

Proposed Residential development at Elmfield, Ninth Lock Road, Clondalkin, Dublin 22.

Energy & Climate Action Report



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Executive Summary

This preliminary planning and development study has been prepared for lands at Elmfield, Ninth Lock Road, Clondalkin, Dublin 22. The proposal was initiated by Thornmeadow Developments Ltd. and aims to establish a forward-thinking urban residential development aligned with the South Dublin County Development Plan 2022–2028, supported by the South Dublin Climate Action Plan 2024–2029.

The site is located within Clondalkin, which has been designated as a Decarbonisation Zone under the South Dublin Climate Action Plan. Its location within this zone places the development in an area identified for targeted climate-action measures aimed at reducing emissions and improving energy efficiency. This policy context supports the delivery of a climate-responsive scheme that contributes to South Dublin's broader objectives for compact growth, sustainable mobility, and high-quality residential environments.

Currently occupied by warehouse storage and logistics operations, the site represents a brownfield opportunity for regeneration and more efficient land use. The proposed development aims to create a resilient residential neighbourhood that integrates passive design measures, energy-efficient technologies, and on-site renewable generation (including solar PV and air-source heat pumps), in line with the County Development Plan's requirements for energy efficiency, low-carbon design and sustainable settlement patterns.

This study includes an integrated energy and climate adaptation framework, emphasising passive design, energy-efficient technologies, and on-site renewable generation (e.g., solar PV, air-source heat pumps), while also addressing nature-based climate adaptation strategies. The ultimate objective is to promote Elmfield as a flagship example of climate action in practice delivering low-carbon urban design, improving liveability, and establishing long-term climate resilience.

Table 1. Summary of proposed measures to adhere to local policies

Development Plan Reference	Measure(s) Taken	Outcome(s)
Policy E1 (Climate Policy Integration)	Fabric first design; airtightness strategy; nZEB compliant building specification.	Reduced operational energy demand and alignment with national/regional climate action frameworks.
E2 Objective 1 (Reduce Fossil)	High efficiency air source heat pumps installed across the development.	Fully electric, low carbon heating system reducing reliance on fossil fuels.
E2 Objective 2 (Promote Renewable Sources)	Significant provision of on site photovoltaic (PV) generation.	Increased on site renewable energy contribution and reduced grid demand.
E3 Objective 1 & 3 (Energy Efficiency & Climate Responsive Design)	Optimised building orientation; insulated building envelope; energy efficient services; PV orientation refined through glint and glare analysis (assessing aviation flight paths, road users, rail networks, and sensitive receptors).	Improved thermal performance; reduced heat loss; safe and effective renewable energy deployment; climate resilient energy design.
E4 Objective 1 (EV Strategy Implementation)	Provision for EV charging infrastructure throughout resident parking.	Supports transition to low emission vehicle use and future mobility needs.
E7 Objective 1 (Support Solar Energy)	PV installed on units with roofspace; layout designed to maximise solar access.	Increased renewable generation capacity and reduced carbon intensity of electricity supply.
CA2 Objective 1 & 2 (Clondalkin Decarbonisation Zone)	Electrified heating; renewable energy integration; low carbon design principles.	Supports DZ objectives for reduced emissions and cleaner local energy systems.
CS1, CS3, CS6 (Compact Growth & Settlement Strategy)	Brownfield / infill redevelopment within an established serviced urban area.	Supports compact urban form, reduces need for greenfield expansion, and optimises existing services and infrastructure.

Development Plan Reference	Measure(s) Taken	Outcome(s)
GI1 Objective 4; GI2 Objective 1–2; Policy GI5 (Green Infrastructure & Biodiversity)	Greenway boulevard; climate responsive planting; ecological buffers; pollinator friendly species.	Enhanced ecological connectivity, improved biodiversity, and resilient site landscaping.
QDP4 Objective 1 (Healthy Placemaking)	Mixed residential uses; integrated childcare; walkable neighbourhood structure.	Reduced need to travel; strengthened community function; vibrant local environment.
QDP6 Objective 6 (Quality Shared Spaces)	High quality communal open spaces; pedestrian friendly layout.	Accessible outdoor amenity spaces that support social interaction and wellbeing.
QDP10 Objective 1 (Housing Mix)	Combination of apartments and own door houses.	Diverse housing supply meeting varied demographic needs.
H13 Objective 1 (Consolidation & Sustainable Intensification)	Regeneration of an underused site in Clondalkin.	Supports strategic densification and urban renewal in accordance with the Core Strategy.
SM1 Objective 4; SM2 Objective 1 & 3 (Active Travel & Permeability)	Extensive pedestrian connections; strong permeability; large provision of secure cycle parking.	Enables modal shift to walking and cycling, reduces short car trips.
SM7 Objective 5 (EV Infrastructure)	EV ready parking with charging capability.	Facilitates long term transition to electric mobility.
COS2 Objective 6 (Climate Responsive Community Infrastructure)	Walkable layout; active travel prioritisation; low carbon mobility.	Reduced carbon impact of daily movement; improved neighbourhood accessibility.
COS5 Objective 19 (Play & Recreation)	Provision of children's play areas and nature based recreational spaces.	Enhanced family friendly amenities and community wellbeing.

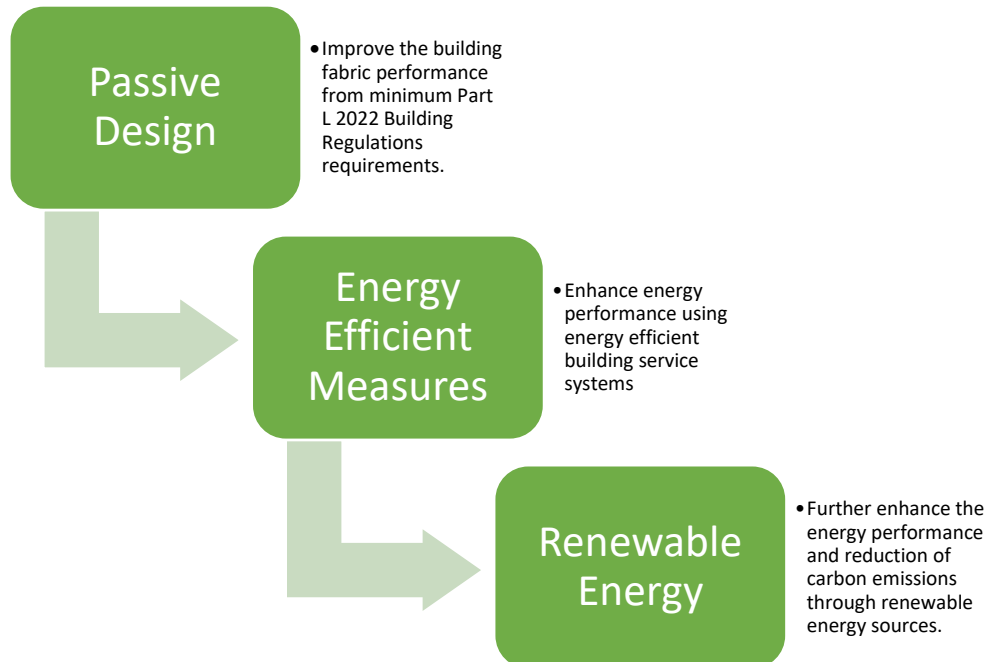
The recommended strategy takes into consideration the site layout and requirements for the building to produce a design that incorporates the most appropriate technologies available to the site that are commercially viable, whilst targeting compliance with all policies applicable to this development.

