WHOLE LIFE CARBON OPTIMISATION THROUGH RETROSPECTIVE MODELING OF HOUSING DEVELOPMENTS.

INTRODUCTION

This study focuses on optimising the whole life cycle carbon emissions based on retrospective modelling of existing housing development(s). This approach aims to identify and implement strategies that reduce carbon emissions over the entire life span of residential buildings, from construction to demolition, ensuring more sustainable housing practices. The team focused on gathering detailed data from existing buildings to develop a comprehensive understanding of their carbon impacts. Key to our strategy was the use of the OneClick LCA tool, which streamlined data analysis and enabled scenario exploration, allowing us to identify effective strategies for reducing carbon footprints in housing developments, leading to practical recommendations for more sustainable future housing developments.

OBJECTIVE

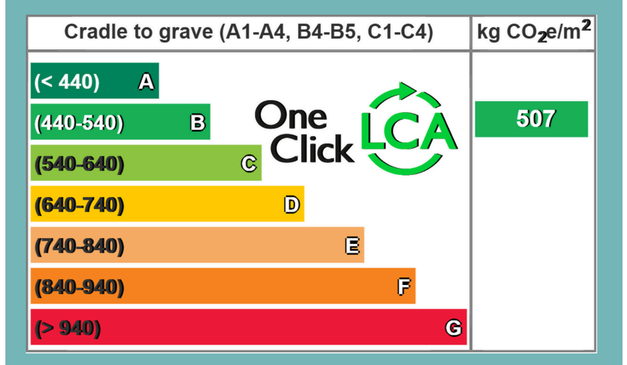
This study focuses on optimising the whole life cycle carbon emissions based on retrospective modelling of existing housing development(s). This approach aims to identify and implement strategies that reduce carbon emissions over the entire life span of residential buildings, from construction to demolition, ensuring more sustainable housing practices. By analysing past developments, the study seeks to provide insights and recommendations for future projects to achieve lower carbon footprints.

METHODOLOGY

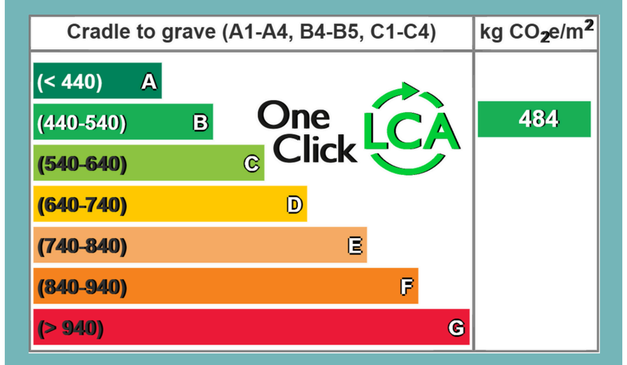
The team focused on gathering detailed data from existing buildings to develop a comprehensive understanding of their carbon impacts. Key to our strategy was the use of the OneClick LCA tool, which streamlined data analysis and enabled scenario exploration, allowing us to identify effective strategies for reducing carbon footprints in housing developments. leading to practical recommendations for more sustainable future housing developments.

FABRIC FIRST (TIMBER-FRAME)

