BATH PRESERVATION TRUST

Centre for Sustainable Energy

Low Carbon Bath

Report from a local consultation

Low Carbon Bath: Report from a local consultation

November 2010

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If you would like to comment on either the content of this report or the draft guidance produced by the Low Carbon Bath project, please write to either of the addresses above or email admin@bpt.org.uk or Will.Anderson@cse.org.uk before January 31st 2011.

Contents

1. Summary

This report describes the results of a consultation in Bath designed to explore the attitudes of local people to improving the energy performance of traditional buildings in the city. These results will inform the development of practical guidance about upgrading the diverse range of historic and traditional (solid wall) buildings in Bath. The consultation sought views from people with a special interest in the heritage of Bath; people with a special interest in green issues; architects, developers and other building professionals; Sixth Form students; and members of the general public.

The following are key findings from the consultation:

- There is a clear consensus that the historic environment of Bath is worthy of preservation. The special qualities of Bath are appreciated by everyone regardless of age or special interest.
- There is also a clear consensus that we need to act to reduce our carbon emissions and build a low carbon future. Preparing for fossil fuel shortages and mitigating climate change are the primary drivers though other benefits of a low carbon world are also acknowledged.
- There is, therefore, no simple dichotomy between protecting the historic environment and building a low carbon future. The challenge is to find a middle way which preserves the features of Bath that people care about while also making changes that are appropriate, acceptable and effective.
- Homes that are cold and hard to heat in the winter are not unusual in Bath. Energy efficiency upgrades in such homes are likely to have immediate impacts on the comfort and health of inhabitants.
- The range of energy performance upgrades for individual dwellings is extensive, ranging from basic draught-proofing through to advanced renewable energy technology such as photovoltaic solar cells. Some interventions may be acceptable for some traditional buildings in Bath but not for others, depending on the character and historic value of the individual building. However the lack of clear local policy on what interventions are appropriate for different building types is perceived to be an obstacle to making energy improvements.
- Improving **glazing** is a particularly sensitive issue for traditional buildings in Bath given the contribution that windows make to the character of local buildings. However there is extensive support for the use of secondary glazing and slimline double glazing in traditional and historic buildings, assuming that the original structural fabric of the window is preserved where possible.
- Attitudes to the use of solid wall **insulation** are mixed. External insulation on the front of buildings in Bath is unlikely to be acceptable, given its visual impact. However there is some support for using external insulation on the rear walls of some, if not all, traditional and historic buildings in Bath. Similarly, internal insulation is likely to be acceptable to most people if it does not adversely affect original features.
- **Solar panels** are generally felt to be acceptable when out of sight in valley roofs but produce a more mixed response when visible. They are unlikely to be acceptable on the visible roofs of important historic buildings in Bath but there is support for their use on traditional buildings elsewhere, though precisely where and how needs further clarification. Heritage solar tiles which are designed to look like traditional slate tiles enjoy wide support.
- There is little support for **wind turbines** on the roofs of traditional, and especially historic, buildings in Bath. However stand-alone wind technology does have some support: a small majority of participants indicated that they would be happy to see wind turbines on both Lansdown and Bathampton Down. Vertical axis turbines also have some local support.

The guidance produced at the end of this project must make sense of these and all other domestic energy improvement issues in a manner that respects both the diversity of the traditional buildings of Bath and the needs of the inhabitants of these buildings.

2. Introduction

The Low Carbon Bath project

Low Carbon Bath is a collaboration between the Bath Preservation Trust and the Centre for Sustainable Energy, funded by the government's Department for Communities and Local Government. The aim of the project is to explore the ways in which climate change mitigation measures, especially those relating to energy conservation and energy generation, can be pursued within listed buildings and the historic environment of Bath. The principal output of the project will be detailed guidance for the citizens of Bath about how they can improve the energy performance of traditional (i.e. solid wall) homes.

The city of Bath is one of the most challenging locations in the country to develop such guidance due to its special historic and aesthetic qualities. Many of the traditional buildings in Bath are listed, many are within conservation areas, and all are within the World Heritage Site which protects the entire city. Consequently great care is needed to ensure that improvements to traditional buildings are both appropriate and acceptable.

The first phase of the project sought to address the issue of acceptability by consulting with diverse audiences within Bath about possible changes to traditional buildings. Some consideration was also given to stand-alone renewable energy technology, as carbon emissions within buildings can be reduced not only by cutting energy use and installing on-site renewable energy technology but also by 'decarbonising' the supply of energy to these buildings.

This report presents the results from this initial consultation. These results will inform the development of the guidance and negotiations with Bath and North East Somerset Council about local planning policy for listed and traditional buildings.

The workshops

The consultation workshops were designed to explore local attitudes to improving the energy performance of traditional buildings and to gather intelligence about what needs to be done to enable change. Separate workshops were run for people with a strong interest in the heritage of Bath, including members of the Bath Preservation Trust; people with a strong interest in green issues, including members of local transition groups; professionals, including architects and builders; and sixth form students. An open public meeting was also held.

The aim of the community consultation was not to gain a statistically representative description of the views of the people of Bath. It was to ensure that the development of local guidance and policy is informed by a breadth of local opinion as well as by appropriate expertise. To this end, the views of a wide range of local people were sought, not just those with an established interest in the heritage of Bath. This process produced invaluable evidence of where consensus does – and does not – exist across some of the key constituent interests within the city. This evidence provides a foundation for developing practical recommendations for building improvements. The draft guidance will be subject to further city-wide consultation.

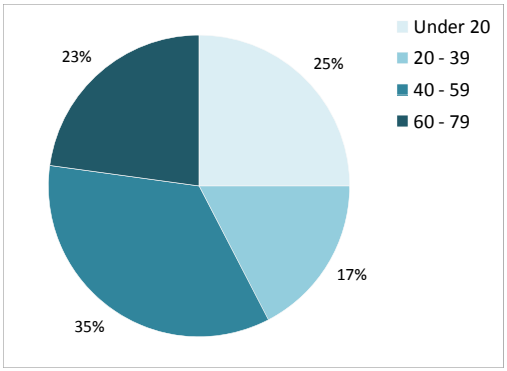
A total of 94 people participated in these workshops, as follows:

- Heritage interest workshop: 25 participants
- Green interest workshop: 10 participants
- Architects, builders and other professionals: 24 participants
- Sixth form: 27 participants including 5 staff

A workshop was also run for a group of six Bath Preservation Trust trustees and employees. Their data is included in the Heritage interest group in the analysis below. The five staff who participated in the Sixth form workshop are included in the analysis for 'All' but excluded from the analysis for 'young people'.

Thanks to the inclusion of the Sixth Form group, the distribution of ages across the workshop participants was very even (Figure 2.1).

Figure 2.1 Age (all workshop participants)



Two thirds (n=60) of the participants lived in the city of Bath and four fifths (n=71) lived in Bath & North East Somerset Council. Two thirds said they would be willing to comment on the draft guidance and provided contact details to enable this.

A public meeting was also held as part of the initial consultation. As a different set of questions was asked at this meeting, and a few participants had also been to the workshops, results are reported separately for this meeting.

Twenty-eight people attended the public meeting. Of these, none were aged under 20, three were aged 20-39 years, 11 were aged 40-59 years, 13 were aged 69-79 years and once was aged 80 or over.

The results in this report are based on the questionnaires filled in by participants at the workshops and public meeting and by the post-it notes collated from specific workshop exercises. Results for the workshops are presented as percentages as total attendance was high enough to justify this. Results for the public meeting are presented as absolute numbers because the conversion of data from 28 people to percentages would be misleading.

3. The built environment of Bath

Preserving the historic environment

Bath is an extraordinary city. Its many qualities are appreciated every day by inhabitants, workers and visitors alike. When the participants in the workshops were asked "How important is it to you to preserve the historic environment of Bath?" all but 2% said this was very or fairly important to them. Nobody reported that this was unimportant (Figure 3.1). Similarly, all the participants at the public meeting acknowledged the importance of preserving the historic environment of Bath (Figure 3.2)

Figure 3.1 Importance of preserving the historic environment of Bath (workshop participants)

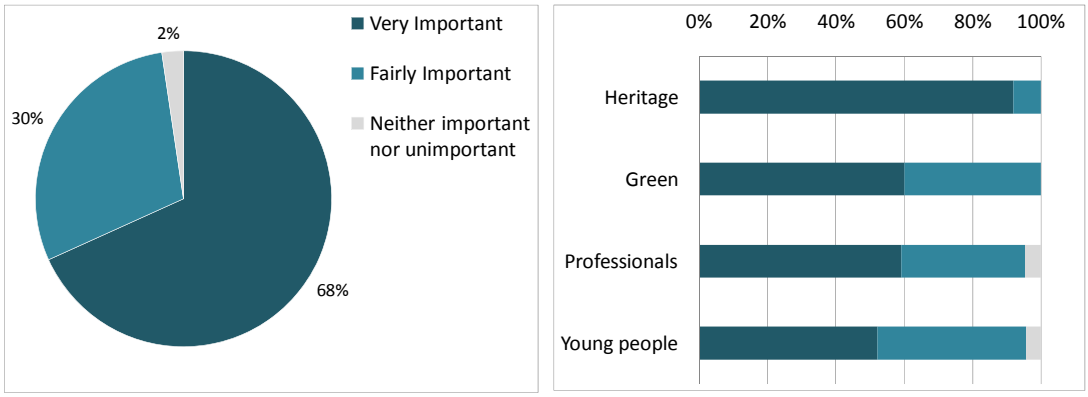
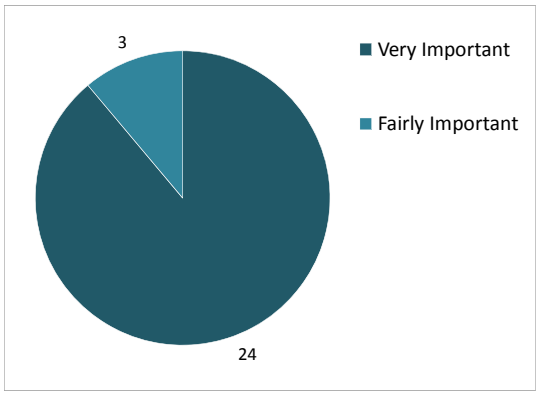


Figure 3.1 Importance of preserving the historic environment of Bath (public meeting participants)



What makes Bath special?

