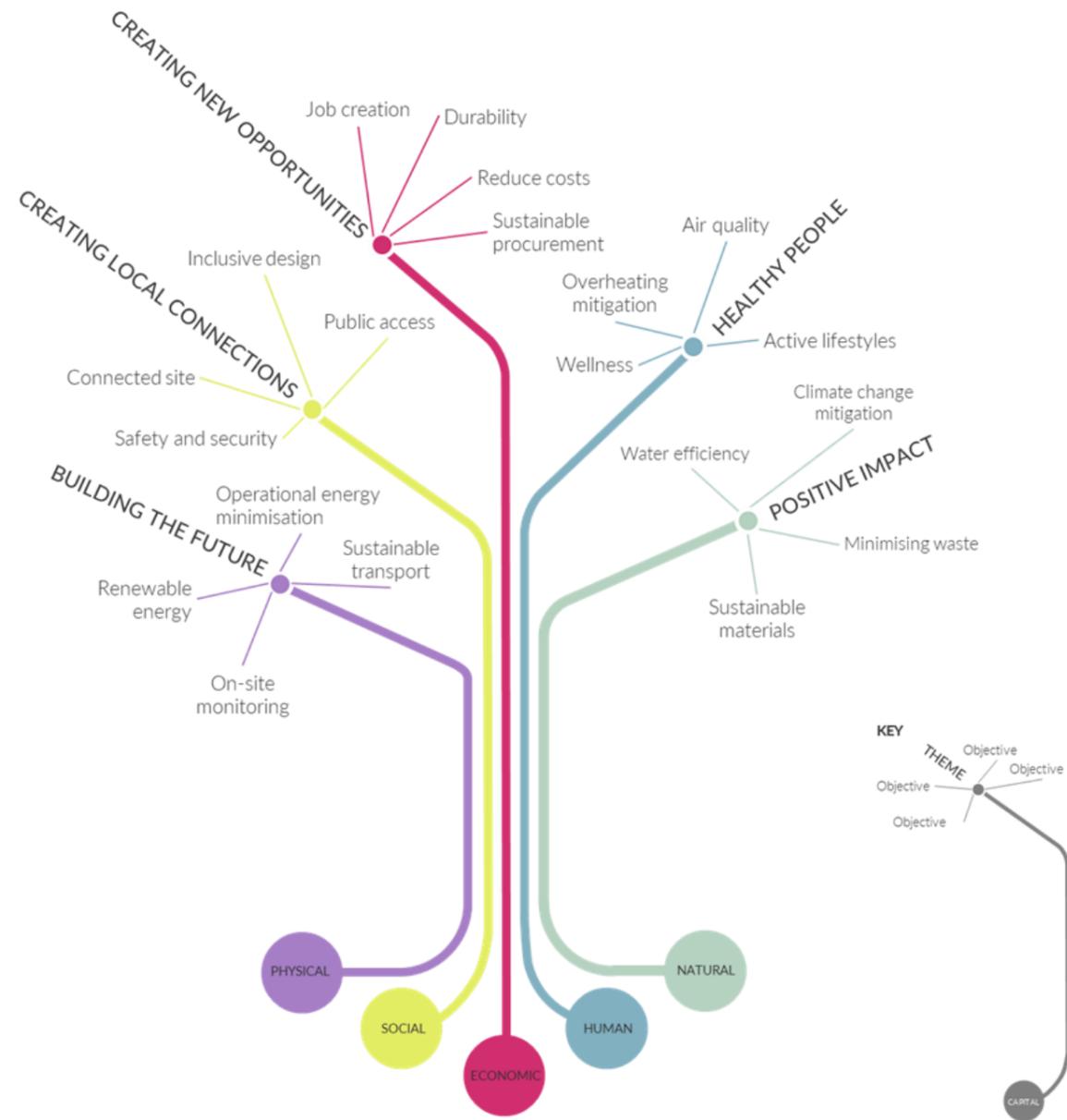


Figure 3: Approach to sustainability for Rhydyrcar West.

Appendix A – Policy Context.

National Policy

This section covers nationwide policy for the UK and specifically Wales. Both the UK and Welsh Governments have declared a climate emergency.

Building Regulations Part L.

The building is being assessed against the Building Regulations Part L2A 2014: for use in Wales. Part L has five key criteria which must be satisfied as follows:

- **Criterion 1** - Achieving the Target Emission Rate (TER) and Target Primary Energy Consumption (TPEC).
- **Criterion 2** - Limits on design flexibility.
- **Criterion 3** - Limiting the effects of solar gains in summer.
- **Criterion 4** - Building performance consistent with the Building Emission Rate (BER).
- **Criterion 5** - Provision for energy efficient operation of the building.

