



National Audit Office

## Building for the future: Sustainable construction and refurbishment on the government estate

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# Building for the future: Sustainable construction and refurbishment on the government estate

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# CONTENTS

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**29 March 2007**

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<b>SUMMARY</b>	4
<b>PART ONE</b>	
Departments and agencies are expected to construct and refurbish buildings sustainably	7
Departments and agencies spend around £3 billion each year on construction and refurbishment	7
Several government bodies share policy responsibility for sustainable construction and refurbishment on the government estate	8
The performance of buildings on the government estate is increasingly subject to environmental targets and initiatives	8
How we approached this study	10
<b>PART TWO</b>	
There is widespread failure to meet targets for sustainable construction and refurbishment	11
Departments and agencies are not assessing the environmental sustainability of projects despite instructions to do so	11
Departments and agencies are failing to achieve the required assessment ratings	12
Eighty per cent of projects would fail to meet the required environmental assessment standards	12

Performance on smaller projects tends to be worse	14	<b>PART FOUR</b>	
The procurement route may affect the scope for considering sustainability	14	Sustainable buildings can deliver tangible benefits but these need to be managed	25
Some aspects of sustainability are more widely achieved than others	15	Departments tend not to define clearly the benefits expected of a sustainable building	25
Uptake of the 'Quick Wins' is limited	16	The benefits of sustainable buildings are generally not measured or quantified	25
There are a variety of reasons why departments are underperforming	17	The most sustainably-designed building can still be unsustainable	27
<b>PART THREE</b>		Integrated teams increase the chances of benefits realisation	27
Departments struggle to reconcile sustainability and value for money	19	New technologies do not always deliver the anticipated benefits	28
Key individuals in departments perceive that sustainability conflicts with value for money	19	<b>APPENDICES</b>	
Departments are not carrying out appraisals of the balance between sustainability and value for money	19	1 Detailed recommendations	29
Departments need clearer guidance on whole life costing	20	2 Methodology	31
Sustainable buildings may have greater capital costs but can have lower running costs	21	3 Departments within the scope of this report	34
Departments are not evaluating wider impacts despite the potential for large savings	23	4 Departments and executive agencies in our sample of projects	35
Departments need to use specific output-related targets to achieve environmental objectives	24	<b>ENDNOTES</b>	<b>36</b>





# SUMMARY

**1** This report examines the extent to which departments and executive agencies are meeting targets to make their new buildings and major refurbishments more sustainable. Each year departments and agencies spend in the region of £3 billion on these projects. If sustainability is handled well, it can and should provide better value for money in the long term.

## Key findings

**2** The government has set sustainability standards for the construction and refurbishment of buildings on the government estate, but these are not being met. Departments are failing to carry out environmental assessments and achieve the target ratings. In the sample of projects we examined, 80 per cent would not have attained the required standards.

**3** The required standards will in any case not be enough to ensure that departments meet the new targets for Sustainable Operations on the Government Estate, in particular the targets set for carbon emissions, energy and water consumption. Current performance against these targets is poor.

**4** Various barriers are hindering progress towards more sustainable buildings. These include, in particular:

- the fragmentation of policy responsibility among government bodies for improving sustainable construction and refurbishment on the government estate and the absence of a coherent approach to monitoring progress and ensuring compliance;

- the relatively small scale of many projects – especially refurbishments – and the lack of sufficient knowledge and expertise in sustainable procurement among those departmental staff responsible for them;
  - the widespread perception of a conflict between sustainability and value for money – partly because project teams are failing to assess the long-term costs and benefits of more sustainable approaches; and
  - the failure to specify expected benefits and undertake rigorous post-occupancy reviews to evaluate performance against them and the consequent lack of robust data to inform business appraisals for new projects.
- define the level of performance required on the government estate, and revise and promote the sustainability requirements in the Common Minimum Standards;<sup>1</sup>
  - develop outcome-based performance targets for individual buildings (for example in terms of energy and water use) which departments can include in specifications for construction and refurbishment projects;
  - monitor and report on progress, including monitoring compliance at the project level, to help understand and hold departments to account for performance; and
  - advise departments on the factors to consider when assessing whether it is appropriate for a BREEAM assessment (Figure 5) or alternative assessment method to be undertaken, and commission alternatives to a full BREEAM assessment for use on smaller projects or minor refurbishments.

## Recommendations

5 Our recommendations, presented in full in Appendix 1, are summarised below.

**Improving sustainable construction is a government-wide responsibility and central government departments should take far more action to address the serious and widespread failure to achieve the targets set. Whilst precise responsibilities for sustainable procurement are still to emerge, it is clear that some key organisations including Defra, OGC and possibly DTI have a role for providing leadership and direction on the government estate. Between them these organisations should:**

- establish a clear understanding on the division of policy responsibilities for sustainable construction in the public sector, in such a way as to ensure clear accountability for this area of policy;
- work with other departments with a role in promoting sustainable construction to ensure a joined-up approach;
- establish a source of expertise available to all departments to provide advice on sustainable construction for smaller construction and refurbishment projects;
- identify and promote cost neutral or low cost approaches to help make smaller construction and refurbishment projects on the government estate more sustainable;

### Treasury and the Office of Government Commerce should:

- clarify their guidance on the use of whole life costing, and promote this standardised approach to all construction and refurbishment projects by departments and agencies; and
- ensure that the development of sustainability targets for government under the High Performing Property initiative incorporates appropriate environmental benchmarks and measurement mechanisms.

### Departments and agencies should improve the sustainability of new builds and refurbishments on the government estate by:

- specifying their requirements for environmental performance in terms of outcomes – including carbon emissions and energy and water consumption – in line with the targets for Sustainable Operations on the Government Estate;
- conducting post-occupancy evaluations to assess whether completed construction and refurbishment projects have delivered the specified level of performance;
- using integrated teams in all projects, so that all stakeholders are signed up to the need to deliver sustainability;
- incorporating to a greater extent the ‘Quick Wins’ (products which meet environmental standards at minimal cost) and any other features of sustainable buildings which are cost neutral or have the potential to deliver cost savings in the short term; and
- taking full account of the government’s environmental targets – and the wider social and economic impacts which sustainable buildings can bring – when assessing value for money.