In each of the workshops and in the public meeting, participants were asked to identify what they valued in the built environment of Bath (both on post-it notes and on the questionnaires). The following is a content analysis of the data collated from all the events.

- The quality and integrity of the historic city as a whole
- The beauty of the buildings, the elegance of the streetscapes and the clarity of the town planning
- The consistency, harmony and homogeneity of the architecture, streets and roofscapes
- The consistency of the materials and colour palette (Bath stone, slate, wrought iron) and the sensitivity of Bath stone to the changing light across the day
- The variety within the uniformity – of periods (Medieval, Georgian and Victorian buildings), street plans (terraces, squares, circuses, crescents), buildings and building details
- The grand set pieces of urban architecture
- The richness and quality of the building details and street details

- The eccentricities and oddities of the buildings and streets: niches, alleyways, hidden courtyards
- The scale and proportion of the buildings and the close relationship of the buildings to the spaces between them, which they define and frame
- The visibility and readability of the history of the city in its buildings and streets
- The quality of the original craftsmanship and the evidence of long-term care of the building fabric
- The human scale of the city; a city that can be traversed easily on foot or bicycle and which provides easy access to the surrounding countryside
- The relationship between the city and the countryside, including the views out of the city towards the surrounding hills and the views over the city from those hills
- The relationship between the built environment and its immediate topography: streets following contours, hills exploited to enable views, buildings and roofscapes made visible by the rising profile of the city
- The green spaces within the city, including downs, parks and squares, and the corridors across the city (river, canal, cycle paths)
- The river, albeit under-exploited
- The industrial heritage
- The integration of a living, working city within a protected historic environment
- The lively public space and streetscapes
- The strong community and rich cultural life
- The robustness and adaptability of the traditional (especially Georgian) buildings and their long history of reuse
- The city's World Heritage Status

4. A low carbon future

Attitudes to cutting carbon

As the project workshops were advertised under the title 'Low Carbon Bath', some self-selection among participants in favour of a pro-environmental view is likely. Nonetheless, the consistency of the views expressed across the workshops is striking.

All the workshop participants were asked to identify how important they felt it was to cut their carbon emissions. A five point scale was used with options ranging from 'Very important' to 'Not at all important'. Nine out of ten participants indicated that cutting carbon was important to them and none felt that cutting carbon was unimportant (Figure 4.1). As expected, participants in the Green workshop showed the greatest enthusiasm for cutting carbon. However, the consensus overall is the key finding.

The participants at the public meeting broadly concurred with the workshop participants although one individual felt that cutting carbon was 'fairly unimportant' (Figure 4.2).

Figure 4.1 How important is it to you to cut your carbon emissions? (workshop participants)

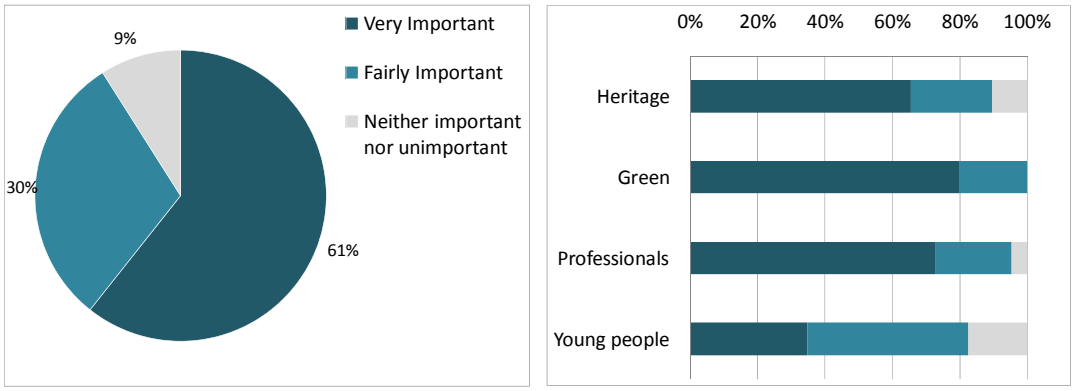
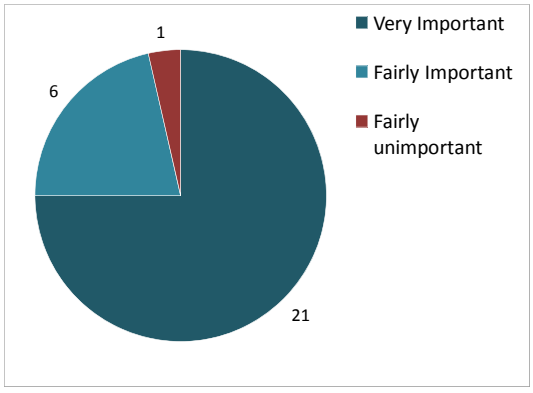


Figure 4.2 How important is it to you to cut your carbon emissions? (public meeting participants)



Workshop participants were also asked about the following five possible drivers for personal action to cut carbon:

- Reducing the severity of climate change
- Preparing for fossil fuel shortages ('peak oil')
- Keeping in step with local and national policy
- Creating an attractive (healthier, more resilient) future
- Reducing energy costs

Figures 4.3 to 4.7 illustrate the responses of the workshop participants. Overall, the 'peak oil' argument was the most persuasive, identified as motivating 95% of all participants a lot or a fair amount, with tackling

climate change not far behind (87% felt this motivated them a lot or a fair amount). A substantial majority of participants were also persuaded that a low carbon world will be an attractive – and cheaper – place to live.

There was little difference in the responses of the participants in the Heritage and Green workshops. In both workshops, the great majority of participants accepted the importance of tackling both climate change and 'peak oil '. The professionals and young people were marginally less enthusiastic about tackling climate change, though four out of five still indicated that this motivated them a lot or a fair amount, and almost all were motivated by the importance of preparing for fossil fuel shortages.

The only argument considered unimportant by substantial numbers across all workshops was the need to keep in step with local and national policy. This may, in part, reflect the fact that the question focused on drivers of personal action to cut carbon.

Figure 4.3 We must reduce the severity of climate change. This motivates me...

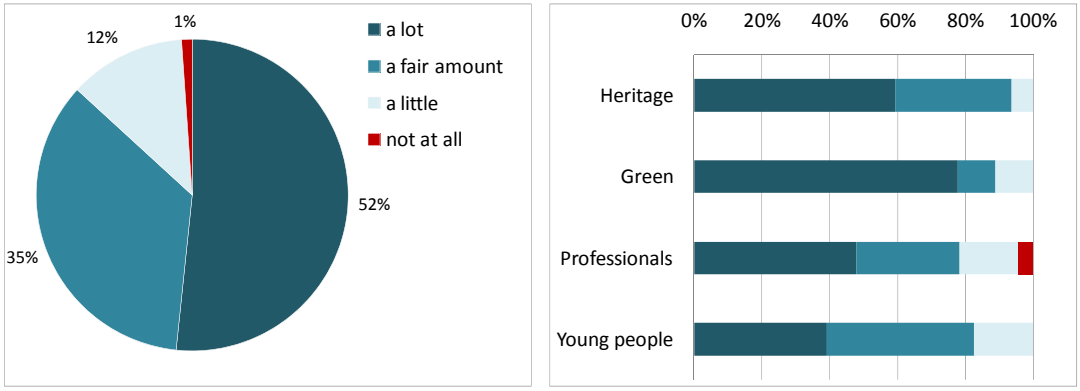


Figure 4.4 We need to prepare for fossil fuel shortages. This motivates me...

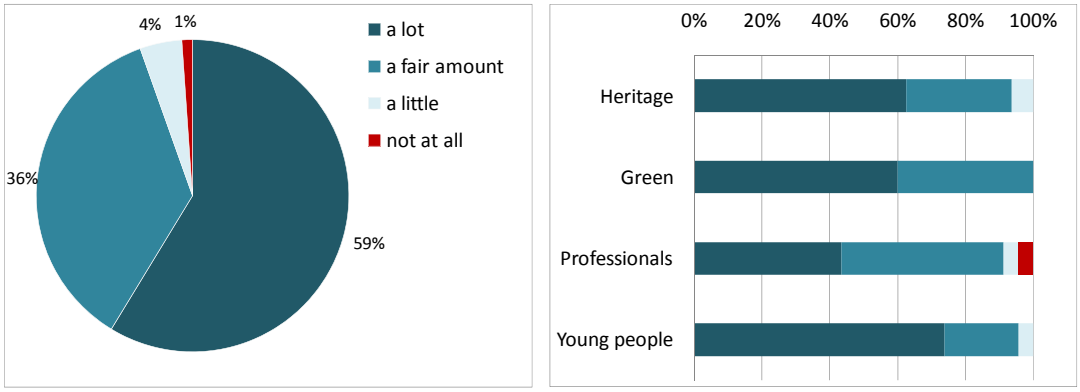


Figure 4.5 We need to keep in step with local and national policy. This motivates me...

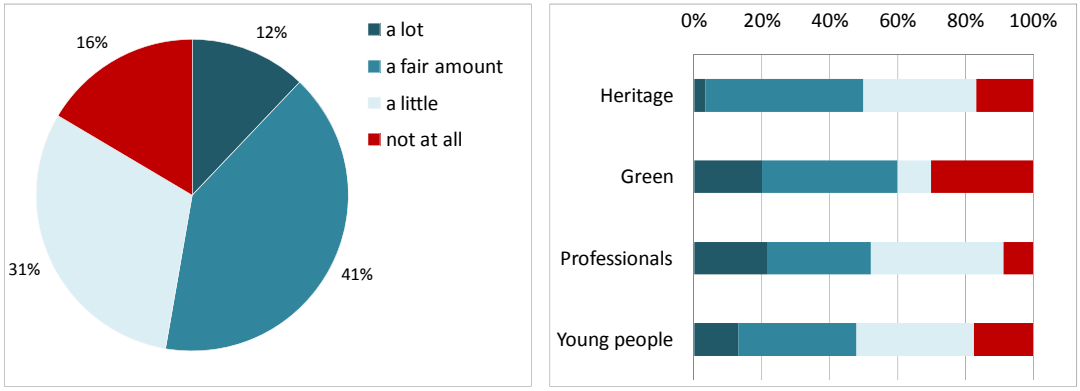


Figure 4.6 A low carbon world is an attractive place to live. This motivates me...

