



Homes
England

The Housing and Regeneration Agency

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the environment

SQW

Homes England – Measuring Social Value

Paper 2: Brownfield Development Values

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This document has been prepared for Homes England by:

Economics for the Environment Consultancy Ltd (eftec)
10F Printing House Yard
Hackney Road, London
E2 7PR
www.eftec.co.uk

In association with:

SQW Ltd
Oxford Centre for Innovation
New Road, Oxford
OX1 1BY
www.sqw.co.uk

Study team:

Russell Drummond (eftec)
Boris Babic (eftec)
Allan Provins (eftec)
Silvia Ferrini (University of East Anglia; eftec associate)
Jo East (eftec associate)
Colin Warnock (Colin Warnock Associates)
Stuart Wells (SQW)
Richard Hindle (SQW)

Reviewer:

Prof. Nicholas Hanley (Chair in Environmental and One Health Economics, University of Glasgow)

Disclaimer:

This report has been prepared in accordance with eftec and SQW's proposal dated November 2021 and agreed revisions to it. eftec and SQW assume no responsibility to any user of this document other than Homes England.

Contact:

economic.appraisal@homesengland.gov.uk
0300 1234 500
gov.uk/homes-england

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List of Abbreviations

| Abbreviation | Full Term |
|--------------|--|
| BCR | Benefit Cost Ratio |
| CL | Conditional Logit Model |
| CI | Confidence Interval |
| DCCV | Dichotomous Choice Contingent Valuation |
| DCE | Discrete Choice Experiment |
| DLUHC | Department for Levelling-Up, Housing and Communities |
| EAV | Equivalent Annual Value |
| GIS | Graphic Information System |
| MXL | Mixed Logit Model |
| NPV | Net Present Value |
| ONS | Office for National Statistics |
| PV | Present Value |
| RP | Revealed Preference |
| RPL | Random Parameter Logit |
| SEG | Socio-Economic Group |
| SP | Stated Preference |
| SQ | Status Quo |
| TEV | Total Economic Value |
| VfM | Value for Money |
| WTP | Willingness to Pay |

1. Foreword

Within our new Strategic Plan we have set ourselves the mission of driving regeneration and housing delivery, to create high-quality homes and thriving places. This will support greater social justice, the levelling up of communities across England and the creation of places people are proud to call home. We have five interconnected strategic objectives that work together to deliver our mission. One of these strategic objectives is to create vibrant and successful places with a brownfield first approach.

As a government agency, we are committed to investing public funds where they will deliver the greatest social value. Rigorous economic appraisal, alongside evaluation, plays a central role in ensuring that the interventions we support achieve this ambition. However, as was recognised in the HM Treasury Green Book review in November 2020, there are a number of challenges in undertaking economic appraisal in practice. One of the most notable issues is that the Benefit Cost Ratio (BCR), used in economic appraisal to inform judgements on value for money, can be misaligned to decision makers' objectives. This is commonly the result of the BCR being overly dependent on benefits that are easy to value in monetary terms.

Recognising these challenges, we recently published a report [on measuring the placemaking impacts of housing-led regeneration](#) – the first of a suite of documents and guidance that we will be producing aimed at improving the way in which economic appraisal is used to accurately and consistently assess the full social value delivered through our housing and regeneration activities. The Department for Levelling Up, Housing and Communities (DLUHC) has also updated its own [DLUHC Appraisal Guide \(2023\)](#), including new guidance on the appraisal of place-based initiatives.

This report is our second research paper and focuses on measuring the social value associated with developing on brownfield land. The study looks specifically at the benefit to local households of the removal of disamenity caused by undeveloped brownfield land and the amenity value created by the inclusion of specific features, such as facilities for local communities and space for nature. Alongside the report, an Excel tool and guidance has been produced to enable these benefits to be captured as part of project BCRs.

The research has been undertaken as part of a wider workstream that is developing new guidance on the economic appraisal of environmental impacts resulting from housing interventions. This new guidance is due to be published early next year and will help appraisal practitioners consistently identify and assess the environmental outcomes of new housing development. All research published under Homes England's measuring social value series is available at gov.uk/government/collections/homes-england-measuring-social-value

I would like to thank SQW and eftec for their work on this project and Professor Nick Hanley, from the University of Glasgow, who provided peer review support. I would also like to thank the many colleagues within Homes England and DLUHC for their input to the research.

Andy Wallis
Chief Economist, Homes England

2. Executive Summary

Research aim

1. The aim of this study was to estimate economic values outside of land uplift value for outcomes associated with the redevelopment of brownfield sites (sites that were previously developed but are no longer being used) for housing or mixed-use developments. This includes: (a) the removal of the disamenity caused by undeveloped brownfield land and associated impacts; and (b) the amenity value created by the inclusion of specific features, such as facilities for local communities and space for nature.
2. In broad terms the study examines the added value of Homes England's interventions and how brownfield projects impact overall societal welfare. These sites can be difficult and expensive to redevelop for several reasons, particularly due to risks associated with clean-up of contaminated land from previous industrial or commercial use and the removal of unsafe structures. Brownfield sites can be a source of significant and persistent disamenity for local communities – with impacts including visual and aesthetic effects (“eyesores”), risks to public safety, crime and anti-social behaviour – and contribute to deprivation that can impact local businesses and property values. For the most part, the benefit of removing the community-level disamenity impacts prior to development of a site is not reflected in the direct private benefit to developers that is measured in the land value uplift.
3. Similarly, the benefit from development features that improve a place and the quality of life for local communities – such as the provision of green space and landscaping, facilities such as play areas, and better connectivity and public access routes – is also not typically (fully) captured in the private benefits. In both cases, the benefits are dispersed over the surrounding residential population along with daily users including workers, commuters and visitors, and is not directly reflected in rents or property values.
4. The main results from the study are public benefit values for brownfield redevelopment outcomes that can be used in economic appraisals and value for money (VfM) assessments that support the business case for the use of public funds in housing market interventions. The evidence and economic values have been estimated using an established method that is recognised in the HM Treasury Green Book (HM Treasury, 2022) as a principal approach for valuing non-market outcomes.

Approach

5. The study applied a stated preference (SP) methodology, which is a survey-based approach that provides a flexible design for capturing the motivations that underlie individuals' preferences for improving local environmental quality. This approach is routinely used to value non-market environmental goods and services, such as the benefits of local environment amenity improvements. The core component of a stated preference survey is a valuation scenario(s) and simulated market that offers choices to respondents over the provision of non-market goods in order to measure their preferences and valuations.
6. As the approach is survey-based and relies on responses to a simulated market – rather than inferring values from observed behaviour – the reliability of results is dependent on factors such as respondent understanding and ensuring that their choices genuinely reflect their preferences for the goods and impacts in question. Poorly designed and implemented surveys can be subject to a range of validity concerns related to respondent understanding and/or design-induced biases. To address these potential issues, the study featured a substantial iterative test-re-test design process to develop and refine the framing of the valuation scenario, with particular

emphasis placed on respondent understanding and ensuring a manageable cognitive burden¹. The analysis of respondent preferences and results was also subject to several validity testing protocols to gauge the robustness of the valuations. This was supported by findings from supplemental questions that directly asked respondents about both the motivations for their choices and their perception of the consequentiality of the survey results. In both instances the feedback indicated that concerns over invalid responses should be limited.

7. A discrete choice experiment (DCE) format was used in the stated preference survey and the valuation scenarios were tailored to Homes England’s evidence needs. In the context of valuing brownfield development outcomes this includes accounting for various aspects of a development such as the previous use of a site, its size and distance from beneficiaries, and any added development features that may be included. To capture both the removal of disamenity and the provision of new amenity in the survey, two DCE exercises were specified: (a) brownfield redevelopment scenarios (DCE1); and (b) added development features (DCE2). Both DCEs were completed by every respondent.

DCE1: Brownfield development scenarios

8. The brownfield development scenarios choice task was framed as a choice between alternative sites in the respondent’s local area that could be redeveloped, which would both create new housing and remove the disamenity experienced from the selected site (Figure 2.1).

Figure 2.1: Brownfield redevelopment scenarios choice task (DCE1)

For your first choice, which option do you prefer – develop Site A, develop Site B or neither (no redevelopment on either of these sites).

Please click on “more information” to the left of the options if you need a reminder of what the brownfield descriptions mean. Also, [click here](#) for a reminder of what a redevelopment site will look like.

Please click on the column of the site you prefer (Site A, Site B or Neither)

| | Site A | Site B | Neither |
|---|--|--|-------------------------|
| Brownfield site type <i>(More information)</i> | Previous industrial use | Previous residential use | No redevelopment |
| Distance to your Home <i>(More information)</i> | 1 mile (1.6 km) <i>(about a 20 minute walk)</i> | 5 miles (8 km) <i>(about a 10 minute drive)</i> | |
| Site size <i>(More information)</i> | Small <i>(1 hectare)</i> | Very large <i>(25 hectares)</i> | |
| Existing building condition <i>(More information)</i> | Already removed | Will be reused | |
| Cost to your household <i>(More information)</i> | £10 per year <i>(£0.83 per month)</i> | £80 per year <i>(£6.67 per month)</i> | No Cost |

9. Alternative sites were described in terms of the following component attributes:
 - Previous use (residential, commercial, or industrial).
 - Size (1 to 25 hectares and accompanying qualitative categorisation as “small” to “very large”).
 - Distance from the respondent’s home (1 to 25 miles).
 - Condition of the existing buildings on the site (will be reused, would be removed, and already removed).

¹ See Section 4 and Section 5

- Cost to respondent’s household described as an increase in council tax over the period from 2023 – 2033.
10. Respondents were presented with eight repeated choices in total, which were drawn from an experimental design, and each time asked to select their preferred option from two sites (Site A or Site B) and a “neither” status quo option. The data produced by DCE1 was analysed and validated to produce statistically robust estimates of: (i) households’ preferences for where brownfield development occurs and those outcomes; and (ii) the value of (avoided) disamenity impacts and the effect of site type, size, and distance on this value.

DCE2: Added development features

11. The added development features choice task (DCE2) captured preferences for specific features of brownfield redevelopment that Homes England could influence. It included:
- Cycle paths
 - Walking paths
 - Sports pitches
 - Multi-use games areas
 - Outdoor workout areas
 - Children’s play areas
 - Nature and wildlife space
 - Green open space
 - Hardscaped space
12. The choice task was presented as a single choice to respondents between two randomly selected alternative features that could be included within a development (with an associated cost to the household), plus an alternative offering no added feature at no added cost (Figure 2.2). Respondents were informed that the site was within their local area (max. 30-minute walk or 10-minute drive), meaning that they would be able to access and use the feature that they selected.

Figure 2.2: On-screen appearance of the features choice task

| Which option do you prefer – Feature A, Feature B or neither (no additional feature) | | | |
|---|--|---|------------------------------|
| <u>Please click on the column of the feature you prefer (Feature A, Feature B or Neither)</u> | | | |
| | Feature A | Feature B | Neither |
| Additional feature | Green open space <i>(general open public park space with grass and some shade trees)</i> | Children’s play area <i>(a play area with equipment such as swings, slides and play structures)</i> | No additional feature |
| Cost to your household | £50 per year <i>(£4.17 per month)</i> | £5 per year <i>(£0.42 per month)</i> | No Cost |

13. Results from DCE2 provide estimates of the value of added features to local communities in terms of the improvement in the local environmental amenity of the area.

Implementation

14. The survey material was tested through ten cognitive interviews prior to three waves of pilot testing between March – May 2022 with 376 respondents in total. Feedback from testing was largely positive and was a key input to various revisions of the survey material.
15. The main survey fieldwork took place in June – July 2022 with a total of 2,168 respondents completing the main survey online. Respondents were randomly selected from survey panel providers and had no knowledge of the content of the survey prior to starting it. The main sample was generally nationally representative of households in England, across the dimensions of age, gender, and socio-economic group (SEG)². The views and preferences of the sample can be interpreted as generally indicative of the views of the general public in England. Based on the results and responses to follow-up questions, respondents understood the survey, were able to give considered answers to the questions and choices posed, and generally felt that their choices and the results of this survey were meaningful.

Findings

16. The key findings from the study present a consistent view of households' perceptions and priorities for developing brownfield sites in England:
 - Households have a good awareness of brownfield sites in their local area and an appreciation of negative disamenity impacts they can generate. Respondents were most familiar with previous use commercial sites and most frequently report being affected by visual disamenity from these sites.
 - Priorities for brownfield redevelopment, including what sites households would prefer to see developed, include:
 - Redevelopment of larger sites closer to their home.
 - Redeveloping commercial sites over residential and industrial sites.
 - Developments that maintain the character of the local area, particularly in terms of retaining local heritage features, as opposed to developing in a way that demolishes structures or develops empty sites.
 - Redeveloping sites versus not developing on those sites. Most respondents showed a strong preference for taking some action as opposed to leaving sites as brownfield.
 - Using the example of a development in Manchester, the household level benefit of the removal of the disamenity of brownfield is around £40-£50 per household per year. This value, though, declines as distance from the site increases and varies according to the site size and previous use.
 - Households also place notable value on additional features that improve the quality of place for the local community. Green open space and space for nature were the most preferred features, with individual level benefits around £90 per household per year.

² Survey weights were applied to the quantitative analysis to account under or over sampling of certain demographic groups.

Application

17. The primary use of the study's results is economic appraisal, which will support the identification of preferred options by Homes England and help demonstrate the VfM of public funding of brownfield housing and mixed-use (such as housing and commercial) projects. The results, though, require careful application to estimate the aggregate benefits of an option or project. The critical factors are the identification of the beneficiary population – accounting for the spatial “distance decay” in benefits and determining is currently affected by disamenity from a brownfield site – and the temporal dimension in terms of the timing of benefits and counterfactual concerning the additionality of Homes England's interventions. The interpretation of the results from this research are very sensitive to both the assumed counterfactual and the assumed beneficiary population.
18. Care should also be taken to avoid double counting within the broader economic appraisal, particularly where separate estimates have been made of amenity or wider placemaking benefits.
19. The guidance and “default” values for use in appraisal are provided in Section 8. These values and the tool published alongside this report facilitate practical assessments.

Conclusions

20. Overall, households in England have a clear preference for brownfield redevelopment. These sites are viewed as a source of local disamenity and households place significant value on the improved local environmental quality that developments can bring. The findings from this study are consistent with the overall trends observed in the wider economic literature that demonstrate the value that such non-market outcomes represent for local communities.
21. The study design, implementation and analysis has followed good practice guidance. The SP survey questionnaire and supporting material were subject to an iterative testing process, which demonstrated that the choice tasks were understood and that respondents interpreted the choice scenarios as realistic policy options. Combining both the strength of the results and the feedback from respondents, the study's results are judged to be robust for use in economic appraisals and are fit for purpose for Homes England's evidence needs.

3. Introduction

22. This report details the design, implementation, and results from the study “Brownfield Development Values” for Homes England. The introduction outlines the background and context for the research, the overall objectives, and report structure.

Background

Research context

23. More than £1.8 billion was allocated in the 2021 Autumn Budget to support redevelopment of brownfield sites in England³. Brownfield sites – also known as previously developed land – are areas previously developed for commercial, industrial, or residential purposes, that are no longer being used. This study provides evidence for economic appraisal of brownfield interventions by Homes England, which will be instrumental to meeting targets for increasing housing supply in the short to medium-term. The study is part of a wider programme of research that has been commissioned by Homes England to develop a framework for identifying and appraising environmental impacts from housing developments. The aim is to produce guidance and economic evidence that will enable environmental impacts to be included in the VfM assessments that form a key part of the business cases for public funding of housing interventions by Homes England.
24. The overall programme is being implemented in five stages. Stages 1, 2, and 3 of the research programme were carried out in 2021 and comprised of:
- Stage 1: Review of existing evidence and appraisal tools – to understand the available evidence on the environmental impacts of housing development and the methods that have been used to measure and value these impacts.
 - Stage 2: Case studies of Homes England’s projects – a retrospective assessment of two previous projects (Burgess Hill and East Ketley) to include the quantification and valuation of the environmental impacts in their respective economic appraisals in order to understand their potential materiality to the overall business case.
 - Stage 3: Scoping empirical research and appraisal guidance document – review of gaps and identification of research priorities to improve the evidence base to support Homes England’s VfM assessments, along with an initial outline of the appraisal guidance document that will augment the existing economic appraisal tools and guidance used by Homes England.
25. Stage 3 identified research to “quantify and value land-use change from a brownfield site” as a key evidence need and priority for empirical research, along with other areas for further research. This research is Stage 4 of the programme. The improved economic value evidence developed in this stage will allow Homes England to account for a wider set of impacts and benefits to society, stemming particularly from the removal of the disamenity that brownfield sites can cause to local communities.

³ See: <https://www.gov.uk/government/news/new-homes-to-be-built-as-part-of-government-drive-to-develop-brownfield-land-and-regenerate-communities>

26. Stage 5 will conclude the overall programme of research by preparing the final guidance that will support the economic appraisal of Homes England projects, providing comprehensive coverage of environmental impacts across land-take, construction and occupancy phases of housing developments.

Objectives

Study aim

27. The aim of this study was to estimate economic values for outcomes associated with the redevelopment of brownfield sites to housing or mixed-use developments, outside of land value uplift⁴. This includes: (a) the removal of the disamenity caused by undeveloped brownfield land and its associated impacts; and (b) the amenity value created by the inclusion of specific features in the development of brownfield sites, such as facilities for local communities and space for nature. In broad terms the study examines the added value of Homes England's interventions and how brownfield development projects impact overall societal welfare.
28. The main results from the study are economic values for brownfield redevelopment outcomes that can be used in economic appraisals and VfM assessments. These appraisals and assessments in turn will support the business cases made for the use of public funds in housing market interventions.

Research scope

29. The study focused on the non-market and public good aspect of brownfield development and particularly the role of Homes England in making sites available for development. Existing brownfield sites can be difficult and expensive to redevelop for several reasons, particularly due to the risk associated with land that was previously used for industrial or commercial purposes and the removal of unsafe structures. Brownfield sites can be the source of significant and persistent disamenity for local communities, with impacts including visual and aesthetic effects ("eyesores"), risks to public safety, crime and anti-social behaviour, and contributions to deprivation that may impact local businesses and property values. For the most part, the benefit of removing these community-level disamenity impacts prior to development of a site is not reflected in the direct private benefit to developers.
30. Similarly, the benefit of features included in the development of sites that improve a place and the quality of life for local communities – such as the provision of green space, landscaping, hardscaping, facilities such as play areas, and better connectivity and public access routes (e.g. pathways and cycleways) – are also not typically (fully) captured in the private benefits. In both cases, the benefits are dispersed over the surrounding residential population, and potentially – particularly for significant urban areas, such as city and town centre developments – workers, commuters and visitors.

Methodology

31. Estimation of the non-market and public good benefits of brownfield redevelopment requires the use of non-market valuation methods. The study used a stated preference approach to examine the general public's preference for different dimensions of brownfield redevelopment and outcomes for local communities. The SP approach is a flexible methodology for estimating economic values. This approach was tailored to Homes England's evidence needs and the additional requirement that the study's results are applicable across a variety of intervention types. Further discussion on the methodological approach is provided subsequently in Section 4.

⁴ Land uplift value is the change in the value of land that results from its development (i.e. for housing). It is calculated in terms of the (private) returns to developers net of development costs and fees and factoring normal profit (DCLG, 2016).

Report outline

32. The remainder of the report describes the implementation of the stated preference methodology, including the analysis of household preferences for brownfield redevelopment and estimation of economic values for use in Homes England's economic appraisals. It is structured as follows:

- **Section 4 – Approach:** summary of the study approach, including overview of the stated preference methodology and practical implementation.
- **Section 5 – Design and testing:** details of the survey structure and content, including the design of the choice task components and iterative development through the survey testing stage.
- **Section 6 – Respondent profile and perceptions:** selected results from the main survey including the sample representativeness and profile, and findings for household's perceptions of brownfield sites.
- **Section 7 – Choice task analysis:** outlines the analysis of the choice task components of the stated preference survey, including the model estimation results, estimates of household WTP for brownfield site redevelopment outcomes, and validity testing assessments.
- **Section 8 – Application of results:** illustrates the use of the study's results to estimate aggregate benefits for the redevelopment of brownfield sites in England.
- **Section 9 – Conclusions:** concludes the report with a summary of the main findings.

33. The main report content is supported by the following appendices:

- Appendix 1: Literature review and attribute selection
- Appendix 2: Stated preference questionnaire
- Appendix 3: Showcards and images
- Appendix 4: Cognitive testing summary
- Appendix 5: Summary statistics
- Appendix 6: Econometric results

4. Approach

34. This section summarises the approach and methodology used in the study. It includes a discussion on the choice of methodology along with a non-technical overview of the stated preference approach, and details of the practical implementation in terms of the main study phases.

Rationale

35. There are several candidate economic (non-market) valuation methods that could be used to value changes in overall societal welfare resulting from improvements in local environmental amenity due to impacts from Homes England's housing interventions⁵. This includes revealed preference (RP) methods such as hedonic pricing, stated preference methods, and subjective wellbeing approaches (Table 4.1)⁶. Each method has strengths and weaknesses, both in conceptual and practical implementation terms, and varies in the scope and extent of total economic value (TEV) that can be captured⁷.
36. RP methods – such as hedonic pricing – use observed market behaviour to infer values for non-market outcomes but are constrained in scope to the use value component of TEV. In contrast, stated preference methods which rely on simulated market settings and valuation scenarios can be used to estimate the direct value of changes in non-market outcomes on individual and societal welfare, whether these are due to changes in use values and/or non-use values. This means that stated preference methods are able to capture a wider set of motivations that may underlie individuals' preferences for improving local environmental quality.
37. Stated preference methods can also value changes that extend beyond recently experienced levels of provision – e.g. future policy scenarios that have enhanced outcomes over the current situation. In the context of valuing brownfield development outcomes this consideration is not critical from a conceptual perspective since brownfield development is a common activity and there should be widespread awareness and familiarity with it. However, for a hedonic pricing approach there is a further practical dimension to consider regarding the requisite data inputs. The starting point would be to identify sites that adequately reflect Homes England's interventions – in terms of preparing sites and added value features – and compiling a suitable dataset that would enable these impacts to be valued from property market data. The combination of finding appropriate sites and related data sets would likely be an intensive undertaking. Moreover, once the data is gathered it may not be possible to differentiate values to the level of granularity that economic appraisals may need – for example, the provision of specific features in a development over a generalised indicator of local amenity.
38. Subjective wellbeing approaches offer an alternative way to value non-market outcomes, but in broad terms the conceptual (use value only) and practical (data requirements and ability to identify values at an appropriate level of granularity) considerations are similar to those for RP methods.