## Value for money potential

6 There is much more that departments can do to demonstrate and achieve value for money through sustainable building on their estates. Some aspects of more sustainable building offer tangible financial savings – for example, savings in energy and water consumption of at least £20 million a year.<sup>2</sup> Other aspects of sustainability are more difficult to value or measure, and work is needed to develop a better framework in which these can be assessed and justified, and to provide data to inform future projects. Some of that additional value may offer direct financial savings in the long run – but other value will come from the contribution departments can make to delivery of the UK’s Sustainable Development Strategy and achievement of related national targets.





# PART ONE

## Departments and agencies are expected to construct and refurbish buildings sustainably

**1.1** ‘Sustainability’ is defined by the UK government as ‘simultaneously delivering economic, social and environmental outcomes’.<sup>3</sup> In practice, it involves a greater emphasis on the environmental implications of policy and business decisions in addition to the traditional focus on economic and social objectives. Individual building projects can have significant environmental and social impacts, and buildings on the government’s own estate can also help or hinder delivery against the UK Sustainable Development Strategy<sup>4</sup> and national sustainability targets, such as a 20 per cent reduction in carbon dioxide emissions below 1990 levels by 2010.

**1.2** While there is no commonly accepted definition of a sustainable building, the defining feature of the concept is a significant reduction in environmental impacts (Figure 1). Thinking on some of the social impacts of buildings, for example the impact on local communities or regeneration, is less well developed than for other aspects, such as disabled access to the finished building. The economic benefits of sustainable buildings can also be considerable: reduced operating costs (through energy and water efficiency) and improved productivity (through the provision of better working environments) are good examples. Sustainability can therefore be seen to be consistent with the Treasury’s definition of value for money as ‘the optimum combination of whole life cost and quality (or fitness for purpose) to meet the user’s requirement’.<sup>5</sup>

**1.3** The sustainability of buildings on the government estate is determined at several stages in their lifecycle (Figure 2 overleaf).

### 1 Environmental features of sustainable buildings

Sustainable buildings can include measures to:

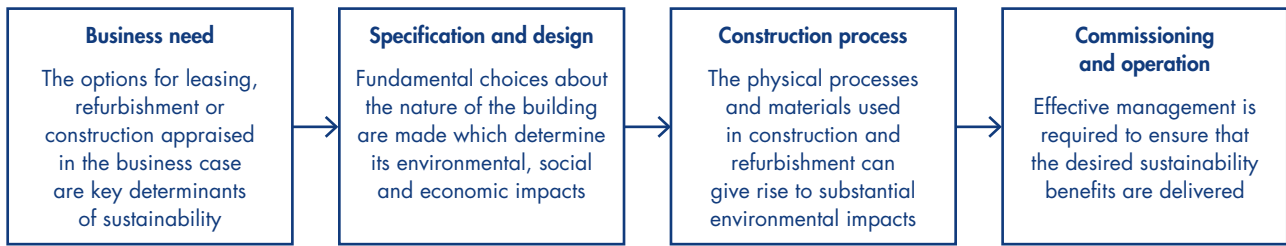
- reduce energy consumption and associated emissions of carbon dioxide;
- minimise the use of resources such as water and construction materials;
- reduce the release of pollutants;
- maximise the use of sustainably sourced and recycled materials (e.g. timber);
- promote sustainable travel choices through public transport and cycling provision; and
- conserve, or enhance, biodiversity.

Source: National Audit Office

## Departments and agencies spend around £3 billion each year on construction and refurbishment

**1.4** Department for Trade and Industry (DTI) data show that central government departments and executive agencies spent £2.3 billion on large-scale construction and refurbishment projects in 2005-06.<sup>6</sup> Refurbishment accounted for 60 per cent of this expenditure (£1.35 billion) whilst construction accounted for 40 per cent (£0.92 billion). However, as the DTI data do not include projects costing less than £2 million, we estimate that departments and agencies spent in the region of £2.8 billion on projects in 2005-06 (of which major refurbishment projects comprised £1.5 billion and construction projects £1.3 billion).<sup>7</sup>

## 2 How building sustainably can reduce environmental impacts



Source: National Audit Office

**1.5** We have examined public sector construction in previous reports.<sup>8</sup> In March 2005 we published *Improving Public Services through better construction*<sup>9</sup> along with an associated volume of good practice case studies.<sup>10</sup> As well as making recommendations to deliver potential annual savings of up to £500 million through the implementation of good practice throughout the public sector, we also recommended that departments should:

- **consider the development of a sustainability action plan** to cover all aspects of construction activity, including specific key performance indicators (such as reduced carbon dioxide emissions and reduced waste to landfill) and monitor their achievement; and
- **make decisions about construction projects based on sustainable whole life value**, in order to demonstrate that they have considered and understand the issues of whole life value involved in a construction project and the opportunities they have to maximise its economic, social and environmental impact.

These recommendations are reinforced by our latest findings as set out in this report.

### Several government bodies share policy responsibility for sustainable construction and refurbishment on the government estate

**1.6** The policy responsibility for sustainable construction and refurbishment on the government estate is split between several government bodies (**Figure 3**), but in future this may be affected by recent developments:

- Responding to the Treasury's launch of *Transforming Government Procurement* in January 2007, the Office of Government Commerce (OGC) will become a smaller, higher calibre organisation.<sup>11</sup> OGC will be given a clear focus to drive better value for money on major complex acquisition projects

and estates management in central government. It will also be given powers to set out procurement standards to be met by departments, challenge performance against the standards, and require inter-departmental collaboration where appropriate.