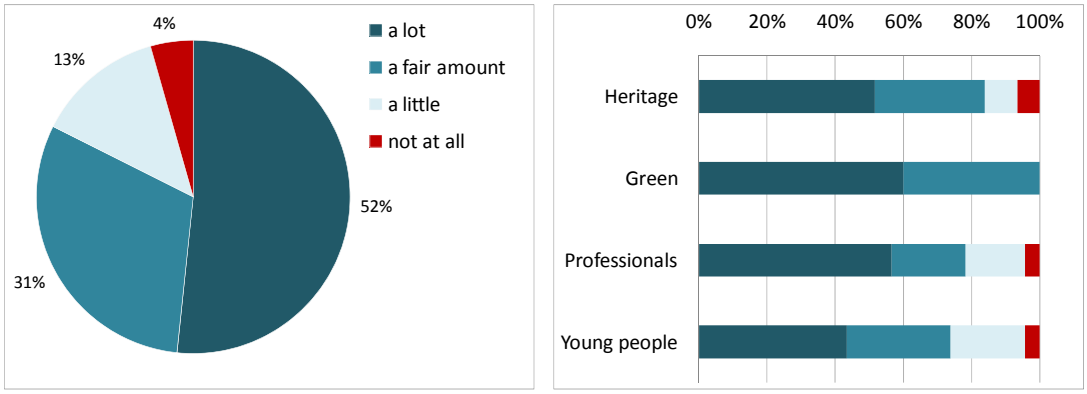
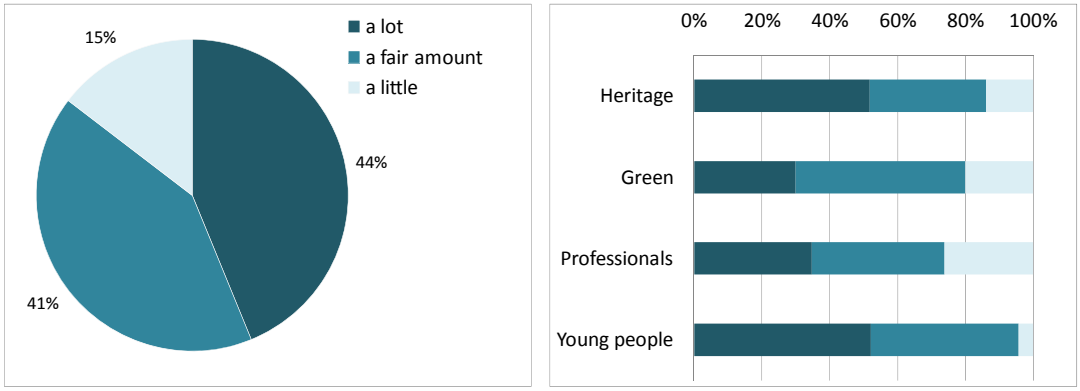


Figure 4.7 Lower energy consumption means lower bills. This motivates me...



The level of consensus across the workshops, concerning both the value of the historic environment of Bath and the importance of reducing carbon emissions, is invaluable in framing the discussion about making changes to the built environment of Bath. There is no simple dichotomy between protecting the historic environment and building a low carbon future. The challenge is to find a middle way which preserves the features of Bath that people care about while also making changes that are appropriate, acceptable and effective.

Housing and warmth

At the public meeting, participants were asked about their experience of heating their homes in the winter. A majority of participants said that they found their homes hard to heat (Figure 4.8). Similarly, a majority had been cold in their homes during the previous winter, with a quarter reporting that they were much colder than they wanted to be (Figure 4.9)

Figure 4.8 Is your home hard to heat in the winter? (public meeting participants)

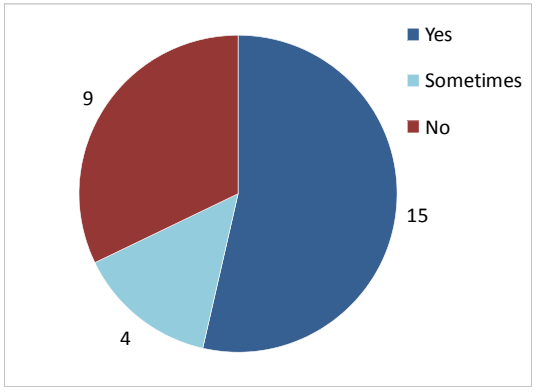
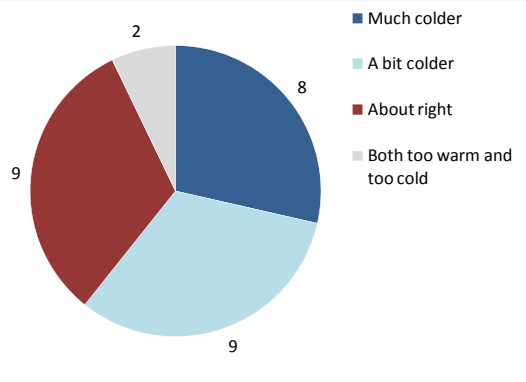


Figure 4.9 Level of warmth in home last winter (public meeting participants)



Participants at the public meeting were also asked whether they lived in a Georgian, Victorian or 20th century houses. The numbers are small but there is no obvious relationship between building period and experience of winter cold:

- 14 lived in Georgian buildings, 7 of whom reported being cold the previous winter
- 7 lived in Victorian buildings, 5 of whom reported being cold the previous winter
- 8 lived in 20th century buildings, 4 of whom reported being cold the previous winter

Fourteen participants lived in listed buildings, 10 of whom reported being cold the previous winter. Of the 8 people who said they were much colder than they wanted to be last winter, six lived in listed buildings. This relationship between listed buildings and the experience of cold is worthy of further investigation.

Although this sample is small, these results suggest that homes that are hard to heat and cold in the winter are not unusual in Bath. Energy efficiency upgrades in such homes are likely to have immediate impacts on the comfort and health of inhabitants.

5. Retrofitting traditional buildings in Bath

There is huge scope for retrofitting traditional buildings, including listed buildings, to improve their energy performance and reduce their related carbon emissions, though careful attention must be paid to a) the technical problems of adapting solid-walled buildings, b) visual impacts and c) impacts on historic fabric. Although technical issues were raised in the workshops and public meeting, the primary focus of the consultation was not performance but acceptability: participants were asked if changes to traditional buildings were acceptable or not. The results are presented in this chapter.

At the four workshops, participants were asked if proposed interventions were acceptable for traditional buildings in Bath 'always', 'sometimes', rarely' or 'never'. At the public meeting, participants were asked to judge the acceptability of the same range of interventions for a specific building in Bath, a Grade 2 listed Georgian building (Figure 5.1). This was assumed to be one of the more challenging buildings in Bath to intervene upon, and therefore a good test case.

At both the workshops and the public meeting, the workshop facilitator presented a range of options that he personally felt was acceptable for the test case Georgian building (Figure 5.1). At the workshops, this case study was described after the participants had made their assessment of the acceptability of the interventions described in this chapter. At the public meeting, this list of options was presented first and participants were effectively asked if they agreed or not with what was proposed for this specific building.

Participants were not asked about all the potential interventions for a traditional building but only those which are likely to be controversial in terms of their impact on the visual quality or fabric of a building.

Figure 5.1 List of possible interventions for Grade 2 listed Georgian building in Bath:

Remove unnecessary lighting and install low energy lighting	Renovate and draught-strip sash windows
Insulate loft	Renovate shutters and install curtains with thermal inter-lining
Replace tumble drier with clothes airer	Install secondary glazing
Install chimney balloons	Upgrade appliances to A++
Draught-strip doors, letter box and key hole	Add vapour-permeable external insulation to rear of building
Draught-strip skirting boards and floors	Add internal insulation to any front rooms without features (top room)
Install humidistat-controlled bathroom and kitchen extractor fans	If necessary, install heat recovery ventilation unit in back wall.
Replace old boiler with new efficient boiler with good thermostat/controller	Install water-efficient aerating taps and shower
Install thermostatic valves on radiators	Install solar hot water panel in valley roof?
Insulate ground floor (if suspended timber floor)	Install photovoltaic heritage tiles or panel in valley roof.

Secondary glazing

Secondary glazing is a means of improving the thermal and noise insulation of a single glazed window without the need to remove the original window.

Good quality secondary glazing is installed with minimal impact on the existing fabric of the window. It should sit within the existing window frame on the interior side of the original glazing. The glazing bars of the new window should be kept to a minimum and designed to align with the principal glazing bars of the original window. Secondary glazing can, however, produce a double reflection effect on the window when viewed from the outside.

Nine out of ten workshop participants felt that secondary glazing was always or sometimes acceptable in the traditional buildings of Bath (Figure 5.2) and the majority of the participants in the public meeting felt that secondary glazing was acceptable for a Grade 2 Georgian listed building (Figure 5.3).

Figure 5.2 When is secondary glazing acceptable for traditional buildings in Bath? (workshop participants)

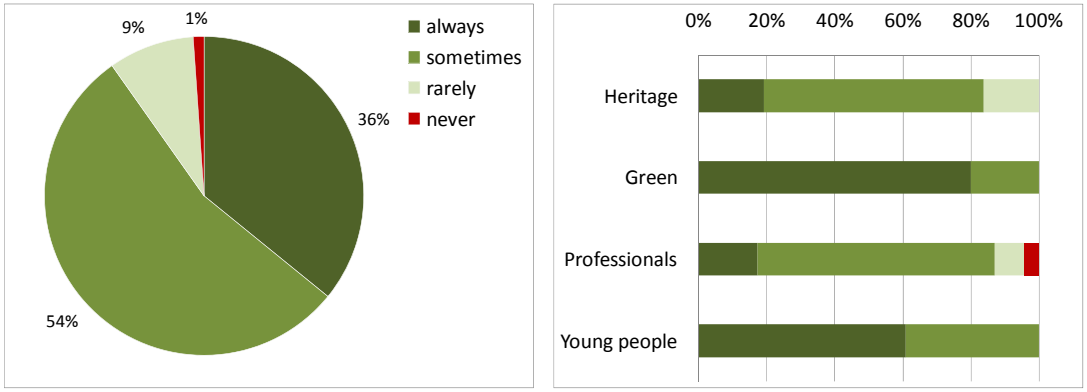
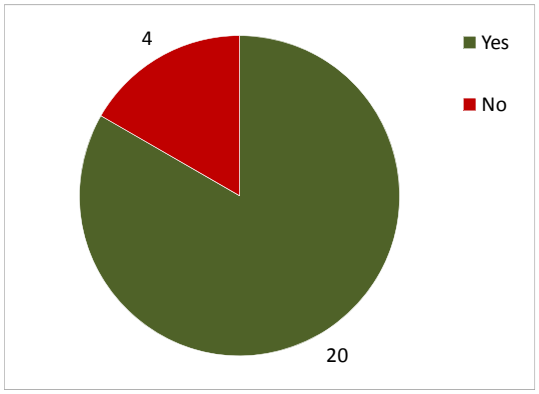