⁵ Appendix 1 provides an example of other methodologies.

⁶ See HM Treasury (2020) and HM Treasury and DWP (2011) for further details.

⁷ Total economic value (TEV) is a typology that describes the scope of economic values that can be derived from a resource or provision of a good or service. TEV comprises of use values that relate to actual use of the good in question or possible (future) use – for example, the amenity value of a local park – plus non-use (or passive use) values. Individual's motivations for holding non-use values can vary, but can typically be summarised in terms of altruistic value (the benefit of others), bequest value (the benefit of future generations) or existence value (the stewardship of an asset – e.g. aspects of nature and wildlife).

Table 4.1: Overview of (selected) non-market valuation methods

| Method | Advantages | Limitations |
|--|---|---|
| <p>Hedonic pricing (revealed preference) Marginal values for the provision of non-market outcomes are inferred from price differentials observed in a related market good. For example, analyses of the variation in property prices can be used to estimate the premium of local environmental amenity features like parks, landscapes, peace and quiet, etc.</p> | <ul style="list-style-type: none"> • Valuations are based on actual / observed market choices and household preferences. • Analysis is suited to identify localised and site-specific impacts. | <ul style="list-style-type: none"> • Can only be applied within bounds of current / previous provision of a good or service level, and generally is best suited to persistent effects. • Does not capture non-use values. • Dependent on data availability and ability to differentiate (identify) effects of interest. |
| <p>Discrete choice experiment (stated preference) Marginal values for the provision of non-market outcomes are estimated from simulated market choices and preferences, via a survey-based methodology. For example, the value of local nature reserves might be estimated by describing sites in terms of their characteristics (attributes) and adjusting their level over a series of repeated choices to estimate household preferences for those characteristics</p> | <ul style="list-style-type: none"> • Flexible approach that can produce values for current and future levels of provision of a good/service. • Only approach that can consistently capture non-use values. | <ul style="list-style-type: none"> • Simulated market and valuations scenarios, and survey-based methods can be subject to various biases. |
| <p>Subjective wellbeing approaches Marginal values for the provision of non-market outcomes are inferred by estimating the impact on a measure of individual wellbeing, using a wellbeing dataset along with previously observed interventions leading to the outcome in question, and then converting that effect into a monetary amount by estimating the equivalent amount of income that would have the same effect on individual wellbeing.</p> | <ul style="list-style-type: none"> • Aims to measure wellbeing directly rather than relying on specification of a simulated market and valuation scenario. • Can naturally adjust for income and wealth effects, as these are implicit within the wellbeing data collected. | <ul style="list-style-type: none"> • Can only be applied within bounds of current / previous provision of a good or service level, and generally is best suited to persistent effects. • Does not systematically capture non-use values. • Dependent on data availability and ability to differentiate (identify) effects of interest. |

Stated preference approach

39. The study used a stated preference approach to estimate the value of brownfield redevelopment outcomes associated with Home England's housing interventions. This is a survey-based approach that presented respondents with simulated choices to measure their preferences and valuations for improvements in local environmental quality. In particular, the removal of brownfield land and associated disamenity and impacts – as a result of development – and the amenity generated by features of developments such as facilities for local communities and space for nature.
40. The choice of a stated preference approach reflects the flexibility of the research method and ability to specify valuation scenarios that are tailored to policy scenarios and evidence needs. In the context of valuing brownfield development outcomes this includes accounting for various contextual factors such as the previous use of a site, its size and distance from beneficiaries, and the specific types of added development features that might be included. The methodology also enables representation of a broader scope of potential benefits (use and non-use values) and beneficiaries (not just local residents) in the valuations, which could be inputs to Homes England's economic appraisals.
41. The central component of a SP survey is a (simulated) choice task (or tasks) in which respondents are asked to make choices about the provision of the good/service of interest (e.g. brownfield redevelopment outcomes). The choice task(s) can involve trade-offs between improved, maintained, or deteriorated levels of provision. The choices that survey respondents make reveal their priorities (demand) for the provision of the good or service; i.e. what they want and care about the most.
42. Where trade-offs with monetary amounts are included (e.g. a "price" for the good or service) respondents' choices also reveal the value they derive from its provision. Most commonly, this value is measured in terms of the respondent's willingness to pay (WTP). This measures the benefit that the respondents derive from improved or maintained (avoided deterioration) provision of the good, in terms of the monetary amount they are prepared to give up to secure that level of provision⁸.
43. Stated preference methods can be broadly defined and are associated with a wide range of terminology and evidence outputs. However, the discrete DCE and dichotomous choice contingent valuation (DCCV) are the theoretically valid methods for estimating willingness to pay (Johnston et al. 2017). This is because these methods – if applied appropriately – meet certain criteria concerning the measurement of economic value. Other methods such as rating and scaling approaches can provide quantitative views on preferences (priorities) but are not consistent with underlying economic theory (Louviere et al. 2010), and do not directly estimate willingness to pay.
44. The DCE was the specific choice format applied in the study. Section 5 details the design and specific of the choice tasks that were used to estimate values for brownfield redevelopment outcomes and added development features for Homes England's interventions.

Validity of stated preference research

45. Stated preference methods are adaptable and hence can be applied to a wide range of settings to produce economic valuations. However, they require careful application to ensure that the results that are produced are both valid and robust. There are established protocols and procedures for assessing and ensuring study validity (Bateman et al, 2002; Johnston et al., 2017). These highlight the typical indicators of poor validity in studies, the

⁸ Willingness to pay (WTP) is a measure of economic value. It applies (universally) to all types of goods and services, whether they are traded in competitive markets, provided in a regulated market setting (e.g. energy), or non-market (e.g. environmental outcomes).

range of biases that can be observed, and how they can be addressed. Since SP methods are survey-based approaches, their reliability is dependent on respondents: (a) understanding the survey topic and the simulated market that is presented; and (b) making choices that genuinely reflect their preferences for the good and impacts in question. Poorly designed and implemented surveys can be subject to a range of validity concerns related to respondent understanding or design-induced biases (Table 4.2).

Table 4.2: Stated preference methods – the 3Cs and validity testing

| Aspect of study | Key issues | |
|---------------------------|--|--|
| Content validity | Do respondents understand the survey purpose and explanatory material? Are the simulated market and choice tasks credible? Is the potential for biases in responses addressed and minimised? | Content validity is addressed in the survey design and testing phase and then tested for in the analysis phase. |
| Construct validity | Do results align with reasonable expectations based on: (i) Underlying economic theory; and, (ii) Findings from similar studies using comparable methods? | Construct validity is tested in the analysis phase for adherence to economic theory, and through comparison to similar studies where available. |
| Criterion validity | Do economic values (WTP) align to observed values (markets or experiments involving economic transactions)? | Practically, it is not possible to test for criterion validity in context of brownfield redevelopment outcomes; second best option is to assess through convergent validity tests. |

46. Good practice guidance for applying stated preference methods emphasises the validity testing process, which is integral to the survey design and analysis phases (Johnston et al., 2017). A key area of focus is the complexity of the survey and choice task(s) and respondent understanding in terms of: (i) the explanatory material describing the good/service/outcome, its characteristics ('attributes') and levels of provision; and (ii) the cognitive burden of the choice task exercise(s). Added to this is the perceived consequentiality of the survey, in terms of whether respondents believe their choices will influence the delivery of outcomes presented in the simulated choice scenarios.
47. Overall, the cognitive burden of a stated preference choice task is determined by a combination of survey design factors (e.g. Needham and Hanley, 2020; Caussade et al, 2005). This includes: (i) the number of attributes respondents are asked to consider; (ii) the levels of provision for these attributes and the range they cover; (iii) the number of alternative options respondents are asked to choose between; and (iv) the number of choices they are asked to make. The survey design process for this study followed an iterative test-retest process to check respondent understanding and balance the amount of information presented with the requirements of the choice tasks. Consequentiality can also be probed through the testing process to gauge how credible respondents find the policy framing for the survey and choice tasks.

Practical methodology

48. The study featured three main phases of work:

- A. **Survey design and testing:** this is a fundamental component of the development of a stated preference study. Alongside the specification of the choice task and valuation scenario, it provides the basis for addressing content validity issues concerning respondent understanding.
- The foundation of the valuation scenario was the specification of brownfield site attributes according to the most relevant characteristics to brownfield disamenity, and those that could be translated into a valuation tool for brownfield development value.
 - The choice task attributes and levels were refined through the design and testing phase, based on the differing dimensions of the possible brownfield sites and respondent understanding of those dimensions.
 - A comprehensive test–retest process via one-to-one cognitive interviews was undertaken to support the development of the survey material, including visual material, over a two-month period (January 2022 – February 2022). 10 interviews were completed over three waves, with the findings and feedback informing subsequent revisions.
 - The phase concluded with pilot stage in March – May 2022, providing a quantitative field test of the stated preference questionnaire and choice experiment prior to the main survey implementation (376 total respondents).
- B. **Implementation:** the survey was implemented through a nationally representative sample via an online platform (2,168 respondents) using online panels. Respondents had no knowledge of the survey topic before opting to participate. Online sampling is recognised as the standard approach for this type of research and is the most cost-effective means for ensuring geographical coverage of England and covering a wide range of household socio-economic circumstances.
- C. **Analysis and reporting:** comprehensive analysis of the survey data was undertaken based on an estimation strategy that examines several construct validity issues. The main results are estimates of household preferences for brownfield sites to be redeveloped based around the household’s distance to the site, the area of the site, the type of site, and the existing condition of the site⁹. This includes estimates of household WTP for redevelopment outcomes along with investigation of non-linear effects such as diminishing marginal benefit from increasing site sizes. An illustrative application is also set out to demonstrate the use of the study results, along with a set of transferable values for wider policy or project appraisals.

⁹ These four factors reflect the basis of the valuation scenario that was specified. Further detail on the selection of these factors is provided in Section 5.

5. Survey design and testing

49. This section summarises the survey structure and content, including the design of the choice task components following good practice for SP questionnaires outlined in Section 4. A key task within the survey design stage was the specification of the choice experiment attributes and levels. Details of the qualitative testing, pilot testing and sampling approach are also provided.

Survey structure and content

50. The survey structure follows the typical format for a stated preference survey (Table 5.1). The survey script (questions and routing) is provided in Appendix 2 and the showcards and image in Appendix 3 for reference.

| Section | Content |
|--|---|
| Introduction | <ul style="list-style-type: none"> • Purpose of survey |
| Section A: Screening & quotas | <ul style="list-style-type: none"> • Respondent screening: household bill payer in England • Respondent quotas: age, gender, socio-economic group |
| Section B: Experience and perceptions | <ul style="list-style-type: none"> • Familiarity with brownfield sites • Brownfield types and disamenity • Redevelopment of brownfield and added value of developments |
| Section C: Choice task 1 – brownfield redevelopment scenarios (DCE1) | <ul style="list-style-type: none"> • Introduction (and specific treatment) • Choice task explanations • Brownfield development values DCE |
| Section D: Follow-ups | <ul style="list-style-type: none"> • Reasons for choice task responses • Credibility and consequentiality questions |
| Section E: Choice task 2 – added development features (DCE2) | <ul style="list-style-type: none"> • Feature importance • Features DCE + follow up questions |
| Section F: Follow-ups | <ul style="list-style-type: none"> • Views on brownfield redevelopment and its impact • Validity testing and consequentiality questions |
| Section G: Respondent profile | <ul style="list-style-type: none"> • Socio-economic and demographic profile • Survey feedback |

Introductory content

51. The introduction and “warm-up” section of the survey focused on scene-setting through a combination of text and showcards accompanied by questions. Respondents were informed that the survey topic was the redevelopment of brownfield sites in England for new homes through projects that receive public funding. They were informed that the survey was being carried out on behalf of Homes England and that the purpose of the survey was to understand views of the general public about redeveloping brownfield sites. The main intention of the introduction was to ensure that the survey was viewed as a credible exercise by respondents.

52. Upfront material in Section B of the survey provided respondents with definitions of brownfield and greenfield sites, along with short explanations of the previous uses that are common for brownfield sites in England, the potential impacts of those sites, and how sites could be redeveloped. Emphasis was placed on describing the

disamenity sites can cause for local communities (the potential negative impacts of sites) and the longer-term benefits of brownfield redevelopment rather than on the specifics of the new developments. The intent was to focus respondents' attention on the types of disamenity that brownfield sites can be a source of and prompt their thinking about what they may have experienced in their own local area ahead of the choice task exercise. The descriptions of potential impacts were tested and refined through the cognitive testing process to ensure that respondents found them credible and consistent with their own experiences.

Figure 5.1: Survey showcard example – impacts of brownfield sites

Impacts of brownfield sites

| | | |
|---|--|--|
| <p>Visual impact of run-down sites and abandoned buildings ("eyesores")</p> |  <p><small>Photo: Chris Allen (creative commons)</small> Abandoned buildings – abandoned industrial buildings</p> |  <p>Possible contamination – industrial coking works</p> |
| <p>Possible contamination from chemicals or waste from previous industrial use that could harm people or the environment</p> |  <p><small>Photo: Repton13x (creative commons)</small> Risk to safety – collapsing house</p> |  <p>Crime or anti-social behaviour – graffiti, fly-tipping and drug use</p> |
| <p>Risk to public safety from unsafe derelict buildings and sites</p> | <p>Sites could be used for crime or anti-social behaviour</p> | |
| <p>Contribution to deprivation in an area, with impact on local businesses and property prices</p> | | |

53. An explanation was also provided for why publicly funded interventions might be necessary and how Homes England can act to accelerate brownfield redevelopment:

Brownfield sites can also be difficult and expensive to remove and/or redevelop for several reasons:

- *Sites may require clean-up and/or contamination removal due to previous industrial or commercial use, or from old building materials like asbestos.*
- *Existing buildings and structures may need to be removed or repaired to redevelop a site.*
- *Insurance or loans may be unavailable for redevelopment or construction on a site due to its current condition.*
- *Sites may require other actions before development can begin, such as the rezoning of an area for new uses.*

When brownfield is difficult to develop, Homes England can support projects that would benefit the local area such as in situations when a project would:

- *Remove the negative impacts of a brownfield site on its local area.*
- *Result in less greenfield development in the area.*
- *Otherwise improve an area.*

54. Accompanying questions in Section B focused on prompting respondents to think about different aspects of brownfield and sites in their local area. Responses provided a broad view on how respondents perceived the qualities and characteristics of their local area, including impacts they have experienced from brownfield sites.

Choice tasks

55. The two choice tasks included in the survey – brownfield redevelopment scenarios and added development features – used the DCE format. As highlighted in Section 4, the DCE format is a theoretically valid method for estimating willingness to pay. Details of the design and specification of the two choice tasks are provided subsequently in Section 5.

Follow-up questions

56. The choice task exercises were followed by a series of questions that elicited respondents' reasons for their choices and probed for potential issues related to understanding of the task and biased (or systematic) responses. This included:

- Ease/difficulty of the choice task questions.
- The importance of each attribute to the choice made – to examine so-called “attribute attendance” to determine if any aspect of the choice scenario was typically ignored.
- Motivations for choices.
- Reasons for serial selection of the “no change” option – to identify potential protest responses versus genuine reasons for zero willingness to pay for brownfield redevelopment.
- The perceived credibility of the choice task exercises in terms of policy consequentiality (that responses would influence which brownfield sites are redeveloped or what added features are included) and payment consequentiality (that responses would result in changes to household expenses that would fund brownfield redevelopment).

57. Responses to these questions mainly inform the assessment of the study results in relation to potential content validity issues (see Table 4.2).

Respondent profile

58. The final section of the survey collected supplemental information on the circumstances of the respondent and their household, including employment status, education, household income, and ethnicity. The closing questions asked for general feedback on the survey in terms of the ease or difficulty and whether it was engaging or otherwise.

Choice task design

DCE1: Brownfield redevelopment scenarios

59. The specification for the brownfield development scenarios DCE was developed throughout the design stage with testing and trialling of various dimensions, including the number of attributes, the number of repeated choices, as well as the definition of the individual attributes and levels. The purpose of the process was to find

an appropriate balance in terms of preference information generated – i.e. trade-offs between brownfield site attribute levels and cost – and the cognitive burden for respondents.

Attributes and levels

60. The specification of the DCE1 attributes was informed by the literature review and discussions – including a workshop – with Homes England technical specialists and economists. Initially a long-list of factors and characteristics of brownfield sites and developments was prepared (see Appendix 1). This was then narrowed down with particular emphasis placed on the preference information that would be needed to estimate benefit values in an economic appraisal – for example site characteristics and factors that influence the extent of disamenity impact experienced by a household (e.g. distance from site). Combinations of attributes were then tested in with respondents in the cognitive interviews to determine which factors were most important and which were less important. The final specification of the attributes and levels is provided in Table 5.2: Attributes and levels for brownfield redevelopment scenarios, which details the four brownfield site attributes that were included, plus the cost attribute.

| Table 5.2: Attributes and levels for brownfield redevelopment scenarios | | |
|---|--|---|
| Attribute | Description | Levels |
| Brownfield site type | The previous use of the site (incl. typical disamenity impacts). | <ul style="list-style-type: none"> Residential Commercial Industrial |
| Distance to your home | The distance of the site to your home. | <ul style="list-style-type: none"> 1 mile 5 miles 10 miles 25 miles |
| Site size | The total area of the brownfield site. | <ul style="list-style-type: none"> Small site (1 hectare) Medium site (5 hectares) Large site (10 hectares) Very large site (25 hectares) |
| Existing building condition | A description of the type of redevelopment that would occur based on the state of the buildings on the site. | <ul style="list-style-type: none"> Will be reused (reuse existing buildings on the site) Will be removed (remove the existing buildings on the site) Already removed (no existing buildings on the site) |
| Cost to your household | Cost to your household in the form of increased council tax for 10 years, from 2023 – 2033. | <ul style="list-style-type: none"> £10 per year (£0.83 per month) £20 per year (£1.67 per month) £30 per year (£2.50 per month) £50 per year (£4.17 per month) £80 per year (£6.67 per month) £120 per year (£10 per month) |

Figure 5.2: Attribute descriptions – brownfield redevelopment scenarios

Types of brownfield sites

| Previous residential use | Previous commercial use | Previous industrial use |
|--|---|--|
|  <p style="font-size: small; text-align: center;">Photo: Robert Dimov (creative commons)</p> |  <p style="font-size: small; text-align: center;">Photo: Regstonx (creative commons)</p> |  <p style="font-size: small; text-align: center;">Photo: Raymond Knappman (creative commons)</p> |
| <ul style="list-style-type: none"> Mainly empty houses or flats in poor condition Poorly maintained open spaces around properties Could attract anti-social behaviour, graffiti, littering or fly-tipping Surrounding public spaces could be in poor condition | <ul style="list-style-type: none"> Empty shops, office buildings, or other structures such as car parks Old or poorly maintained buildings, pavements, and surrounding public spaces Could attract anti-social behaviour, graffiti, littering or fly-tipping Could be contaminated and require clean-up | <ul style="list-style-type: none"> Abandoned warehouses and industrial buildings Sites and surrounding areas usually not accessible to public due to safety risks Could attract anti-social behaviour, graffiti, littering or fly-tipping More likely to require the clean-up of contamination that could harm people or the environment |

Existing building condition

The current condition of the buildings on the site, described as either:

Will be reused – the existing buildings on site can be renovated and updated to be made fit for residential use. This means that the buildings on site will remain. This can help to maintain the current character of the local area, especially if the buildings have local heritage significance.

Will be removed – the existing buildings on site are dangerous or not repairable and will be demolished for the new residential development. This means that the redevelopment *may* change the character of the local area due to the change in the building architecture.

Already removed – the buildings have already been mostly or completely demolished, but some foundations or other remnants of the previous buildings remain. The site would still need to be cleaned up before new construction could begin.

Site size

The site size is described on a scale from small to very large. These descriptions are accompanied by the site size in hectares.

Developing larger brownfield sites will remove more abandoned, derelict or underused land from your area, and will create more public space and amenities as a result of the redevelopment. Developing larger sites will also result in more new housing in your area. For example, a 1 hectare brownfield site has space for 40-80 new homes depending on the type of homes built, and a 10 hectare site has space for 400-800 new homes.

*1 hectare is 100 metres by 100 metres.
This is approximately the size of a football pitch or the area on the inside of a standard athletics running track.*

Distance to your home

The distance of the site to your home described in terms of miles, the equivalent in kilometres, and roughly how long it would take to walk or drive to the site.

61. The explanatory information provided to respondents is shown in Figure 5.2. It included reminders of the disamenity impacts that can be experienced by local communities from brownfield sites, with some differentiation by previous use (residential, commercial and industrial). The information on site size and distance proxy the potential scale of disamenity impact that may be experienced from a site.
62. The cost attribute was defined in terms of an increased amount of tax paid. Council tax was selected as the payment vehicle since it is coercive and aligned to local level development. The credibility of specifying council tax as the payment vehicle in the context of Homes England’s interventions was tested in the cognitive interviews that supported the survey development and was found to be satisfactory.

Choice task framing and valuation scenario

63. The choice task was framed as a choice between alternative sites in the respondent’s local area that could be redeveloped, which would remove the disamenity experienced from the selected site. The exercise was introduced as follows:

Homes England would like to understand people’s priorities for the removal and redevelopment of brownfield sites to help inform decisions about which projects to support.

In the next few questions, you will be presented with choices about different brownfield sites that could be removed and redeveloped. Your responses will help inform decisions by Homes England about when to support the redevelopment of brownfield sites, which in turn may affect the development that occurs in your local area. Your views are very important, as the support provided by Homes England is paid for by taxpayers and is only available when the redevelopment of sites is in the public interest and will provide benefits to the local area.