Ethan: Plot 19

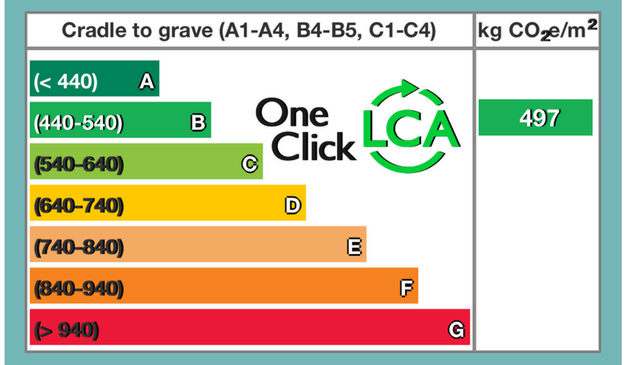


Jak: Plot 32-34

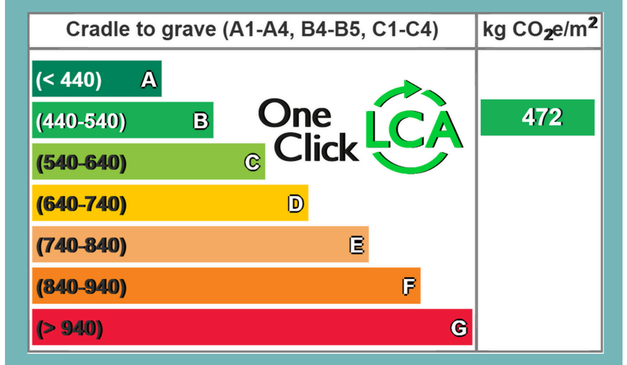


PASSIVHAUS

Vina: Plot 5-8



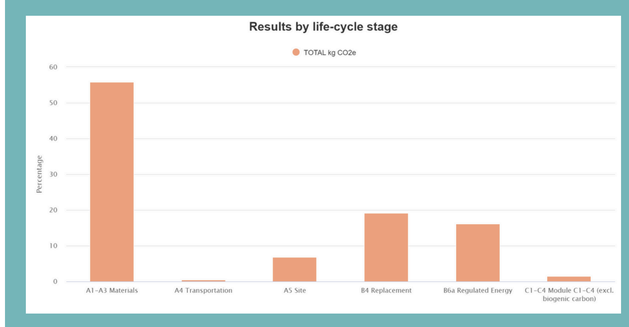
Naomi: Plot 1-4



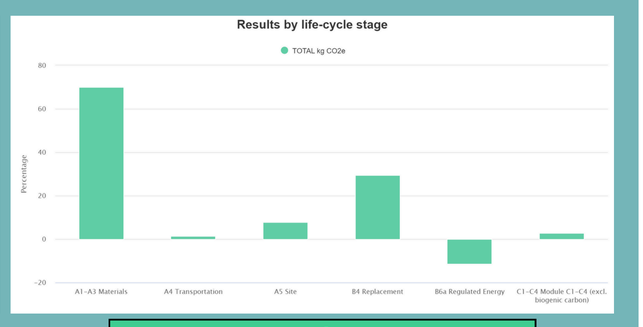
INSULATION

FABRIC FIRST Plot 19 VS PASSIVEHAUS Plot 5-8

Rockwool Insulation

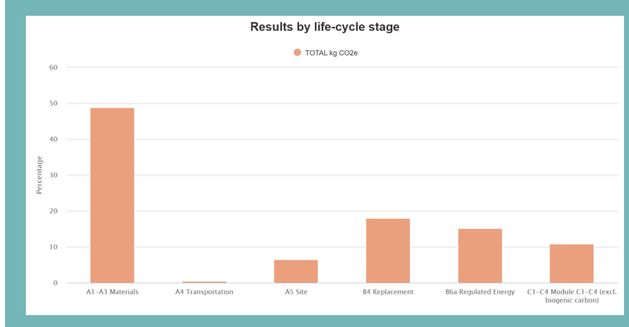


37,513 kgC02e

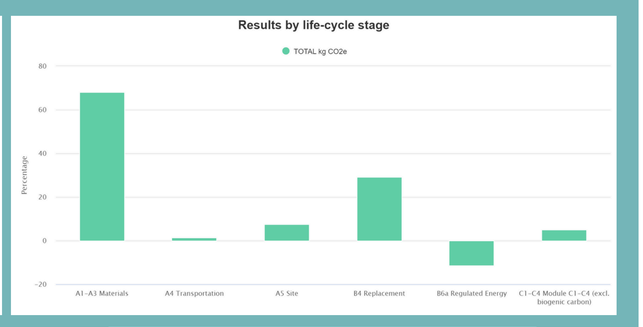


25,394 kgC02e

Hempwool Insulation



34,986 kgC02e

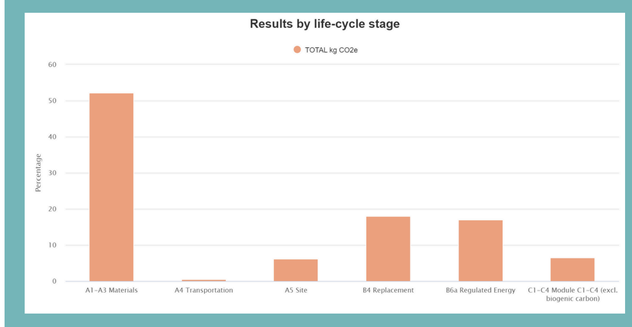


24,841 kgC02e

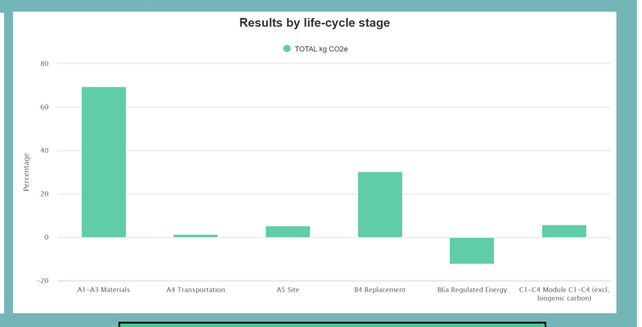
PHYSICAL APPEARANCE

FABRIC FIRST Plot 32-34 VS PASSIVEHAUS Plot 1-4

Timber Cladding

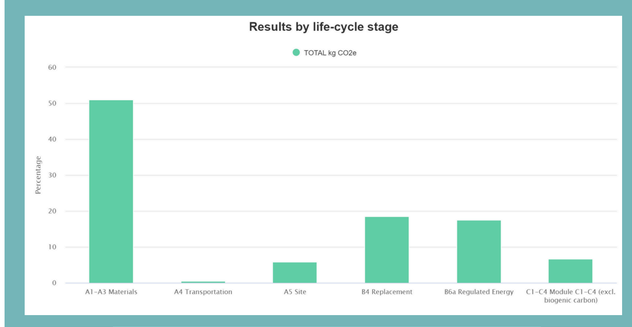


32,147 kgC02e

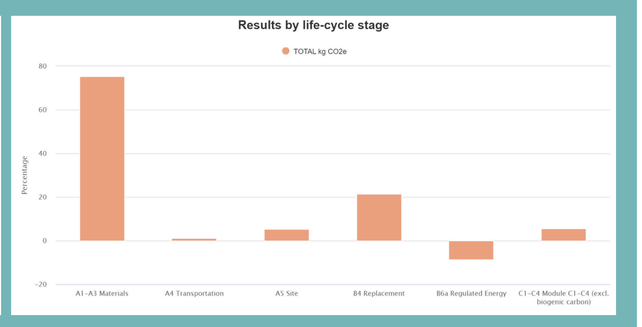


23,834 kgC02e

Render



30,356 kgC02e



36,815 kgC02e

RESULTS

Our experiment showed that overall if changes were to be made to the passive Haus dwellings then they would be significantly improved on their carbon rating. Through physical appearance timber cladding on a passive Haus house would give a lower carbon rating. On the other hand, the best insulation was hempwool on a passive Haus house again.

CONCLUSION

Overall, this experiment shows that using a combination of brick exteriors, glass wool insulation, and clay roof tiles could cut the carbon footprint of future housing projects by around 32% attaining a category A benchmark. It's clear that even relatively small changes in material choices can have a significant impact, offering a practical way to make new buildings much more sustainable without sacrificing quality or design. These findings highlight the importance of carefully considering the materials used in construction to benefit the future development of modern homes if we want to reduce the total carbon footprint of our homes throughout a 60 year lifespan.

OUR EXPERIENCE

Our experience with the Undergraduate Research Opportunities Scheme (UROS) has been incredibly rewarding. The scheme provided us with a unique platform to engage in hands-on research, deepening our understanding of real-world challenges while developing valuable skills in data collection, analysis, and project management. Working on a project centred around sustainability, we were tasked with assessing the life cycle carbon emissions of different housing types, which allowed us to explore an important and timely issue with the guidance of NKDC.

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Supervisor: Rosi Fieldson

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Undergraduate Research Opportunities Scheme

DISCOVER_
Find out more about UROS and this research project at:
LNCN.AC/UROS