Figure 5.3 Would secondary glazing be acceptable for a Grade 2 listed Georgian building in Bath? (public meeting participants)



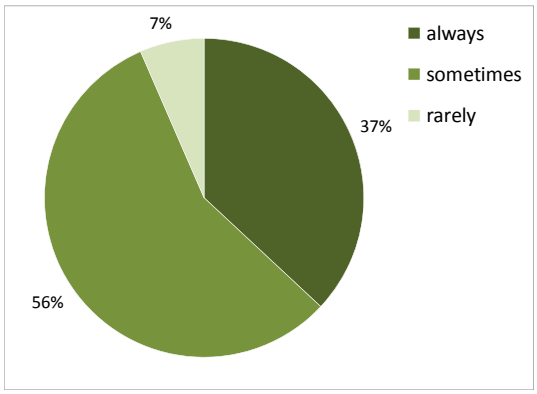
Slimline double glazing

Double glazing is usually installed as a complete replacement window. Although the uPVC double glazing industry now dominates the market in Britain, alternatives to plastic are available including good quality timber windows and the refurbishment of existing windows with slimline double glazed panes (which can even include the use of Crown effect glass on the exterior pane). Slimeline double glazing has a narrow gap between the panes and is therefore more discreet than ordinary double glazing.

Almost all workshop participants felt that slimline double glazing was acceptable in traditional buildings always or sometimes with no-one ticking the 'never' box (Figure 5.4). The option presented at the public meeting was the retention of the existing window's structural fabric and the replacement of the glass panes with slimline double glazing. There was universal support for this option (Figure 5.5).

Photographs © Changeworks

Figure 5.4 When is slimline double glazing acceptable for traditional buildings in Bath? (workshop participants)



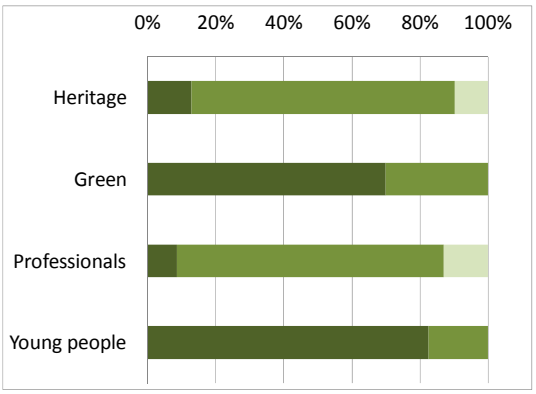
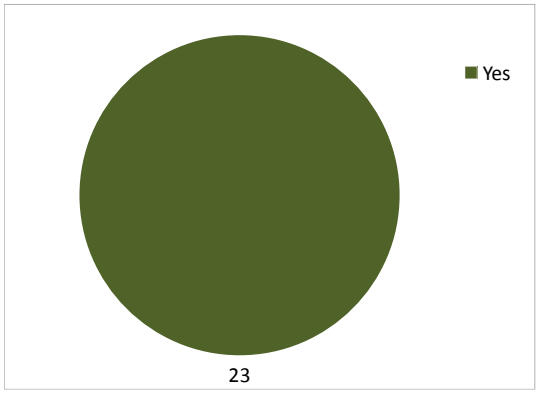


Figure 5.5 Would slimline double glazing be acceptable for a Grade 2 listed Georgian building in Bath? (public meeting participants)

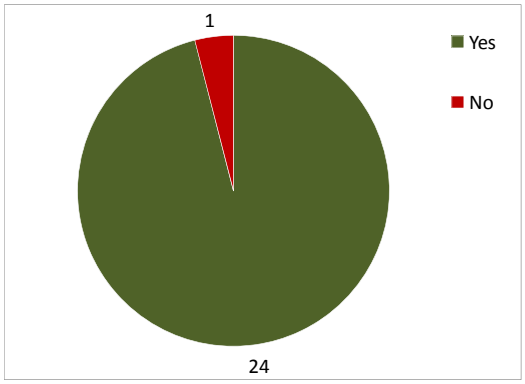


Floor insulation

Insulation installed under the ground floor can play a major role in preventing heat loss from a traditional building. Different methods are needed for different floor constructions. For suspended timber floors, it is sometimes possible to insulate from below, if a cellar or crawl space is accessible. When this is not possible, floorboards have to be taken up, insulation installed between the joists and the floorboards put back. There is, therefore, a potential risk of damage to the fabric of a historic building.

Workshop participants were not asked to make a judgement about floor insulation but the participants at the public meeting were asked if they thought it would be acceptable to install ground floor insulation in a Grade 2 listed building in Bath. All but one thought that this would be acceptable (Figure 5.6).

Figure 5.6 Would ground floor insulation be acceptable for a Grade 2 listed Georgian building in Bath? (public meeting participants)



Internal wall insulation

Traditional buildings do not have cavities in their walls. The only way to insulate them is to install insulation on the interior or exterior walls and add a new wall finish on top. This inevitably has an impact on the look of the building as well as disturbing any historic fabric.

The installation of internal wall insulation requires the removal of historic features such as cornices. Window frames may also have to be adjusted. This was recognised by workshop participants who predominantly felt that internal insulation would be acceptable sometimes rather than always in the traditional buildings of Bath (Figure 5.7). The majority of the participants in the public meeting did not think that internal insulation would be acceptable in the main rooms of a Grade 2 listed building in Bath (Figure 5.8).

The impact of internal wall insulation is reduced if the rooms affected have no important features. This is often the case in rooms at the back or top of traditional buildings. Workshop participants were more enthusiastic about using wall insulation in these circumstances (Figure 5.9) and all but one of the participants in the public meeting felt that this would be acceptable for a room in the roof of a Grade 2 listed building, assuming that this had no significant features (Figure 5.10)

Figure 5.7 When is internal wall insulation acceptable for the front rooms of traditional buildings in Bath? (workshop participants)

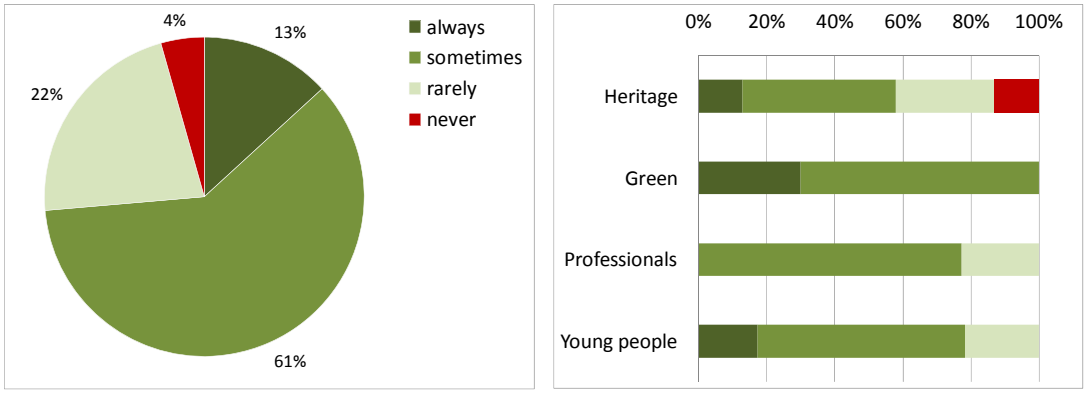


Figure 5.8 Would internal wall insulation be acceptable for the main rooms of a Grade 2 listed Georgian building in Bath? (public meeting participants)

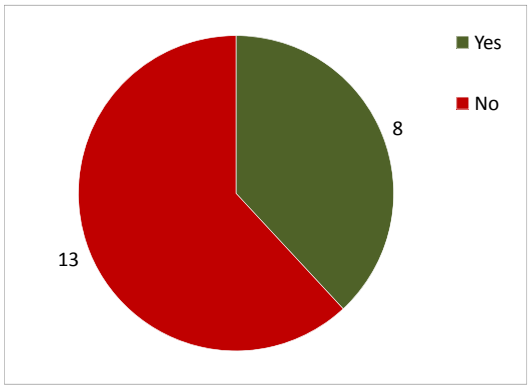


Figure 5.9 When is internal insulation acceptable for the back rooms of traditional buildings in Bath? (workshop participants)

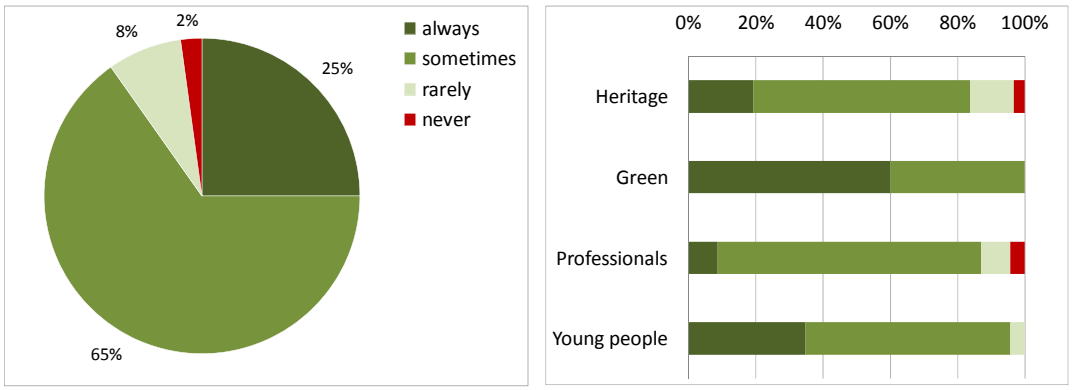
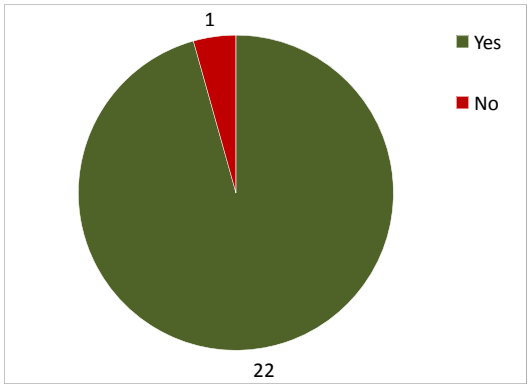


Figure 5.10 Would internal wall insulation be acceptable for the top room (in the roof) of a Grade 2 listed Georgian building in Bath? (public meeting participants)



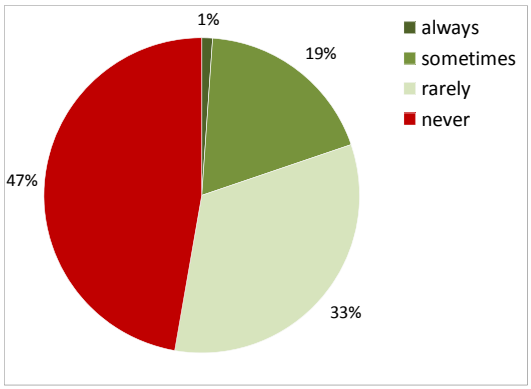
External wall insulation

External wall insulation is typically more effective than internal insulation but has a greater impact on the look of the building and its fabric. This is obviously a major issue in a city such as Bath where the consistency of the finishes, especially the use of Bath stone, lies at the heart of the city's history and identity. There was a consistent view across the workshops that the fronts of the traditional buildings of Bath should be protected in most cases (Figures 5.11 and 5.12).