64. An example choice card is provided in Figure 5.3¹⁰. The choice offered was between redevelopment of two alternative sites that varied in terms of brownfield site characteristics with some cost to the respondent’s household (Site A and Site B) and a “status quo” option (labelled “Neither”). In the status quo option neither site was redeveloped and there is no cost to the household. Inclusion of the status quo option represents a feasible alternative for the respondent (available at no added cost) and avoids a situation of forced choice where the respondent is required to choose between added cost alternatives – neither of which they may prefer.

¹⁰ Note that in the survey, the choice card layout and instructions for answering the choice tasks were explained to respondents via an animated gif that stepped through a series of instructions.

Figure 5.3: Example choice card – brownfield redevelopment scenarios

For your first choice, which option do you prefer – develop Site A, develop Site B or neither (no redevelopment on either of these sites).

Please click on “more information” to the left of the options if you need a reminder of what the brownfield descriptions mean. Also, [click here](#) for a reminder of what a redevelopment site will look like.

Please click on the column of the site you prefer (Site A, Site B or Neither)

| | Site A | Site B | Neither |
|---|--|--|-------------------------|
| Brownfield site type <i>(More information)</i> | Previous industrial use | Previous residential use | No redevelopment |
| Distance to your Home <i>(More information)</i> | 1 mile (1.6 km) <i>(about a 20 minute walk)</i> | 5 miles (8 km) <i>(about a 10 minute drive)</i> | |
| Site size <i>(More information)</i> | Small <i>(1 hectare)</i> | Very large <i>(25 hectares)</i> | |
| Existing building condition <i>(More information)</i> | Already removed | Will be reused | No Cost |
| Cost to your household <i>(More information)</i> | £10 per year <i>(£0.83 per month)</i> | £80 per year <i>(£6.67 per month)</i> | |

65. In the early stages of the survey design stage, multiple framing options were considered for the valuation scenario and choice task (see Appendix 1). Other possibilities included:

- Focussing on redevelopment outcomes – respondents would be shown a site, and then choose between options for how that site was redeveloped (with costs). While this framing would give a good indication of respondent preferences for how sites are developed, it would not give any indication of the preferences for removal of disamenity impacts and would not directly provide the evidence required to estimate economic values based on brownfield site characteristics.
- Focussing on brownfield sites and redevelopment outcome – respondents would be given a choice among sites with a set of attributes, and then based on that choice of site, be given a set of potential redevelopment outcomes. This framing was found to be cognitively difficult for respondents, and it was also determined that redevelopment outcomes are relatively static in the view of Homes England, so it was not necessary to examine in detail preferences in this regard.

Box 5.1: Previous study framing

Previous research conducted by DLUHC (2019) used a stated preference survey to estimate the value of returning previously developed land to an undeveloped state. The study used a pivot design, where first respondents were asked to choose between two brownfield sites that might be returned to greenfield, and then they were asked to choose between a series of final characteristics of that site, along with associated costs.

This survey design and framing was effective at estimating the value of taking brownfield and turning it into greenfield. The report also frames this value as part of an equation that could value brownfield development into new housing or commercial spaces:

$$WTP_{PDL \text{ to } UDL} + WTP_{UDL \text{ to } DL} = WTP_{PDL \text{ to } DL}$$

Where: PDL is previously developed land (brownfield),

UDL is undeveloped land (greenfield), and

DL is developed land (housing or commercial spaces).

There are both practical and theoretical limitations with using this framing to value Homes England's interventions, as the DLUHC study only measures $WTP_{PDL \text{ to } UDL}$. Practically, using this result to value the redevelopment of brownfield into housing requires ready estimates of the value of developing greenfield into housing $WTP_{UDL \text{ to } DL}$. This value can be calculated through estimating the loss in amenity and natural capital from the development of a hypothetical site, but these estimates (i) may not capture all of the cultural value of greenfield space and (ii) are also highly dependent on the characteristics of the greenfield site itself. Point (i) requires further evidence on local cultural values to estimate, and point (ii) is difficult in the framing of the DLUHC study, as the intermediate greenfield stage is hypothetical and not defined in a way where the amenity value could be easily estimated.

In contrast, the framing selected in this research directly measures $WTP_{PDL \text{ to } DL}$, and is therefore able to capture preferences on and directly estimate the cultural value of removing brownfield disamenity for new housing development. This is a more direct approach to estimating preferences and WTP for brownfield development to housing and is better suited to Homes England's evidence needs.

Treatment for redevelopment outcomes

66. To control for respondents' perceptions of what the wider outcomes could be post-development – including considerations such as increased pressure on public services and local transport networks due to increased population or additional public space on sites – a series of treatments were defined (Table 5.3). The treatment was fixed for each respondent across each choice that was presented in the choice task. The intent was to focus respondents' attention on the removal of brownfield disamenity offered in the choice and their preferences for the selection of brownfield sites for redevelopment, as opposed to preferences on the specifics of how the brownfield is redeveloped.

| Table 5.3: Treatments for post-development outcomes | | |
|---|---|------------|
| Treatment no. | Density and home type | Open space |
| 1 | 30-40 homes per hectare, terraced and detached homes | 10% |
| 2 | 30-40 homes per hectare, terraced and detached homes | 20% |
| 3 | 30-40 homes per hectare, terraced and detached homes | 30% |
| 4 | 40-70 homes per hectare, mainly terraced homes | 10% |
| 5 | 40-70 homes per hectare, mainly terraced homes | 20% |
| 6 | 40-70 homes per hectare, mainly terraced homes | 30% |
| 7 | 70+ homes per hectare, mainly flats in 4-6 storey buildings | 10% |
| 8 | 70+ homes per hectare, mainly flats in 4-6 storey buildings | 20% |
| 9 | 70+ homes per hectare, mainly flats in 4-6 storey buildings | 30% |

67. As Table 5.3 shows the treatments varied the amount of public green space (10%, 20%, or 30%), the type of homes built (terraced and detached homes, mainly terraced homes, or mainly flats in 4-6 storey buildings), and the density of the new homes built (30-40 homes per hectare, 40-70 homes per hectare, or 70+ homes per hectare). Each respondent was randomly assigned a treatment based on whether they live in an urban, sub-urban, or rural location – those in an urban area were assigned 40-70 or 70+ homes per hectare treatments, sub-urban respondents could be assigned any treatment, and rural respondents were assigned only 30-40 or 40-70 homes per hectare treatments.

Experimental design

68. Respondents were presented with eight repeated choices, and each time asked to select their preferred option from two sites (Site A or Site B) and the “neither” status quo option. The attribute levels shown for Site A and Site B in each repeated choice were generated by an experimental design, which was specified to optimise the amount of preference information that was generated by choice tasks given the sample size for the survey¹¹. The experimental design featured 48 choice cards in total, divided into 6 groups of 8.

Instructions and reminders

69. Prior to commencing the choice task, respondents were: (i) reminded that their responses would inform decisions by Homes England about when to support the redevelopment of brownfield sites; and (ii) asked to keep in mind the following when making their choices:

¹¹ There are numerous ways in which choice experiment attribute levels can be combined for a given choice option. In addition, there are many more ways of combining these into choice sets from which respondents are asked to choose their preferred alternative. The purpose of the experimental design is to ensure that the effects of interest can be adequately and efficiently estimated from the available sample size. The design therefore specifies combinations of attribute levels for each choice task faced by a respondent; i.e. it determines which levels of attributes will be presented on a given choice card in a choice experiment.

...when making your choices please keep in mind:

- The impacts of brownfield sites
- That development may still occur in your local area regardless of your choices
- That development on brownfield sites means less development will occur on greenfield sites
- Your overall household income and expenses, remembering that:
 - The payment is on top of your regular household expenditure
 - Any money you allocate to this will not be available for you to spend elsewhere
 - Other sources of household expenditure may go up or down over time
- The amount you pay in council tax may change for other reasons over the 10-year period.

DCE2: Added development features

70. The added development features choice task was included as a supplemental exercise to capture preferences for specific features of brownfield redevelopment that Homes England could influence.

Attributes and levels

71. The final specification for the attributes and levels is shown in Table 5.4. The choice task featured two attributes (features and cost) with the levels for features attribute (11 in total) determined based on review of a selection of Homes England projects and consultation with Homes England specialists.

Table 5.4: Attributes and levels for added development features choice task

| Attribute | Description | Levels |
|------------------------|--|---|
| Additional feature | Additional feature to be included as part of a brownfield redevelopment | <ul style="list-style-type: none"> • Cycle path – cycle path separated from car traffic that connects local areas • Walking path – a path within an open space for walking or running • Sports pitch – a grass or turf sports pitch, for football, rugby, or other organised sport • Children’s play area – a play area with equipment such as swings, slides, and play structures • Nature and wildlife space – space dedicated to provide natural habitats for wildlife • Green open space – general open public park space with grass and some shade trees • Hardscaped space – general open public area with benches, tables, planters, and paving • Multi-use games area • Outdoor workout area |
| Cost to your household | Cost to your household in the form of increased council tax for 10 years, from 2023 – 2033 | <ul style="list-style-type: none"> • £1 per year (£0.08 per month) • £5 per year (£0.42 per month) • £10 per year (£0.83 per month) • £25 per year (£2.08 per month) • £50 per year (£4.17 per month) • £100 per year (£8.33 per month) |

72. The cost attribute specification was consistent with DCE1, but the payment was presented as an additional amount on top of any payment the respondent was willing to pay for redeveloping brownfield sites.

Choice task framing and valuation scenario

73. The choice task was presented as a choice between two alternative features that could be included within a redeveloped brownfield site with an associated cost to the household, plus a feasible alternative offering no added feature at no added cost (Figure 5.4). Respondents were informed that the site was within their local area (max. 30-minute walk or 10-minute drive), implying that they would be able to access and use the feature that they selected.

Figure 5.4: Example choice card for added development features choice task

| | | | |
|---|--|---|------------------------------|
| Which option do you prefer – Feature A, Feature B or neither (no additional feature) | | | |
| <u>Please click on the column of the feature you prefer (Feature A, Feature B or Neither)</u> | | | |
| | Feature A | Feature B | Neither |
| Additional feature | Green open space <i>(general open public park space with grass and some shade trees)</i> | Children’s play area <i>(a play area with equipment such as swings, slides and play structures)</i> | No additional feature |
| Cost to your household | £50 per year <i>(£4.17 per month)</i> | £5 per year <i>(£0.42 per month)</i> | No Cost |

Experimental design

74. The choice tasks presented a single choice to respondents, with the attribute levels for Feature A and Feature B generated by an experimental design. The experimental design featured 54 choice cards in total.

Qualitative testing

Cognitive interviews

75. The survey content (survey wording and show cards) was initially developed through an iterative process that used one-to-one interviews with a small sample of respondents to trial the evolving materials. The main objectives of these interviews were to test:

- Whether respondents understood the purpose of the survey.
- How difficult it was for respondents to complete the survey and whether the instructions were clear.
- How respondents found the descriptions and visual material describing brownfield sites, disamenity and impacts from sites, redevelopment of sites, and attribute descriptions (site type, distance, size, site condition, and cost) and accompanying instructions and reminders for the choice task.
- How respondents felt about the layout and presentation of the choice task, and the amount of instruction needed to explain how to complete the exercise.
- How respondents felt about being asked to make trade-offs between brownfield sites.
- The rationale for respondents' decisions on the choices they made.
- Whether or not the number of choices was too difficult for respondents to handle.

76. A total of ten cognitive interviews were conducted in three waves. Between waves the survey materials were amended and updated based on feedback from preceding interviews. Table 5.5 provides a summary of the key learning from the testing process. Appendix 4 provides a summary report of the cognitive interviews, including quotes from respondents.

Table 5.5: Key learnings from the cognitive interviews

| Aspect of the survey | Key findings |
|---------------------------|--|
| Survey understanding | Overall respondents exhibited a good understanding of the survey topic, purpose, and how to complete the choice tasks. Respondents also demonstrated a good level of familiarity with brownfield sites and brownfield redevelopment. |
| Terminology | Generally, respondents understood the terminology used, but in some cases terminology needed to be simplified or made more consistent to aid in respondent understanding. Respondents also felt the terminology was too ‘emotive’ in some places within the survey, and the language was revised to be more neutral. |
| Ease of survey completion | All respondents found the overall survey easy to understand and straightforward to complete. As well as having a clear and concise layout, people felt the subject matter was interesting, and something they could easily engage with. |
| Choice tasks | Most respondents found the choices straightforward to complete – particularly DCE2. They understood what they were being asked to do in terms of choosing their preferred option, but some had difficulty with the quantity of information. |
| Visual design element | Respondents found the showcards clear, helpful and relevant. People also felt the words and pictures complemented each other and the titles and links were helpful in aiding understanding. |
| Motivation for choices | Motivations for choices were mixed, ranging from respondents choosing the options they felt would most improve their local area, to respondents choosing options that were the least cost to their household. Generally, respondents were reluctant to choose the “no redevelopment” option in DCE1, as they wanted at least some say in the type of redevelopment that would occur. |

Pilot survey

77. The pilot survey was carried out in three waves from March to May 2022. The purpose was to quantitatively test the survey – in particular the choice task components – and refine the experimental design in order to improve its efficiency in terms of the precision of choice model estimates prior to the main fieldwork phase. The data gathered by the pilot survey was not included in the main analysis reported in Section 7.
78. A total of 375 completed responses were obtained (15% of main survey sample) during the pilot phase. Whilst overall results from the pilot were positive – indicating the survey was working well and respondents engaged well with the topic and were trading-off brownfield redevelopment outcomes and cost amounts in the choice task as intended – results from the initial waves prompted some further revisions to the survey design. In particular, early DCE1 results were difficult to interpret due to confounding effects from respondents’ preference for removal of disamenity versus disruption from development. In addition, analysis of the DCE1 choice task responses indicated that it was appropriate to reduce the number of attribute levels for cost, size and distance.
79. Based on these learnings, the results from wave 1 and 2 of the pilot informed the final update and specification for the DCE1 attributes and levels, along with some refinements to the DCE1 instructions and warm-up questions to place even greater emphasis on the disamenity aspects of existing brownfield sites. Results for the final wave of the pilot indicated that the amendments were effective in focusing respondent attention on the removal of disamenity impacts independent of the post-development outcomes for the local area.

Sampling strategy

80. The main sampling requirement for the study was for a nationally representative sample of households in England based on the following respondent criteria: age; gender; and socio-economic group (SEG)¹². Sampling quotas also specified a minimum number of respondents per region. Sampling quotas were specified according to national statistics (Table 5.6). A large overall sample size was specified (2,125 respondents) to: (i) allow for breakdown of results by region; and (ii) accommodate a survey design with multiple treatments.

| Table 5.6: Sampling quotas | | |
|-----------------------------------|------------------------------|-------------------|
| Socio-economic group | Target % ¹ | Target (n) |
| SEG AB | 22% | 468 |
| SEB C1C2 | 52% | 1,105 |
| SEG DE | 26% | 552 |
| Total | 100% | 2,125 |
| Gender | Target % ² | Target (n) |
| Female | 51% | 1,084 |
| Male | 49% | 1,041 |
| Total | 100% | 2,125 |
| Age | Target % ² | Target (n) |
| 18-24 | 11% | 234 |
| 25-34 | 17% | 361 |
| 35-44 | 16% | 340 |
| 45-54 | 18% | 382 |
| 55-64 | 15% | 319 |
| 65+ | 23% | 489 |
| Total | 100% (total sample) | 2,125 |
| Region | Target % 2 | Target (n) |
| North East | 11% | 236 |
| North West | 11% | 236 |
| Yorkshire and the Humber | 11% | 236 |
| East Midlands | 11% | 236 |
| West Midlands | 11% | 236 |
| East of England | 11% | 236 |
| London | 11% | 236 |
| South East | 11% | 236 |
| South West | 11% | 236 |
| Total | 100% (total sample) | 2,125 |

Source: ¹ England – 2011 Census data; ² England – mid-2018 data.

¹² Socio-economic group - Market Research Society definitions are: A = professionals, very senior managers, etc.; B = middle management in large organisations, top management or owners of small businesses, educational and service establishments; C1 = junior management, owners of small establishments, and all others in non-manual positions; C2= skilled manual labourers; D = semi-skilled and unskilled manual workers; E = state pensioners, casual and lowest grade workers, unemployed with state benefits only.

6. Respondent profile and perceptions

81. This section presents selected results from the main survey including the sample profile, sample representativeness and findings for household’s perceptions of brownfield sites. Full summary statistics are provided in Appendix 5.

Sample representativeness

82. The survey was administered online in June – July 2022 to a representative sample of households in England. Respondents were recruited from online panel providers. A total sample of 2,168 respondents completed the survey. The average duration for the survey (time to complete) was 21 minutes.

83. The sample matched the target quotas across all age segments to within four percentage points (Figure 6.1).

Figure 6.1: Respondent age profile (n = 2,168)

| | | n | % |
|--------------|--------------|-------------|-----|
| 18 - 24 | | 260 | 12% |
| | <i>Quota</i> | | 11% |
| 25 - 34 | | 380 | 18% |
| | <i>Quota</i> | | 17% |
| 35 - 44 | | 360 | 17% |
| | <i>Quota</i> | | 16% |
| 45 - 54 | | 400 | 18% |
| | <i>Quota</i> | | 18% |
| 55 - 64 | | 350 | 16% |
| | <i>Quota</i> | | 15% |
| 65+ | | 418 | 19% |
| | <i>Quota</i> | | 23% |
| Total | | 2168 | |

84. The proportion of male / female respondents (Figure 6.2) is also consistent with the sampling quota targets.

Figure 6.2: Respondent gender (n = 2,168; 10 respondents answered “other / prefer not to say”)

| | | n | % |
|--------------|--------------|-------------|-----|
| Female | | 1098 | 51% |
| | <i>Quota</i> | | 51% |
| Male | | 1060 | 49% |
| | <i>Quota</i> | | 49% |
| Total | | 2158 | |

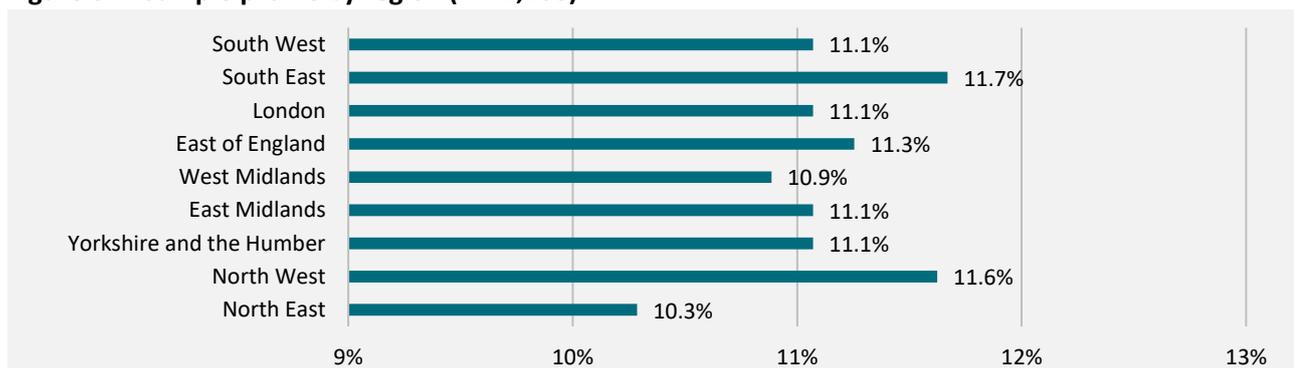
85. The SEG profile of the respondents over-represents the SEG AB group by 7 percentage points and under-represents the C1C2 and DE groups by 4 and 2 percentage points, respectively (Figure 6.3). Over/under-representation of the sample in terms of SEG is controlled for by the application of conventional sampling weights in the analysis.

Figure 6.3: Respondent socio-economic group profile (n = 2,168)

| | | n | % |
|--------------|-------|-------------|-----|
| AB | | 625 | 29% |
| | Quota | | 22% |
| C1C2 | | 1030 | 48% |
| | Quota | | 52% |
| DE | | 513 | 24% |
| | Quota | | 26% |
| Total | | 2168 | |

86. In addition to the target quotas for age, gender, and SEG, a requirement for a minimum of 10% of respondents per region was also specified to allow for the analysis of the survey data by region (Figure 6.4).

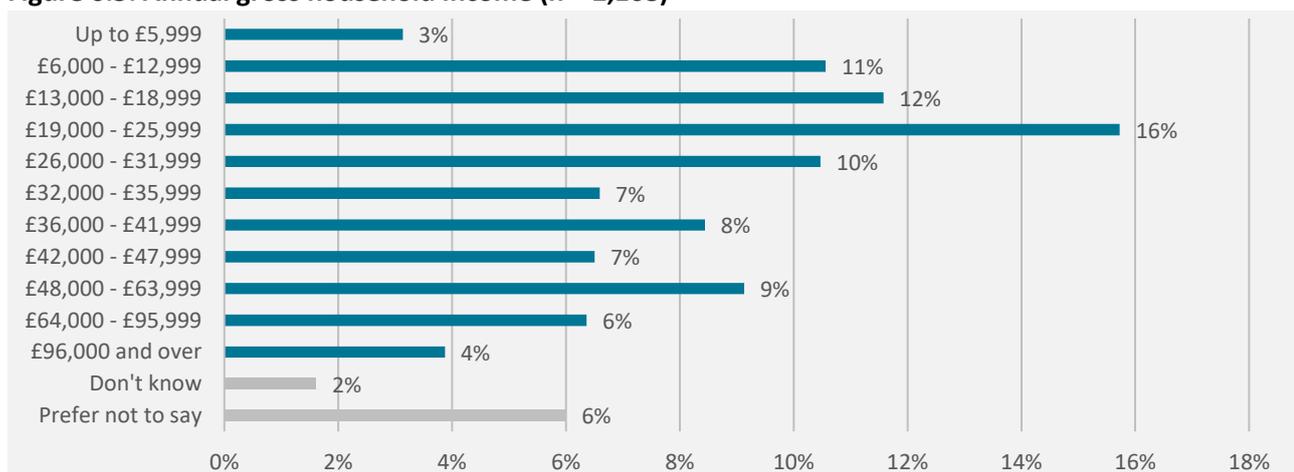
Figure 6.4: Sample profile by region (n = 2,168)



Sample profile

87. Respondents were asked to state their pre-tax annual household income (Figure 6.5). Mean household income for the survey sample was £35,260 per year, with a median of just under £32,000 per year (median income range was £26,000 – £31,999).

