A Participatory Life Cycle Sustainability Assessment Framework for the Appraisal of Estate Regeneration Schemes

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Introduction

- Life Cycle Sustainability Assessment (LCSA) was theorised by Klopffer in 2008 [1] and launched by UNEP/SETAC in 2011 [2].
- To use LCSA effectively for the appraisal of estate regeneration schemes, stakeholders should be involved in different phases of the decision analysis.

Research Aim:

- Developing a framework for participatory LCSA for the appraisal of estate regeneration schemes.

Methods

Qualitative	Quantitative
Data Collection • Co-design workshops • Semi-structured interviews • Survey (open-ended) • Desk-based (scoping review)	**Data Collection** • Survey (close-ended) • Quasi-experiments (LCA)
Data Analysis • Thematic Analysis (TA)	**Data Analysis** • Descriptive and inferential statistical analysis

Table 1. A summary of the qualitative and quantitative research methods for the study

Results

1. **Building LCA:** The community have engaged in developing regeneration scenario 4 on which LCA has been conducted

Scenario	1. Existing Building	2. Minimum Regulation Compliant Retrofit	3. Limited Retrofit	4. Moderate Retrofit and Top Floor Extension	5. New Build
External Wall U-value (W/m^{2}k)	1.48	0.32	0.32	0.18	0.18
Glazing U-value (W/m^{2}k)	1.96	1.60	1.30	1.00	1.30
Lowest Floor U-value (W/m^{2}k)	0.54	0.54	0.54	0.15	0.13
Roof U-value (W/m^{2}k)	0.83	0.26	0.12	0.12	0.13
Heating	Boiler	Boiler	Heat Pump	Heat Pump	Boiler
Ventilation	Natural	Natural	MVHR	MVHR	MVHR

Table 2. Summary of key modelling assumptions based on building regulations and LETI [3]

- LCA results demonstrate the benefits of engaging with the community for developing retrofit scenarios to achieve better performance results than the planning approved new build scenario

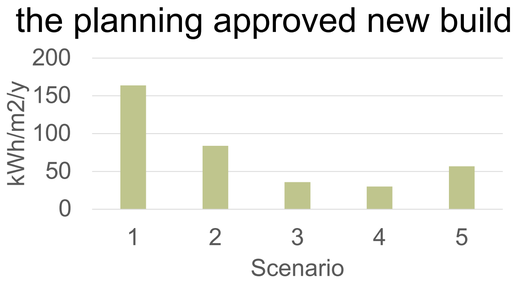

Figure 1. Energy Use Intensity (kWh/m2/y)

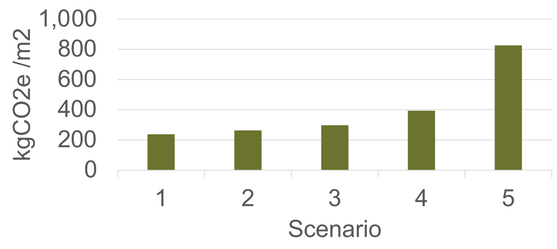

Figure 2. Lifecycle Embodied Carbon (kgCO2/m2)

2. Impact Criteria

- To take into account the priorities of stakeholders, a list of impact criteria has been identified from the review of literature and engagement with the stakeholders
- New relevant criteria have emerged