Criterion 1 of the Building Regulations Part L 2014: for use in Wales requires that the building as designed is not anticipated to generate CO₂ emissions in excess of that set by a Target Emission Rate (TER) calculated in accordance with the approved the National Calculation Methodology (NCM) 2013 for non-dwellings. Furthermore, the Proposed Building BPEC (Building Primary Energy Consumption) needs to be lower than the TPEC (Target Primary Energy Consumption).

Criterion 2 places upper limits on the efficiency of controlled fittings and services.

Criterion 3 requires that zones in commercial buildings are not subject to excessive solar gains. This is demonstrated using the National Calculation Methodology (NCM) 2013.

Proposed changes to Part L.

Part L2021 is due to be adopted in June 2022 as an interim uplift of standards en route to the adoption of the Future Homes Standard and Future Buildings Standard.

A transitional period will be available for 12 months from this date that will allow continued use of Part L2013 but will require commencement works and submission of initial building notice by June 2022 for this to be enabled. For the purpose of this issue, commencement works include:

- Drainage works
- Excavation / trench foundations
- Digging out and prep for raft foundations
- Piling, boring or piles or pile driving.

Unlike previous transitional periods associated with changes to Part L, for June 2022-June 2023, this only applied on a building level rather than site level.

The Future Homes Standard and Future Building Standard will then be adopted in 2025.

Well- Being of Future Generations (Wales) Act 2015

The Act, which received Royal Assent on the 29th April 2015, requires public bodies to consider the long term; to work more effectively with people, communities and each other; to look at problem prevention and to take a more joined-up approach. It gives a legally binding common purpose – seven well-being goals – for national and local government as well as local health boards and other public bodies. These seven goals are:

- A prosperous Wales
- A resilient Wales
- A healthier Wales
- A more equal Wales
- A Wales of cohesive communities

- A Wales of vibrant culture and thriving Welsh language
- A globally- responsible wales.

It is through this act that Wales is set to make its contribution to the achievement of the 17 United Nations Sustainable Development Goals.

Planning Policy Wales.

Planning Policy Wales (PPW) sets out the planning policies for the Welsh Government. The PPW together with a series of Technical Advice Notes, Welsh Government Circulars, and policy clarification letters provide the national planning policy framework for Wales.

The purpose of the PPW is to “ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental and cultural well-being of Wales, as required by the Planning (Wales) Act 2015, the Well-being of Future Generations (Wales) Act 2015 and other key legislation and resultant duties such as the Socio-economic Duty.”

Relevant key information to note:

Everyone engaged with the planning system in Wales should make placemaking decisions which create sustainable places and improve wellbeing. Goals are:

- a. To create places which are “attractive, sociable, accessible, active, secure, welcoming, healthy and friendly.” With the aim to bring people together and improve well-being for all.
 - b. To choose locations which encourage sustainable and active travel
 - c. To respect the local landscape and culture
- Planned developments should factor in making a sustainable contribution to the local area and play their role in tackling the climate emergency, to achieve this, plans should:
- d. Enhance biodiversity, minimise pollution, minimise emissions and protect the local environment
 - e. Use renewable and low carbon energy sources and reduce energy demand wherever possible
 - f. Maintain and advance green infrastructure
 - g. Sustainably manage the use of local resources including water, take design decisions to reduce waste, reuse and recycle waste wherever possible

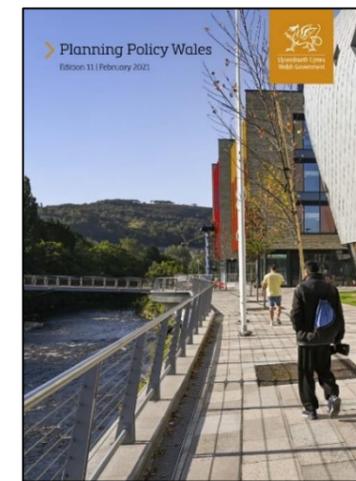


Figure 4: Planning Policy Wales

Plans should also be resilient to the effects of climate change and future challenges such as:

- h. Flooding, land contamination and instability, coastal change

Future Wales – The National Plan 2040.

Future Wales – The National Plan 2040 sets the direction for development in Wales and contains a strategy for “addressing key national priorities through the planning system, including sustaining and developing a vibrant economy, achieving decarbonisation and climate-resilience, developing strong ecosystems and improving the health and well-being of our communities.”