However, external insulation has a lesser impact on the backs of buildings, where the exposed surface area and heat losses are typically greater than at the front. Although the backs of traditional buildings are often visible in the urban landscape of Bath, they have diverse finishes (including original render) and were obviously not designed to make the same contribution to the character of the city as the front facades.

Potentially, external insulation can be added to the backs of traditional buildings with careful colour matching of the new rendered weather screen against surrounding buildings. This was the option presented to participants at the workshops and public meeting. Almost half of workshop participants indicated that this would be acceptable always or sometimes in the traditional buildings of Bath (Figure 5.13). The participants in the public meeting were split 50:50 over whether it would be acceptable to upgrade a Grade 2 listed Georgian building in this way (Figure 5.14).

Figure 5.11 When is external insulation acceptable for the front facades of traditional buildings in Bath? (workshop participants)



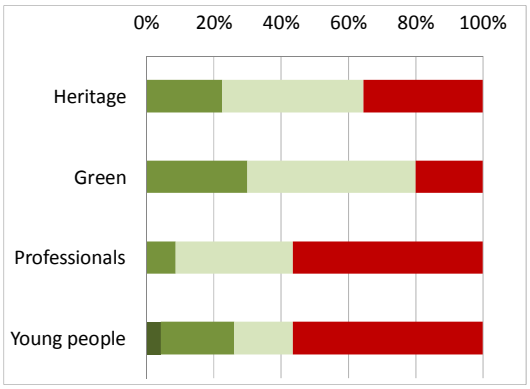


Figure 5.12 Would external wall insulation be acceptable for the front facade of a Grade 2 listed Georgian building in Bath? (public meeting participants)

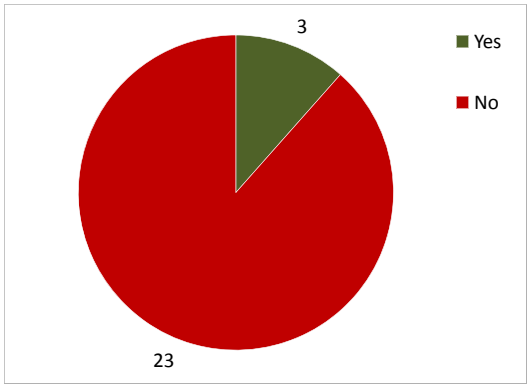
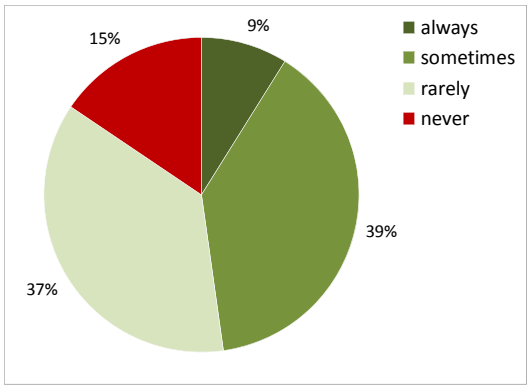


Figure 5.13 When is external insulation acceptable for the backs of traditional buildings in Bath? (workshop participants)



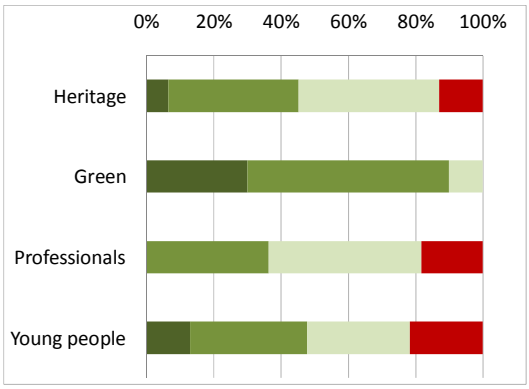
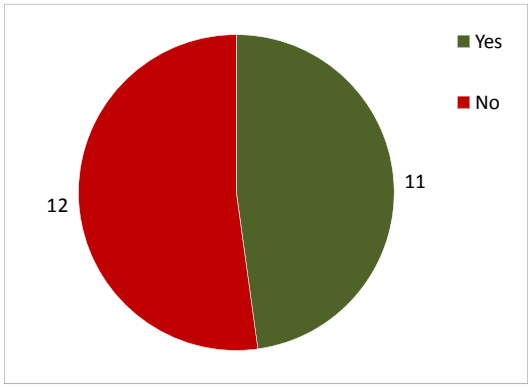


Figure 5.14 Would external wall insulation be acceptable for the back facade of a Grade 2 listed Georgian building in Bath? (public meeting participants)



Rooftop wind turbines

Currently it would probably be inappropriate to recommend rooftop wind turbines for Bath on technical grounds alone, given their poor power outputs in the turbulent wind created by the urban landscape. Nonetheless, the technology may improve and there may be some circumstances – houses facing unobstructed, steady winds – where they are viable. Consequently all participants were asked whether they felt rooftop turbines were acceptable or not.

The majority of workshop participants felt that rooftop wind turbines would never be acceptable or only rarely acceptable for the traditional buildings of Bath (Figure 5.15). Most of the participants at the public meeting did not think that a wind turbine would be acceptable on the roof of a Grade 2 listed Georgian building (Figure 5.16).

Figure 5.15 When are rooftop wind turbines acceptable on traditional buildings in Bath? (workshop participants)

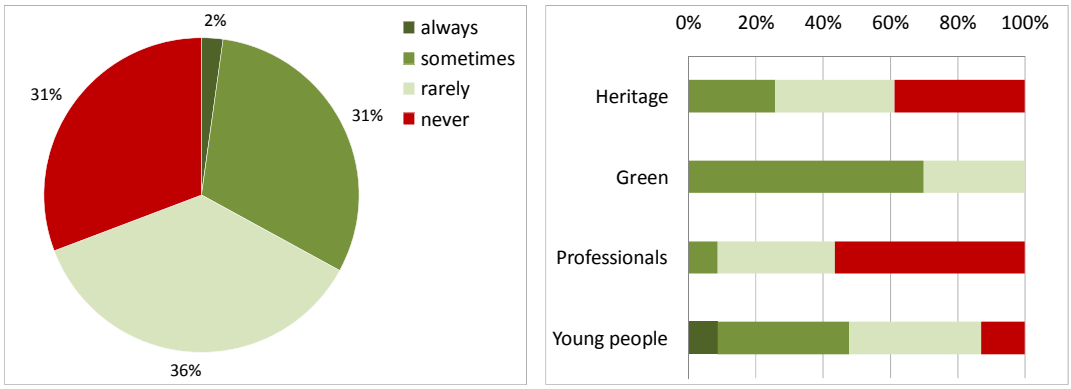
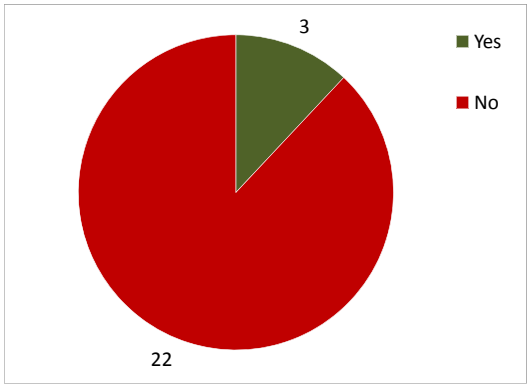


Figure 5.16 Would a rooftop wind turbine be acceptable for a Grade 2 listed Georgian building in Bath? (public meeting participants)



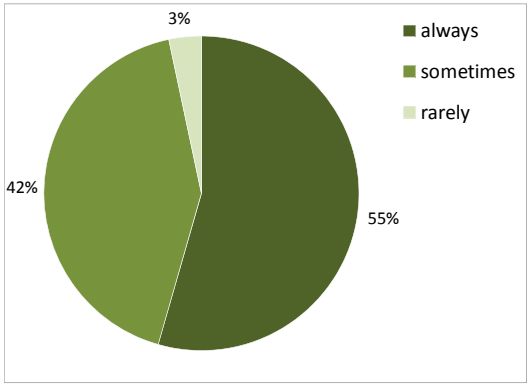
Solar panels

The builders of Georgian Bath bequeathed an ideal roof design for the solar energy enthusiasts occupying their buildings two centuries later – the valley roof. Solar thermal or solar photovoltaic panels can be installed in these hidden spaces with no visual impact. The fabric of the roof can also be preserved if the panel is set above the original finish.

A majority of workshop participants felt that the installation of solar panels in valley roofs was always acceptable (Figure 5.17). Participants in the Heritage and Professional workshops were slightly more cautious – more said 'sometimes' than 'always' – but overall there was no opposition to this approach to using renewable technology in traditional buildings. All but one of the participants at the public meeting felt that a solar panel was acceptable in the valley roof a Grade 2 listed Georgian building (Figure 5.18).

