Alton Estate Regeneration
Hybrid Application

Whole Life Cycle Carbon Emissions Report

Hodkinson Consultancy
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ALTON GREEN

ROEHAMPTON SW15

REDROW

HODKINSON

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ABOUT HODKINSON CONSULTANCY

Our team of technical specialists offer advanced levels of expertise and experience to our clients. We have a wide experience of the construction and development industry and tailor teams to suit each individual project.

We are able to advise at all stages of projects from planning applications to handover.

Our emphasis is to provide innovative and cost-effective solutions that respond to increasing demands for quality and construction efficiency.

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1. INTRODUCTION

1.1 This Whole Life Cycle Carbon Emissions (WLCCE) report has been prepared by Hodkinson Consultancy, a specialist energy and environmental consultancy for planning and development, appointed by Redrow Homes Ltd.

1.2 The purpose of this report is to provide feedback on Redrow's general design principles and provide best practice recommendations to reduce both the operational and embodied carbon for the proposed development at Alton Estate, Roehampton. By considering these two types of emissions together it is possible to optimise the design and ensure the lowest overall emissions reduction for the development.

1.3 This report focuses on embodied carbon and the Life Cycle Assessment (LCA) element of WLCCE and best practice design principles have been recommended. Once a full detailed building model is available a full WLCCE assessment can be undertaken. The aim is to help the design team understand, at design stage, the lifetime consequences of their design decisions.

2. POLICY AND REGULATIONS

The London Plan

2.1 It is anticipated that the **Draft New London Plan** will be adopted in Spring 2020 although the policies are already carrying weight with the Greater London Authority (GLA). This includes Policy SI 2 which is relevant to this report:

Policy SI 2 Reducing Greenhouse Gas Emissions – Clause F

> Development proposals referable to the Mayor should calculate whole life-cycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions.

> > Operational carbon emissions will make up a declining proportion of a development's whole life-cycle carbon emissions as operational carbon targets become more stringent. To fully capture a development's carbon impact, a whole life-cycle approach is needed to capture its unregulated emissions (i.e. those associated with cooking and small appliances), its embodied emissions (i.e. those associated with raw material extraction, manufacture and transport of building materials and construction) and emissions associated with maintenance, repair and replacement as well as dismantling, demolition and eventual material disposal). Whole life-cycle carbon emission assessments are therefore required for development proposals referable to the Mayor. Major non-referable development should calculate unregulated emissions and are encouraged to undertake

whole life-cycle carbon assessments. The approach to whole life-cycle carbon emissions assessments, including when they should take place, what they should contain and how information should be reported, will be set out in guidance.

2.2 No formal guidance has been released to date but is expected in the coming months. In the interim the following guidance is available to conduct assessments:

> BS EN 15978:2011 - *Sustainability of construction works. Assessment of environmental performance of buildings. Calculation method.*

> ISO 14040:2006 - *Environmental management — Life cycle assessment — Principles and framework.*

> RICS Professional Statement Whole life carbon assessment:2017 - *Whole life carbon assessment for the built environment.*

> BREEAM New Construction Non-Domestic Buildings (SD5076: 2014).

3. DEVELOPMENT OVERVIEW

Site Location

3.1 The proposed development site is located in Roehampton within the London Borough of Wandsworth. Figure 1 illustrates the site masterplan.

Figure 1: Site Location – Site Masterplan, 2019

3.2 The planning application is being submitted as a Hybrid Application, comprising a Detailed Application for Blocks A, K, M, N, O, Q and Portswood Place, with an outline application for the rest of the site.

Proposed Development

3.3 The description of development for the planning application is (floor areas TBC following receipt of the finalised schedule):

a. *Phased demolition of all existing buildings and structures (except Alton Activity Centre community building);*

b. *Mixed-use phased development ranging from 1-9 storeys above ground level comprising up to 1,108 residential units and up to 9,377 sqm (GIA) of non-residential uses comprising new and replacement community facilities (including library and healthcare facilities, youth facilities, community hall, children's nursery & children's centre) (Class D1); flexible commercial floorspace (comprising retail (Class A1), financial and professional services (Class A2), café / restaurants (Class A3), hot-food takeaways (Class A5), business (Class B1), and community uses (Class D1)); landscaping; removal and replacement of trees; public realm improvements; access improvements; relocation of bus turnaround area and provision of bus driver toilet facility; improvements to children's play facilities; provision of energy centre and associated rooftop plant enclosure; car & cycle parking; and other highway works incidental to the development. All matters reserved except for Blocks A, K, M, N, O, Q, Portswood Place Nursery and Community Centre and highway/landscape/public realm improvements.*

4. WHOLE LIFE CYCLE CARBON EMISSIONS ASSESSMENT

4.1 The new draft London Plan has introduced a requirement for all new referable developments to calculate and reduce WLCCE, this is both embodied and operation carbon:

> **Operational carbon** is the energy required to heat and power a building.