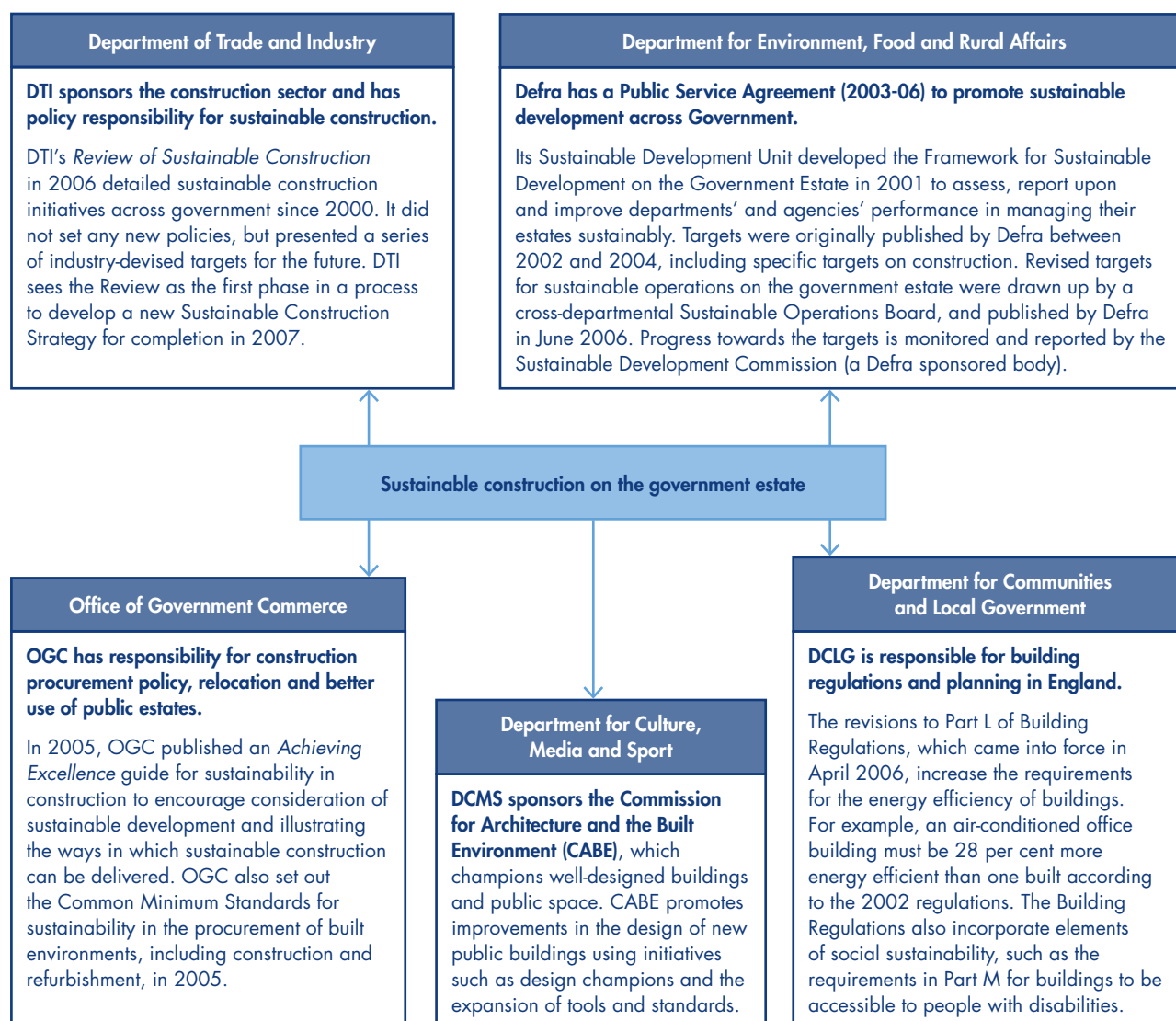
- In March 2007, the *UK Government Sustainable Procurement Action Plan* was launched in response to the recommendations of the business-led Sustainable Procurement Task Force.<sup>12</sup> One of the key goals of the Action Plan is to move towards a sustainably built and managed central government estate that minimises carbon emissions, waste and water consumption and increases energy efficiency; it therefore sets out a series of measures which departments will need to take for construction and refurbishment projects. The Action Plan tackles the issue of leadership for sustainable procurement and aims to put in place lines of accountability and reporting, notably that the Head of the Civil Service will oversee delivery of the Action Plan and report on progress in 2008.<sup>13</sup>

Policy on sustainable construction is also likely to be informed by and reflected in DTI's forthcoming Sustainable Construction Strategy, scheduled for completion in 2007; the Strategy is also likely to influence construction activity on the government estate.

### The performance of buildings on the government estate is increasingly subject to environmental targets and initiatives

**1.7** In 2005, OGC published the Common Minimum Standards for the procurement of built environments in the public sector,<sup>14</sup> which apply to both construction and refurbishment projects. The standards refer to OGC's *Achieving Excellence* guide on sustainability in construction<sup>15</sup> which provides guidance to departments

### 3 Policy responsibility for sustainable construction and refurbishment on the government estate is shared



Source: National Audit Office

on all aspects of sustainability – including economic, social and environmental issues. They also draw together existing environmental policy standards, including:

- the requirement for departments to carry out an environmental assessment on projects using the Building Research Establishment's Environmental Assessment Method (BREEAM) or equivalent;
- the targets under the Framework for Sustainable Development on the Government Estate; and
- the OGC Buying Solutions/Department for Environment Food and Rural Affairs (Defra) 'Quick Wins' specifications for the procurement of a range of construction products.<sup>16</sup>

**1.8** Departments have been required to conduct a BREEAM assessment, or equivalent, on all construction and refurbishment projects since 2002, and from March 2003 all new build projects should achieve a rating of 'Excellent' and refurbishment projects 'Very Good'.<sup>17</sup> The target for the latter was raised in 2006, requiring 'Excellent' BREEAM standards, or equivalent, for major refurbishments as well as new builds.<sup>18</sup>

**1.9** Since 2002, the Framework for Sustainable Development on the Government Estate (Figure 3) has included operational targets covering energy, water, waste, travel, construction and procurement. The revised targets, entitled ‘Sustainable Operations on the Government Estate’, were launched by the Prime Minister in 2006,<sup>19</sup> on the same day as the Sustainable Procurement Task Force published its recommendations to government.<sup>20</sup> While fewer in number, the targets are more demanding in some respects and include requirements to:

- achieve a 30 per cent improvement in energy efficiency by 2020;
- make the central government office estate carbon neutral by 2012;
- reduce water consumption to three cubic metres per person per year for all new office builds or major office refurbishments; and
- reduce waste arisings by 5 per cent, and recycle 40 per cent of waste, by 2010.