1. Introduction

The team at Lawler Sustainability consists of a variety of qualified Engineers and Environmental Consultants with a broad range of backgrounds including Mechanical & Electrical Engineering, Building Services Engineering, and Environmental Science. The team are CIBSE Low Carbon Consultants, CIBSE Low Carbon Energy Assessors, SEAI registered Non-Domestic BER Assessors, BREEAM Assessors, LEED & WELL Accredited Professionals, and Fitwel Ambassadors. This broad range of knowledge and qualification allows the team to produce documentation for planning submissions that are tailored to the individual sustainability requirements of the development at Elmfield Park and to ensure National and Local Policy compliance is clearly demonstrated.

An energy hierarchy methodology is employed by Lawler Sustainability to assess the potential energy demand and carbon emissions of the proposed development and demonstrate improvements towards a building with very low energy demand. This methodology is outlined below.

This report evaluates the proposed development against the statutory requirements of the South Dublin County Development Plan 2022–2028, with additional reference to the South Dublin Climate Action Plan 2024–2029 where it supplements Development Plan policy.



2. Policy Review

An effective planning framework is central to delivering sustainable, low-carbon growth across South Dublin. The South Dublin County Development Plan 2022–2028 sets the core spatial and environmental objectives that guide new development, with a strong emphasis on compact urban form, climate-responsive design and integrated green infrastructure. These priorities are further reinforced by the South Dublin Climate Action Plan 2024–2029, which provides a complementary layer of climate-action measures aimed at strengthening energy efficiency, reducing emissions and enhancing local resilience. Situated within the Clondalkin Decarbonisation Zone, the Elmfield development is positioned in an area identified for targeted climate-led innovation and accelerated decarbonisation. The policy context therefore places a clear expectation on new development to support energy-efficient design, sustainable movement, high-quality placemaking and low-carbon infrastructure. The following section outlines how the Elmfield scheme aligns with the Development Plan’s key policy themes (climate action, compact growth, green infrastructure, design quality, sustainable mobility, community provision and low-carbon energy) demonstrating a robust and coherent response to South Dublin’s strategic planning objectives.

Climate Action Integration in Plan-Led Development

It is South Dublin County Council’s objective to:

- Policy CA1 — Climate Action:
To support the implementation of International and National climate action legislation and ensure alignment between the SDCC Climate Change Action Plan, the County Development Plan and national climate objectives.
- CA1 Objective 2:
Ensure that spatial and infrastructure planning decisions are consistent with climate mitigation and adaptation objectives.
- CA1 Objective 3:
Implement the SDCC Climate Change Action Plan 2019–2024 (or superseding plan) and facilitate a just transition to a low-carbon, climate-resilient county.

The Elmfield development aligns strongly with the climate-action priorities embedded in the Development Plan’s overarching strategy. Located within the established urban fabric of Clondalkin, the project naturally supports SDCC’s compact-growth and regeneration-led spatial model, which is central to CA1 Objective 2. Its design places a clear emphasis on energy efficiency and reduced operational emissions, responding directly to the climate-mitigation intent of Policy CA1. Integration of high-performance building fabric, low-carbon heating systems (such as air-source heat pumps), and the inclusion of rooftop photovoltaic generation contribute substantively to the countywide climate-action pathway referenced under CA1 Objective 3. Furthermore, by intensifying an existing serviced site, the scheme helps to reduce car-based travel demand and makes strategic use of existing service and transport infrastructure, both recognised in Chapter 1 as critical mechanisms through

which new development can support climate mitigation and resilient settlement patterns. In doing so, the project demonstrates a coherent alignment with the broader climate-positive trajectory SDCC seeks to embed across all plan chapters.

Compact Growth, Settlement Strategy & Sustainable Urban Structure

It is South Dublin County Council's objective to:

- CS1 Objective 1:
Ensure a sustainable, plan-led allocation of housing growth within SDAs in line with MASP provisions.
- CS3 — Monitoring Population & Housing Growth:
Promote and facilitate housing growth in accordance with the Core Strategy and ensure availability of zoned land, prioritising brownfield over greenfield sites.
- CS3 Objective 1:
Ensure sufficient zoned land is available to meet county growth targets, with brownfield prioritised over greenfield.
- CS6 — Settlement Strategy: Strategic Planning Principles:
Promote consolidation and sustainable intensification of development within urban settlements.
- CS6 Objective 2:
Achieve at least 50% of new homes within or contiguous to Dublin City & Suburbs by promoting compact, infill development.
- CS6 Objective 5:
Design future development to support sustainable travel patterns and increase the share of walking, cycling and public transport use.

The Elmfield scheme is naturally aligned with the Core Strategy's central objective of consolidating growth within established urban areas. As a residential development located in Clondalkin, a key urban settlement within Dublin City & Suburbs, the scheme directly supports CS6 Objectives 2 and 5 by delivering new homes in a location already served by community amenities, public transport and established active-travel networks. Its brownfield-regeneration context aligns with CS3 Objective 1, which places strong emphasis on prioritising infill and redevelopment opportunities over outward expansion. By making efficient use of serviced urban land, the project contributes positively to the settlement hierarchy's aim of strengthening the county's compact urban structure and reducing the environmental impacts associated with car-dependent, greenfield development. The proposed site layout, which includes enhanced pedestrian and cyclist connections, complements SDCC's movement and accessibility ambitions and is consistent with the integrated land-use and transport principles described throughout Chapter 2. Overall, Elmfield supports SDCC's MASP-aligned growth distribution

and embodies the type of sustainable, well-located urban housing that the Core Strategy seeks to facilitate throughout the 2022–2028 plan period.

Green Infrastructure, Biodiversity & Sustainable Landscape Integration

It is South Dublin County Council's objective to:

- Policy GI1 — Overarching GI Policy
Protect, enhance and further develop a multifunctional Green Infrastructure (GI) network using an ecosystem-services approach, integrating parks, open spaces, trees, hedgerows, watercourses and natural features into all development.
- GI1 Objective 4
Require all new development to incorporate GI as an integral part of design and layout, identifying environmental assets and linking into countywide GI networks.
- Policy GI2 — Biodiversity
Strengthen the GI network and ensure new developments enhance biodiversity in line with national and county biodiversity plans.
- GI2 Objective 1
Reduce fragmentation and strengthen ecological links between urban areas, Natura sites, parks, open spaces and the wider GI network.
- GI2 Objective 2
Protect and enhance ecological features including trees, woodlands, hedgerows and watercourses as part of the design and construction process.
- Policy GI5 — Climate Resilience
Strengthen urban and rural GI to improve resilience against climate impacts, with emphasis on tree planting, native species, and urban greening measures.