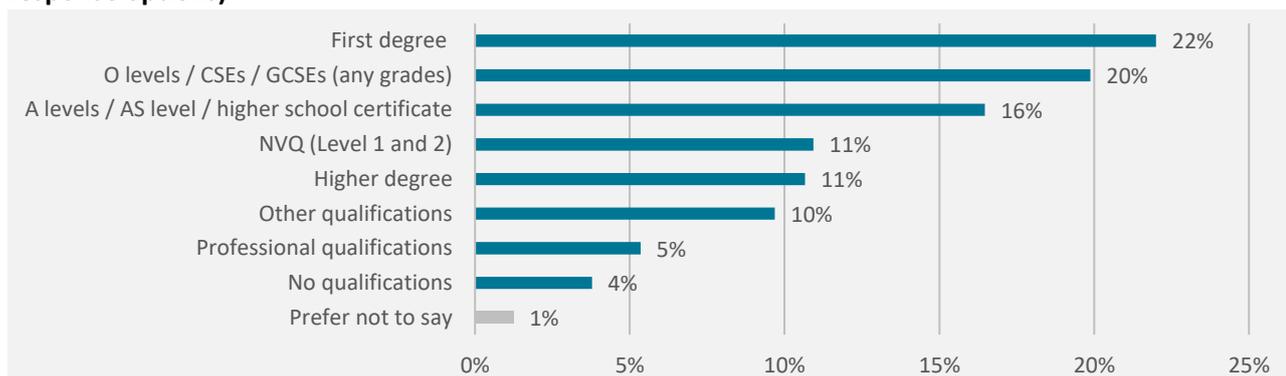
Figure 6.5: Annual gross household income (n = 2,168)



88. Overall, 22% of the respondents reported having a first degree (e.g., BA, BSc), 10% held a higher degree (e.g. masters) and 5% held professional qualifications (Figure 6.6).¹³

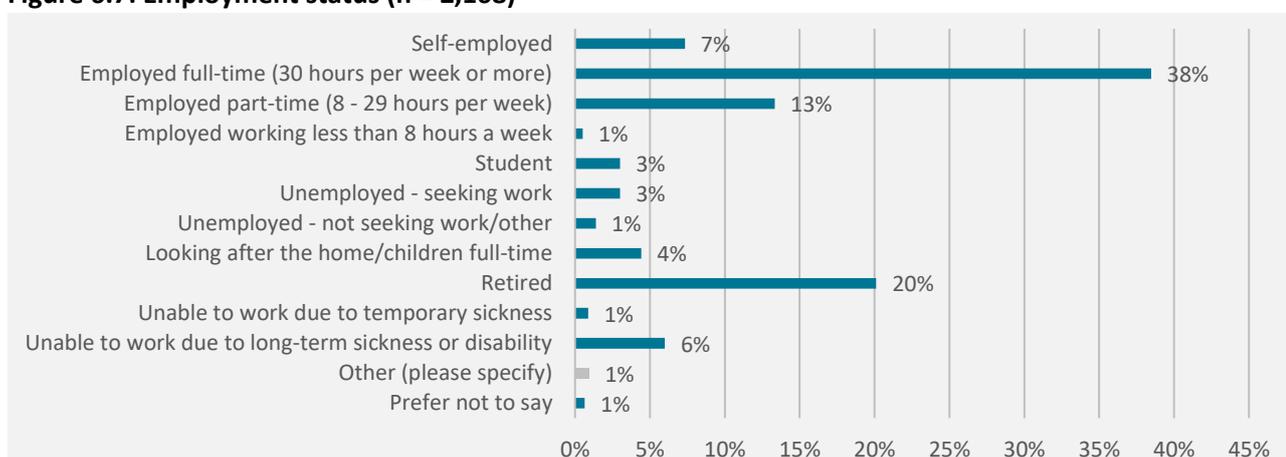
¹³ Responses indicated that 32% of the sample had completed tertiary education, which is below the overall proportion of the population with a tertiary-level qualification in the UK (49.4%) (https://stats.oecd.org/Index.aspx?datasetcode=EAG_NEAC).

Figure 6.6: Education level (n = 2,168; labels shortened from question format for legibility, see Appendix 5 for full response options)



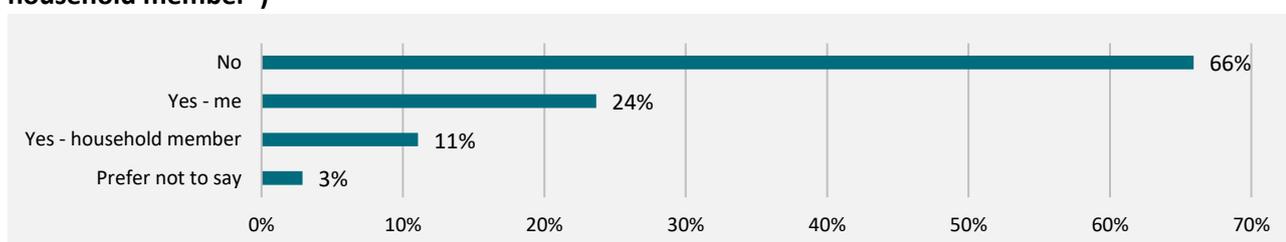
89. Around 40% of the sample were full time employed, with a further 13% part time employed and 20% retired (Figure 6.7). Only 3% were unemployed but seeking work, which is roughly in line current statistics for the UK labour market¹⁴.

Figure 6.7: Employment status (n = 2,168)



90. Around two thirds of the respondents stated that neither they nor a household member has a long-term illness or disability (Figure 6.8). The incidence of those reporting a disability (24%) is slightly higher than the overall population¹⁵. The majority of respondents who reported having a disability stated that it limits their daily activities (74%).

Figure 6.8: Long term illness or disability (n = 2,168; respondents able to select both “yes – me” and “yes – household member”)



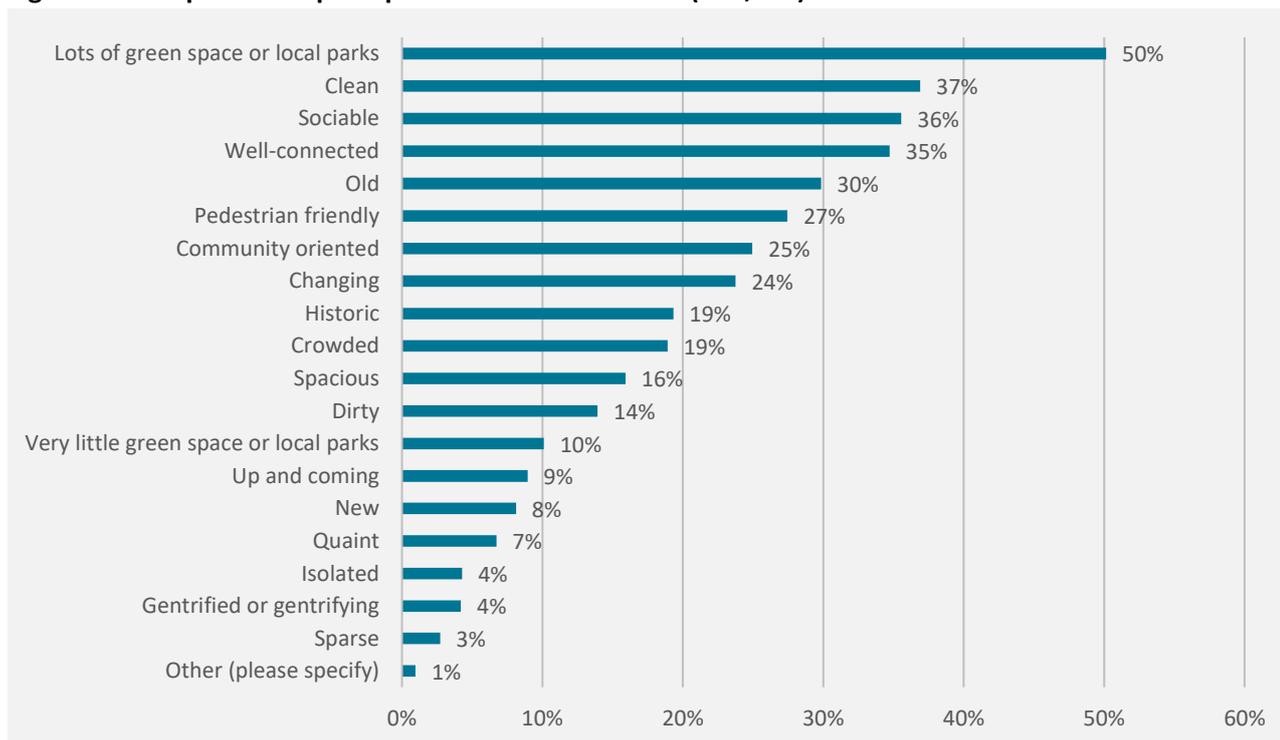
¹⁴ The reported unemployment rate for February – April 2022 was 3.8%. ONS labour market overview, UK: June 2022. (<https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/bulletins/uklabourmarket/june2022>).

¹⁵ Approx. 22% of the UK population are estimated to have a disability, based on the latest Family Resources Survey (financial year 2020 to 2021) (<https://www.gov.uk/government/statistics/family-resources-survey-financial-year-2020-to-2021>).

Perceptions and attitudes

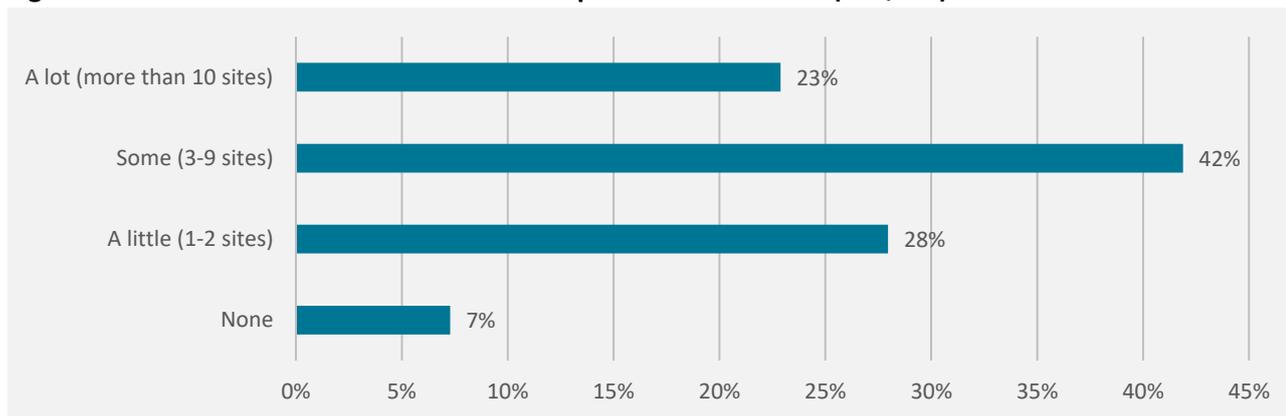
91. Responses to several questions asked early in the survey give insight into respondents' perceptions of their local area and experience of brownfield sites. In these cases, respondents were asked to consider their "local area" places within a 30-minute walk or 10-minute drive from their home.
92. In general, respondents described their local area in positive terms (Figure 6.9). Half of the respondents stated that there is lots of green space or local parks – compared to just 10% who felt their local area had very little green space or local parks. A larger proportion also felt that their local area was "clean" (37%) compared to those who said it was "dirty" (14%).

Figure 6.9: Respondents' perceptions of their local area (n=2,168)



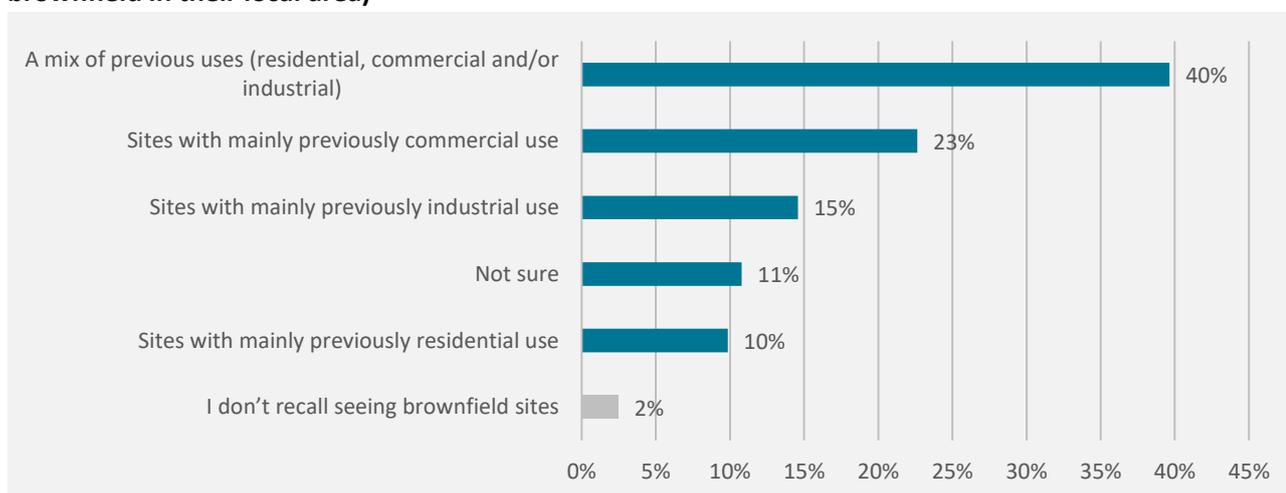
93. The breakdown of results by socio-economic groups indicates some trends. Respondents in higher SEG groups were more likely to report: (i) "lots of green space" in their local area (56% for AB, n=625; 42% for DE, n=513); (ii) that their local area was "sociable" (40% for AB versus 32% for DE); and (iii) to consider their local area "clean" (46% for AB versus 29% for DE). In terms of geography, respondents in Greater London were more likely to consider their area both well-connected (30%, n=240) and crowded (30%) compared to other regions.
94. Almost all respondents (93%) reported the presence of at least one brownfield site in their local area (Figure 6.10). Respondents in the East of England (n = 240) were more likely to report less brownfield in their local area (36%; "A little"). Respondents in the North West (n = 232) were more likely to report higher amounts of brownfield in their local area (31%; "A lot").

Figure 6.10: Presence of brownfield sites in respondents' local area (n=2,168)



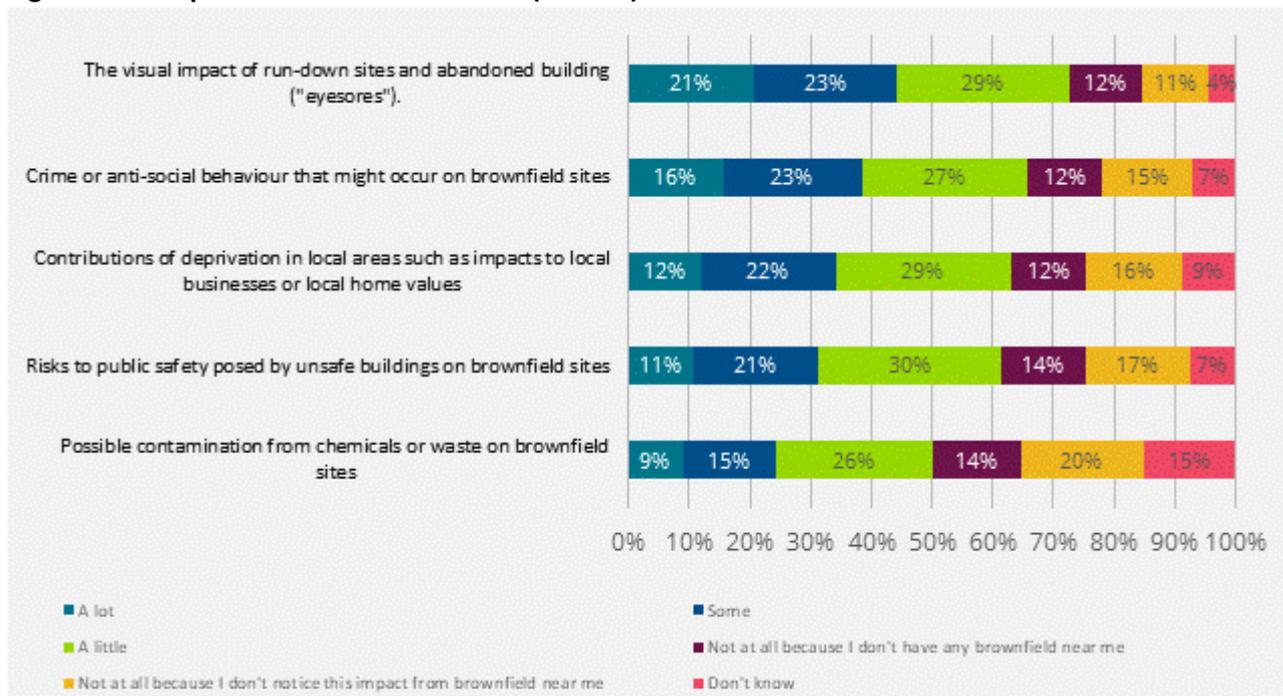
95. Of those indicating the presence of at least one site, 40% reported that the brownfield was a mix of previous uses and 23% that it was mainly previous commercial use (Figure 6.11).

Figure 6.11: Type of brownfield sites in respondents' local area (n=2010; only those that reported seeing brownfield in their local area)



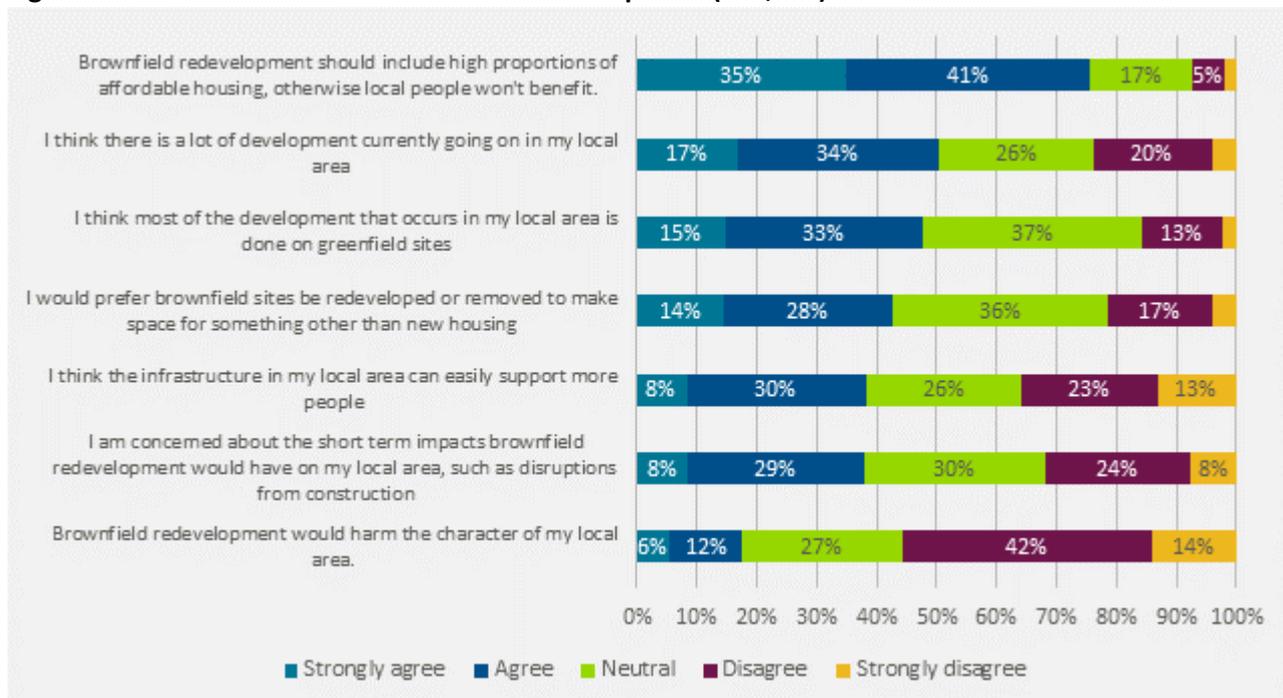
96. The most commonly reported disamenity experienced by respondents from brownfield sites was the visual impact of sites and abandoned buildings (44%; “A lot” or “some” impact) (Figure 6.12). This was followed by concerns about crime and anti-social behaviour, contribution to deprivation and the impact on businesses and property values, and risk to public safety from unsafe buildings. Less concern was evident for potential contamination of sites (24%; “A lot” or “some” impact). Overall, there was no significant variation in responses by respondent socio-economic group or income level. However, in terms of geography, respondents in London and the East Midlands were more likely to say they experienced disamenity in the form of crime or anti-social behaviour.

Figure 6.12: Impacts from brownfield sites (n=2168)



97. Respondents were also asked their views on development in their local area (Figure 6.13). Around half felt that there is already a lot of development going on (51%; “strongly agree” or “agree”) and that it was mainly on greenfield sites (48%; “strongly agree” or “agree”). A small majority felt that brownfield redevelopment would not harm the character of their local area (56%), whilst a larger proportion wanted developments to include high proportions of affordable housing (76%; “strongly agree” or “agree”).

Figure 6.13: Views on brownfield local area development (n=2,168)



7. Choice task analysis

98. This section reports the analysis of the DCE responses. Overall, the two exercises – brownfield redevelopment scenarios (DCE1) and added development features (DCE2) provided a rich dataset on household preferences for brownfield redevelopment. The main results of the analyses are reported along with supporting validity testing assessments.