**1.10** The drive for sustainable buildings is running in parallel with several other cross-government initiatives; departments and agencies are under other pressures to improve the performance and efficiency of their estate. OGC plays a central role in the coordination of these initiatives (Figure 4).

## How we approached this study

**1.11** In this study, we examined:

- the extent to which departments and agencies are meeting the standards set for sustainable construction and refurbishment on the government estate (Part 2 of this report);
- how departments and agencies evaluate value for money when designing and specifying sustainable buildings (Part 3); and
- whether buildings on the government estate which were designed to be sustainable have delivered the expected benefits (Part 4).

**1.12** Our approach involved gathering information from departments and agencies about all building construction and refurbishment projects under way in 2005-06. This included a wide range of building types: offices, courts, laboratories, storage centres, vehicle testing centres, job centres, detention centres and others. Public buildings such as hospitals and schools, which fall outside the immediate control of departments and agencies, were excluded.

**1.13** We analysed a sample of projects using questionnaires completed by project sponsors, and case studies to explore certain issues in greater detail. We appointed engineering and management consultants Arup to assist us in this work. We also interviewed staff in 18 departments, and consulted a series of stakeholders and experts. Our methodology is set out in Appendix 2. Appendices 3 and 4 provide details of the departments and agencies covered.

## 4 OGC-led initiatives to improve the performance and efficiency of the government estate

- **Gershon Efficiency Review (2004):** Departments are required to deliver 2.5 per cent annual improvements in efficiency from 2005-06<sup>1</sup>, creating pressure to seek cost savings in construction and refurbishment projects.
- **Lyons Review (2004)<sup>2</sup>:** The report noted the concentration of public sector activity in the South East and has set in train a programme for relocating departmental functions to other parts of the country<sup>3</sup>, where refurbishment or new buildings may be required.
- **Property Benchmarking Programme:** This development will enable departments to measure the performance of buildings through a range of key performance indicators covering both efficiency and effectiveness (such as cost per square metre and workplace productivity) and environmental indicators (such as annual water consumption per person and energy consumption per square metre). Data in OGC’s database of government buildings, ePIMS, can be analysed and benchmarked against sectoral, national and international comparators.<sup>4</sup>
- **High Performing Property (2006):** OGC’s *High Performing Property – Routemap to asset management excellence* sets out a comprehensive approach to integrate property asset management into central government’s strategic business delivery. Building operation efficiency benchmarks aim to deliver annual efficiency savings of 20 per cent by 2013 and continuous improvement against sustainability targets.

Source: National Audit Office

### NOTES

1 *Releasing resources to the front line – Independent Review of Public Sector Efficiency*, Sir Peter Gershon, December 2004, [http://www.hm-treasury.gov.uk/media/B2C/11/efficiency\\_review120704.pdf](http://www.hm-treasury.gov.uk/media/B2C/11/efficiency_review120704.pdf).

2 *The Lyons Review, Well Placed to Deliver? – Shaping the Pattern of Government Service*, July 2004, [http://www.hm-treasury.gov.uk/consultations\\_and\\_legislation/lyons/consult\\_lyons\\_index.cfm](http://www.hm-treasury.gov.uk/consultations_and_legislation/lyons/consult_lyons_index.cfm).

3 A relocation portal has been developed to act as an aid in achieving relocation commitments, [http://www.ogc.gov.uk/efficiency\\_recources\\_government\\_relocation\\_portal.asp](http://www.ogc.gov.uk/efficiency_recources_government_relocation_portal.asp).

4 *Property Benchmarking*, [http://www.ogc.gov.uk/documents/OGC\\_Property\\_Benchmarking\\_Pilot\\_Report\\_PDF.pdf](http://www.ogc.gov.uk/documents/OGC_Property_Benchmarking_Pilot_Report_PDF.pdf).





## There is widespread failure to meet targets for sustainable construction and refurbishment

**2.1** This Part of the report describes the extent to which departments and agencies are meeting the targets to make construction and refurbishment activity more sustainable and to carry out assessments of the likely environmental performance of new and refurbished buildings. Our findings are based on our cross-departmental survey and our analysis of a sample of construction and major refurbishment projects in 2005-06.

### Departments and agencies are not assessing the environmental sustainability of projects despite instructions to do so

**2.2** All departments are required to carry out BREEAM assessments (**Figure 5**) or equivalent on new build and major refurbishment projects. We contacted all central government departments and 14 (including their executive agencies) reported that they had embarked upon, or completed, construction or major refurbishment projects in 2005-06. Assessment of what constitutes a major refurbishment is, to a degree, subjective but departments for the most part used a combination of value and the nature of the work to reach their judgements.<sup>21</sup> 10 of these departments had used, or were planning to use, BREEAM assessments on at least one project.<sup>22</sup> However, our analysis of departmental data for all projects under way in 2005-06 showed that the proportion of projects undertaking BREEAM assessments was very low:

- **35 per cent** (37 of 106) new build projects have carried out, or plan to carry out, BREEAM assessments or equivalent; and
- **18 per cent** (61 of 335) major refurbishment projects have carried out, or plan to carry out, BREEAM assessments or equivalent.

Only two of the assessments used an alternative to BREEAM.

**2.3** The low rate of compliance partly reflects the fact that some departments apply a minimum financial threshold for carrying out BREEAM assessments. For example, HM Revenue and Customs only requires BREEAM assessments to be completed on projects with capital construction works in excess of £250,000. In addition, under the Common Minimum Standards, departments are permitted to exercise judgement about each project, and they may decide in some cases that it is not appropriate to conduct a BREEAM assessment.

#### **5** The Building Research Establishment Environmental Assessment Method (BREEAM)

BREEAM was developed by the Building Research Establishment to assess the likely environmental performance of buildings, and can be used on construction or refurbishment projects. Independent, certified assessors conduct assessments in several of the following categories: management; pollution; water; ecology; land use; materials; energy use; transport; and health and well-being. The credits awarded in each area are weighted to produce a single overall score, on which BRE awards a certificate for a BREEAM rating of 'Pass', 'Good', 'Very Good' or 'Excellent'. The assessment takes approximately one week, although the assessors may also provide consultancy advice during the design and specification stages of a project to increase the likelihood of achieving the desired BREEAM rating.