The Elmfield Park scheme reflects the principles of SDCC's GI strategy by embedding green infrastructure into the structure of the site rather than treating landscape as a secondary layer. The proposed greenway boulevard, landscaped open spaces and planted buffers contribute to a locally connected GI network in a manner consistent with GI1 Objectives 1 and 4. These elements provide ecological permeability, support pollinator-friendly planting regimes, and help strengthen green links throughout the urban environment, aligning closely with GI2 Objectives 1 and 2. Enhancing tree cover and using climate-sensitive planting species also reflects GI5's emphasis on resilience, with the development helping to moderate local microclimates, provide shade, and soften the transition between built form and adjoining streets. The integration of naturalistic planting, generous verge treatments, and site permeability demonstrates a proactive response to the multifunctional GI

approach set out in Chapter 4, ensuring that the landscape delivers biodiversity, amenity, climate adaptation and placemaking value for future residents and the wider Clondalkin community.

Quality Design and Healthy Placemaking

It is South Dublin County Council's objective to:

- QDP4 Objective 1
Deliver successful and sustainable neighbourhoods that are attractive, connected, vibrant and well-functioning through high-quality design and healthy placemaking, in a manner that reduces the need to travel, facilitates a mix of uses, and supports efficient use of land and infrastructure.
- QDP6 Objective 6
Ensure that all new developments (particularly apartment schemes) provide sufficient public-realm space within the development to enable healthy outdoor living, and prevent layouts that downgrade the quality, accessibility, or usability of shared open spaces.
- QDP10 Objective 1
Require new residential developments to provide a variety of dwelling types, sizes and tenures to meet the diverse housing needs of South Dublin's population.

The Elmfield scheme aligns strongly with the placemaking and neighbourhood-focused objectives of the Development Plan. In keeping with QDP4 Objective 1, the project integrates residential uses with community-supporting functions, including an on-site childcare facility that reduces the need for external trips and supports day-to-day living within walking distance. This mix of residential and local-serving uses directly supports the plan's ambition for sustainable neighbourhoods where essential services are accessible without reliance on private car travel.

The development also responds well to QDP6 Objective 6 through the provision of a landscaped public-realm environment that includes a greenway boulevard, pedestrian-friendly circulation routes, and generous areas of communal open space. These elements allow residents to enjoy high-quality outdoor environments within the development itself, ensuring that shared spaces are usable, accessible and beneficial for physical activity, social interaction and overall wellbeing.

Finally, the scheme is consistent with QDP10 Objective 1 by offering a varied mix of dwelling types and sizes that support different household structures and life-stage needs. The inclusion of both apartments and own-door houses adds welcome diversity, supporting a balanced residential community. This mix reflects the Development Plan's emphasis on providing choice within new housing schemes, contributing to an inclusive neighbourhood structure capable of accommodating a broad range of residents.

Housing: Consolidation, Sustainable Intensification & Urban Efficiency

It is South Dublin County Council's objective to:

- H13 Objective 1
Promote and support residential consolidation and sustainable intensification at appropriate locations, encouraging redevelopment in existing built-up areas and ensuring such development strengthens communities.

The Elmfield development accords strongly with the County Development Plan's emphasis on consolidation and compact urban growth. As a brownfield infill scheme located within the established suburban fabric of Clondalkin, the project directly supports H13 Objective 1 by delivering new homes in a serviced, sustainable location without contributing to outward sprawl. The proposal makes efficient use of underutilised urban land and integrates comfortably within an existing community. In doing so, Elmfield reinforces the plan's strategy of intensifying suitable urban areas in a manner that promotes local regeneration, supports existing amenities and optimises the value of surrounding infrastructure. This form of targeted intensification contributes positively to compact growth principles and aligns with the broader sustainable settlement strategy set out in the Development Plan.

Sustainable Movement: Active Travel, Connectivity & Low-Carbon Mobility

It is South Dublin County Council's objective to:

- SM1 Objective 4
Ensure that future development is planned and designed to facilitate sustainable travel patterns, increasing walking, cycling and public transport use, and creating safe and attractive street environments.
- SM2 Objective 1
Transition towards County mode share targets of 15% walking and 10% cycling through active travel improvements.
- SM2 Objective 3
Maximise pedestrian and cyclist connectivity in new development, reduce walking and cycling distances, and promote compact growth and permeability through site layout and design.
- SM7 Objective 5
Support expansion of the EV charging network by increasing provision of EV charging facilities on public and private lands.

The Elmfield development demonstrates a clear alignment with South Dublin's sustainable movement priorities by embedding active travel, permeability and low-carbon mobility measures within its site

layout. The project's internal pedestrian routes, greenway boulevard and direct connections to surrounding streets create a highly walkable environment, consistent with SM1 Objective 4 and SM2 Objective 3, which promote compact layouts and the prioritisation of walking and cycling. In addition, the development provides a substantial quantity of secure cycle-parking, supporting modal shift by ensuring that residents have convenient and attractive alternatives to car travel. These features directly advance the Council's sustainable-transport objectives under SM2 Objective 1, by reducing reliance on private car trips and making short everyday journeys more accessible by foot or bicycle. Furthermore, the scheme facilitates future-proofed mobility by accommodating the integration of electric-vehicle charging infrastructure in accordance with SM7 Objective 5, supporting the transition to lower-emission transport modes. Collectively, these measures contribute to creating a safe, attractive and sustainable movement environment, aligning with the Development Plan's climate-action objectives and reinforcing Elmfield's role in fostering healthier and less car-dependent neighbourhood patterns.

Community Infrastructure & Open Space

It is South Dublin County Council's objective to:

- COS2 Objective 6
Ensure that social, community, cultural and recreational facilities are provided in ways that reduce climate impacts by promoting walkable access, active travel routes, co-location of uses, renewable energy sourcing, energy-efficient buildings, and increased tree planting and biodiversity-supportive management.
- COS5 Objective 19
Support the provision within new residential developments of formal and informal play areas incorporating nature-based play opportunities, ensuring accessibility for differing age groups and abilities, and complying with universal design principles.

The Elmfield development supports the County Development Plan's goals for sustainable, inclusive neighbourhoods by creating a well-designed internal environment with accessible open spaces and integrated residential play areas. The scheme's landscape design and circulation networks encourage active travel within and around the site, reflecting the climate-responsive principles of COS2 Objective 6. By prioritising pedestrian movement, integrating cycling-supportive routes and reducing dependence on car-based internal trips, the development contributes to healthier mobility patterns and supports the creation of a lower-carbon community framework.

The inclusion of dedicated children's play areas and nature-based amenity spaces aligns with COS5 Objective 19, ensuring that recreational provision is incorporated as an integral part of the residential environment. These spaces provide opportunities for informal play, social interaction and outdoor activity within a safe and accessible setting. Their design enhances wellbeing, supports family needs and contributes to the development of a balanced and socially supportive neighbourhood.