Future Wales supports:

- Places which are decarbonised and climate-resilient
- Delivering renewable and low carbon energy
- Sustainable travel
- Strengthening ecosystems and biodiversity
- Healthier places
- Vibrant rural areas
- Sustainable development choices
- Green infrastructure
- Thriving Welsh language



Figure 5: Future Wales - The National Plan 2040

Local Policy

Merthyr Tydfil Local Development Plan 2016 - 2031

The Local development plan represents the local planning policies currently applied by the Council to inform the determination of planning applications in the Borough and enforce planning control. It was adopted by the council in January 2020, superseding the previously adopted 2016 Development Plan.

This section summarises the local and national planning policy relating to energy and sustainability. The following documents have been reviewed:

- Merthyr Tydfil Local Development Plan 2006-2021 (adopted in 2011)
- The Environment (Wales) Act, 2016
- Planning Policy Wales (Edition 11)
- Well-being of Future Generations (Wales) Act, 2015
- Welsh Government Part L2A

Table 1: Policy Context Review

Sustainability Theme	Policy Document		
	Merthyr Tydfil Local Development Plan	The Environment (Wales) Act, 2016, Planning Policy Wales (Edition 10), Well-being of Future Generations (Wales) Act, 2015	Welsh Government Part L2A
<p>Building Performance</p> 	<p>Policy BW7: Sustainable design and placemaking The Council requires all new development to:</p> <ul style="list-style-type: none"> - minimise the demand for energy and, where appropriate, utilise renewable energy resource - adopt energy conservation/ efficiency measures <p>Policy TB7: Renewable Energy Development proposals that meet national and local renewable energy targets will be viewed favourably if:</p> <ul style="list-style-type: none"> - They do not have an acceptable impact on biodiversity and landscape including the setting of the Brecon Beacons National Park - For wind turbines, their capacity does not exceed 25 MW on urban and industrial brownfield, and 5MW elsewhere - They do not have an unacceptable impact on the amenity of residential areas 	<p>The Environment (Wales) Act, 2016 The Act received Royal Assent on 21st March 2016, providing new legislation to manage the natural resources of Wales proactively and sustainably. The Act also tasks Welsh Ministers with setting targets to reduce greenhouse emissions and the setting of carbon budgets.</p>	<p>Section 3 – Criterion 1</p> <p>Regulation 26 CO₂ emissions rates (Building Primary Energy Consumption (BPEC) and Building CO₂ Emissions Rate (BER)) for new buildings are not to exceed targets (TBEC and TER) set out in regulation 25. These are both to be calculated and expressed in accordance to regulation 24.</p> <p>Regulation 25A Before construction, technical, environmental and economic feasibility of high-efficiency alternative systems must be considered, including:</p> <ul style="list-style-type: none"> - Decentralised energy supply based on renewables - Cogeneration - District or block heating and cooling - Heat pumps <p>The person carrying out the work must submit notice to the local authority which detail and document these considerations to allow for official verification and inspection.</p> <p>Section 4 – Criterion 2 Limits on design flexibility Reasonable provisions should be made for the conservation of fuel and power in buildings by:</p> <ul style="list-style-type: none"> - Limiting heat gains and losses <ul style="list-style-type: none"> - Through thermal elements and building fabric - From pipes, ducts and vessels used for heating, cooling and hot water services - Providing fixed building services which <ul style="list-style-type: none"> - Are energy efficient - Have effective controls to enable achievement of reasonable standards - energy meters should be installed so that occupier can assign at least 90% of estimated annual energy consumption to a fuel. - Are commissioned by testing and adjusting for only necessary fuel and power consumptions

			<p>Approved software tools should be used to produce list of specifications and highlight the features of the design critical to achieving compliance, alongside BPEC/TPEC and BER/TER figures.</p> <p>SECTION 5 – Criterion 3 Reasonable provisions should be made to limit overheating in new buildings from solar and other heat gains.</p> <p>Section 6 – Criterion 4 In order to keep construction consistent with the BPEC and BER, it should be demonstrated with evidence that:</p> <ul style="list-style-type: none"> - Thermal bypasses are limited - Insulation is reasonably continuous over the whole building - Air permeability is within reasonable limits. To be in compliance, air permeability should be no worse than $10m^3/(h.m^2)$ at 50 Pa. <p>All non-domestic building should be pressure tested unless the building is less than 500 m^2 total useful floor area, a factory-made modular building, large extensions or large complex building.</p>
<p>Water & Drainage</p> 	<p>Policy BW7: Sustainable design and placemaking The Council requires all new development to:</p> <ul style="list-style-type: none"> - adopt water conservation/efficiency measures <p>Policy BW8: Development and the water environment Proposal for development will only be permitted where:</p> <ul style="list-style-type: none"> - they do not have adverse effects on the quality and/or quantity of water surfaces or groundwater resources - adequate water and sewerage systems exist or are reasonably accessible or capable of being provided prior to the development becoming operational - Sustainable drainage systems (SuDS) are used for the disposal of surface water. Alternative methods only considered if SuDS proven inappropriate for practical or environmental reasons 		
<p>Flood Risk</p> 	<p>Policy BW8: Development and the water environment Proposal for development will only be permitted where:</p> <ul style="list-style-type: none"> - identified river floodplains are avoided 		
<p>Waste</p> 	<p>Policy BW7: Sustainable design and placemaking The Council requires all new development to:</p> <ul style="list-style-type: none"> - Incorporate facilities for the segregation, recovery and recycling of waste 	<p>Planning Policy Wales (Edition 11) There have been several updated, amended or wholly new Technical Advice Notes (TANs) affiliated with PPW, including:</p> <ul style="list-style-type: none"> - TAN 21: Waste (February 2017) <p>The new and/or updated TANs, in addition to the updated PPW, will require substantial consideration throughout the revision process, in order to ensure that any revised LDP is compliant with national planning policy.</p>	