Versions of BREEAM are available for offices, homes, schools, prisons, health centres and industrial units, and bespoke versions can also be developed. BREEAM can be used to assess different stages of a building's life cycle but it is used mostly at the design phase. BREEAM is not a panacea, but it is a helpful tool: by designing a construction or refurbishment project to achieve the desired BREEAM rating, project teams can reduce the likely environmental impacts of the building.

*Source: National Audit Office*

## Departments and agencies are failing to achieve the required assessment ratings

**2.4** Since 2002, all new build projects should achieve an ‘Excellent’ BREEAM rating, while refurbishments should achieve ‘Very Good’. Our analysis of departmental data indicates that where BREEAM assessments are planned or have been carried out for projects under way in 2005-06:

- **38 per cent** (14 of 37) new build projects met (or expect to meet) the required ‘Excellent’ BREEAM rating; and
- **44 per cent** (27 of 61) major refurbishment projects met (or expect to meet) the required ‘Very Good’ BREEAM rating.

These results indicate that, even where BREEAM assessments have been carried out, the majority of projects are still failing to meet the targets. Moreover, performance is worse if assessed against all 2005-06 projects – including those where an assessment was not undertaken. On this basis, only nine per cent of projects (41 out of 441) met the required BREEAM standard. These results conceal considerable variation between departments and some are performing extremely well. Defra, for example, has ensured that all refurbishment and new build projects have achieved BREEAM ‘Excellent’ or equivalent, and several of its buildings have achieved sustainability awards.

**2.5** There has been some improvement in compliance since the requirement to carry out BREEAM assessments was introduced: data compiled by Defra indicates that in 2003-04 only three out of 147 new build projects (two per cent) met the requirement to achieve BREEAM ‘Excellent’ and only six out of 200 refurbishments (three per cent) met the requirement to achieve BREEAM ‘Very Good’.<sup>23</sup> However, the level of improvement is small. This indicates a continuing widespread lack of commitment on the part of departments and agencies to undertake environmental assessments.

## Eighty per cent of projects would fail to meet the required environmental assessment standards

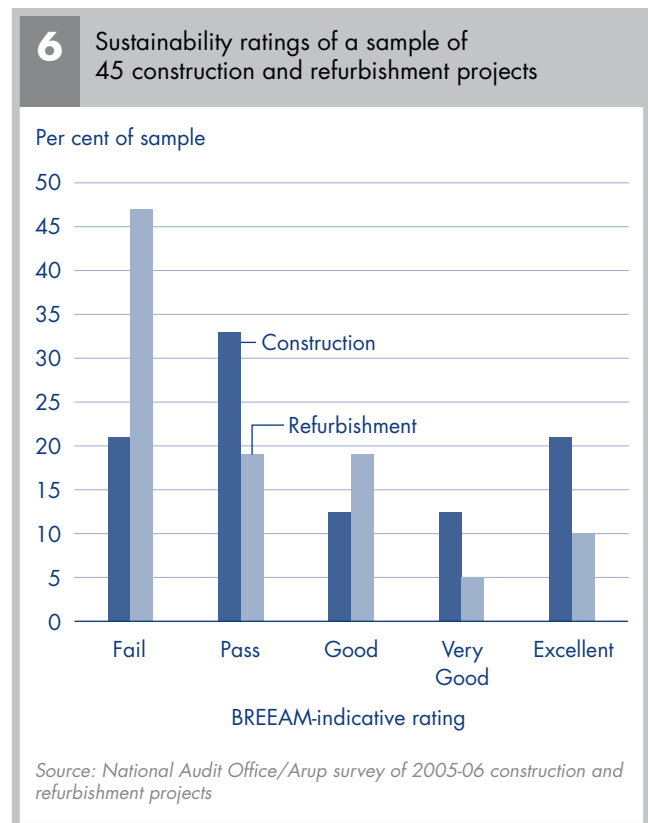
**2.6** The limited use of BREEAM assessments by departments and agencies makes it difficult to assess the sustainability of new build and major refurbishment

projects. With assistance from engineering and management consultants, Arup, we therefore conducted a sample survey of 45 projects on the basis of a questionnaire completed by project sponsors. Our aim was to score projects on a similar basis to BREEAM in order to assess how they might have performed against the BREEAM targets. Scores were correlated with BREEAM assessments, where available, to provide a ‘BREEAM-indicative’ rating (Appendix 2).

**2.7** Our results indicated that 80 per cent of projects in our sample of 45 projects would fail to meet the required environmental assessment standards:

- only **five construction projects** in our sample achieved the target of a BREEAM-indicative rating of ‘Excellent’; and
- only **three refurbishment projects** in our sample achieved a BREEAM-indicative rating of at least ‘Very Good’.

Further details on the ratings of the individual construction and refurbishment projects in our sample are shown in **Figure 6** and **Figure 7**.



**2.8** 79 per cent of construction projects in our sample achieved at least a 'Pass' rating, short of the standard, but indicating that sustainability has been considered in at least some aspects of the project. Refurbishment projects on average perform less well than new build and nearly half of refurbishment projects did not even achieve a 'Pass' rating. The Building Research Establishment commented that it is difficult for some refurbishments to achieve a high BREEAM rating due to the way credits are allocated, although it is still possible to achieve at least a 'Pass' rating.