Through these measures, Elmfield aligns with the Development Plan's broader vision of fostering sustainable, climate-aware and community-focused residential areas, while ensuring that open-space and amenity functions are delivered in a way that is appropriate to the scale and nature of the scheme.

Clondalkin Decarbonisation Zone: Low-Carbon Energy & Renewables

It is South Dublin County Council's objective to:

- Policy E1: Responding to European, National and Regional Climate Policy
Integrate climate-action policies that promote renewable energy, energy conservation and efficiency in line with European, national and regional climate objectives.
- E2 Objective 1
Reduce reliance on fossil fuels by lowering the energy demand of existing and new development.
- E2 Objective 2
Promote the generation and supply of low-carbon and renewable energy alternatives.
- E3 Objective 1
Reduce energy needs and enhance energy efficiency through the design and location of new development.
- E3 Objective 3
Require new development to incorporate energy-efficiency and renewable-energy measures and to be designed with regard to climate-change impacts.
- E4 Objective 1
Support implementation of the Dublin Region EV Charging Strategy.
- E7 Objective 1
Encourage and support the development of solar energy infrastructure for on-site energy use.
- CA2 Objective 1
Engage with and support the emerging Clondalkin Decarbonisation Zone, coordinating with the Climate Action Plan to maximise climate benefits at local level.
- CA2 Objective 2
Seek to achieve DZ carbon-emission-reduction targets through sustainable development principles and adoption of best-practice measures.

The Elmfield scheme is located within the Clondalkin Decarbonisation Zone, a designated pilot area for achieving accelerated carbon reduction through place-based measures. This spatial context provides a strong policy basis for enhanced energy performance and sustainable design. In accordance

with CA2 Objective 1 and CA2 Objective 2, the development contributes to local DZ objectives by integrating energy-efficient technologies and renewable-energy measures that reduce on-site emissions and support the CAP's 2030 climate-action targets.

The project adopts a high-performance, fabric-first design consistent with E2 Objective 1 and E3 Objective 1, reducing energy demand through optimised construction materials, airtightness and heat-loss mitigation measures. This approach supports both national nZEB requirements and the Council's broader ambition under Policy E1 to integrate climate-action principles across all new development.

To support E2 Objective 2 and E3 Objective 3, the development incorporates air-source heat pumps and on-site renewable electricity generation through photovoltaics. The orientation and layout of PV panels follow best-practice guidance for maximising solar gain, ensuring panels are positioned to optimise annual yield while minimising overshadowing. Final PV placement will also be informed by a glint and glare analysis, which assesses potential reflective impacts on aviation flight paths, nearby transport corridors, rail infrastructure, and sensitive receptors such as residences, ensuring that solar-panel positioning does not create visual hazards.

These renewable-energy measures align with E7 Objective 1, the Climate Action Plan's emphasis on electrification of heat, and the Decarbonisation Zone's objective of increasing local clean-energy generation.

EV charging infrastructure is integrated in line with E4 Objective 1, supporting the Dublin Region EV Charging Strategy and the broader decarbonisation objectives of the Climate Action Plan. The scheme contributes to reducing long-term emissions associated with private-vehicle use and supports the low-carbon transport ambitions within the Clondalkin DZ

3. Proposed Strategy and Development

This statement adopts the following approach to ensure compliance with the Local and National Planning Policies:

- To propose improving the building fabric beyond the minimum requirements of Part L 2022 Building Regulations.
- To propose reducing energy consumption and carbon dioxide emissions through passive design and energy efficient systems.
- To propose further reductions in emissions by incorporating on-site renewable energy technologies such as solar PV and air source heat pumps.
- To propose the provision of EV charging points and ducting infrastructure to enable sustainable transport options.

3.1. Proposed Development

The proposed development is to be located on a brownfield site at Elmfield Park, Ninth Lock Road, Clondalkin, Dublin 22. The proposed development will consist of the demolition of the existing warehouses and structures on site and the construction of a mixed-use residential-led development comprising a total of 408 no. residential units ((403 apartments consisting of 24 no. studio units, 230 no. 1 bed units and 149 no. 2 bed units, and 5 no. 3 bed 2 storey houses) and 1 no. childcare facility. The residential units will comprise a mixture of apartments and own-door houses and range in height from 2-9 storeys. The proposed development will also comprise all associated car parking (205 no. spaces), cycle parking, refuse and storage areas, plant, landscaping, open space, boundary treatment, public lighting, ESB substations, and site and infrastructural works necessary to facilitate the proposed development.

The development is designed to align with the sustainability objectives of the South Dublin County Development Plan 2022–2028, supported where relevant by the South Dublin Climate Action Plan 2024–2029.

The development will comprise of the following:

- 408 total residential units, a mixture of own-door houses and apartments and 1 no. childcare facility within 4 no. Blocks ranging in height from 2-9 storeys above ground level.
- The proposed development will also comprise all associated car parking (210 spaces), cycle parking, refuse and storage areas, plant, landscaping, open space, boundary treatment, public lighting, ESB substations, and site and infrastructural works necessary to facilitate the proposed development.

The development also includes a landscaped greenway boulevard, green buffer zones, and public open spaces designed to enhance biodiversity and provide communal recreational areas for residents and visitors. The proposed site plan can be seen below in Figure 1.



Figure 1. Proposed Site Plan

4. Building Regulations TGD Part L (2022)

4.1. Dwellings

The proposed residential units within the development are assessed under Technical Guidance Document L – Conservation of Fuel and Energy: Dwellings (2022), which sets out the statutory energy-performance requirements for new dwellings as defined in the Building Regulations and associated EU Energy Performance of Buildings Regulations. Compliance for new houses and apartments is demonstrated using the Dwelling Energy Assessment Procedure (DEAP), which calculates primary-energy demand and carbon emissions for each dwelling type.

For new dwellings, compliance with Part L is achieved as follows:

- L1 A dwelling must be designed and constructed to limit primary-energy consumption and associated CO₂ emissions as far as reasonably practicable. Performance is measured using DEAP, ensuring that the dwelling meets the nearly zero-energy building (NZEB) standard by achieving:
 - a. Energy Performance Coefficient (EPC) ≤ 0.30
 - b. Carbon Performance Coefficient (CPC) ≤ 0.35

These metrics compare the proposed dwelling against a notional reference dwelling.