> **Embodied carbon** is the carbon that is released in the manufacturing, production, and transportation of the building materials used.

4.2 Analysis by RICS shows that the proportion of embodied energy in relation to regulated operational energy is, in most new building typologies, greater than 50%, as shown in Figure 2 overleaf.

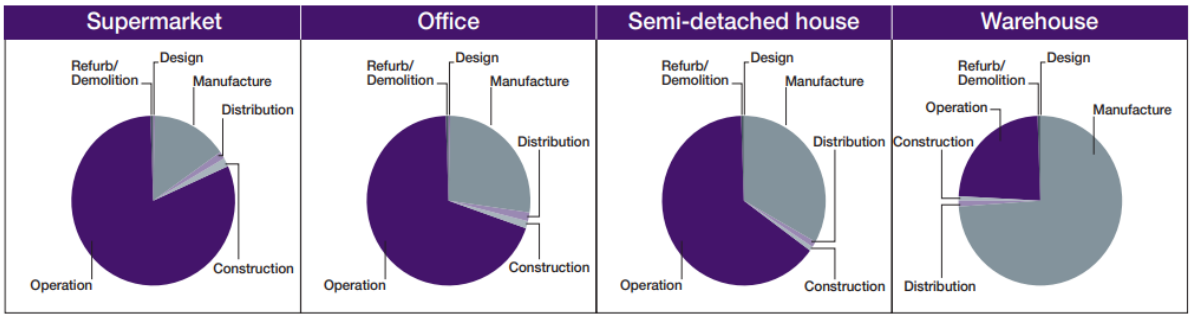

Figure 2: Impact of the consequent life cycle stages on the overall carbon footprint for different types of buildings, calculated over 30 years (HM Government, 2006).

4.3 Embodied and operational carbon are both an important part of the built environment's impact on climate change.

Operational Emissions

4.4 Redrow Homes have prioritised an energy strategy which places significant emphasis on the reduction of energy demands, in line with GLA's London Plan energy hierarchy. This is outlined in the proposed Energy Strategy for the development.

4.5 At this stage operational emissions have not been reviewed; these will be included in the full WLCCE assessment.

Embodied Emissions

4.6 This report focuses on the LCA part of the WLCCE assessment. Undertaking an LCA is fundamental to a WLCCE assessment. It provides a reliable picture of the material and building environmental impacts of a building using science-based metrics (e.g. Global Warming Potential).

4.7 It can be summarised as *"a systematic set of procedures for compiling and examining the inputs and outputs of materials and energy, and the associated environmental impacts directly attributable to the functioning of a building throughout its life cycle"* (ISO 14040: 2006).

4.8 An LCA will help the design team understand, at design stage, the lifetime consequences of their design decisions. This promotes durability, resource efficiency, reuse and future adaptability, all of which contribute to life-time carbon reductions.

Future Methodology

4.9 The WLCCE assessment for Alton Estate will be assessed in accordance with the principles and guidance outlined in section 2.2 above. To undertake a beneficial WLCCE assessment it requires a

detailed building model to be available, against which materials are assigned (or mapped) to building elements with suitable environmental profiles. Further details on distances travelled for construction materials and longevity of materials are also assigned, where these are not known default values can be used.

4.10 Once the model is available, OneClick LCA will be used to conduct the LCA. This is a web based approved LCA and design software for buildings and infrastructure. It is fully compliant with the standards referenced within this report and allows for both embodied and operational emissions to be accounted for.

4.11 To understand embodied carbon the full detailed building model is used and to understand operation carbon the values noted within the energy statement are used.

4.12 The uncertainty around unknown building elements, specific manufacturers and location of suppliers will be diminishing as the project progresses and the different design elements are developed further. The WLCCE will be updated during later stages in the design (RIBA 3 or 4) to ensure that it has a higher level of confidence and precision.

5. REDROW DESIGN PRINCIPLES – INITIAL OBSERVATIONS

5.1 Redrow Homes Ltd have produced a guidance document *"General Project Design Requirements Guidance Notes: London Divisions"* which gives a clear brief regarding the standard design requirements expected on each of its complex projects.

5.2 This sets out how Redrow Homes Ltd are already considering embodied carbon and ensuring building fabric longevity in their design standards.