Choice modelling analysis

99. The data from the two choice tasks were analysed in choice models that examine how respondents selected: (i) their preferred options for brownfield sites (“Site A”, “Site B”, or “neither”) in each repeated choice in DCE1; and (ii) their preferred feature (“Feature 1”, “Feature 2”, or “neither”) in the single choice in DCE2. In both cases respondents’ preferences for the respective outcomes are quantified by estimating the likelihood of a respondent selecting an option as a function of the level for each choice task attribute. In basic terms the analysis estimates demand for brownfield redevelopment outcomes and added features by measuring how much different factors – such as the characteristics of the brownfield sites – influenced their choices.

DCE1: Brownfield redevelopment scenarios

Estimation strategy

100. The analysis for DCE1 followed an estimation strategy that investigated a range of effects in household preferences for brownfield redevelopment sites (Table 7.1). This included:

- Pooled models¹⁶ across all respondents as well as models for specific demographic segments¹⁷.
- Tests for linear and non-linear (via piecewise, polynomial, and logarithmic specifications¹⁸) effects in certain site attributes with relation to the brownfield redevelopment outcomes and household preferences.

101. All of the models were estimated in “utility space” and have a conventional interpretation that establishes the effect that each attribute / level has on household welfare – both the brownfield site characteristics and the cost attribute. Household WTP for brownfield redevelopment outcomes is estimated from these models as the trade-off between the change in utility associated with the outcome and the disutility of an increase in cost to the household¹⁹.

¹⁶ Pooled models were estimated using all choice task response data across all respondents. Demographic characteristics are either controlled for as an independent variable, or not controlled for at all in the case of the main effects models.

¹⁷ Segmented models only used the choice task response data for the demographic segmentation in question.

¹⁸ Piecewise linear models estimate effects of specific ranges rather than assuming an overall linear relationship.

¹⁹ Household WTP = $-\beta$ (Brownfield site redevelopment) / β (Cost), where β is the relevant coefficient estimate from the choice model estimation.

Table 7.1: Estimation strategy – brownfield sites choice task

| Estimation(s) – model specification | Description and use |
|--|---|
| Main effects | Models limited to DCE attributes and levels to determine the influence of the main factors on preferences for brownfield redevelopment. |
| Individual specific status quo | Controls for potential variation in the reference point for respondents in terms of the “status quo” (no change at no cost) option for their local areas. The individual specific status quo is coded according to information provided by respondents about their local area (instead of treating it as a fixed alternative across the sample). |
| Non-linear effects | The effect of distance and area on preferences for redevelopment can be modelled as linear relationships or non-linear. A range of alternative specifications were tested to determine the best fitting “shape” of preferences for those attributes. Model fit statistics and analytical judgement were used to select the preferred specification. |
| Interaction effects for respondent characteristics | Model specifications that test for statistically significant differences in strength of preference for redevelopment, based on individual specific characteristics such as socio-economic group. |
| Geography – region and urban/rural location | Separate sub-sample models for urban, suburban, and rural respondents to determine if the type of area a respondent lives in affects strength of preference for redevelopment. |

102. Each choice model was estimated using either a conditional logit (CL) or mixed logit (MXL) specification. The CL specification is the standard choice model, but it is based on some practical but restrictive assumptions about household preferences²⁰. In contrast the MXL model specification relaxes these assumptions, for example, by allowing respondent preferences to vary across observed characteristics. The MXL model specification used in the analysis was the random parameter logit (RPL) model. This specification allows the estimate of the utility coefficient to vary across individuals instead of being fixed at the same level for all; hence it allows coefficient estimates to vary over respondents according to some distribution reflecting their individual tastes.

103. The overall choice of the “preferred” model or set of models is based on interpretation of various aspects of the model results. This includes how the model results align to expectations regarding the effect of brownfield redevelopment on household utility (the sign and statistical significance of coefficient estimates), along with indicators of model fit (how well the model explains the data / respondent choices), which includes parameters such as the log-likelihood, information criterion, and pseudo R².

104. Full model estimations and results are provided in Appendix 6.

Data sample

105. The choice model analysis for DCE1 used the representative sample of respondents from the main survey implementation (n = 2,168). Sample weights were applied to address the over/under-representation of socio-

²⁰ The conditional logit (CL) model is derived by placing some practical, yet restrictive assumptions on the random (unobserved) component of utility. The random component arises either because of randomness in the preferences of the individual (household) or the fact that the analyst does not have the complete set of information available to the individual. A key implication of the assumptions is that individual choices obey the independence from irrelevant alternatives (IIA) property, which states that the relative probabilities of two options being selected are unaffected by the introduction or removal of other alternatives. Less restrictive model specifications relax some of the assumptions of the MNL model. For example, by allowing for: (i) variations in tastes by individuals in relation to the observed characteristics; (ii) correlation (non-independence) of unobserved factors in repeated choices by respondents; and/or (iii) different variances across alternatives (or bundles of characteristics). These are represented by the RPL model; the RPL-correlated model; and the error-component (EC) model respectively. Collectively all these belong to the family of mixed logit (MXL) models.

economic groups, age groups, and gender in the sample. Data quality issues (e.g. “speeders” who undertook the survey too quickly to have been able to engage with the questions) were not found to be prevalent.

Individual specific status quo

106. Option C in DCE1 offered respondents a “status quo” choice, with neither site redeveloped and no cost to the household. In the choice model analysis the status quo option could either be treated as a fixed (non-varying) alternative over all respondents or modelled based on the circumstances of each respondent – for example, based on the amount of brownfield and the rate of development already occurring in a respondent’s local area.

107. Specifying the status quo for each respondent controls for the different reference points that respondents may have for evaluating the continued disamenity that might be experienced from selecting neither redevelopment option. The status quo levels were specified according to wider survey responses provided by respondents:

- Site type: the type of brownfield site respondents reported seeing most often. If respondents selected “don’t know” or “mixed”, this attribute was assigned a level of “0”, indicating the information was not known.
- Site size: the amount of brownfield a respondent reported having in their local area. The more brownfield they reported having, the larger the site size was specified to be (applying the categorical scale from “small” to “very large” that captured this information).
- Distance: the impact respondents reported experiencing from brownfield sites in their local area. The higher the level of impact reported, the closer the site was specified to be.
- Site condition: undefined for all respondents, reflecting the highly site-specific nature of this attribute.

Non-linear effects

108. Non-linear effects for site size and distance were tested. Both logarithmic and quadratic specifications for distance and area along with inclusion of an interaction term for these two variables showed an improved model fit over the standard linear specification, and in both instances a diminishing marginal benefit effect. Due to similar trends in results and overall model simplicity, the log specification was adopted for ease of use (Appendix 6, models 1A, 1B, and 1C).

Protest responses

109. Protest responses refers to zero-WTP choices in SP exercises that are based on a rejection of the simulated market rather than a genuine valuation of the outcome of interest. The procedure for identifying protest responses is through the follow-up questions that ask respondents to state their reasons for their choices. These responses are then used to distinguish between respondents that place zero-value on an outcome because they genuinely do not value it and those that are responding zero for some other reason.

110. In DCE1 potential protest responses were identified as respondents who gave 8 (out of 8) status quo responses (no redevelopment, no cost) – so-called “serial SQ responses” (i.e. non-trade-off behaviour) – and gave a protest motivation as the reason for their choices in the follow-up questions. A total of 195 respondents provided serial SQ responses, and 140 were identified as protest responses through follow-up questions. This gives a protest rate of approximately 6%, which is judged to be reasonable for a study of this nature. Sensitivity analysis was conducted to assess the impact of inclusion/exclusion of protest responses on the choice model estimations and willingness to pay values (see below).

Household preferences for brownfield redevelopment

111. Table 7.2 presents the preferred model estimation for DCE1. The specification used the individual specific status quo and specified the distance and area parameters in log form to reflect diminishing marginal effects as site size and distance from respondent increases. The specification also included an interaction effect for distance and area, capturing the combined effect of the two attributes on respondent preferences (that preference for area depends on the distance of the site, and vice versa). The primary interpretation of the model results is based on: (a) the sign (positive / negative) of the estimation coefficients for each explanatory variable (attribute or attribute level); and (b) their statistical significance. In combination, this indicates how respondents' choices were influenced by the levels of the attributes and the change in cost presented in the choice task²¹.

| Table 7.2: Brownfield redevelopment scenarios – model estimation (DCE1) | | | |
|---|----------------------------------|---|----------|
| Model parameters | | Model with individual specific status quo | |
| Attribute | Level | Coefficient (95% CI) | St. dev. |
| Site type | Industrial (base) | - | - |
| | Residential | -0.17*** (-0.27, -0.06) | 0.47*** |
| | Commercial | 0.12** (0.00, 0.24) | 0.24** |
| Distance (ln) | - | -0.22*** (-0.31, -0.13) | 0.39*** |
| Site size (ln) | - | 0.078* (-0.014, 0.169) | 0.056*** |
| Distance x Site Size (ln) | - | 0.071*** (0.035, 0.107) | 0.010 |
| Site condition | Will be demolished (base) | - | - |
| | Already demolished | 0.045 (-0.093, 0.183) | 0.12 |
| | Could be reused | 0.14*** (0.00, 0.27) | 0.36*** |
| Cost | (Linear) | -0.024*** (-0.025, -0.022) | N/A |
| SQ (neither site) | (Constant) | -3.68*** (-4.34, -3.03) | 2.19*** |
| Controls | Urban / suburban / rural | 0.18 (-0.02, 0.38) | 0.24 |
| | SEG (A=1 / B / C1/ C2 / D / E=6) | 0.19** (0.47, 0.34) | 0.20 |
| | Observations (n) | 48,672 | - |
| Model fit | Log-likelihood | | -14,788 |
| | Pseudo R2 | | 0.17 |

112. The overall model fit for the main estimation was good in terms of pseudo R2 and – where relevant – all coefficient estimates had the expected direction of effect and in most cases were statistically significant at the 1% level. The main interpretations for the model results are:

- There was a strong preference for redevelopment (selection of “Site A” or “Site B”) and removal of the brownfield disamenity, versus the alternative of redeveloping neither site (the status quo option). This is signified by the positive and statistically significant coefficient estimate for the “SQ (neither site)” parameter.

²¹ The MXL specification also features an additional set of coefficient estimates, which describe the distribution of the attribute coefficients in terms of its standard deviation (St. dev.) in accordance with the preference heterogeneity assumption noted above. A statistically significant standard deviation parameter estimate signals that there is observed variance in household preferences. In turn this implies that the CL assumption of a fixed effect does not reflect the varying strength of preferences. The overall finding is that the MXL specification provides a better explanation of household preferences for brownfield development compared to the CL specification for the choice models.

All else equal – respondents found greater utility in redevelopment over no development and made their choices accordingly.

- There was an observed preference for the redevelopment of commercial sites over former residential or industrial sites. This is shown by coefficient estimates for the “Site type” dummy variables, where the estimate for “commercial” is positive and statistically significant relative to the “industrial” base case. The coefficient estimate for “residential” is negative and statistically significant, indicating this had the lowest level of preference, giving an overall ordering of commercial > industrial > residential. As noted in Section 6, mixed or previous commercial sites were the most commonly observed brownfield site types in respondents’ local areas, which is consistent with the finding here that previous commercial sites have the greatest effect on respondents.
- There was an observed preference for re-using existing structures where possible. This is shown by coefficient estimates for the “Site condition” dummy variables, where the estimate for “could be reused” is positive and statistically significant relative to the “will be demolished” base case. There was no statistically different preference for redevelopment of already cleared sites (“already demolished”) and the base case. The preference for retaining existing structures likely relates to maintaining the character of an area and retaining buildings that contribute to this (e.g. local heritage and historical significance).
- There was a pronounced preference for development of sites that are closer to the respondent’s home. The negative coefficient estimate, which is statistically significant at the 1% level, represents the expected distance decay effect, whereby the impact of redevelopment diminishes as the distance from the site increases.
- There was a preference for removal of disamenity generated by larger sites versus smaller sites. The coefficient estimated for “Site size” is positive but only found to be statistically significant at the 10% level. The preferred model also includes, however, an interaction term between site size (area) and distance. The coefficient estimate for this parameter is positive and statistically significant at 1% level, indicating that site area (the positive term) has more impact on preferences than distance.
- Overall preferences were constrained by cost, as signified by the negative and statistically significant coefficient estimate for the “Cost” attribute. All else equal – respondents preferred redevelopment options that had a lower cost to their household in terms of the increase in council tax. This is an important underlying result in terms of the validity of model results since it indicates a downward sloping demand curve for removal of brownfield disamenity.
- The model results also show significant heterogeneity in respondent preferences – i.e. preferences are not uniform across the sample with some respondents having particularly strong preference for certain outcomes, others a relatively weak preference. Put another way, there is significant variation around the “average” result, particularly for site size, distance, and site condition, which is shown by statistically significant coefficient estimates for the standard deviation parameter for these variables.

Marginal willingness to pay estimates

113. Marginal willingness to pay (mWTP) estimates for the brownfield redevelopment scenario attributes are reported in Table 7.3²². The core effect is reflected in the mWTP value associated with the status quo parameter, which can be interpreted as the value of removing the disamenity from brownfield sites

²² Marginal WTP is calculated from the choice model results as the trade-off – the marginal rate of substitution (MRS) – between the effect for each respective attribute and the cost attribute: $mWTP = -\beta X / \beta_{Cost}$, where β is the coefficient estimate and X the attribute of interest.

independent of the site characteristics. The sample average result is approximately £133 per household per year – this represents the individual household level benefit of the avoided disamenity.

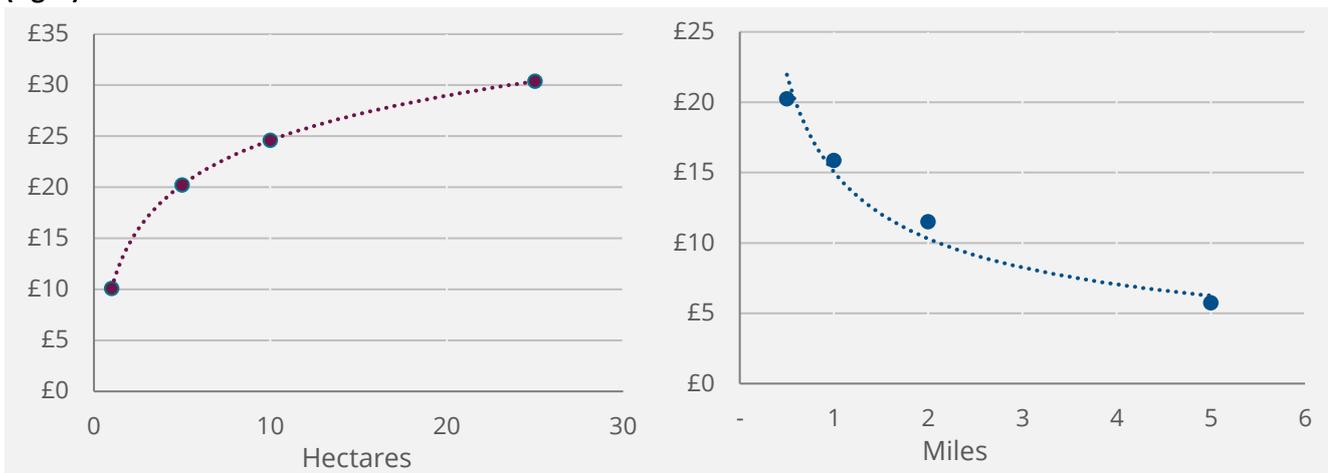
| Table 7.3: Brownfield redevelopment attributes – marginal WTP (£/hh/yr) | | |
|---|---------------------------|-------------------------|
| Attribute / effect | Unit | Marginal WTP (95% CI) |
| Local amenity improvement | - | 133.00 (105.00, 161.00) |
| Site type | Residential (base) | - |
| | Industrial | +7.00 (3.00, 12.00) |
| | Commercial | +12.00 (7.00, 17.00) |
| Distance (ln) ^a | Per mile | -6.00 (-9.00, -4.00) |
| Site size (ln) ^b | Per hectare | +0.60 (-0.10, 1.00) |
| Site condition | Will be demolished (base) | - |
| | Already demolished | +2.00 (-4.00, 8.00) |
| | Could be reused | +6.00 (0.00, 12.00) |

Notes: Values are rounded to nearest £1. ^a Reported value is for reduction in disamenity between a site 1 mile away vs. 2 miles away. ^b Reported value is for increase in disamenity between 5 hectare site vs 6 hectare site.

114. The valuations for the specific attributes show the incremental change in the household level benefit due to site type, size, condition, and distance. For example, the added benefit associated with redevelopment of a previous commercial use site is approximately £12 per household per year when compared to the same development on land that was previously residential in use. Similarly, the added benefit of re-using existing structures on site is £6 per household per year (compared against demolishing structures).

115. Note also that marginal WTP estimates for distance and site size reported in Table 7.3 show the effect at a specific point, and do not reflect the extent of the observed non-linear relationships for these attributes and preferences for brownfield redevelopment (Figure 7.1)²³.

Figure 7.1: Example of annual household benefit of brownfield redevelopment against size (left) and distance (right)



²³ Non-linear mWTP is calculated as follows:

$$mWTP_i = \beta_i \left(LN \left(\frac{x_{i,1}}{x_{i,0}} \right) \right)$$

where: i denotes the specific attribute, β_i is the specific WTP value and $\frac{x_{i,1}}{x_{i,0}}$ denotes the ratio between the unit value now and the starting unit value.

DCE2: Added development features

Estimation

116. The choice task data for DCE2 was analysed in a similar fashion to the brownfield redevelopment scenarios choice task. As the exercise itself was simpler, a single main-effects model was estimated using a CL model specification (Table 7.4). No additional model specifications were estimated, given the model fit and the statistical significance of the coefficients for the features and cost variables.

| Table 7.4: Added development features – main effects estimation (DCE2) | | | |
|--|------------------------|------------------|-----------------|
| Attribute | Level | Coefficient | 95% CI |
| Feature | Green open space | 1.74*** | 1.51 – 1.96 |
| | Wildlife space | 1.68*** | 1.45 – 1.90 |
| | Walking path | 1.22*** | 1.01 – 1.42 |
| | Children’s play area | 1.14*** | 0.90 – 1.37 |
| | Hardscaped space | 0.94*** | 0.72 – 1.17 |
| | Multi use | 0.80*** | 0.53 – 1.07 |
| | Sports pitch | 0.51*** | 0.28 – 0.74 |
| | Cycle path | 0.48*** | 0.26- 0.71 |
| | Outdoor workout area | -0.02 | -0.26 – 0.22 |
| Cost | <i>(Linear)</i> | -0.02*** | -0.02 - -0.02 |
| SQ (no action) | <i>(Constant)</i> | (Base / omitted) | - |
| Model fit | Observations (n): 6084 | | Pseudo r2: 0.15 |

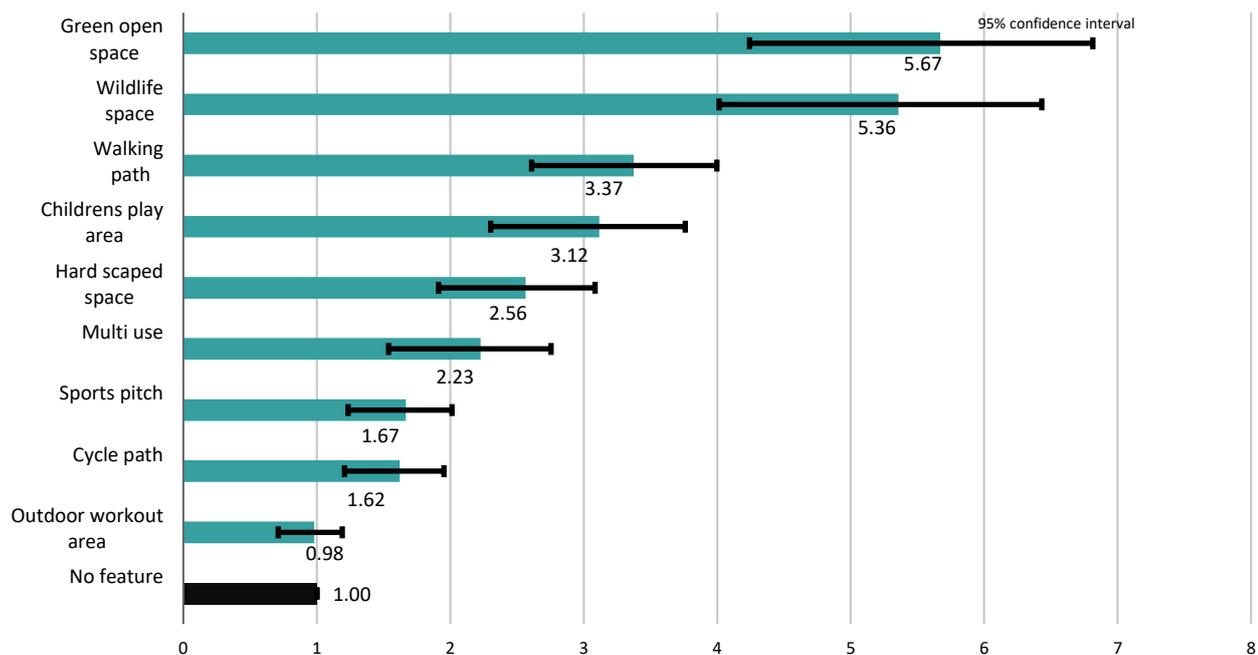
Notes: statistical significance: <0.10 (*), <0.05 (**), and <0.01 (***).

117. The DCE2 model results show that all added features were preferred to the alternative of no feature, with the exception of outdoor workout spaces. Green open space and space for wildlife were the most preferred features, followed by walking paths and children’s play areas. Preferences were constrained by cost – as signified by the statistically significant negative coefficient for the cost attribute – indicating that as the cost to the household of an added feature increased (all else equal), respondents were more likely to select the no added feature alternative.

118. Results showing the relative preferences between alternative features are illustrated in Figure 7.2. These are reported as the odds ratios²⁴ for each added feature, which quantify the relative strength of preference (i.e. priority) that respondents assigned to each. The odds ratios show the relative weight compared to the base case, which is no added feature. A preference weight greater than 1 indicates that the feature is preferred relative to the base (e.g. 1.67x “better”); conversely a weight less than 1 indicates that it is not preferred relative to the base. The difference in preference weights between each added feature shows the incremental changes in respondent preferences (i.e. how much a feature is preferred over another).