- L2A. Multi-unit residential buildings must provide ducting infrastructure for every car-parking space to facilitate future installation of EV charging. Where a dwelling has a private curtilage parking space, appropriate EV-charging infrastructure must be installed to enable future charger installation, in accordance with I.S. 10101:2020
- Building Fabric: The dwelling envelope must limit heat loss through compliance with backstop U-value requirements, including:
 - Roof: 0.16–0.20 W/m²K
 - Walls: 0.18 W/m²K
 - Ground floors: 0.18 W/m²K
 - Windows/doors/rooftlights: 1.4 W/m²K

Provisions must be made to minimise thermal bridging at junctions and to ensure construction aligns with Acceptable Construction Details or certified equivalent details
- Air Permeability: Air infiltration must be limited, with all dwellings requiring airtightness testing in accordance with I.S. EN ISO 9972:2015. A maximum air-permeability rate of 5 m³/hr/m² at 50 Pa applies. Where mechanical ventilation with heat recovery is used, lower permeability (<3 m³/hr/m²) is recommended.
- Renewable Energy Contribution: Dwellings must achieve a Renewable Energy Ratio (RER) ≥ 0.20, meaning at least 20% of primary energy must be delivered from renewable technologies such as heat pumps, PV, biomass systems, or other recognised renewable sources. Centralised renewable heat systems may also be used to meet this requirement.
- Building Services: Space and water-heating systems must be energy-efficient and fitted with effective controls. Oil or gas boilers, where provided, must meet a minimum 90% seasonal efficiency. Heat pumps must comply with Ecodesign efficiency requirements. Controls must include room-temperature control, hot-water temperature control, time zoning, and system interlock.
- Ventilation: Mechanical-ventilation systems (where installed) must meet minimum performance backstops, including specific-fan-power limits and minimum heat-recovery efficiency (≥70% for MVHR), and must be supported by adequate dwelling airtightness.
- Pipes, Ducts and Hot-Water Systems: Hot-water storage vessels, pipework and associated ducting must be insulated to limit heat loss, with cylinders achieving standing-loss performance of ≤0.8 W/litre, in accordance with BS 1566-1.
- Self-Regulating Devices: All new dwellings must include self-regulating temperature-control devices for each room or designated heated zone, where technically and economically feasible.
- User Information: Homeowners must be provided with sufficient information regarding operation and maintenance of fixed building services—including renewable-energy systems—to enable efficient operation throughout the building's life.

The residential component of the development will be designed to meet or exceed the above requirements, ensuring full compliance with TGD Part L (2022) for dwellings.

4.2. Buildings other than Dwellings

The proposed development includes a new childcare facility at ground floor level, which will be assessed under Part L 2022 of the Building Regulations. The requirements regarding the conservation of fuel and energy are laid out in Part L of the Second Schedule to the Building Regulations 1997 (S.I. No. 497 of 1997) as amended, and the European Union (Energy Performance of Buildings) Regulations 2021 (S.I. No. 393 of 2021).

For new buildings other than dwellings, compliance with Part L of the Second Schedule to the Building Regulations is achieved as follows:

- L1. A building shall be designed and constructed so as to ensure that the energy performance of the building is such as to limit the amount of energy required for its operation and the associated carbon dioxide (CO₂) emissions, insofar as is reasonably practicable.
- L5. For new buildings other than dwellings, the requirements of L1 shall be met by:
 - a. Providing that the energy performance of the building is such as to limit the calculated primary energy consumption and related CO₂ emissions to a Nearly Zero Energy Building (NZEB) level, insofar as is reasonably practicable, when calculated using the Non-Domestic Energy Assessment Procedure (NEAP) published by SEAI.
 - b. Providing that the nearly zero or very low amount of energy required is covered to a very significant extent by energy from renewable sources produced on-site or nearby.
 - c. Limiting heat losses and, where appropriate, availing of useful heat gains through the building fabric.
 - d. Providing and commissioning energy efficient space heating and cooling systems, water heating, and ventilation systems with effective controls.
 - e. Ensuring the building is designed to limit the need for cooling and that any air-conditioning or mechanical ventilation systems installed are energy efficient, appropriately sized, and well controlled.
 - f. Limiting heat loss from pipes, ducts, and vessels used for the transport or storage of heated water or air.
 - g. Limiting heat gains by chilled water and refrigerant vessels, and by pipes and ducts serving air-conditioning systems.
 - h. Providing energy efficient artificial lighting systems and appropriate controls for those systems.
 - i. Providing sufficient information to the building owner regarding the building's fixed services, controls, and maintenance needs, to enable efficient operation of the building.

Under the European Union (Energy Performance of Buildings) Regulations 2021 (S.I. No. 393 of 2021), for new non-residential buildings, the following applies:
Regulation 5

- a) A new building shall, where technically and economically feasible, be equipped with self-regulating devices for the separate regulation of the temperature in each room or in designated heated zones.

- e) A building with more than 10 car parking spaces shall include at least one EV recharging point and ducting infrastructure (i.e., conduits for electric cables) for at least one in every five spaces to allow future installation of additional recharging points.

5. Energy Efficient Design Strategy

This section analyses the proposed development using an energy hierarchy methodology employed by Lawler Sustainability. The methodology outlined below highlights the steps taken to optimise the proposed design in terms of energy efficiency. It prioritises the “Fabric First” approach, which focuses on optimising the performance of building components and materials before sizing building service systems. Lawler Sustainability considers this design methodology to be widely recognised by local authorities, including South Dublin County Council, as a best-practice framework for developing low carbon and energy efficient buildings.

1. **Passive Design** is crucial during the initial stages of building conception for various reasons. Its main goal is to improve energy efficiency and ensure occupant comfort while reducing operational costs and environmental impact. By incorporating passive design principles early, the need for costly retrofitting or adjustments during construction or operation can be greatly reduced. Important factors to consider include orientation, insulation, natural ventilation, and shading. Addressing these factors from the outset can help avoid expensive fixes later on. A well-executed passive building also provides better indoor environmental quality, including improved thermal comfort, ample daylighting, and enhanced indoor air quality. Considering these elements early enables occupants to experience increased comfort and productivity, potentially leading to lower absenteeism and higher satisfaction levels.
2. **Energy Efficient Measures** incorporated into the design can further reduce energy consumption and carbon emissions for the development. The following measures have been considered:
 - a. The use of energy efficient mechanical ventilation with heat recovery,
 - b. Air source heat pumps with high efficiency ratings,
 - c. The provision of zonal thermal controls,
 - d. Metering of HVAC and lighting systems,
 - e. Thermal insulation for pipework and ductwork.
 - f. Air tightness value of 3.0 m³/hr/m²,
 - g. The provision of energy efficient lighting, to achieve a minimum average luminous efficacy of ≥110 lm/W,
 - h. The provision of energy efficient lighting controls - PIR controls and occupancy sensing,
3. **Renewable Energy Sources** will contribute to the building’s low carbon profile by supplying clean electricity for building systems. Rooftop solar PV will support compliance with the Renewable Energy Ratio (RER) targets under TGD Part L 2022 and help offset electricity demands of shared building services.

5.1. Passive Design and Energy Efficiency Measures

The following recommended passive design and energy saving measures support the development in achieving compliance with the South Dublin County Council Development Plan and provide a strategy to reduce carbon emissions beyond the baseline (Part L minimum requirements) model.