Attitudes to solar panels on visible roofs were more diverse. Only one in ten workshop participants felt that visible solar panels would always be acceptable on the traditional buildings of Bath. Most felt that they would be acceptable sometimes or rarely (Figure 5.19). The majority of the participants at the public meeting did not feel that a solar panel would be acceptable on the visible front roof a Grade 2 listed building in Bath (Figure 5.20).

Figure 5.17 When are valley roof solar panels acceptable on traditional buildings in Bath? (workshop participants)



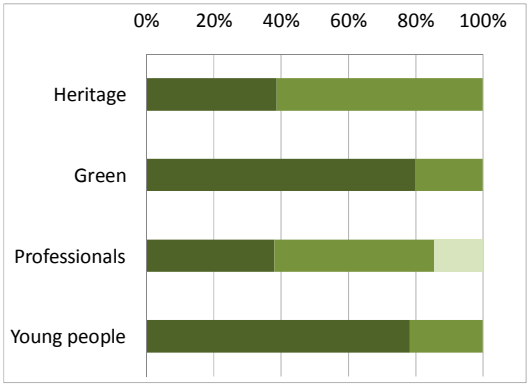


Figure 5.18 Would a solar panel be acceptable in the valley roof of a Grade 2 listed Georgian building in Bath? (public meeting participants)

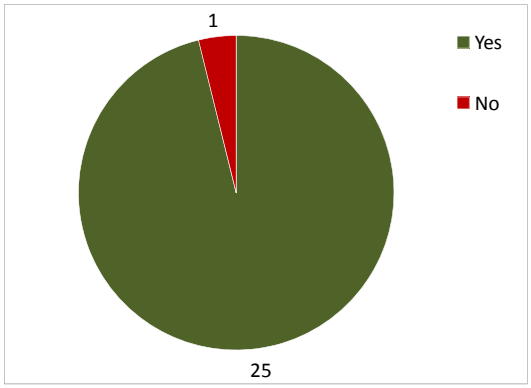
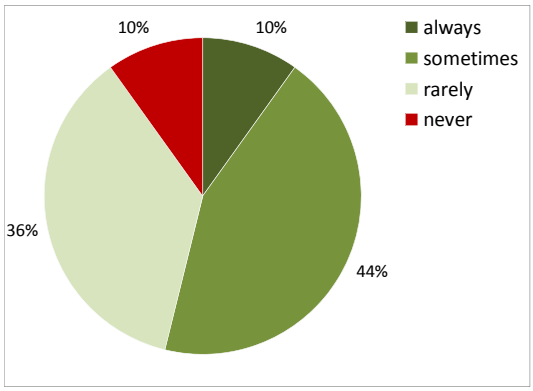


Figure 5.19 When are solar panels acceptable on visible roofs of traditional buildings in Bath? (workshop participants)



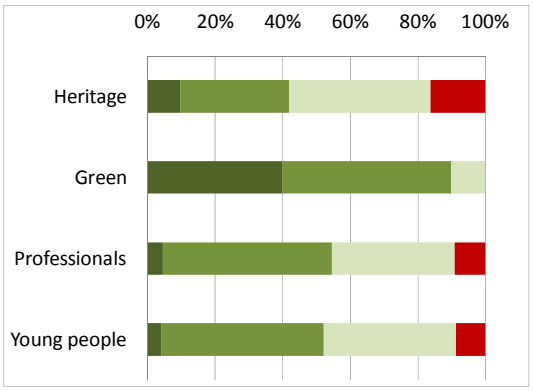
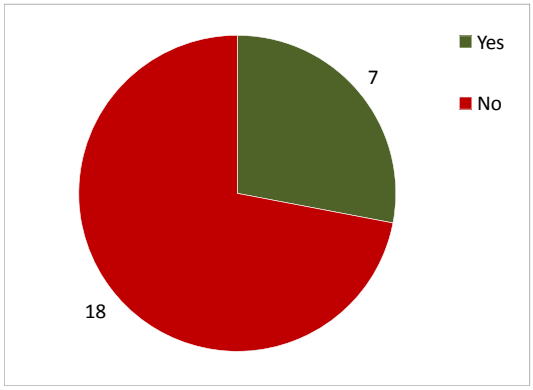


Figure 5.20 Would a solar panel be acceptable on the front, street-facing roof of a Grade 2 listed Georgian building in Bath? (public meeting participants)



Heritage solar tiles

Heritage solar tiles are miniature photovoltaic panels designed to replace slate tiles and be fully integrated into the fabric of a roof. They have been developed specifically to mitigate the visual impact of ordinary solar panels, especially in conservation areas.

There was clear support for the use of Heritage solar tiles across the workshops: half of all participants feeling they would always be acceptable and most of the remainder felt they would sometimes be acceptable (Figure 5.21). All but one of the participants at the public meeting felt that Heritage solar tiles would be appropriate for the street-facing mansard roof of a Grade 2 listed building in Bath, assuming this was wholly replaced with the solar tiles (Figure 5.22).

Figure 5.21 When are heritage solar tiles acceptable on visible roofs of traditional buildings in Bath? (workshop participants)

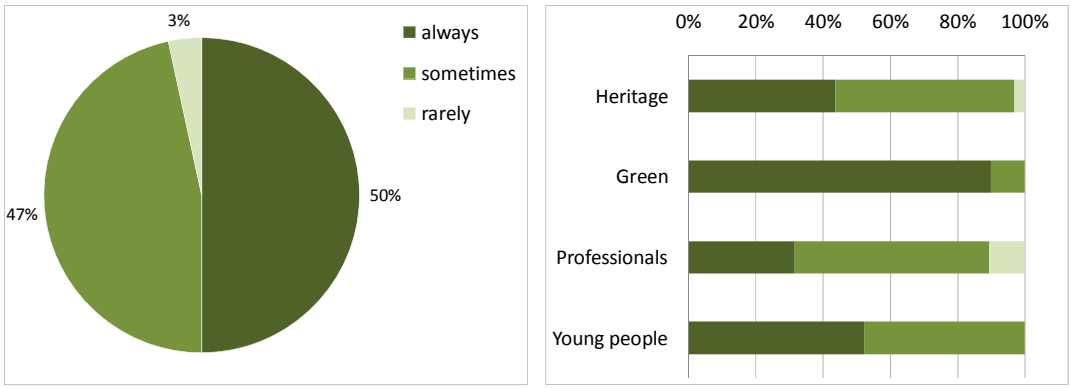
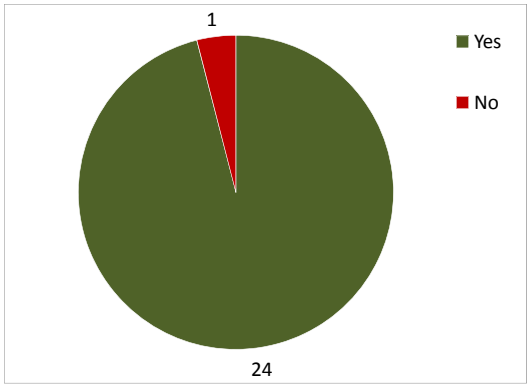


Figure 5.22 Would heritage solar tiles be acceptable on the front, street-facing roof of a Grade 2 listed Georgian building in Bath? (public meeting participants)



Solar panels on Snow Hill

Snow Hill may not be constructed of traditional buildings but its roof has a major impact on the view of the traditional urban landscape of Bath. Workshop participants were asked if they would be happy to see solar panels on this infamous roof. The great majority felt that this would be acceptable (Figure 5.23). Objections were principally raised in the Professional workshop, though even here there was a majority in favour.

The participants at the public meeting concurred with the workshop participants, with most in favour of solar panels on Snow Hill (Figure 5.24).

Figure 5.23 Would solar panels be acceptable on roofs of Snow Hill? (workshop participants)

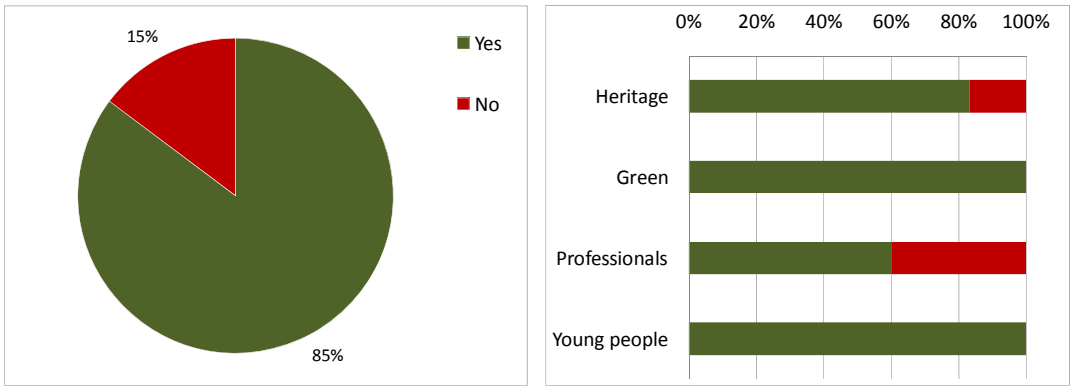
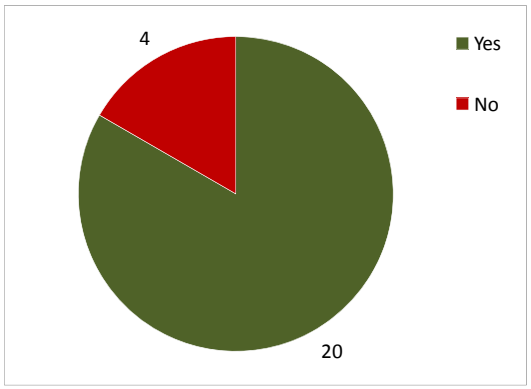


Figure 5.24 Would solar panels be acceptable on roofs of Snow Hill? (public meeting participants)



6. Stand-alone renewable energy technology

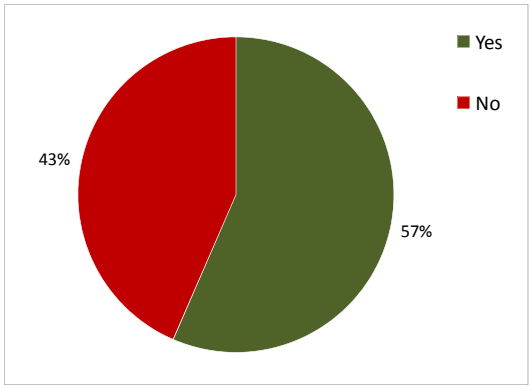
A low carbon future for Bath will require a greater supply of renewable energy as well as more energy efficient buildings. The amount of renewable energy that can be generated through building-integrated renewable technology will always be limited, so it is worth considering the options for developing medium to large scale technology in the local area.