²⁴ Odds ratio (OR) = $\exp(\beta_i)$, where β is the model coefficient estimate for added feature i .

Figure 7.2: Added development features – odds ratios (DCE2)



Willingness to pay estimates

119. Household WTP for the added development features – the benefit to local communities from their provision – is reported in Table 7.5. Values range from approximately £27 per household per year for cycle paths to £97 per household per year for green open space²⁵. Note that in line with the model estimation results, no added value is assigned to the provision of an outdoor work out area (WTP estimate is not statistically different from zero).

| Table 7.5: Added development features – household WTP (£/hh/yr)* | |
|--|---------------|
| Feature | WTP (95% CI) |
| Green open space | £97 (81, 112) |
| Wildlife space | £94 (80, 108) |
| Walking path | £68 (55, 81) |
| Children’s play area | £64 (49, 78) |
| Hardscaped space | £52 (40, 65) |
| Multi use | £45 (30, 59) |
| Sports pitch | £29 (16, 41) |
| Cycle path | £27 (14, 40) |
| Outdoor workout area | £-1 (-15,12) |

Notes: Values are rounded to nearest £1.

²⁵ A comparison of sample segments for added features (Appendix 6) showed no statistically significant differences in mWTP estimates between the preferred model and sub-sample models for urban and suburban respondents, with three exceptions: (i) urban respondents were the only group to put positive value on outdoor workout areas; (ii) urban respondents placed more value on hardscaped space; and (iii) urban respondents placed significantly more value on cycle paths.

Validity testing

120. The main aspects for assessing the validity of stated preference studies are convergent validity, content validity and 'construct validity'. These considerations cover both the main empirical results from the study (the choice model analysis) and wider considerations in relation to respondent understanding and the motivations for their responses.

Convergent validity

121. In general, convergent validity is difficult to assess for non-market outcomes, since by definition there are no markets that give directly comparable valuations. Assessments therefore rely on comparison to studies with similar scope, that use either stated preference or revealed preference approaches to gauge whether results are similar or vary in a predicted manner. In the context of brownfield development, candidate comparator studies include those that value changes in local environmental amenity, particularly in the context of the removal of disamenity or improving quality of life (Table 7.6; also see Appendix 1). However, comparator studies from the UK are limited, with only one that directly relates to brownfield redevelopment (Table 7.6). Other studies have some relevance on the basis that they value improvements in local amenity or the costs of disamenity.

| Table 7.6: UK-based studies valuing local environmental amenity impacts | | |
|---|--|---|
| Study | Summary of study | Comparison of findings |
| eftec, 2020 | This study used a stated preference approach to estimate the local environment amenity benefits of reducing litter, specifically in the context of a deposit return scheme. The study – which surveyed 730 respondents – found that households derive significant value from litter reductions. | Households were willing to pay to have less litter, and benefits for a substantial (85%) reduction in local litter were around £67 (March 2022 prices) per household per year. The main focus of this study – disamenity – is similar in nature to brownfield disamenity, although litter has a more transient effect, compared to the “permanent” disamenity from brownfield site. The study results are therefore broadly comparable and there is a degree of consistency with valuations for litter removal being significant but lower than disamenity from brownfield sites. |
| Cambridge Economic Associates et al., 2010 | This study used a stated preference approach to value outcomes from regeneration projects, ranging from skills training in communities to neighbourhood renewal projects. The survey gathered 106 responses in Seaham and East Durham. In terms valuing the benefits of brownfield redevelopment, the focus was the removal of visual disamenity from derelict structures | The study is limited in terms of the number of respondents, but provides a useful reference for both the methodological approach and for the scale of benefits. It finds that households are willing to pay to remove derelict structure and improve green open space, as well as to create recreational facilities and green routes. The most directly comparable feature is recreational facilities, which were valued at £24 per facility per household per year (2022 prices). |
| Cambridge Economic Associates, eftec, and WRC, 2003 | This study estimated the disamenity costs associated with landfill sites in the UK using a hedonic pricing method. Residential property sales transaction data (over 590,000 transactions) and spatial data on landfills) were analysed, and the study found that there is a substantial loss of property value for homes close to landfill sites. | While this study uses a revealed preference method, the results show substantial disamenity effects from operational landfill sites. As the sites were operational, disamenity was generated not only by the site but also the activities associated with the site (such as traffic). The average reduction in home prices was around £2,500 (2022 prices) for a distance of 0.25 to 0.5 miles from a landfill site. The study also found substantial regional and spatial variation in disamenity, as well as variation based on the type of site in question. |

Construct validity

122. Construct validity is primarily concerned with the robustness of the choice models and how well they explain respondent preferences based on reasonable expectations; both in relation to previous empirical research and underlying economic theory.

Overall findings

123. Overall, the choice model results are in line with expectations. Coefficients estimates for both DCE1 and DCE2 have the expected sign (i.e. the direction of preferences is consistent with expectations based on economic theory or the existing literature), the majority are found to be statistically significant, and the pattern of results

show the expected direction of effect. Various aspects of the findings demonstrate the validity of the results, including:

- Both DCE1 and DCE2 estimations are constrained by the cost attribute, and preferences for improvement options are decreasing in cost.
- Preferences for brownfield redevelopment – the removal of disamenity – show diminishing marginal utility in relation to the site size – that is redevelopment of larger sites brings greater benefit but at a decreasing rate.
- Generally, a stronger preference is placed on redevelopment of sites and removal of disamenity that are closer to the respondent’s household – a “distance decay” effect reflecting the expectation that closer sites are more likely to impact a respondent on a daily basis.
- Generally, the same patterns of preferences were found between demographic and geographic groups. Differences in segment model estimations were not found to be statistically significant – the confidence intervals for the coefficients overlap – which indicated that the pooled model can be used to represent the preferences of all groups (Appendix 6).
- Respondents in low socio-economic groups (D, E) were less likely to choose an intervention than those in high SEGs (A, B). This could be because lower SEGs are correlated with lower household income, and therefore respondents from a low SEG are less likely to be able to afford to pay for an intervention. Segmented model specifications were estimated in order to test for income effects and estimate income elasticity, but none of the models found statistically significant variation by income.
- Two models (Appendix 6) tested for the effects of perceived consequentiality of the survey and choice tasks. Respondents that did not feel the survey was consequential were generally observed to have lower sensitivity to the brownfield development attributes, and were also observed to have a lower WTP on average. Including protest responses was found to decrease WTP and increase cost sensitivity, but this relationship is to be expected based on the definition of a protest response. In a model that used protest status as a variable, the overall preferences were unchanged, only the WTP values changed.

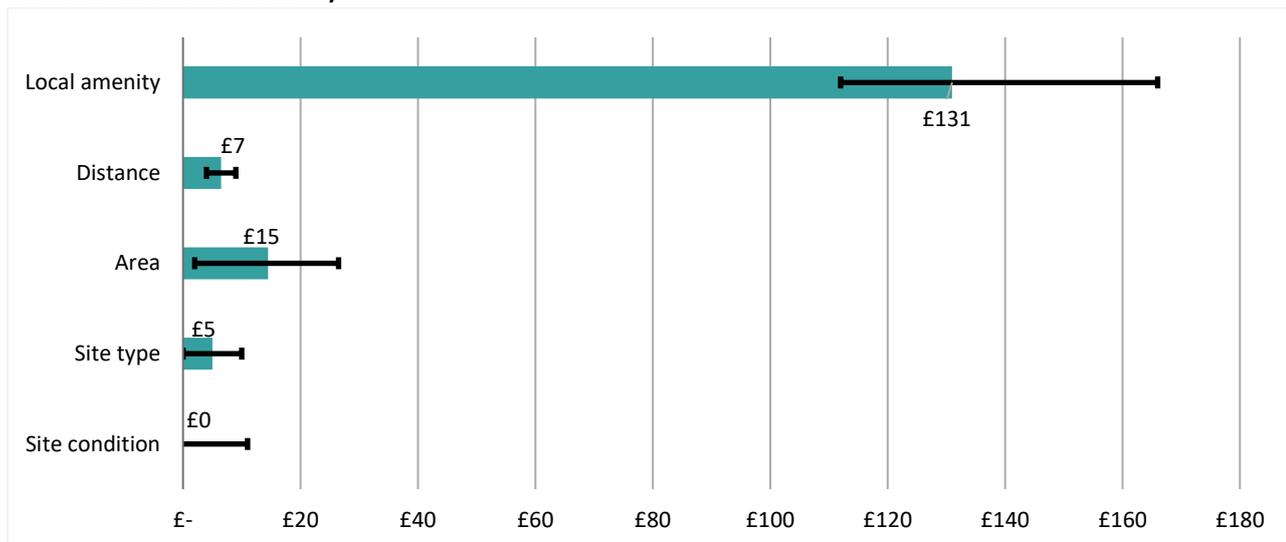
General amenity improvement versus site specific values

124. The preferred model estimation results (Table 7.2) has two main component parts:

- A. The preference for local amenity improvement independent of brownfield site characteristics. This is a general preference for improving local-level environmental quality due to Homes England intervention.
- B. Preference for removal of disamenity from a specific site according to factors such as distance, site type (previous use), size (area), and condition (retaining character features).

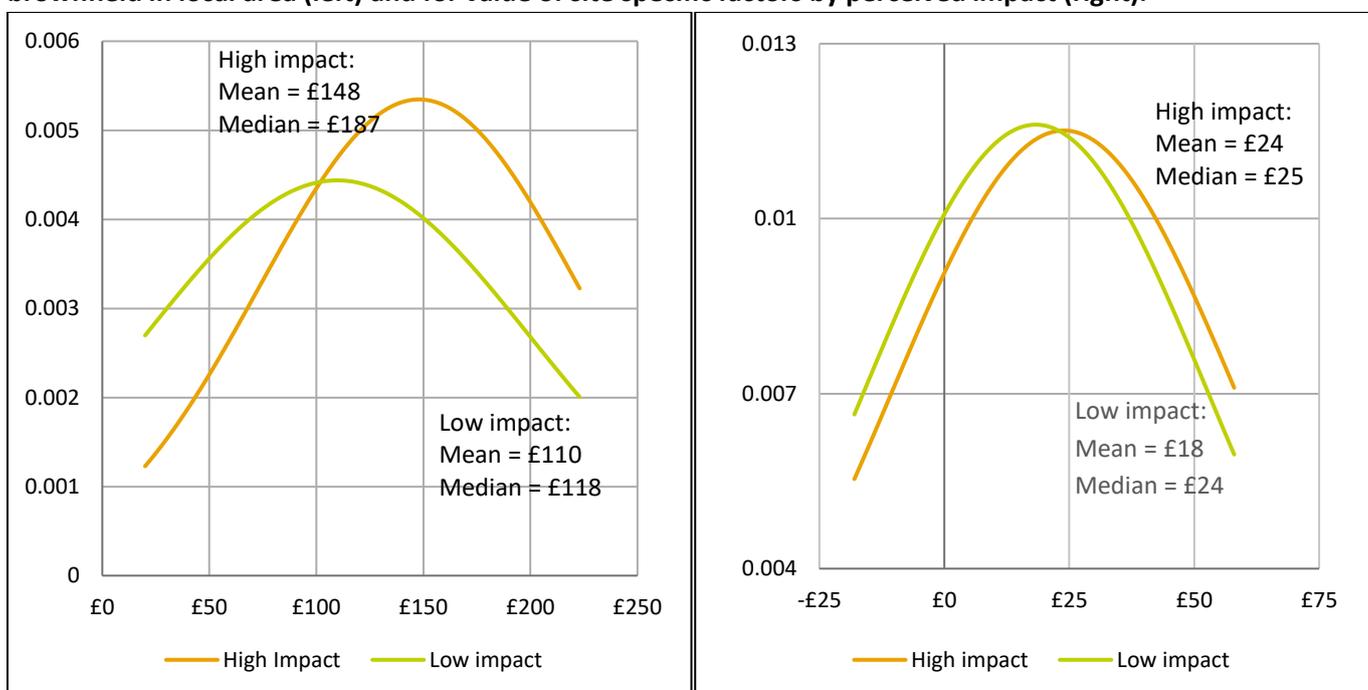
125. As Figure 7.3 illustrates, the local amenity component represents the greatest share of total WTP.

Figure 7.3: Household WTP and 95% CI bands (£/hh/year) for distance of ½ mile and area of 10 ha (figures rounded to the nearest £1)



126. Further analysis of the local amenity improvement component of total household WTP indicates that it was driven by the perceived impact of brownfield in the local area. This readily aligns with prior expectations – the higher the perceived impact, the higher the expected WTP to avoid that impact. Perceived impact is, though, a subjective measure reflecting how the individual views localised disamenity, and the data showed significant differences in household WTP depending on a “low” or “high” impact perception. This contrasts with values that are site specific (areas, distance, type, and condition), which do not vary substantially by impact perception (Figure 7.4).

Figure 7.4: Probability density functions for value of local amenity improvement by perceived impact of brownfield in local area (left) and for value of site specific factors by perceived impact (right).



127. This analysis indicates that a given project – i.e. a single site – would only account for the “full” value of the local amenity improvement if it substantially reduced the disamenity generated by (all) brownfield in a local area (or alternatively significantly brought this forward in time). Given that the local amenity improvement component of household WTP is: (i) not site specific; and (ii) varied according to an unobservable factor (impact perception)

from an appraisal perspective, it requires careful application in a practical appraisal. Alternative approaches to practical application of this value are discussed in Section 8.

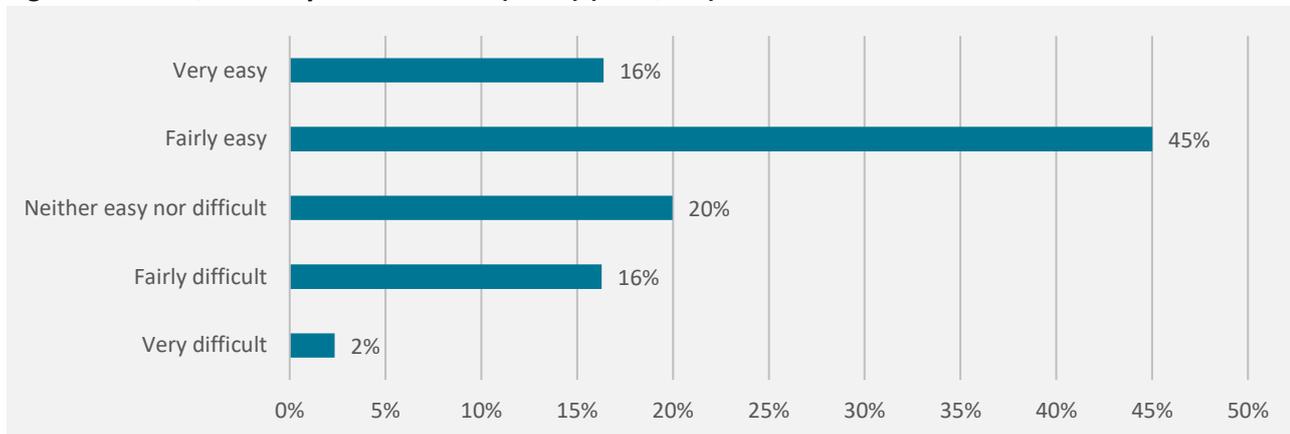
Content validity

128. The assessment of content validity involves examining whether respondents understood what they were being asked for within a choice task, verifying that they thought that the task was credible, and confirming that respondents were answering accordingly. Note also that some aspects of content validity are assessed in the survey design phase via the cognitive interviews and the test-retest process used to develop the survey materials (see Section 5 and Appendix 4).

Respondent understanding

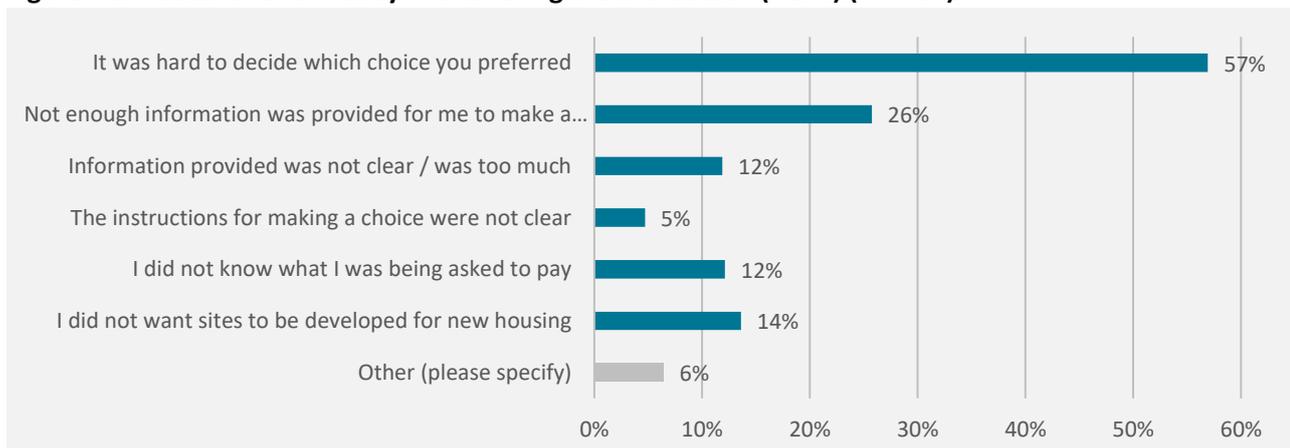
129. The follow-up questions to the brownfield redevelopment scenarios choice task (DCE1) indicate that the majority of respondents were comfortable with the exercise. The greatest proportion stated that it was easy to complete (61%; “fairly easy” or “very easy”) (Figure 7.5).

Figure 7.5: Ease/difficulty of choice task (DCE1) (n = 2,168)



130. Respondents who stated that the choice task was difficult (18%; “very difficult” or “fairly difficult”) were asked a follow-up question about why it was difficult (Figure 7.6). The greatest proportion of these respondents (57%; 230 total) reported that the difficulty was due to it being hard to decide which option they preferred. This indicates that the difficulty for the most part was not due to the design of the task itself, but instead because of the nature of the choice and trade-offs. The second most common response was that not enough information was provided for the respondent to make a choice (26%; 100 respondents total, representing <5% of the total sample).

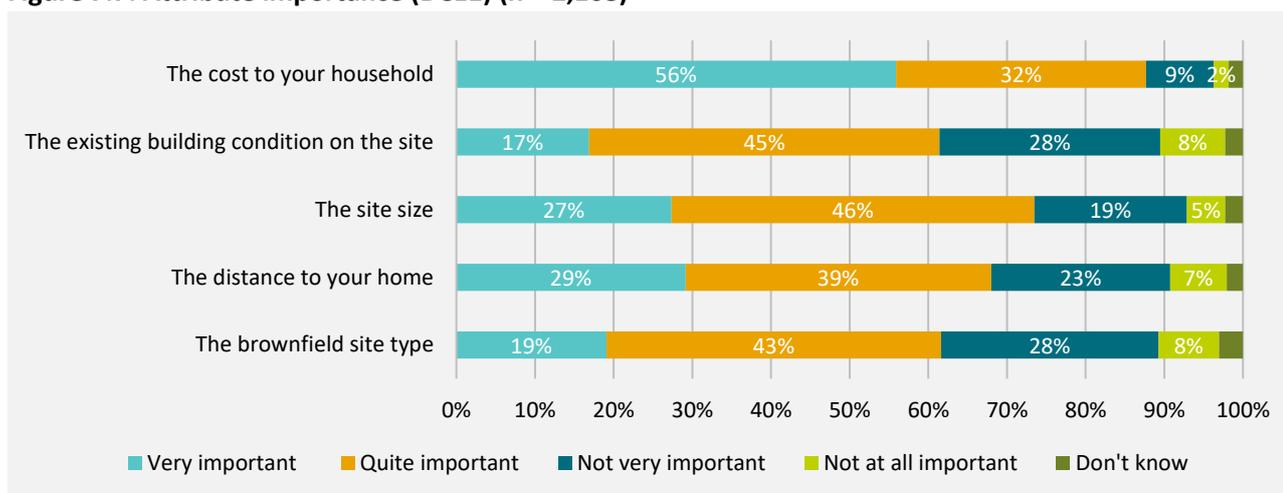
Figure 7.6: Reasons for difficulty in answering the choice task (DCE1) (n = 404)



Attribute attendance

131. Figure 7.7 presents respondents' self-reported importance for each attribute in the brownfield redevelopment scenarios choice task (DCE1), which provides a view on the attention paid to each aspect of the choice task scenarios – the basic test being that respondents were considering all of the attributes within the choice task, and that no individual attribute strictly dominated the others in respondent decision making. Overall, no single attribute was viewed to be substantially more important than any other. Cost was stated to be the most important attribute (88%; “very” or “quite” important), with the four brownfield site characteristics all similarly scored (between 62% - 73%; “very” or “quite” important). These responses, paired with the choice model estimation results, indicates that the choice task was being considered along all dimensions of the scenarios presented.