5.1.1. Building Fabric

The following U-values will be incorporated into the development in compliance with Part L (2022) and aligned with the South Dublin County Council Development Plan. The external walls, ground floor, roof, and external glazing exceed the minimum requirements of Part L to reduce the heating and cooling demands of the building. This also facilitates the downsizing of HVAC systems, thereby reducing energy consumption.

Table 2. Proposed building fabric performance.

Element	Part L Requirements (W/m ² K)	Proposed U-value (W/m ² K)
External Wall	0.18	0.18
Ground Floor	0.18	0.15
Flat Roof	0.16	0.13
Windows	1.40	1.20
Personnel Doors	1.40	1.20

In addition to the above, the proposed glazing details will have a g-value of 0.44 to help with minimising the amount of solar gain penetrating into the space. Thus, reducing the cooling demand.

5.1.2. Energy Efficiency Measures

In conjunction with the passive design measures detailed above, the development incorporates the following energy efficiency strategies, Supporting the South Dublin County Development Plan's objectives for decarbonisation and sustainability:

- Installation of **energy efficient LED lighting systems**, achieving a minimum average luminous efficacy of ≥ 110 lm/W.
- Integration of **lighting controls**, including PIR sensors and daylight dimming, to limit energy use in unoccupied or naturally lit spaces.
- Implementation of **zonal thermal controls** to enable responsive heating and cooling for different building zones, improving energy management.
- Enhanced **thermal insulation** for pipework and ductwork to minimise energy losses during heating, cooling, and ventilation.
- Use of **mechanical ventilation with heat recovery (MVHR)** systems, with typical heat recovery efficiency of up to 85%, to reduce heating energy demands.
- Installation of **smart metering systems** for HVAC and lighting, allowing for effective monitoring and ongoing energy optimisation.
- Implementation of **electric power factor correction systems** with a target correction factor of >0.95 to improve electrical efficiency.
- Targeting a design air permeability rate of **3.0 m³/hr/m²** at 50 Pa to minimise uncontrolled heat loss through the building envelope.

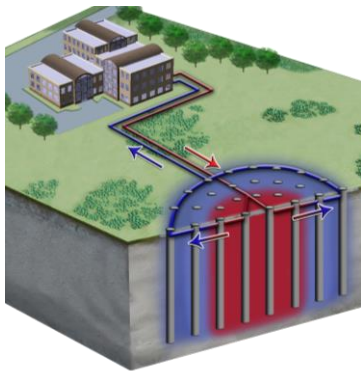
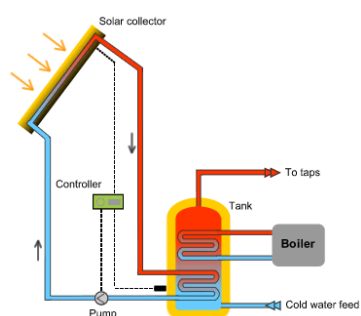
These measures collectively ensure the proposed development exceeds current regulatory requirements, reduces its operational energy use and carbon footprint, and contributes to South Dublin's goal of delivering high performance, low carbon buildings.

5.2. Low-Carbon Energy Measures & Renewable Sources

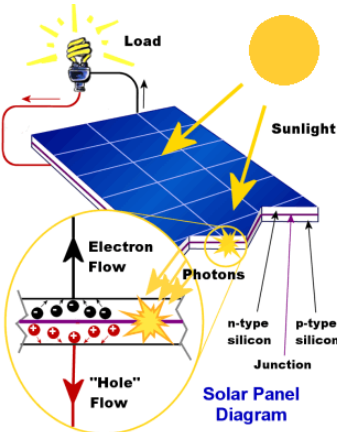
A range of renewable and low/zero carbon technologies have been assessed for implementation into the development and are addressed in the following table. The following technologies are assessed considering the generation of on-site renewable energy and their suitability to the development.

Table 3. Renewable energy technology feasibility assessment

Type of Technology	Feasibility Assessment	Feasible?
Biofuel Boilers 	Biofuel boilers are specifically designed to burn either solid biomass or liquid biofuel in order to heat water or raise steam. This system can be used for space heating or DHW supply. Biofuel boilers are not proposed for use within this Development for the following reasons: 1. The storage requirements for the biofuel would require a large plant space with an auxiliary storage facility to allow for a two-week period where delivery of fuel might not be available. 2. Biomass boilers generate Nitrogen Oxides (NOx) and particulates (PM10) which would affect air quality within the populated area. <u>Land Use</u> Large volumes of storage are required for fuel at ground level with sufficient vehicular access. <u>Noise</u> Noise levels are generated by the operation of the biofuel boiler and associated deliveries of the biofuel. The plant room enclosure would have to be attenuated to acceptable levels imposed by the planning and Acoustician recommendations.	No
Small Scale Wind Turbines	Wind turbines convert the kinetic energy in the wind into mechanical energy which is then converted into electricity. Wind turbines can provide electrical power either directly to a load or via a battery system. Wind turbines are not proposed for use within this Development for the following reasons: 1. Noise pollution from wind turbines can be significant within a few hundred metres.	No

Type of Technology	Feasibility Assessment	Feasible?
	2. Wind turbines situated at low heights could create a strobe or flicker effect. <u>Land Use</u> The site plans demonstrate that there may be space available for the allocation of a suitably sized wind turbine but would require further investigation. <u>Noise</u> Noise levels are generated by the rotating blades; these noise levels will vary dependant on wind velocity and will need to be in acceptable levels imposed by planning and Acoustician recommendations.	
Ground Source Heat Pumps 	Space heating and cooling can be provided by circulating water heated or cooled directly by the ground or via subterranean water. Ground water cooling using aquifers makes use of the relatively stable ground/water temperature which can be available at temperature range of 10-14°C. Ground Source Heat Pumps (GSHP) are not proposed for use within the development for the following reasons: 1. The installation of GSHP for this development would involve extensive excavation works. <u>Land Use</u> This installation would require Environmental Protection Agency approval (if an open loop system connecting to an aquifer is selected). Ground and hydrology analysis would be required to investigate if favourable conditions exist. <u>Noise</u> There are no noise issues generated by this technology.	No
Solar Water Heating 	Solar Water Heating (SWH) systems use radiant energy from the sun to heat water. Systems comprise of a roof mounted heat collector piped to a coil located within a hot water storage cylinder. Solar Thermal Panels can be proposed for use within this Development. However, it is proposed that the electrical demand of the building will outweigh the demand for hot water. Hence, solar PV panels are proposed in lieu of solar thermal panels. 1. The hot water demand for the current development is low, therefore the panel area	No