Lansdown and Bathampton Down wind turbines

As the power output of a wind turbine increases with the cube of the wind speed, turbines are best placed on the tops of hills. A small majority of workshop participants felt that large wind turbines on both Lansdown and Bathampton Down would be acceptable (Figure 6.1 and Figure 6.3). However there was no consensus across the workshops on this issue: participants in the Green workshop and Sixth Form workshop were strongly in favour of these turbines whereas the majority of participants in both the Heritage and Professional workshops were opposed.

The same questions were asked at the public meeting and the response was consistent with the overall results for the workshops: a majority in favour of both but with substantial opposition (Figure 6.2 and Figure 6.4).

Figure 6.1 Would wind turbines be acceptable on Lansdown? (workshop participants)



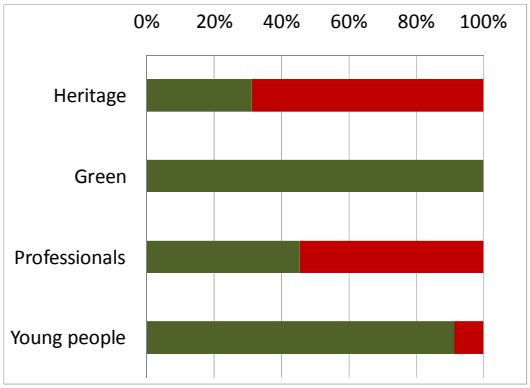


Figure 6.2 Would wind turbines be acceptable on Lansdown? (public meeting participants)

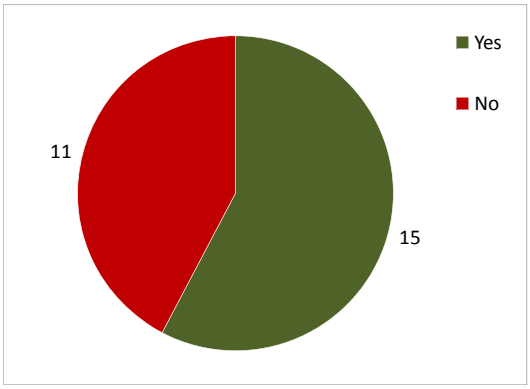
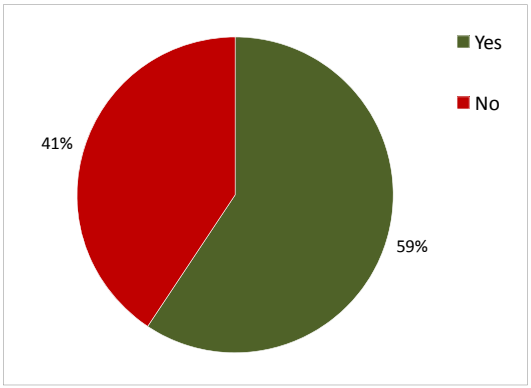


Figure 6.3 Would wind turbines be acceptable on Bathampton Down? (workshop participants)



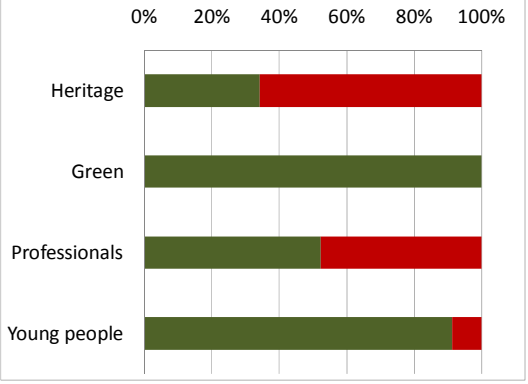
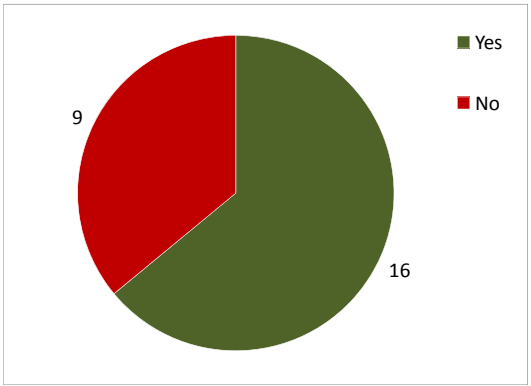


Figure 6.4 Would wind turbines be acceptable on Bathampton Down? (public neeting participants)



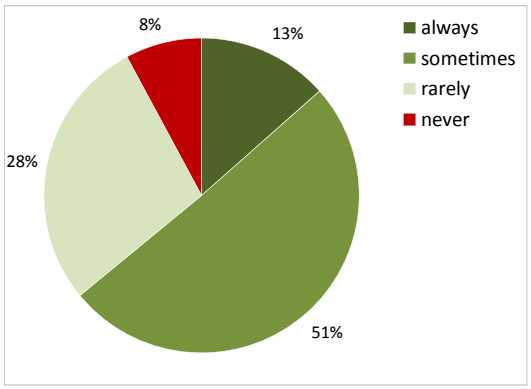
Vertical axis wind turbines

Vertical axis wind turbines have been developed to exploit the turbulent wind of urban areas without the loss of efficiency suffered by horizontal axis turbines in these conditions (the latter struggle because they are always chasing the wind). Their visual impact is also different as they always look the same, albeit spinning at different rates, because they do not change the direction in which they point.

The majority of workshop participants felt that vertical axis wind turbines would be acceptable always or sometimes in the built environment of Bath (Figure 6.5). Although there were differences across the workshops, these differences were not as great as those for the wind farms in the landscape of Bath. Half of the participants in the Heritage workshop felt that these turbines would be acceptable always or sometimes.

At the public meeting, participants were given a blunter Yes/No choice to the proposition of installing vertical axis wind turbines in the built environment of Bath. The results are equivocal, with half supporting and half opposing (Figure 6.6).

Figure 6.5 When are vertical axis wind turbines acceptable within the built environment of Bath? (workshop participants)



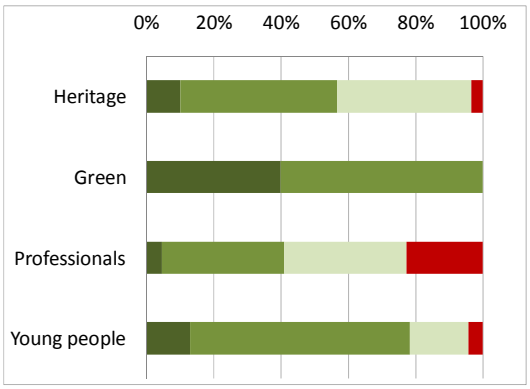
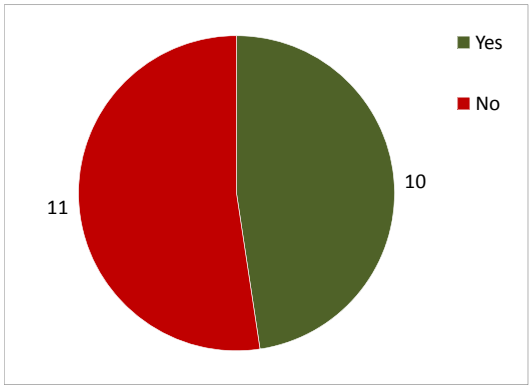


Figure 6.6 Are vertical axis wind turbines acceptable within the built environment of Bath? (workshop participants)



7. Constraints

Participants were asked to identify the constraints that prevented or obstructed their efforts to make carbon-saving improvements to their homes. Their responses are summarised below.

Local planning constraints

Listed buildings and buildings in conservation areas are subject to explicit prohibitions on various changes to the building fabric, such as the installation of double glazing in listed buildings. However the lack of clear and consistent guidance about exactly what can and cannot be done is itself a constraint. Different conservation officers may come to different decisions about specific proposals. This contributes to a general perception that planning permission is difficult or troublesome to get. The stretched resources of the local planning department add to these problems.

Issues beyond the conservation of the building fabric may be ignored. These include the effects of cold, hard-to-heat buildings on inhabitants' welfare, the cost and carbon intensity of using electricity as a heating fuel and the conservation of the mixed demographic of the population of the city of Bath (which is threatened by the current difficulty in bringing listed buildings in social ownership up to the Decent Homes Standard).

Many people proceed with changes without seeking permission. Those who do seek planning permission are penalised for doing the right thing.

Workshop participants were also specifically asked whether they felt that local planning constraints on energy-related home improvements are too severe, about right or too lax. Two fifths of all participants felt that they were too severe (Figure 7.1). If the 'don't know' responses to this question are excluded, it is clear that current planning constraints are far more likely to be perceived as too severe than too lax, even among those with a heritage interest (figure 7.2).