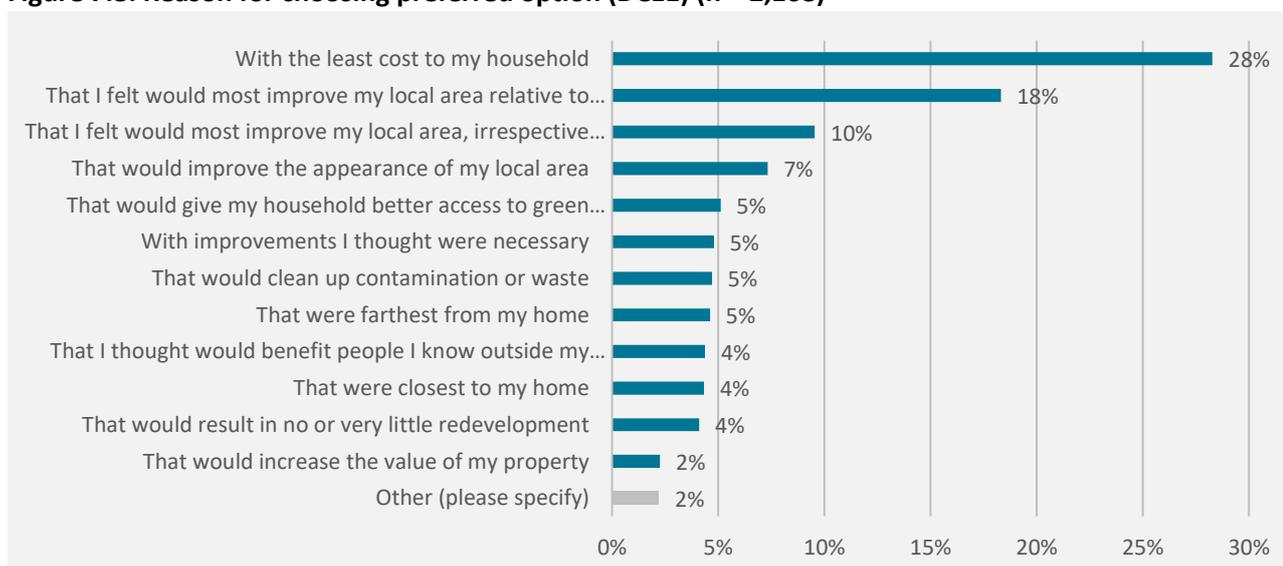
Figure 7.7: Attribute importance (DCE1) (n = 2,168)



Reasons and motivations for choices

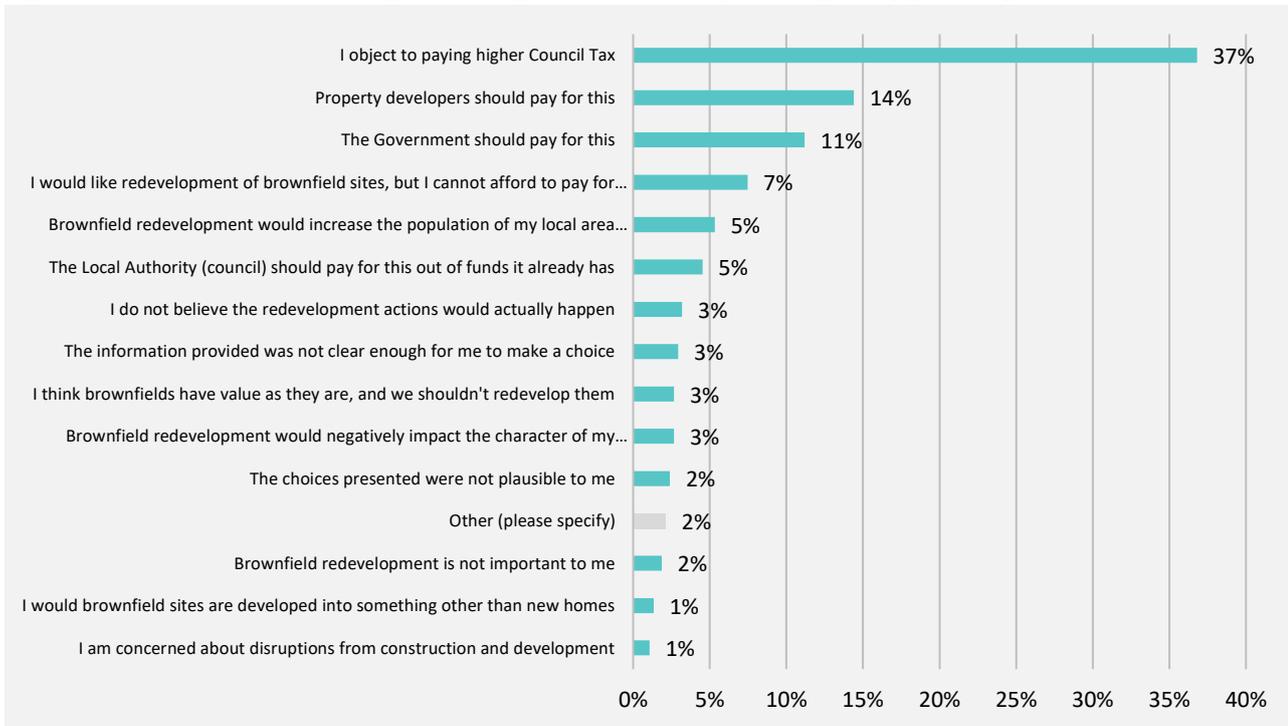
132. Explanations provided by respondents for how they chose their preferred options in the brownfield redevelopment scenarios choice task show a variety of considerations (Figure 7.8). Over a quarter of respondents were focused on the cost to their household (28%), whilst smaller proportions highlighted their consideration of the impact on their local area (18%) and the level of improvement offered (10%).

Figure 7.8: Reason for choosing preferred option (DCE1) (n = 2,168)



133. Reasons given for “status quo” choices – for respondents who choose the “neither” option in the majority of their choices in DCE (17%; 375 respondents total with minimum of 5 SQ choices out of 8) reflected a combination of genuine zero-value and protest responses (Figure 7.9). The most common responses – objection to paying higher council tax (37%), stating developers (14%) or the Government (11%) should pay – represent protest responses and a rejection of the simulated market and/or the payment vehicle. Smaller proportions of respondents offered genuine zero-WTP responses, such as “I cannot afford to pay” (7%) or “sites have value as they are” (3%).

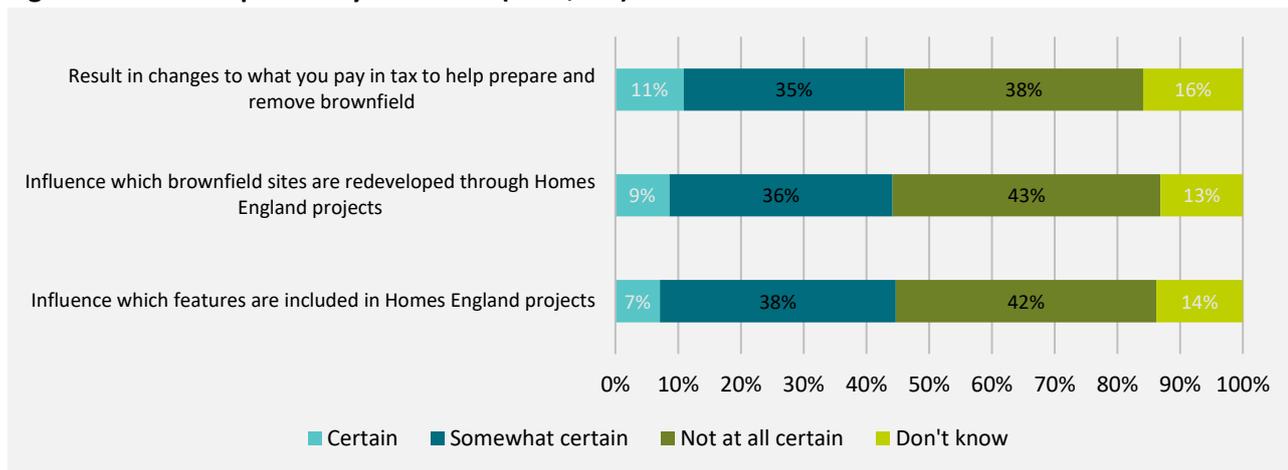
Figure 7.9: Reasons for selecting “no change – no redevelopment” (DCE1) (n = 375)



Consequentiality

134. Whilst respondents reported a good level of understanding of the survey and consistent reasons for their answers to the choice tasks, there was – as would be expected – some level of scepticism that it would influence decisions. Nevertheless, a majority overall (61%) considered at least some aspect of the choice scenario – the payment vehicle, the site choices, or the development features. This is judged to be a good result considering the survey topic and broader context of public distrust in planning and policy decision-making overall. There were similar levels of confidence that the survey results would influence specific considerations concerning the consequentiality of responses (around 45%; either “certain” or “somewhat certain”) (Figure 7.10).

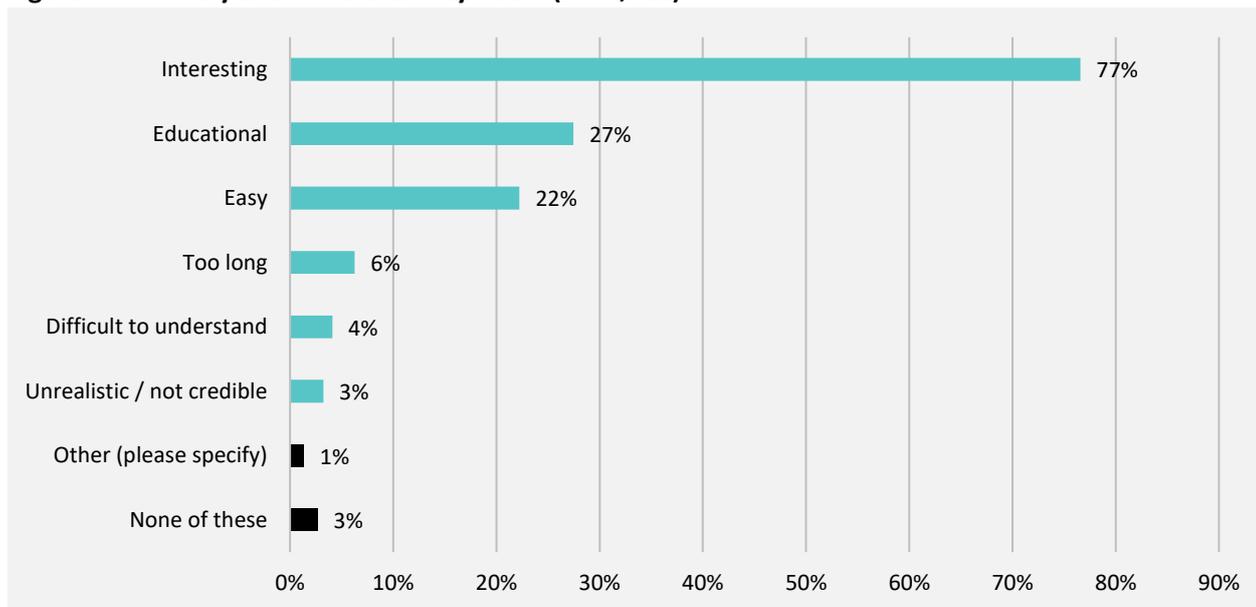
Figure 7.10: Consequentiality of choices (n = 2,168)



Overall feedback

135. In general, respondent feedback to the survey overall was positive, with the majority stating it was “interesting” (77%) and a sizeable proportion also saying that it was “educational” (27%). Very few reported that it was “difficult to understand” (4%) or unrealistic/not credible (3%).

Figure 7.11: “Did you think the survey was... (n = 2,168)



8. Application of results

136. This section illustrates the use of the study's results to estimate aggregate benefits for the redevelopment of brownfield sites in England for use in economic appraisals and VfM assessments by Homes England. Aggregate benefit estimates represent the increase in overall societal welfare from redevelopment of a brownfield site, based on households' demand (WTP) for redevelopment outcomes – as elicited by the DCE components of the study. In accordance with the study design and findings regarding respondents' motivations for their choices and responses, benefit values should be interpreted as an estimate of the direct contribution to household welfare from redevelopment of a site, encompassing the value of the removal of local level disamenity from the site, along with amenity benefits associated with added features such as recreation areas.

Attributing local amenity improvement

137. The value of brownfield redevelopment is driven primarily by two aspects of household preferences – the effect of specific characteristics of brownfield sites (such as size and distance to households) and the wider effect of removal of disamenity from brownfield within the local area (see Section 7). The latter "local amenity improvement" value reflects a general preference for improving the quality of place. It does not vary by the characteristics of the site to be redeveloped but rather reflects the localised circumstances for a household. Given this, the total local amenity improvement value is unlikely to be fully attributable to a single project or intervention and there is a risk in overvaluing an individual project's outcomes by attributing too much of this general value to it. The requirement therefore is to determine what proportion of the estimated value can be attributed to a specific brownfield intervention.

Quantification based on local brownfield extent

138. A pragmatic approach is to consider the proportion of the total extent of brownfield that a particular site represents within the local area, and attribute that proportion of the local amenity improvement value to the site. For example, if the site accounts for 10% of the total extent, then 10% of the value could be attributed. This requires that the spatial extent of the "local" brownfield is defined (Table 8.1), which should be possible from data that is readily available.

| Table 8.1: Options for specifying spatial area for determining total extent of “local” brownfield | | |
|---|--|--|
| Option | Application | Example (Manchester) ¹ |
| <p>A. 2-mile radius from the site Determine how much brownfield (by area) is within two miles of the redevelopment site. This method requires use of data provided in brownfield registers, or local-scale surveys.</p> | <p>This method is likely suitable for more densely populated areas (e.g. urban or semi-urban). A 2-mile radius provides a reasonable spatial area from a site that households might encounter other brownfield sites and their disamenity impacts on a regular basis.</p> | <p>There is approx. 78 hectares of brownfield land within 2 miles of the city centre. Redevelopment of a 10 hectare site would represent 13% of local brownfield area.</p> |
| <p>A. 4-mile radius from the site Determine how much brownfield (by area) is within four miles of the redevelopment site. This method requires use of data provided in brownfield registers, or local-scale surveys.</p> | <p>This method is likely suitable in less densely populated areas (e.g. market towns or rural areas). A wider radius from a site may be appropriate where the occurrence of other brownfield sites is lower compared to urban areas – hence sites that are further away might be more prominent compared to the urban context.</p> | <p>There is approx. 236 hectares of brownfield land within a 4 mile radius. Redevelopment of a 10 hectare site would represent 4.2% of local brownfield area.</p> |
| <p>B. Consider the “local area” to be the Local Authority Determine the total brownfield area in the local authority</p> | <p>This method may be suitable if there is very little local brownfield at smaller spatial scales, or in cases where local level information is difficult to obtain. It is unlikely that a single site would remove all the brownfield disamenity experienced by a household, so this method can be used if it is judged that other options are likely to result in over-estimating the disamenity removal value of a single site.</p> | <p>Manchester has roughly 316 hectares of brownfield, so a 10 hectare development would be 3.8% of the brownfield in the Manchester local authority.</p> |

Notes: ¹ Data sourced from The Manchester City Council. Available at: https://open-data-mcr-council.hub.arcgis.com/datasets/9816d098a2fa4fb6bd88c2dafd84469c_0/explore?location=53.479761%2C-2.221953%2C14.10&showTable=true

139. The attribution of the local amenity improvement value could also be refined by a more qualitative assessment and knowledge of the local context. For example, a site may have a disproportionate effect on local level disamenity because of its prominence – e.g. a site that is highly visible, such as those on main thoroughfares or near local landmarks versus those that are on quieter roads or in areas with little traffic or footfall. Adjustments made in this regard, however, would need to be appropriately explained and evidenced in an appraisal and subject to appropriate sensitivity testing.

140. Overall, the calculation to determine the household values is detailed in Box 8.1.

Box 8.1: Calculation of household local disamenity removal values

$$WTP_{localdisamenity\ removal} = WTP_{totaldisamenity\ removal} * \left(\frac{\text{hectares of site}}{\text{hectares of total local brownfield}} \right)$$

Such that:

$$\left(\frac{\text{hectares of site}}{\text{hectares of total local brownfield}} \right) \leq 1$$

Aggregation model

141. Results from DCE1 and the interpretation of the local amenity value in Section 7 provide the basis for estimating the value of brownfield redevelopment to a local household in terms of the removal of brownfield disamenity impacts.

Individual household values

142. Total household WTP for a site is calculated as the sum of the component parts of the brownfield development scenario, as detailed in Box 8.2.

Box 8.2: Calculation of household WTP for a specific brownfield site development

$$WTP_{site} (\text{£/hh/yr}) = WTP_{localdisamenity\ removal} + WTP_{type} + WTP_{condition} + [WTP_{area} * \ln(\text{area})] - [WTP_{dist} * \ln(\text{dist})] + [WTP_{dist*area} * \ln(\text{dist} * \text{area})] + WTP_{feature}$$

Where most of the values, such as WTP_{type} are calculated from the model in Section 7 and the analysis performed in Section 8.

Inclusion of additional features

143. The household WTP values for additional features (Table 7.5) were framed as additional to the brownfield redevelopment outcomes, and therefore are additive to the brownfield development values (Box 8.1). However, respondents were only asked about one potential additional feature. Therefore, to account for possible substitution between options, only the highest value feature that is part of a redevelopment is included in the estimates²⁶.

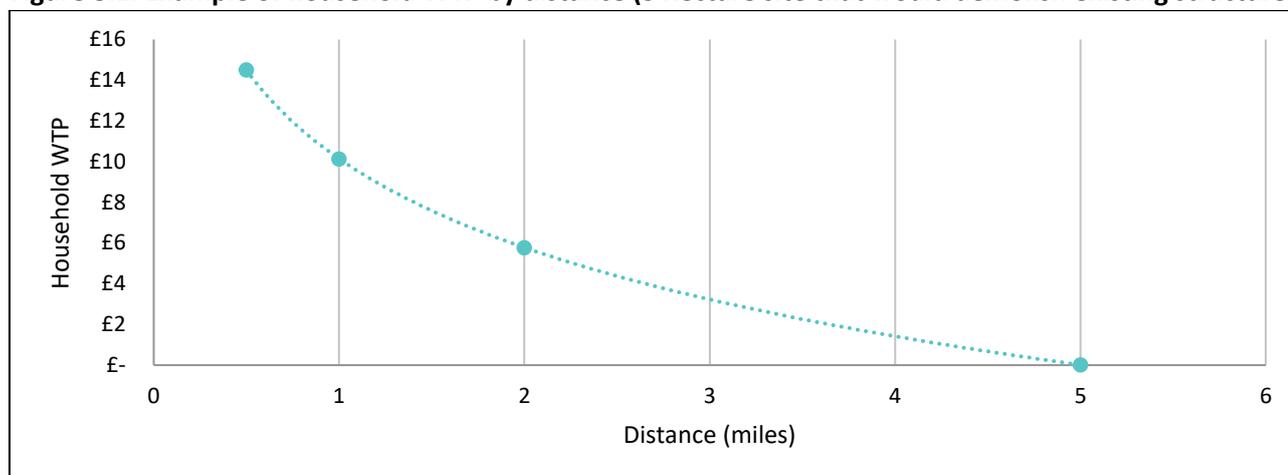
Spatial aggregation and beneficiary population

144. As household WTP for brownfield development is a function of distance, spatial aggregation is most easily accomplished in a practical appraisal via “distance bands”. While each household WTP could be estimated on the basis of their exact distance to the site, this level of precision is not supported by the underlying evidence. Distance bands of: (i) less than ½ mile, (ii) ½ to 1 mile, and (iii) 1 to 2 miles are deemed to provide a fair reflection of the distance decay effect in marginal WTP and provide a pragmatic trade-off between the precision

²⁶ Note that the valuation scenario framing does not explicitly account for the existence of a similar feature nearby. However, choices made by respondents likely reflect the local level abundance and their perception of the quality of potential substitutes. The additional feature values should be interpreted in this context, reflecting the average preferences of survey sample and their local circumstances.

of distance to the site within the household values and ease of use (Figure 8.1). The population over a greater distance from the site is not included in the “default” aggregation calculation, but for very large developments a wider spatial area may be appropriate and could be applied as part of sensitivity testing for aggregate benefit estimation.

Figure 8.1: Example of household WTP by distance (5 hectare site that would demolish existing structures)



145. Table 8.2 provides the corresponding unit value WTP estimates to the Figure 8.1 example, which are in the range £6 - £27 per household per year, varying by distance and site development type. Note that household values may be as high as £45 per household per year for very large developments of 50+ hectares.

Table 8.2: Amenity benefit from brownfield redevelopment by distance band (£/hh/yr) – Example for 5-hectare development with buildings that would be reused (not including local disamenity values)

| Primary previous site use | Distance | | |
|---------------------------|---------------|--------------|------------|
| | 0 - 0.5 miles | 0.5 – 1 mile | 1- 2 miles |
| Residential | £20 | £16 | £12 |
| Commercial | £32 | £28 | £24 |
| Industrial | £27 | £23 | £19 |

Note: figures rounded to the nearest £1

146. Spatial aggregation is also heavily dependent on the housing density of the area surrounding the brownfield development site. The beneficiary households can either be precisely counted if GIS or similar data is available to the household level or estimated based on an assumption of local housing densities.

Temporal aggregation

147. The valuation scenario specified a payment period of 10-years, which provides the basis for the temporal aggregation of values – i.e. calculate present value (PV) benefits over a 10-year time horizon to reflect the total benefit value. The profiling of benefits should, though, reflect the timing of the removal of brownfield disamenity, which should in most cases occur after site clearance (and hence before project completion).

148. If it is preferable to reflect a stream of benefits over the full-time horizon of the economic appraisal, then the 10-year PV value can be amortised using an equivalent annual value calculation. This may be particularly useful when comparing total benefits to a counterfactual scenario (see below).