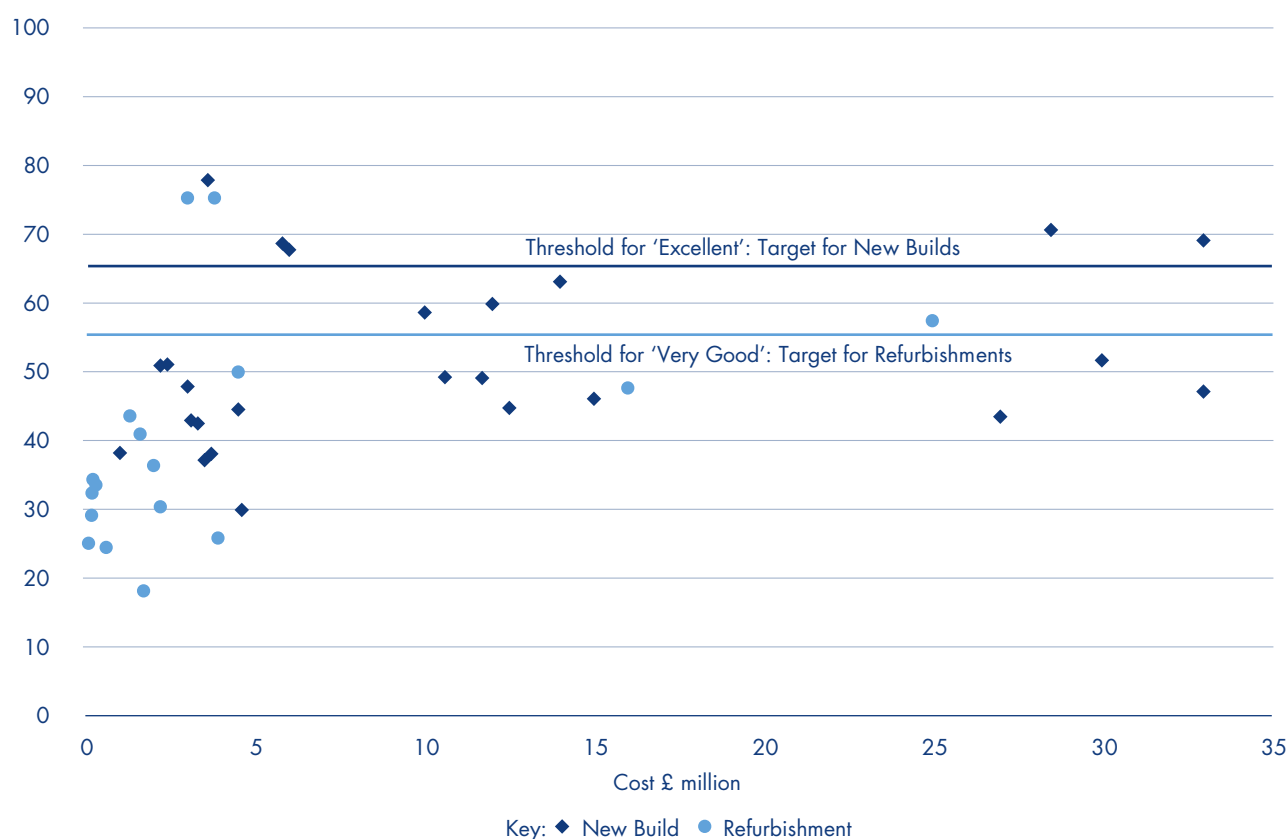
**2.9** Performance across the entire population of 2005-06 construction and refurbishment projects is likely to be worse than these figures suggest. Our sample had a larger proportion of projects which had undertaken BREEAM assessments than the population of all 2005-06 projects, as we received fewer survey responses from projects which had not undertaken BREEAM assessments. Departments

will generally only conduct BREEAM assessments when the project specification states that a particular BREEAM rating must be achieved; environmental issues are therefore included in the design to allow this specification to be met. The bias in our sample towards projects with BREEAM assessments therefore indicates that significantly more than 80 per cent of projects would fail to meet the required sustainability standards.

**2.10** Poor performance can be explained partly by the timescales of construction and refurbishment projects: some projects completed in 2005-06 will have been designed and specified several years ago when standards were less stringent. However, the requirement for departments to carry out BREEAM assessments (along with other environmental standards) was introduced in 2002, so the vast majority of projects in our sample would have been subject to these requirements.

## 7 Project cost and sustainability rating

### BREEAM-indicative rating



Source: National Audit Office/Arup survey of 2005-06 construction and refurbishment projects

## Performance on smaller projects tends to be worse

**2.11** Our sample indicated that the value of the project is closely linked to whether or not an assessment is carried out. Of the thirteen projects in our sample costing less than £3 million, only one had undertaken (or planned to undertake) a BREEAM assessment. We also found that no project in our sample costing less than £3 million would achieve a BREEAM-indicative rating of 'Very Good' or 'Excellent', although some would achieve a 'Good' rating (Figure 7).

**2.12** The higher the project cost, the more likely an environmental assessment; all projects in our sample costing over £5 million had undertaken (or planned to undertake) a BREEAM assessment. This can be explained partly by the higher profile of such projects, and the reputational risk to departments and agencies if minimum standards are not met. Our interviews with departments indicated that larger projects also tend to have more experienced, full-time client project teams – often including individuals with experience in building sustainably – than project managers on small projects.

**2.13** Conducting BREEAM assessments for construction and refurbishment projects comes at a cost, especially if specialist consultancy advice is sought in addition to the assessment. Low-cost projects with tight budgets are less able to absorb this additional cost, whereas the additional cost may constitute only a small fraction of large project budgets. Members of our expert panel suggested that a 'barrier to entry' exists for projects costing less than £1.5 million, largely because the consultancy fees associated with designing a building to meet high environmental standards and gain the appropriate BREEAM rating can be prohibitive for low-value projects.

**2.14** However, several projects with large capital investment failed to achieve a BREEAM-indicative rating of 'Very Good'; as Figure 7 shows, the relationship between the cost of a project and its likely environmental performance is not straightforward.

## The procurement route may affect the scope for considering sustainability

**2.15** There is a widespread perception – reflected in our interviews with departments – that Private Finance Initiative (PFI) projects should offer greater scope to achieve the required BREEAM rating. In PFI projects, procuring authorities examine long-term investment needs and are not constrained by the short-term affordability issues characteristic of capital procurement projects. This gives PFI projects greater scope to consider sustainable options with a higher up-front cost if value for money gains can be achieved over the whole life of the procurement. In contrast, the scope for achieving BREEAM ratings in leased buildings is more limited as the economic interests of the landlord may militate against this.