Figure 7.1 Views of current planning constraints on energy-related home improvements (workshop participants)

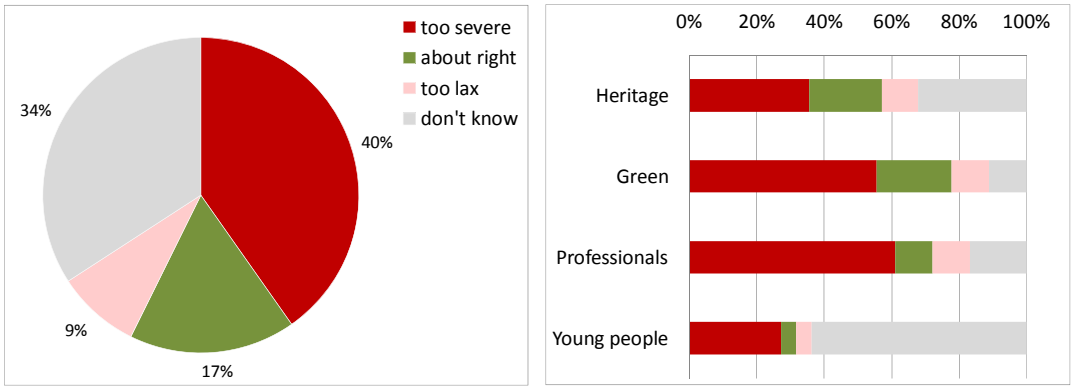
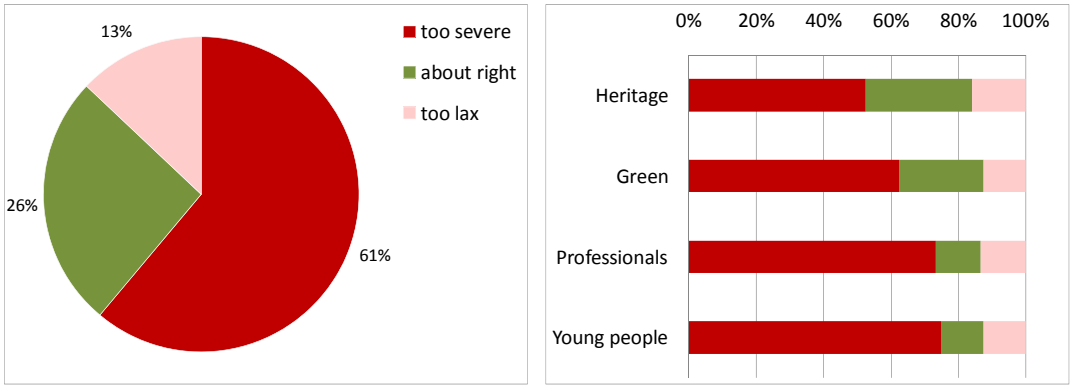


Figure 7.2 Views of current planning constraints on energy-related home improvements with 'don't know' responses excluded (workshop participants)



Lack of professional knowledge and skills

Architects and builders do not always understand the issues of eco-renovation, especially in relation to traditional solid wall buildings. Consequently they may advise against accepted solutions simply because they are unfamiliar with them. There is also a lack of local skilled labour with appropriate experience. It is not always easy to find out if a local installer is reliable and trustworthy.

Visual impacts

Certain interventions, such as solar panels and external wall insulation, have obvious visual impacts. However judgements about visual impacts can be difficult to make depending on the location and character of the property. It may not be clear what a change in character means in practice.

Even minor changes can attract 'nimby' responses if they are seen as disrupting an established order.

Costs

The costs of interventions are always likely to be an obstacle to action, especially if there are other pressing demands on household income. It may be difficult to assess running cost improvements, payback times, value for money or impact on capital value. Government grant schemes do not always extend to the interventions needed for traditional buildings and access to other sources of finance may be limited.

Lack of reliable information and evidence

There is limited authoritative information available on energy efficiency and renewable energy which is relevant to the traditional buildings of Bath. In part, this is due to a lack of empirical evidence about the effects of energy efficiency upgrades within traditional buildings. The issues are complex and there are sometimes conflicting claims about the benefits of different green options.

It may be difficult to gain enough confidence to install certain measures, such as renewable energy technology, if they are perceived to be still in development or subject to falling prices. The long term impacts of such measures may also be difficult to assess.

Technical constraints

Upgrading traditional solid wall buildings is far from straightforward and many technical issues have to be addressed. These include the maintenance of adequate levels of ventilation and the prevention of condensation and damp within the building fabric. Renewable energy technology may also be difficult to install on traditional buildings.

Time, effort and disruption

Any change to the building fabric of a home requires time and effort which may be hard to muster given the many other demands on householders' time. The disruption caused to internal space and everyday routines is also a significant obstacle.

Apathy may be a significant obstacle for households who do not see the potential benefits of action or who are generally resistant to change.

Too much onus on the individual household

There is considerable scope for community-level action to improve the energy efficiency of properties or install renewable energy. Currently there is little obvious support for this level of action.

Tenure and neighbours

Those who do not own their homes may have their hands tied by their landlords who may not be interested or willing to improve the energy performance of the home. Owner occupiers may also be constrained, in divided buildings, by the willingness of their neighbours to act collectively.

Expectations and behaviour

Energy efficiency improvements ought to go hand in hand with a more thoughtful approach to how a home is used but individuals may be unwilling to change their behaviour or their expectations of comfort levels.

8. Outline of content of proposed guidance

This outline is based on the constraints identified in the workshops and the ideas put forward by participants to address these constraints. The first draft of this outline was shared at the public meeting where the participants made clear that the guidance a) must be designed, illustrated and communicated effectively and b) must be specific to the buildings of Bath. There was also some discussion about whether there was too much generic information included.

The heart of the guidance is Section 5: *Practical guidance – what you can do*. This is where the local character of the guidance must shine through, not least in clarifying the planning constraints for different areas, building types and building facades. This will only be achievable with the support of the council's planning department and conservation officers.

1. Bath: past, present and future

An overview of the features of the built environment of Bath that local people value and want to protect, alongside a vision of the scope for improving the energy and thermal performance of homes in order that the citizens of Bath do not live in cold homes, household energy costs are reduced and the city's carbon emissions are reduced.

A discussion of the local issues that define the challenge including:

- A profile of the housing types in Bath and the scope for intervening on each, from the most precious Grade 1 Georgian buildings to workaday Victorian terraces with few historic features
- Maps of areas affected by specific planning constraints (conservation areas, World Heritage Site)
- The specific challenges presented by listed buildings
- The national and local targets for cutting carbon emissions

2. Your energy use at home

Basic introduction covering:

- Sources and costs of energy
- What uses the most energy at home (and differences between different building types within Bath)
- Power and energy (how to turn an appliance's power rating into an energy cost)
- Energy and carbon emissions (which fuels are dirtiest?)
- Carbon emissions and climate change
- Energy efficiency before renewable energy

3. How buildings work

A guide to the relationship between energy use and building performance including:

- Natural and artificial light
- Thermal comfort
- How homes lose heat (fabric and ventilation/infiltration heat losses)
- Air quality
- Damp and condensation
- Differences between modern and traditional buildings

4. Deciding what to do

A guide to auditing home energy use and prioritising actions including:

- Checking meters and bills
- Using clip-on energy monitors, smart meters and online services
- Typical costs, benefits and payback periods of interventions
- A hierarchy of cost-effective actions
- Sources of funding and finance (including the Green Deal)

5. Practical guidance: what you can do

This is the main part of the guidance and will examine each issue in detail, covering:

- the pros and cons of different approaches
- technical challenges
- planning constraints (and lack of them where relevant) for different areas, building types and building facades (front and back)
- minimising visual impacts
- costs and savings (£, kWh and CO2)
- materials, components and suppliers

The aim, for each measure or technology, is to provide criteria to enable people to identify the best options for their circumstances, rather than simply presenting a list of options.

The following sections on measures and technology will be preceded by a discussion of behavioural issues including effective use of traditional cellular-plan buildings.

Lighting

- Daylight maximisation
- Lighting design and controls
- Low energy lighting (LEDs, compact fluorescents, miniature bulbs)

Draught-proofing and ventilation

- Doors and windows
- Chimneys/flues
- Floors and skirting boards
- Ventilation systems (extractors, heat-recovery ventilators, trickle vents)

Appliances

- A++ appliances
- Efficient use of (and alternatives to) cold appliances
- Efficient use of (and alternatives to) wet appliances
- Electronic appliances and equipment

Insulation

- Reflective wall panels for radiators
- Loft and roof insulation
- Floor insulation (and possibly between floor insulation for flats)
- Solid wall insulation – interior, exterior

Windows

- Shutters and curtains
- Renovation and draught-proofing
- Double glazing
- Secondary glazing

Heating systems

- Heating controls and targeted heating
- Condensing boilers
- Micro combined heat and power boilers
- Electric heating
- Wood burners and boilers
- Heat pumps

Solar panels

- Solar hot water panels
- Solar electric panels

6. Getting permission

Detailed guidance covering:

- National and local planning policy and building regulations
- Buildings affected
- Permitted developments
- How to seek permission
- How to appeal against a refusal

7. Organising the work

A guide to general practical issues including:

- Integrating energy improvements with other home improvements
- Finding suppliers, surveyors, architects, builders and engineers
- Professional accreditation schemes
- How to brief architects
- Raising the money

8. Collective approaches

A guide to community approaches to action on cutting carbon including:

- The cost-effectiveness of collective approaches
- The scope for community-scale and community-owned renewables (e.g. combined heat and power schemes)
- The scope for more cost-effective solutions
- Integration with wider community interests and action
- Potential source of capital funding and post-installation income streams

9. Case studies

Including examples from Bath, other historic cities and Europe as appropriate

10. Sources of advice

- Local and national advice services
- Local Green Doors day
- Green Communities

9. Conclusion

People who live, work and study in Bath have no doubts about the quality of the built environment they navigate every day. The exceptional homogeneity and beauty of Bath, from the details of the frieze in the Circus to the grand panorama of the city when viewed from the surrounding hills, are universally valued.

Nonetheless, local people recognise that Bath is part of a changing world, a world in which the problems of climate change and fossil fuel shortages are only likely to worsen as the century progresses. The people of Bath do not wish to sit back and ignore these problems. There is a clear consensus that the fossil-fuel-dependent society that we currently take for granted has to change. Somehow we have to reduce our energy use and carbon emissions and create a more sustainable world.

The preservation of the built environment of Bath and the creation of a sustainable future for the city need not be in conflict. There are many ways of improving the fabric and use of traditional buildings in Bath without radically changing their appearance or their historic fabric. For example, the renovation and draught-proofing of sash windows will significantly reduce heat loss and draughts and the renovation of shutters will help to keep the heat in during the dark evenings of winter just as the original builders intended. Improving the thermal performance of an old building can include the restoration of original features as well as the addition of new ones.

There are, however, some changes which not everyone agrees with, at least not for all buildings. A key issue in Bath is the diversity of traditional and historic buildings ranging from Grade 1 listed Georgian houses in Royal Crescent to unlisted Victorian terraced houses, many of which have already been radically changed. It is therefore important to draw distinctions across this range of buildings wherever necessary. For example, the use of internal insulation is unlikely to be appropriate or acceptable in the principle rooms of listed buildings but may have little impact on unlisted buildings which have no important internal features.

The primary goal of this project is to produce detailed practical guidance for the people of Bath which addresses these issues in detail, building on the results reported in this document. Every building in Bath is different and judgements will always have to be made about what is and is not appropriate for any individual building, but this should not obstruct the development of clearer guidance – and local policy – on this issue. We hope that this small step will not only contribute to the long-term goal of reducing the city's carbon emissions but will also help the more immediate need to ensure that the people of Bath do not go cold in their traditional and historic homes during the winter months.