Type of Technology	Feasibility Assessment	Feasible?
	required would be small and the installation and maintenance costs outweigh the savings. <u>Land Use</u> Roof space is required for the installation of solar panels, optimum installation is south facing at an angle of 30 degrees. <u>Noise</u> Noise levels are generated by pumps at roof level, these are insignificant so should pose no issue.	
Air Source Heat Pumps WINTER HEATED AIR COOL AIR COOLED AIR OUTSIDE AIR SUMMER COOLED AIR HEATED AIR WARM AIR OUTSIDE AIR	An Air Source Heat Pump (ASHP) extracts heat from the outside air in the same way that a fridge extracts heat from its inside. It can extract heat from the air even when the outside air temperature is as low as -15°C. ASHPs are proposed for use within the Development to provide heating and cooling for the following reasons: 1. They are ideally suited to serve the cooling requirement of the Development during periods when they may require heating or cooling. The times when cooling is required may differ for different spaces depending on their use, occupancy period and levels, the operation of individual air source heat pumps would allow individual control and can be efficiently accommodated within each building design. 2. Air-to-Air or Air-to-Water applications can be used to suit the future tenant's bespoke environmental requirements. 3. The heat pump units can be configured to provide internal heat reclaim from dissimilar environmental zones, reducing energy consumption and carbon emissions. 4. ASHP can be easily accommodated into the new design and plant layouts. ASHPs will be utilised in the Development as they are the most efficient way to meet the heating and cooling demands of the Development. Furthermore, ASHPs contribute to the Development carbon savings.	Yes

Type of Technology	Feasibility Assessment	Feasible?
	<u>Land Use</u> ASHPs can be installed on ground mounted, roof mounted, or wall mounted frames. When installing ASHPs, there are various factors to consider; Heat Pumps should be positioned to provide shelter from high winds which can reduce efficiency by causing defrost problems and be kept free from leaves and debris. <u>Noise</u> Noise levels are generated by fans, and compressors causing vibrations. The noise levels are dependent on manufacturer and vary accordingly, these will need to be in acceptable levels imposed by planning and Acoustician recommendations.	
Photovoltaic Panels  The diagram illustrates the operation of a photovoltaic panel. Sunlight (photons) strikes a junction of n-type silicon and p-type silicon. This causes the flow of electrons (indicated by an upward arrow) and 'hole' flow (indicated by a downward arrow). The panel is connected to a load, represented by a light bulb. The entire diagram is labeled 'Solar Panel Diagram'.	Photovoltaic (PV) panels convert sunlight directly into DC electricity. The solar cells consist of a thin piece of semiconductor material, in most cases silicon. Mono-crystalline PVs are proposed for use within the development, for the following reasons: 1. The roof space is free from any over-shading from surrounding buildings. 2. PVs are a low maintenance technology. 3. They provide a visible contribution to the public, promoting the use of renewable technology. <u>Land Use</u> There are no land use issues or adverse visual impacts as the PV panels are roof mounted. <u>Noise</u> There are no noise issues generated by this technology.	Yes

5.3. District Heating Consideration

South Dublin County Council has launched the Tallaght District Heating Scheme.

District heating was not considered for this project as the development is served by high-efficiency air-source heat pumps and extensive on-site solar PV generation, which together meet the project's low-carbon heating and energy-performance requirements.

5.4. Targeted Building Energy Ratings (BER)

The proposed development is expected to achieve a BER of (A2).

6. Sustainable Environment Infrastructure

6.1. Light Pollution

All Site light fittings proposed on this Development are LED fittings. There is zero upward light ratio of LED lighting with direct downward light also limited to task light, this reduces any light spill from the LED fixtures. LED lighting is also dimmable and capable of trimming during late hours thus reducing disturbance to wildlife or neighbours at night.

The Design Team involves specialist consulting engineers who use software such as Dialux and Relux to simulate the car park areas and potential areas of excessive light, bounce or spill. They adhere to the following Standards and outdoor lighting guides:

- BS EN 12464-2:2007 'Lighting of Work Places – Part 2 – Outdoor Workplaces'
- BS 5489-1 (2012) – Code of practice for the Design of Road Lighting – Lighting of roads and public amenity areas
- Guidance note for the Reduction of Obtrusive Light – GN01:2011, produced by the Institute of Lighting Professionals (ILP)
- Society of Light and Lighting (SLL) – Lighting Handbook 2012
- CIBSE Environmental considerations for External Lighting – Factfile no.7 (2003)

Table 1 – Environmental Zones			
Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark	UNESCO Starlight Reserves, IDA Dark Sky Parks
E1	Natural	Intrinsically dark	National Parks, Areas of Outstanding Natural Beauty etc
E2	Rural	Low district brightness	Village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Small town centres or suburban locations
E4	Urban	High district brightness	Town/city centres with high levels of night-time activity

Table 2 – Obtrusive Light Limitations for Exterior Lighting Installations – General Observers						
Environmental Zone	Sky Glow ULR [Max %] ⁽¹⁾	Light Intrusion (into Windows) E _v [lux] ⁽²⁾		Luminaire Intensity I [candelas] ⁽³⁾		Building Luminance Pre-curfew ⁽⁴⁾
		Pre-curfew	Post-curfew	Pre-curfew	Post-curfew	Average, L [cd/m ²]
E0	0	0	0	0	0	0
E1	0	2	0 (1*)	2,500	0	0
E2	2.5	5	1	7,500	500	5
E3	5.0	10	2	10,000	1,000	10
E4	15	25	5	25,000	2,500	25

Figure 2. Guidance notes for the reduction of obtrusive light (Source: GN01:2011)

6.2. EV Charging Points

In accordance with the **EU Energy Performance of Buildings Directive (2021)**, developments with more than ten car parking spaces are required to provide at least one operational EV charging point and ducting infrastructure for one in every five spaces to allow for future EV charger installation. The proposed development includes a total of 205 car parking spaces, which will include the above requirement for both EV and future EV installations.

The proposed provision will exceed the minimum requirements of the EU Directive by including a number of operational EV charging points as part of the development and enabling future expansion through ducting for additional spaces. This approach also aligns with objectives of the South Dublin County Development Plan 2022–2028, which seeks to expand EV-charging infrastructure on both public and private lands. Collectively, these measures support South Dublin County Council’s objectives for sustainable mobility and future-proofed transport infrastructure.

6.3. Energy Efficiency and Climate Change Adaption

IS 399:2014 “Energy Efficient Design Management” is a management system standard developed by SEAI and NSAI to support the design of buildings with operational lifecycle energy costs in mind. This is achieved by investing in energy efficient technologies and practices at the earliest design stages. The standard has been further developed by SEAI into the EXEED (Excellence in Energy Efficient Design) certification pilot programme.