Box 8.3: Example aggregation scenario – Manchester

A hypothetical redevelopment in Manchester has the following characteristics:

- 12 hectares of previously mixed-use land (assumed 33% each commercial, industrial & residential)
- Many of the existing buildings will be re-used
- Includes new hardscaped spaces available to the general public
- Local housing density of around 5,200 households per square mile (ONS, 2020).
- The site is in an urban centre and a high visibility area near major commuting routes. There are 76 hectares within 2 miles of city centre (the approximate site location) – therefore the local amenity improvement values is calculated as follows:

$$\text{Local general amenity improvement (upper bound)} = \text{£133} * \frac{12 \text{ ha}}{76 \text{ ha}} = \text{£21 / hh / year}$$

These values are combined with the site-specific values and additional features, as follows:

Household WTP (£/hh/yr):

| | Step 1 | Step 2 | Step 3 | Step 4 | |
|---------------|--------------------------------|--|--|--|---------------------|
| Distance band | General local disamenity (16%) | Site characteristics (mixed-use, re-use buildings) | Site size (12 ha) & distance (by band) | Additional features (hardscaped space) | Total WTP (£/hh/yr) |
| <0.5 miles | £21 | £12 | £20 | £52 | £106 |
| 0.5-1 mile | £21 | £12 | £16 | £52 | £101 |
| 1-2 miles | £21 | £12 | £11 | - | £44 |

Total benefits:

| Distance band | Total Households | Household WTP (£/hh/yr) | Total annual value (£ million/yr) | PV benefit (10-years, £ million) |
|---------------|------------------|-------------------------|-----------------------------------|----------------------------------|
| <0.5 miles | 4,100 | £106 | £0.43 | £3.73 |
| 0.5-1 mile | 12,200 | £101 | £1.24 | £10.65 |
| 1-2 miles | 48,900 | £44 | £2.17 | £18.68 |
| TOTAL | 65,200 | - | £3.84 | £33.06 |

Notes:

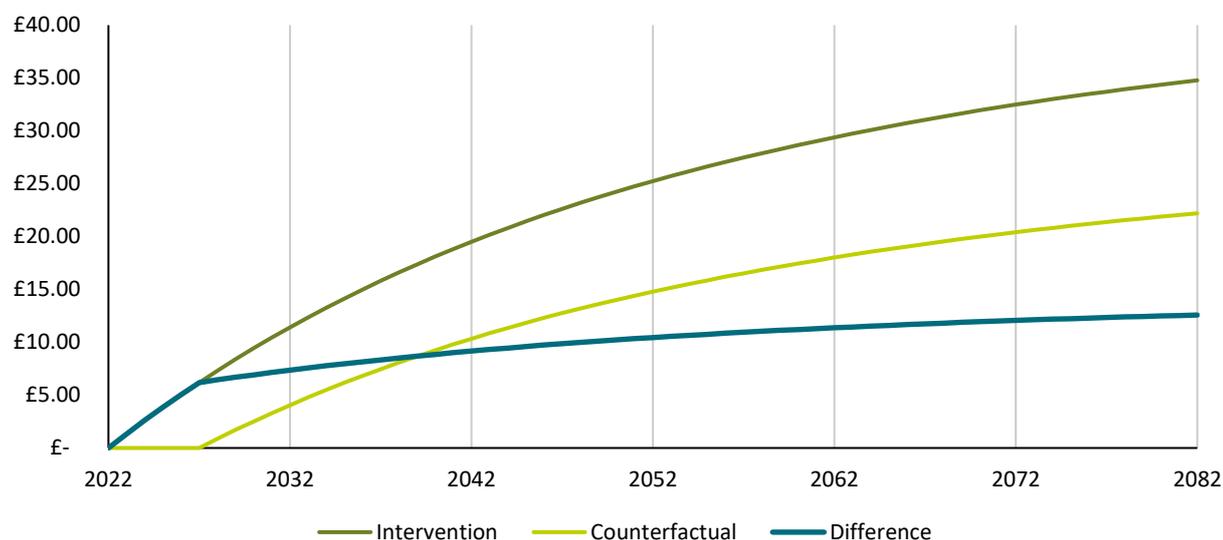
- These values assume the brownfield is removed and hardscaped space delivered in the first year.
- These values are *gross values* – they do not account for the additionality of a Homes England intervention.
- This approach estimates a single WTP for brownfield removal and feature amenity combined. The accompanying brownfield tool estimates total values for these separately.

Comparison against the counterfactual

149. The final element of the aggregation procedure is to estimate the additionality of the intervention versus the counterfactual scenario – i.e. what would have occurred on the site, and when it would have occurred in the absence of a Homes England Intervention. Homes England housing interventions can add value by accelerating

brownfield redevelopment (bringing it further forward in time) and may also provide funding for facilities that bring wider public benefits, that would not otherwise be provided. Aggregate values therefore need to be interpreted in the context of their additionality alongside the total benefit estimate. This is illustrated in Figure 8.2 for an example where Homes England brings forward development outcomes by 5 years. The additional benefits for the intervention scenario versus the counterfactual are around £12.5 million in present value terms over 60 years.

Figure 8.2: Illustrative scenario – aggregate benefits for intervention vs. no intervention scenario – not including the 2 mile band (£/million)



Sensitivity testing

150. There are several parameters in the aggregation procedure that in most circumstances should be considered in sensitivity testing: (i) the assumptions used to attribute the proportion of the “local disamenity values” value to a site; (ii) the beneficiary population, both in terms of the distance bands used and the number of households; and (iii) the assumptions for the counterfactual scenario to calculate the additionality of the intervention.

151. The 95% confidence interval values can also be applied to test sensitivity to reflect the uncertainty in the estimation of household values for removal of brownfield disamenity and added features.

Appraisal values

152. Household WTP values for Homes England interventions can be specifically calculated using the equations and models laid out in Section 7 and 8. The following is a set of steps, values, and guidance that could be used for a basic appraisal. These are all calculated on a per household basis – the user of these values will need to determine the appropriate number of beneficiary households in the distance bands (Table 8.3). A tool has also been published alongside this report to enable to estimation of the values for economic appraisal.

Table 8.3: Per household appraisal values

| | | | | | |
|--|---|--|--------|--------|--------|
| Step 1 – determine general local disamenity values: | % of local brownfield redeveloped by the intervention | Value per household (£ / hh / yr) | | | |
| | 1% | £1.30 | | | |
| | 3% | £4.00 | | | |
| | 5% | £6.60 | | | |
| | 10% | £13.30 | | | |
| Step 2 – add site characteristic values for previous use and condition: | Previous use (£ / hh / yr) | Residential: £0 (base) Commercial: £12 Industrial: £7 | | | |
| | Current site condition (£ / hh / yr) | Structures will be removed: £0 (base) Structures are already removed: £2 Structures will be reused: £5 | | | |
| Step 3 – add site characteristic values for site size and distance to household: ^a | Distance to household | Site area | | | |
| | <i>Values in this section are £ / hh / yr</i> | 1 ha | 5 ha | 10 ha | 25 ha |
| | 0 - 0.5 miles | £4.40 | £14.50 | £18.90 | £24.70 |
| | 0.5 - 1 miles | £0 | £10.10 | £14.50 | £20.30 |
| | 1 - 2 miles | -£4.40 | £5.80 | £10.20 | £15.90 |
| Step 4 – add additional feature value: ^b | Feature | Value per household (£ / hh / yr) | | | |
| | Green open space (£ / hh) | £97 | | | |
| | Wildlife space (£ / hh) | £94 | | | |
| | Walking path (£ / hh) | £68 | | | |
| | Children's play area (£ / hh) | £64 | | | |
| | Hardscaped space (£ / hh) | £52 | | | |
| | Multi use (£ / hh) | £45 | | | |
| | Sports pitch (£ / hh) | £29 | | | |
| | Cycle path (£ / hh) | £27 | | | |
| | Outdoor workout area (£ / hh) | £0 | | | |

Note: all values are rounded to the nearest £1 or £0.10. ^a Negative values are included where relevant to reduce values above. Do not calculate using a negative final household value. ^b Use the highest valued feature if multiple features are included in a development and only apply these values to households 0 – 1 mile from the site.

Use of results in other contexts

153. There may be cases where the study results are applied outside of the context of brownfield development for housing. The “transferability” of values to wider policy and appraisal contexts depends on a number of considerations including the details of the good being valued, the change in provision, and the circumstances of the affected population²⁷. Broad guidance for using the study results in alternative contexts include:

²⁷ For further guidance on value transfer see: <https://www.gov.uk/government/publications/valuing-environmental-impacts-guidelines-for-the-use-of-value-transfer>

- A. Removal of local disamenity.** Whilst the valuation scenario for removal of brownfield disamenity- (DCE1) was based around development of sites for housing, the outcomes concern the removal of disamenity from sites in their current state (see Figure 5.1). Given this, the study results are suitable for use in contexts where end developments might differ (e.g. mixed-use, commercial), provided that similar brownfield disamenity impacts are removed. What may need to be factored in, though, is disruption or new disamenity that may result from a development (e.g. a new warehouse complex that brings additional disturbance to an area), which is outside the scope of the evidence developed by this study. These impacts should be accounted for within the wider economic appraisal.
- B. Removal of other sources of local disamenity.** The impacts that are experienced by households should be carefully considered when appraisal requires values for the removal of local disamenity from non-brownfield sources. As the limited literature that is highlighted in Section 7 shows (see Table 7.6), factors such as the permanence and form of disamenity (for example, if it includes disturbance from activity and site operations – e.g. a landfill) do appear to influence values. When disamenity is generated by different sources, judgement is needed to determine whether the impacts (visual, risk to public safety, crime and anti-social behaviour) and the spatial area over which they may be experienced are similar, or whether the nature of the impacts vary in how they affect households day-to-day.
- C. Valuing increased levels of local disamenity from brownfield sites.** The study results are framed from a perspective of improving the quality of a place and local environment and the resulting gains in social welfare. Policy scenarios that consider the reverse – for example the societal cost from decline and deterioration in a place – require valuations that are consistent within a context of reduced local amenity and reduction in individual welfare. The equivalence of preferences concerning gains and losses for an environmental outcome should not be assumed – non-linear effects may be present (e.g. gains-loss asymmetry) and using the results from this study to proxy the welfare loss of increased local disamenity would likely under-estimate the value of impacts.
- D. Valuing added features and facilities in a place.** Similar to (A) above, the study results for added features of developments could also be applied in a non-housing development context. In general, the set of features apply to amenities in residential areas and improving the quality of space through the provision of new infrastructure or equipment (e.g. a playground). These values could be applied in a standalone way, subject to consideration of any substitute sites and their quality within a reasonable spatial extent; for example, 1-mile as per the application of these values set out in Section 8.

9. Conclusions

Summary

154. Overall, households in England place significant value on the redevelopment of brownfield sites. This value stems from the removal of the disamenity generated by sites that negatively impact local communities, and the enhancements that developments can bring in terms of new facilities and improved quality of place. The economic value evidence produced by this study improves the understanding of these benefits and how they vary with different characteristics of brownfield sites. The results provide a robust basis for including these benefits within the economic appraisals and VfM assessments that support Homes England's projects.
155. The stated preference survey questionnaire and supporting material were subject to an iterative design and testing process. Multiple waves of cognitive interviews and pilot testing were carried out prior to finalising the survey content. This focused on ensuring respondent understanding of the survey content and ensuring that the choice tasks were fit for purpose. Feedback from the testing and main survey implementation indicated that respondents understood the survey and were able to give considered responses to the questions and choices posed.
156. The survey fieldwork took place in June and July 2022 with a total of 2,168 respondents participating in the main sample. Respondents were randomly selected from survey panel providers and respondents had no knowledge of the content of the survey prior to starting it. The sample was nationally representative and overall, the study results can be interpreted as representative of the view of the general public in England.
157. The study's results – based on the analysis of household preferences – exhibit good levels of validity both in terms of respondent understanding and credibility of the DCE exercise, along and empirical findings that align well to prior expectations based on previous research and underlying economic theory.

Main findings

158. The key findings from the study present a consistent view of households' perceptions and priorities for redeveloping brownfield sites in England:
- Households have a good awareness of brownfield sites in their local area and an appreciation of negative disamenity impacts they can generate. Respondents were most familiar with previous use commercial sites and most frequently report being affected by visual disamenity from these sites.
 - Priorities for brownfield redevelopment, including what sites households would prefer to see developed, include:
 - Respondents generally preferred redevelopment of larger sites closer to their home. The strongest preference was for redeveloping commercial sites. Developments that maintain the character of the local area, particularly in terms of retaining local heritage features, were also preferred.
 - For the example of a household about ½ mile from a 12 hectare redevelopment in Manchester, the benefit of the removal of the disamenity of brownfield is around £46 per household per year. This value declines with distance from the site and varies according to the site size and previous use.

- Households also place notable value on additional features that improve the quality of place for the local community. Green open space and space for nature were the most preferred features, with individual level benefits around £100 per household per year.

Application

159. The primary use of the study's results will be in economic appraisal that support the identification of preferred options by Homes England and help demonstrate the VfM of public funding of brownfield housing projects. The results, though, require careful application to estimate the aggregate benefits of an option or project. The critical factors are the identification of the beneficiary population – accounting for the spatial “distance decay” in benefits – and the temporal dimension in terms of the timing of benefits and counterfactual concerning the additionality of Homes England's interventions.

160. Care should also be taken to avoid double counting within the broader economic appraisal, particularly where separate estimates have been made of amenity or wider placemaking benefits.

161. The guidance and “default” values set out in Section 8.3 and the tool accompanying this publication provide an initial basis for practical assessments.

Limitations

162. The household and aggregate values estimated in this research are dependent on several local factors, such as the amount and quality of local brownfield, the amount of redevelopment already ongoing in an area, and household perceptions around the impacts of those brownfield sites. This research has addressed many of these issues and taken pragmatic steps to provide household estimates that both fit with economic theory and are supported by the survey results.

163. Some aspects, however, such as beneficiary populations, are difficult to estimate in a survey setting and can have large impacts on the aggregate benefit values. In cases where the beneficiary population is not clear sensitivity analysis should be performed.

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Image references

| Page | Reference | Title or description | Author | Source |
|------------|--------------------------------|--------------------------------------|---------------------|---|
| 10 | Figure 3.1 | Derelict mills, Gloucester | Chris Allen | https://www.geograph.org.uk/photo/2529569 |
| 10 | Figure 3.1 | Derelict mills, Gloucester | BEIS/Coal Authority | Homes England News, 2022. https://www.gov.uk/government/news/the-avenue-landscaping-and-remediation-project-one-of-the-uks-most-significant-brownfield-projects |
| 10 | Figure 3.1 | Derelict building, Burscough | ReptOn1x | https://commons.wikimedia.org/wiki/File:Derelict_building_in_Burscough_(1).JPG |
| 10 | Figure 3.1 | <i>Crime / anti-social behaviour</i> | Not attributed | SQW, "Ancoats Urban Village, Manchester - case study" July 2021 |
| 13 | Figure 3.2 | Heygate Estate | Robert Dimov | https://commons.wikimedia.org/wiki/File:Dead_Zone_-_panoramio.jpg |
| 13 | Figure 3.2 | Church Road, Tranmere | ReptOn1x | https://commons.wikimedia.org/wiki/File:Derelict_shops_on_Church_Road,_Tranmere.JPG |
| 13 | Figure 3.2 | Hartford Mill | Raymond Knapman | https://commons.wikimedia.org/wiki/Category:Hartford_Mill,_Oldham#/media/File:The_derelict_Hartford_Mill_-_geograph.org.uk_-_3049600.jpg |
| Appendix 3 | Showcard 1 | Llanthony Provender Mill | Tom Axford | https://commons.wikimedia.org/wiki/File:Llanthony_Provender_Mill_buildings_in_April_2010.jpg |
| Appendix 3 | Showcard 1 | Tree belt, Culverstone Green | Marathon | https://commons.wikimedia.org/wiki/File:Tree_belt_near_Culverstone_Green_-_geograph.org.uk_-_2604961.jpg |
| Appendix 3 | Showcard 2 | Heygate Estate | Robert Dimov | https://commons.wikimedia.org/wiki/File:Dead_Zone_-_panoramio.jpg |
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| Appendix 3 | Showcard 3 | Derelict mills, Gloucester | Chris Allen | https://www.geograph.org.uk/photo/2529569 |
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| Appendix 3 | Showcard 3 | Derelict mills, Gloucester | BEIS/Coal Authority | Homes England News, 2022. https://www.gov.uk/government/news/the-avenue-landscaping-and-remediation-project-one-of-the-uks-most-significant-brownfield-projects |
| Appendix 3 | Showcard 5 | <i>Crime / anti-social behaviour</i> | Not attributed | SQW, "Ancoats Urban Village, Manchester - case study" July 2021 |
| Appendix 3 | Showcard 5 | <i>Former industrial site</i> | Raymond Knapman | https://commons.wikimedia.org/wiki/Category:Hartford_Mill,_Oldham#/media/File:The_derelict_Hartford_Mill_-_geograph.org.uk_-_3049600.jpg |
| Appendix 3 | Showcard 5 | <i>Former housing site</i> | Robert Dimov | https://commons.wikimedia.org/wiki/File:Dead_Zone_-_panoramio.jpg |
| Appendix 3 | Showcard - Tell Me More Type 1 | Heygate Estate | Robert Dimov | https://commons.wikimedia.org/wiki/File:Dead_Zone_-_panoramio.jpg |

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| Appendix 3 | Showcard - Tell Me More Type 1 | Church Road, Tranmere | ReptOn1x | https://commons.wikimedia.org/wiki/File:Derelict_shops_on_Church_Road,_Tranmere.JPG |
| Appendix 3 | Showcard - Tell Me More Type 1 | Hartford Mill | Raymond Knapman | https://commons.wikimedia.org/wiki/Category:Hartford_Mill,_Oldham#/media/File:The_derelict_Hartford_Mill_-_geograph.org.uk_-_3049600.jpg |
| Appendix 3 | Showcards Treatment 1-3 | New construction | Shaun Flannery Photography | https://www.coventrytelegraph.net/news/coventry-news/work-begins-scheme-knock-down-22644376 |
| Appendix 3 | Showcards Treatment 1-3 | Renovation | Jeremy King Architects, Charlotte Wood | https://jeremykingarchitects.com/projects/the-dairy-3 |
| Appendix 3 | Showcards Treatment 4-6 | St Chad's | Kilian O'Sullivan | https://www.piquantcollective.co.uk/ |
| Appendix 3 | Showcards Treatment 4-6 | Dobson's Mews, Sutton-in-Ashfield – | Dave Bevis | https://commons.wikimedia.org/wiki/File:Sutton-in-Ashfield_-_Dobson%27s_Mews_-_geograph.org.uk_-_1170523.jpg |
| Appendix 3 | Showcards Treatment 7-9 | New construction | Not attributed | https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/575764/Estate_regeneration_case_studies.pdf |
| Appendix 3 | Showcards Treatment 7-9 | Renovation | Dacre, Son & Hartley | https://www.dacres.co.uk/properties/15092824/sales |
| Appendix 4; p5 | Figure A2.1 | Ickneild Airport Loop, Birmingham | Midland Aerial Pictures | https://www.alamy.com/stock-photo-aerial-view-the-ickneild-port-loop-canal-in-birmingham-uk-2002-34425452.html |
| Appendix 4; p5 | Figure A2.1 | Houlton, Warwickshire | : © Houlton (Urban&Civic and Aviva Investors) | Homes England Sustainability and Design Framework Case Studies |
| Appendix 4; p5 | Figure A2.1 | Hackney, London | Hackney council | https://news.hackney.gov.uk/asset/433286/mandeville-st-1 |
| Appendix 4; p5 | Figure A2.2 | Heygate Estate | Getty images | https://www.dailymail.co.uk/news/article-2316072/Poignant-pictures-decaying-crime-ridden-housing-estate-fallen-ruin-remaining-residents-await-bulldozers.html |
| Appendix 4; p5 | Figure A2.2 | Avenue Coking Works | Today's conveyancer | https://todaysconveyancer.co.uk/avenue-coking-works-remediation-making-impossible-possible/ |
| Appendix 4; p6 | Figure A2.3 | Houlton, Warwickshire | : © Houlton (Urban&Civic and Aviva Investors) | Homes England Sustainability and Design Framework Case Studies |
| Appendix 4; p6 | Figure A2.3 | Ancoats, Manchester | Not attributed | SQW, "Ancoats Urban Village, Manchester - case study" July 2021 |
| Appendix 4; p6 | Figure A2.3 | Whapping Wharf, Bristol | Jon Craig | https://www.buildingconstructiondesign.co.uk/news/eating-on-the-dock-of-the-bay-wapping-wharf-bristol/ |
| Appendix 4; p6 | Figure A2.3 | Oval Quarter, London | Gov.uk | https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/575764/Estate_regeneration_case_studies.pdf |
| Appendix 4; p6 | Figure A2.3 | Park Central, Birmingham | Gov.uk | https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/575764/Estate_regeneration_case_studies.pdf |
| Appendix 4; p8 | Figure A2.5 | Great Western Park, Didcot | gov.uk | https://www.gov.uk/government/publications/national-design-guide/national-design-guide-accessible-version |

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| Appendix 4; p8 | Figure A2.5 | Beaulieu, Chelmsford | Rendall Thorp | https://www.randallthorp.co.uk/beaulieu-chelmsford-continues-to-win-recognition/ |
| Appendix 4; p8 | Figure A2.6 | <i>Residential site - before</i> | Guardian | https://risingeast.co.uk/gentrification-the-good-the-bad-and-the-sad/ |
| Appendix 4; p8 | Figure A2.6 | <i>Residential site - after</i> | Renice Soraya | https://risingeast.co.uk/gentrification-the-good-the-bad-and-the-sad/ |
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| Appendix 4; p9 | Figure A2.7 | <i>Commercial site - after</i> | Wapping wharf facebook website | https://www.facebook.com/BristolWappingWharf/ |
| Appendix 4; p9 | Figure A2.8 | <i>Industrial site - before</i> | Today's conveyancer; Derbyshire Times. | https://todaysconveyancer.co.uk/avenue-coking-works-remediation-making-impossible-possible/ |
| Appendix 4; p9 | Figure A2.8 | <i>Industrial site - after</i> | Today's conveyancer; Kier Living | https://todaysconveyancer.co.uk/avenue-coking-works-remediation-making-impossible-possible/ |
| Appendix 4; p10 | Figure A2.9 | Coal Drops Yard, London | Not attributed | https://www.kingscross.co.uk/coal-drops |
| Appendix 4; p10 | Figure A2.9 | Coal Drops Yard, London | JOHN STURROCK | multiple locations: https://www.rli.uk.com/coal-drops-yard-welcomes-four-independent-retailers/ |

Appendix 1 – Literature review and attribute selection

Appendix provided as separate file – please see [Appendix 1 – Literature review and attribute selection.pdf]

Appendix 2 – Survey questionnaire

Appendix provided as separate file – please see [Appendix 2 – Survey questionnaire.pdf]

Appendix 3 – Showcards and images

Appendix provided as separate file – please see [Appendix 3 – Showcards and Images.pdf]

Appendix 4 – Cognitive testing summary

Appendix provided as separate file – please see [Appendix 4 – Cognitive testing summary.pdf]

Appendix 5 – Summary statistics

Appendix provided as separate file – please see [Appendix 5 – Summary statistics.csv]

Appendix 6 – Econometric results

Appendix provided as separate file – please see [Appendix 6 – Econometric results_choice model estimations.xlsx]