**2.16** Our sample was not large enough to draw definitive conclusions about the relationship between the procurement route and the sustainability of the building; some leased buildings and PFI projects performed well and some less well. However, the fact that some projects in leased buildings have achieved a BREEAM-indicative rating of at least 'Very Good', does demonstrate that perceived barriers to achieving high ratings in leased buildings can be overcome.

### CASE EXAMPLE 1

#### Defra's refurbishment of leased offices at Whitehall Place achieved BREEAM 'Excellent'

Defra's offices in Whitehall Place are in a Grade II listed building, owned by the Crown Estate. Defra had a long lease on the offices, but they were in need of refurbishment. Largely as a result of its policy responsibility to promote sustainability, Defra wanted the refurbishment to be rated BREEAM 'Excellent' rather than the 'Very Good' standard required at the time. The Crown Estate selected Kier, in consultation with Defra, to redevelop and operate the building under a 'sale and leaseback' arrangement. But there were conflicts of interest between Defra and its landlord. For example, Defra would have preferred a naturally ventilated building, but the landlord insisted that the building should be air-conditioned. The conflicts of interest were managed through discussion, compromise, and the implementation of a 'sustainability charter' which was drawn up prior to the refurbishment project. The offices were redeveloped a cost of £2.1 million, but Defra now leases the property at 75 per cent of the commercial rent.

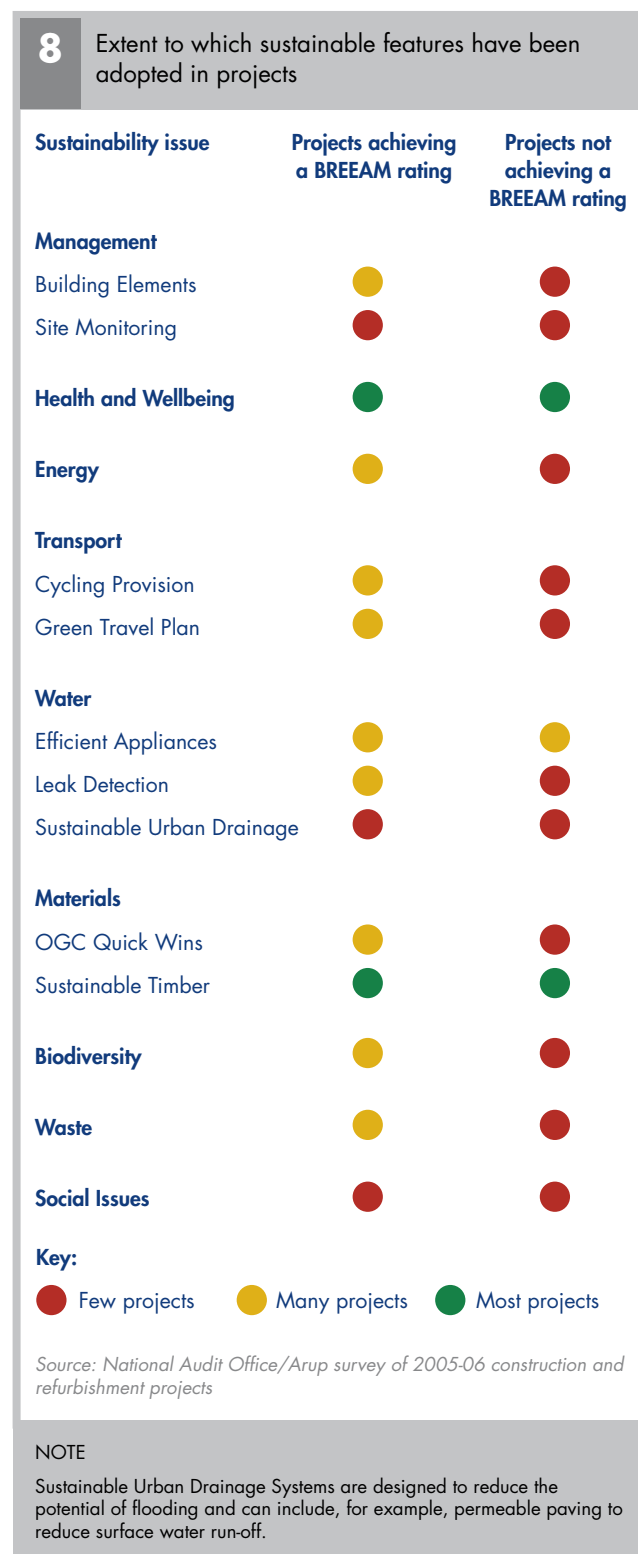


## Some aspects of sustainability are more widely achieved than others

**2.17** Our sample indicated that sustainable features are adopted more widely in some parts of the building design than others (Figure 8). For example:

- **Sustainable timber:** Over 80 per cent of projects used timber that fulfilled the requirements in the Common Minimum Standards for legal and sustainable sourcing.
- **Health and well-being:** In over 80 per cent of our sample, workspaces were within seven metres of a window, allowing users sufficient levels of daylight. In 60 per cent of cases, external windows could be opened to allow fresh air in – a good level of performance as this would not have been appropriate for some types of buildings. Over 85 per cent of projects have air intake systems which avoid major sources of external pollution.
- **Energy:** 87 per cent of the projects in our sample incorporated energy efficient lighting systems and more than half included ‘intelligent’ lighting systems (such as daylight sensors and movement sensors). In 66 per cent of our sample, energy consumption could be monitored throughout the day and night, thus helping to identify where consumption can be reduced.
- **Water:** 80 per cent of projects have installed water meters. To improve water efficiency, 45 per cent have implemented at least one water-saving measure, such as low flush or dual flush toilets, movement sensors on taps and waterless urinals. However, only 36 per cent of projects have included water leak detection and shut-off systems.
- **Transport:** 82 per cent of our sample provided facilities to encourage staff to cycle to work. Although less than half had developed a ‘green travel plan’, 82 per cent of projects were located in areas where public transport was likely to be the main mode of staff transport.
- **Waste:** Almost half (46 per cent) of the projects in our sample had undertaken some recycling of metals or aggregates during the construction or refurbishment process.
- **Biodiversity:** 42 per cent of projects in our sample conducted a biodiversity impact assessment study. All but two of the projects in our sample used existing brownfield sites, rather than greenfield sites, which is likely to have had a lower impact on wildlife.