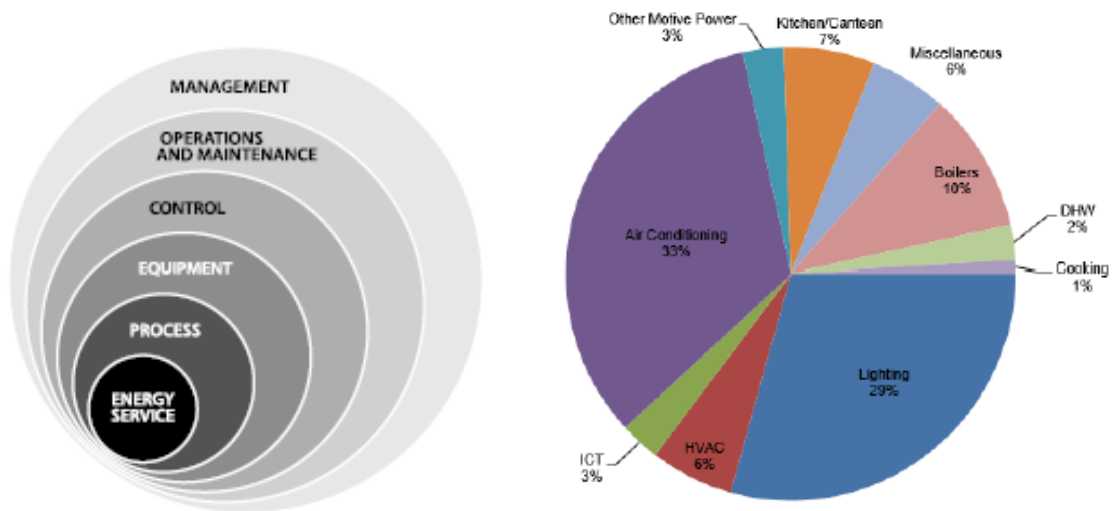


Figure 3. Energy Efficient Design Venn Diagram and Typical Energy Balance Study (Source: IS 399:2014)

This development has been reviewed by Mechanical and Electrical Consulting Engineers to identify and implement the most effective energy-saving strategies early in the design process. The proposed scheme incorporates high-performance building fabric, airtightness, efficient lighting, heating, and ventilation technologies. The design team has prioritised early-stage investment in low-carbon systems and technologies to reduce long-term operational energy costs. High energy use areas are targeted from the outset by maximising natural lighting and ventilation and using smart technologies such as LEDs and occupancy sensors.

The following measures will be implemented to maximise energy efficiency and reduce carbon emissions:

- **Energy Efficient Lighting Internal and External:** All lighting across the development will utilise LED fixtures. The lighting design achieves approx. 30% energy and cost savings compared to traditional lighting systems. Luminous efficacy targets include ≥ 110 lm/W for general lighting and ≥ 100 lm/W for display lighting.
- **Heat Recovery in HVAC Systems:** Mechanical ventilation with heat recovery will transfer heat between incoming and outgoing air streams, with recovery efficiencies of up to 80%, reducing the heating load.
- **Occupancy Controls:** PIR presence detection will be installed in low-occupancy zones such as stores, service rooms, and WCs, automatically switching off lighting and equipment in unoccupied areas.
- **Air Source Heat Pumps:** High-efficiency air source heat pumps will be installed to serve residential units and communal areas, with SCOPs up to 4.00 for heating and SEERs up to 6.40 for cooling.
- **U-Values and Air Tightness:** The development incorporates high-performance building envelope specifications in accordance with TGD Part L 2022, ensuring improved thermal retention and reduced heating demand.
- **Water Efficient Fixtures:** Low-flow fittings and fixtures will be installed to minimise water consumption and reduce associated energy demand for hot water generation.

7. Conclusion

The design team has recognised the importance of energy savings from the early stages and has prioritised the implementation of energy efficiency measures to significantly reduce the environmental impacts associated with daily operations. These efforts align with the sustainability objectives of the South Dublin County Council Development Plan.

The development has committed to the sustainability improvements detailed below, achieving environmental, commercial, and economic viability in climate adaptation measures. These commitments are summarised in the following table:

South Dublin County Council Reference Measure(s) Taken and Outcome(s)

Development Plan Reference	Measure(s) Taken	Outcome(s)
Policy E1 (Climate Policy Integration)	Fabric first design; airtightness strategy; nZEB compliant building specification.	Reduced operational energy demand and alignment with national/regional climate action frameworks.
E2 Objective 1 (Reduce Fossil)	High efficiency air source heat pumps installed across the development.	Fully electric, low carbon heating system reducing reliance on fossil fuels.
E2 Objective 2 (Promote Renewable Sources)	Significant provision of on site photovoltaic (PV) generation.	Increased on site renewable energy contribution and reduced grid demand.
E3 Objective 1 & 3 (Energy Efficiency & Climate Responsive Design)	Optimised building orientation; insulated building envelope; energy efficient services; PV orientation refined through glint and glare analysis (assessing aviation flight paths, road users, rail networks, and sensitive receptors).	Improved thermal performance; reduced heat loss; safe and effective renewable energy deployment; climate resilient energy design.
E4 Objective 1 (EV Strategy Implementation)	Provision for EV charging infrastructure throughout resident parking.	Supports transition to low emission vehicle use and future mobility needs.
E7 Objective 1 (Support Solar Energy)	PV installed on units with roofspace; layout designed to maximise solar access.	Increased renewable generation capacity and reduced carbon intensity of electricity supply.

Development Plan Reference	Measure(s) Taken	Outcome(s)
CA2 Objective 1 & 2 (Clondalkin Decarbonisation Zone)	Electrified heating; renewable energy integration; low carbon design principles.	Supports DZ objectives for reduced emissions and cleaner local energy systems.
CS1, CS3, CS6 (Compact Growth & Settlement Strategy)	Brownfield / infill redevelopment within an established serviced urban area.	Supports compact urban form, reduces need for greenfield expansion, and optimises existing services and infrastructure.
GI1 Objective 4; GI2 Objective 1–2; Policy GI5 (Green Infrastructure & Biodiversity)	Greenway boulevard; climate responsive planting; ecological buffers; pollinator friendly species.	Enhanced ecological connectivity, improved biodiversity, and resilient site landscaping.
QDP4 Objective 1 (Healthy Placemaking)	Mixed residential uses; integrated childcare; walkable neighbourhood structure.	Reduced need to travel; strengthened community function; vibrant local environment.
QDP6 Objective 6 (Quality Shared Spaces)	High quality communal open spaces; pedestrian friendly layout.	Accessible outdoor amenity spaces that support social interaction and wellbeing.
QDP10 Objective 1 (Housing Mix)	Combination of apartments and own door houses.	Diverse housing supply meeting varied demographic needs.
H13 Objective 1 (Consolidation & Sustainable Intensification)	Regeneration of an underused site in Clondalkin.	Supports strategic densification and urban renewal in accordance with the Core Strategy.
SM1 Objective 4; SM2 Objective 1 & 3 (Active Travel & Permeability)	Extensive pedestrian connections; strong permeability; large provision of secure cycle parking.	Enables modal shift to walking and cycling, reduces short car trips.
SM7 Objective 5 (EV Infrastructure)	EV ready parking with charging capability.	Facilitates long term transition to electric mobility.
COS2 Objective 6 (Climate Responsive Community Infrastructure)	Walkable layout; active travel prioritisation; low carbon mobility.	Reduced carbon impact of daily movement; improved neighbourhood accessibility.
COS5 Objective 19 (Play & Recreation)	Provision of children's play areas and nature based recreational spaces.	Enhanced family friendly amenities and community wellbeing.