> RC structural floor slab thickness – 225mm if possible but generally 250mm (except ground and first floor levels)

    > Structural slabs are a major contributor to a building's embodied carbon, they provide structural, acoustic and fire resistance capabilities for the building. Reducing the net thickness of structural slabs by 10mm reduces the building envelope height correspondingly, thus saving materials from slabs and walls, and energy via reduced conductive loss. The use of hollow slabs or bubble decks could further reduce building life-cycle embodied impacts by approximately 6%.

> Porcelain tiles to be used in entrance lobbies and in other communal areas.

    - Ceramic and porcelain are generally good for the environment as they do not contain VOCs (Volatile Organic Compounds), are low maintenance and have a long-life cycle.

- Construction to be reinforced concrete (RC) frame.
    - This is a common and established construction method, comprising a network of columns and connecting beams that forms the structural 'skeleton' of a building. The use of this construction method at Alton Estate is typical for a development of its height. Alternative methods of construction may offer greater carbon savings but may not be appropriate to the building.

- Polyester powder coatings (PPC) are to be used on balustrades and balconies.
    - The choice of a PPC finish can save up to about 30% embodied carbon compared to an anodised finish. A PPC finish also ensures that the product remains recyclable which meets Circular Economy principles. Anodising aluminium makes it much more complex to recycle at the end of its life. A PPC finish is proposed for balustrades and balconies but should also be considered for curtain walling.

- Use of chamfered RC columns in car parks.
    - A chamfered edge on a concrete column improves aesthetics, safety and ensures the easy removal of concrete formwork once the concrete has reached its sufficient strength. Compared to right-angle external corners, chamfered corners are less vulnerable to damage which means maintenance requirements are reduced and longevity of the material is increased.

6. BEST PRACTICE

6.1 In addition to those observations made within Redrow's design principles, a set of good practice principles are set out below. These are based on embodied carbon and life cycle only and must be considered alongside other design considerations:

- Using concrete as a finish can reduce the need for other materials. In addition, exposed areas of concrete can optimise the thermal mass performance. Thermal mass, with adequate ventilation, can be used to control daytime peak temperatures of a space and therefore reduce or minimise the need for air-conditioning. The areas where this can be done would need to be carefully considered. The durability of concrete also offers further savings through a reduction in the need for maintenance and repair (compared to a painted finish for example).

> The average embodied CO_2e impact of concrete is around 100kg CO_2e per tonne. The value for different concrete products will differ and the use of Ground Granulated Blast Furnace Slag (GGBS) or fly ash can significantly reduce the overall greenhouse gas emissions associated with the production of concrete.

> Admixtures can be used to enhance sustainability credentials and reduce the embodied CO_2 of concrete.

> The transportation of materials from the manufacturing facility to the building site adds to the carbon of the development. Buying from local sources reduces the emissions produced during transportation, once further details of manufacturers and their locations are known the WLCCE assessment can be updated to reflect this.

> The façade and roof are under constant wear from the environment, can lead to frequent repairs and maintenance. By using durable materials, this not only reduces the cost and frequency of refurbishment but also reduces the use of material replacement and its associated carbon footprint.

> Trialling the use of innovative low carbon materials, such as cement-free concrete, on noncritical areas, such as temporary works before attempting to use them more widely on permanent works.

> Chose lower carbon solutions where the design allows for it. Setting carbon performance requirements on the project allows for the reduction of embodied carbon emissions in a meaningful and effective way. This strategy works effectively for all materials where supply is competitive, and some suppliers are willing to supply products with improved environmental performance.

> Consideration of offsite fabrication, modularisation and standard sizes to reduce building complexity and embodied energy use in production.

> Recycled aggregates should only be considered within the design when they are locally available, otherwise transportation impacts exceed the intended benefits. The use of recycled aggregates within a project also enables credits to be awarded under BREEAM.

> One of the simplest ways to reduce aluminium's embodied carbon without altering its appearance is to use aluminium with a higher recycled content (RC). Compared with virgin aluminium, increasing the %RC can reduce the embodied carbon by around 42% for medium RC (50%RC), or by 75% for very-high RC (90%RC).

6.2 The above measures are based on good practice and are require consideration by the design team to reduce the embodied carbon of the development at this stage.

7. CONCLUSION

7.1 This Whole Life Cycle Carbon Emissions (WLCCE) report has been prepared by Hodkinson Consultancy, a specialist energy and environmental consultancy for planning and development, appointed by Redrow Homes Ltd.

7.2 This report focuses on embodied carbon and the Life Cycle Assessment (LCA) element of WLCCE and best practice design principles are set out. Once a full detailed building model is available a full WLCCE assessment can be undertaken with the aim to help the design team understand, at design stage, the lifetime consequences of their design decisions.

7.3 It also includes a review of Redrow Homes Ltd design standards and demonstrates that they are already considering embodied carbon and ensuring building fabric longevity in their design standards.