<p>Materials</p> 	<p>Policy BW7: Sustainable design and placemaking The council requires all new developments to incorporate resource efficient/ adaptable buildings and layouts using sustainable design and construction techniques</p>	<p>The Environment (Wales) Act, 2016 The Act received Royal Assent on 21st March 2016, providing new legislation to manage the natural resources of Wales proactively and sustainably... It further introduces new powers to increase the amount of materials for recycling, as well as improving the quality of materials to be recycled.</p>	
<p>Biodiversity</p> 	<p>Policy BW5: Natural Heritage In order to protect and support the enhancement of the County Borough's natural heritage, development proposals will only be permitted where they maintain, enhance and do not harm:</p> <ul style="list-style-type: none"> - Landscape character of the countryside - National and local nature conservation designations - Trees, woodlands and hedgerows that have natural heritage value - Other biodiversity interests such protected and priority species and ecological networks 	<p>The Environment (Wales) Act, 2016 The Act received Royal Assent on 21st March 2016, providing new legislation to manage the natural resources of Wales proactively and sustainably. The Act includes a new biodiversity duty that aims to aid the reversal of decline and secure the long-term resilience and future of biodiversity in Wales.</p> <p>Well-being of Future Generations (Wales) Act, 2015 Under the act developments must support a resilient Wales described as a nation which maintains and enhances a biodiverse natural environment with healthy functioning eco systems.</p>	
<p>Transport</p> 	<p>Policy BW12: Development proposals and transport Where appropriate the Council will expect all development proposals to demonstrate how they will:</p> <ul style="list-style-type: none"> - Help reduce the need to travel - Encourage use of transport other than the private car - Avoid increasing traffic to unacceptable levels - Avoid causing or exacerbating highway safety problems 	<p>Planning Policy Wales The sustainable transport hierarchy must be used for new developments. This prioritises walking, cycling and public transport ahead of the private car.</p>	
<p>Health & Wellbeing</p> 	<p>Policy BW7: Sustainable design and place making The council require new developments to contribute to the provision useable open and outdoor play space, ensuring its accessibility and connectivity to other green infrastructure, footpaths and cycleways</p>	<p>Well-being of Future Generations (Wales) Act, 2015 Under the Act, Local Authorities are required to publish a 'Well-being Statement' when preparing their well-being objectives in order to explain how said objectives will accomplish their goals, and how the sustainable development principle has been applied. Each year, an 'Annual Report' must also be produced to highlight the progress made in achieving the stated objectives.</p> <p>It will be appropriate moving forward to consider how a revised LDP and its policies will respond to each of the 'Well-being Goals' and the Council's own 'Well-being Objectives'.</p>	
<p>Pollution</p> 		<p>See The Environment (Wales) Act, 2016 excerpt included in the building performance row of this column.</p>	

<p>Community</p> 	<p>Policy BW7: Sustainable design and place making The council will require all new developments to:</p> <ul style="list-style-type: none">- Foster inclusive design to ensure the development allows access to for the widest range of people possible- Provide a safe environment by addressing issues if security and crime prevention in the design of building as well as surrounding space and routes- Not result in unacceptable impact on local amenity in terms of visual impact, loss of light or privacy, disturbance and traffic movement.	<p>Planning Policy Wales (Edition 11) As part of cultural considerations for development, it will be considered how far the proposal supports the conditions that allow for the use of the Welsh language</p> <p>Some relevant points in Well-being of Future Generations (Wales) Act, 2015, shown in the Health & Well-being row of this column.</p>	
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