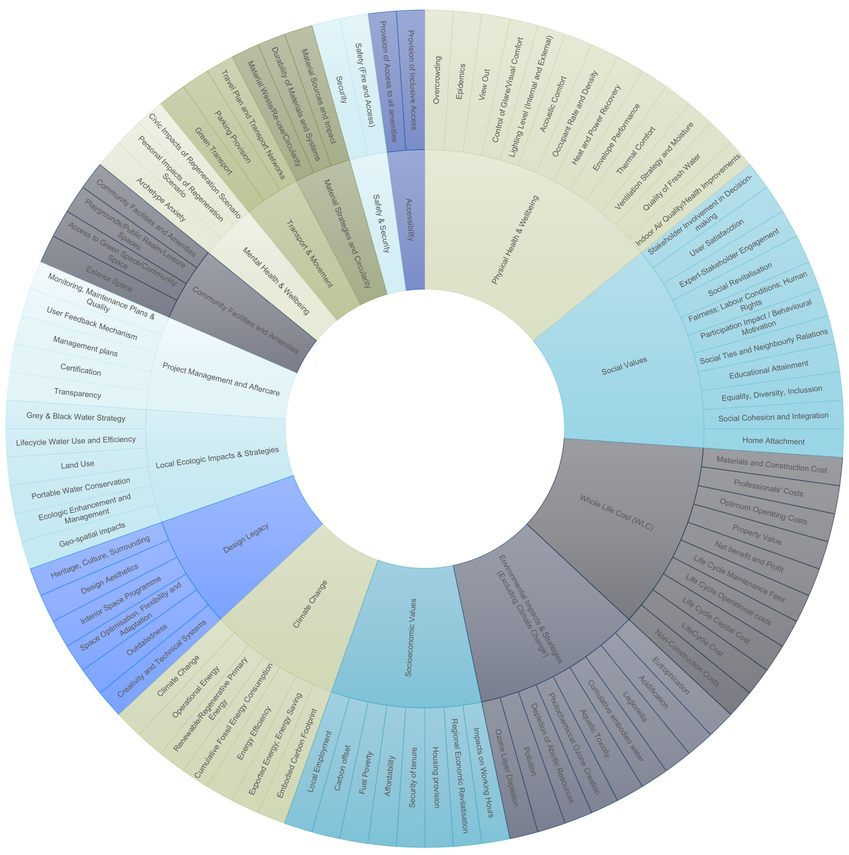

Table 3. The identified impact criteria for LCSA of the case study

Proposed Framework

- Collaborative methods of this research have assisted in developing the proposed participatory LCSA, consisting of five stages:

  1-Goal and Scope Definition;
  2-Scenario Development;
  3-Impact Assessment;
  4-Aggregation;
  5-Interpretation.

- Stakeholders are involved in the selection and weight elicitation of impact criteria and scoring the assessment results
- Please refer to our paper for further information [4]

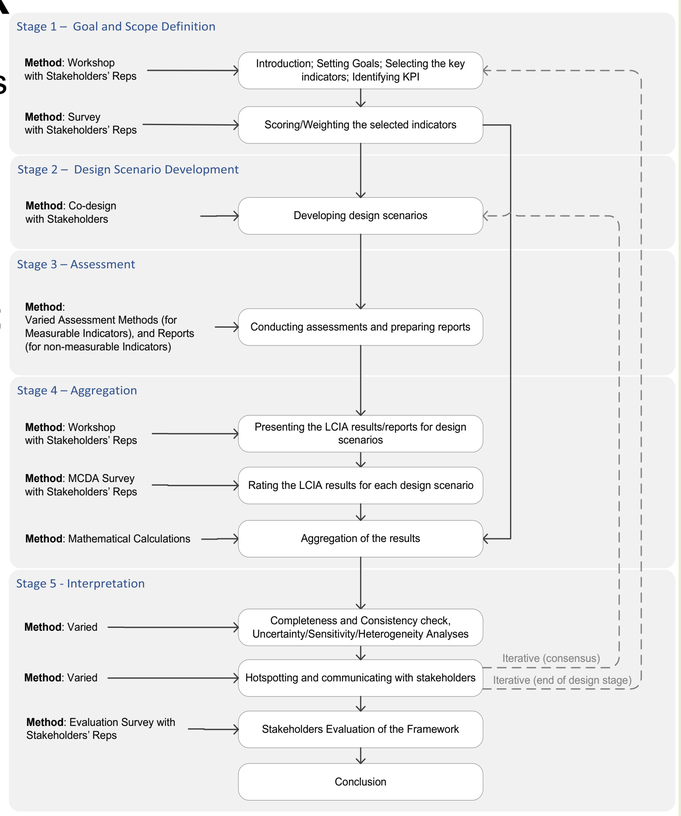

Figure 3. The proposed participatory LCSA framework

Conclusion

- Excluding the stakeholders from identifying the impact criteria and from the assessment and analysis are the main gaps in it conducting LCSA
- The findings support the importance of engaging with the communities in identifying a plausible scope and framework for LCSA to assist with informed decision-making over the regeneration of housing estates.
- We would encourage the researchers to examine the proposed methodologies beyond this study sample

Acknowledgements

- We would like to thank the Engineering and Physical Sciences Research Council (EPSRC) for funding this research – Grant Reference EP/N509577/1 and EP/T517793/1.
- We would also like to thank all our participants from the Alton Estate community, and Alton Action group who have generously taken the time and energy to take part in our research.

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