For many of these features (notably energy, water, transport, waste and biodiversity) the uptake was higher for projects which had carried out a BREEAM assessment (Figure 8).



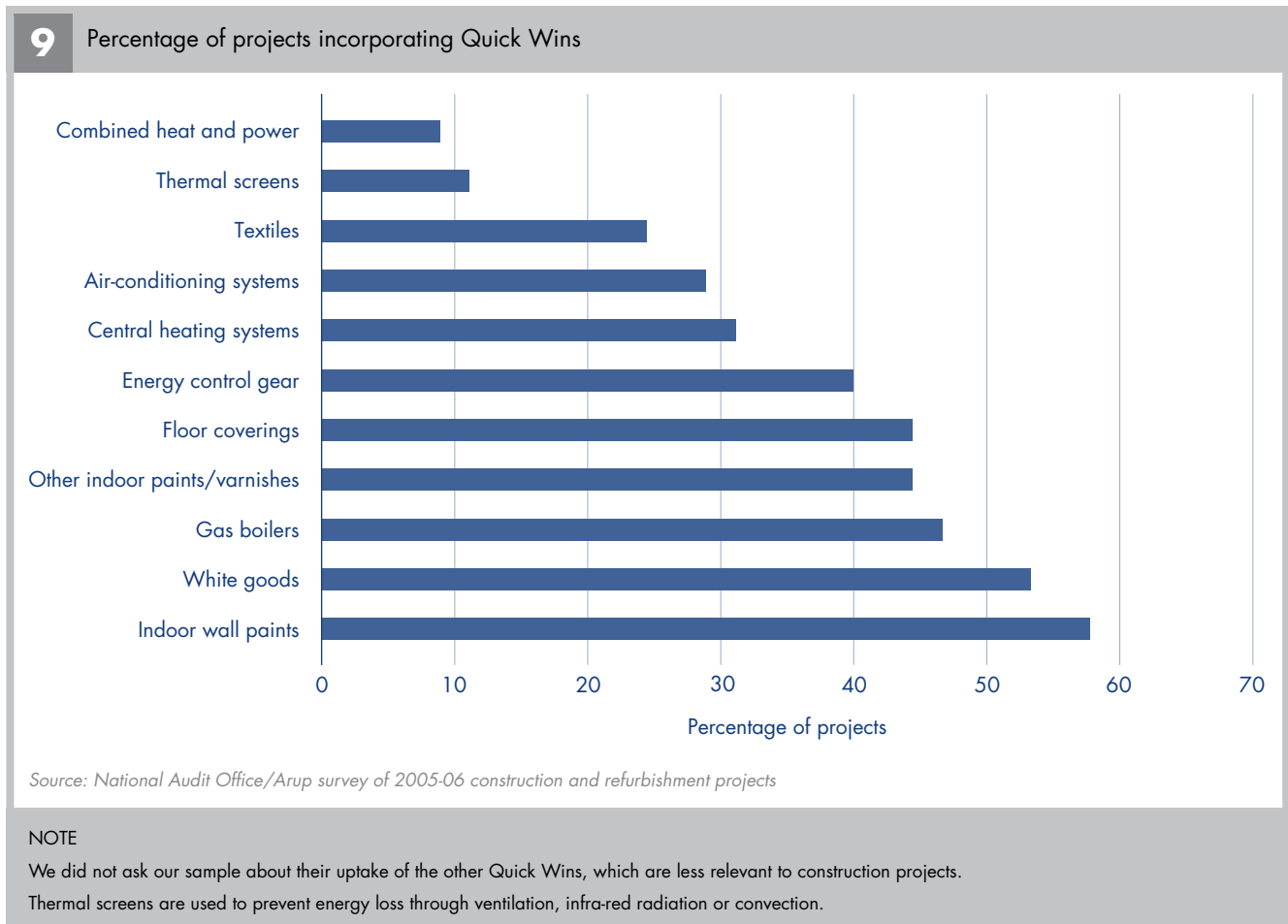
**2.18** Some aspects of sustainability were considered in few buildings in our project sample. These included:

- **Energy generation from renewable sources:** Over 35 per cent of the projects in our sample carried out feasibility studies into on-site energy generation from renewable sources (such as photovoltaic cells, solar water heating, wind turbines and biomass) but only 10 per cent of the projects went on to implement one or more of these technologies.
- **Site monitoring:** Less than 40 per cent of projects monitored the environmental impacts of the construction and refurbishment process itself. Of those that did, energy use and water use were monitored by 38 per cent of projects, and carbon dioxide emissions were monitored by 22 per cent of projects.
- **Social issues:** Less than 40 per cent of projects carried out consultation with the local community, incorporated childcare facilities, or looked to source employees from the local community. By contrast, disabled access – where legal requirements exist – was addressed in 85 per cent of the buildings in our sample.

## Uptake of the ‘Quick Wins’ is limited

**2.19** The ‘Quick Wins’ are specifications for products with lower environmental impacts than standard options, such as energy efficient lighting and refrigeration systems. Their use across the government estate has been mandatory since November 2003. In our 2005 review, *Sustainable Procurement in Central Government*, we recommended that Defra and OGC’s executive agency, OGC Buying Solutions, should do more to encourage the uptake of Quick Wins by departments.<sup>24</sup> Since then, OGC Buying Solutions has set up a website to provide an easy route to suppliers who can meet these specifications,<sup>25</sup> but we found that the Quick Wins are not being used consistently in construction and refurbishment projects.

**2.20** We found, however, that more than half of the projects in our sample used Quick Wins for indoor wall paints<sup>26</sup> and energy efficient white goods,<sup>27</sup> but the uptake of other Quick Wins appropriate for construction and refurbishment projects – such as textiles and air-conditioning systems – is lower (**Figure 9**). Though some refurbishment projects would not require products from all of the Quick Wins categories, this does not fully explain why the uptake of this key initiative is so low.



**2.21** Given the poor sustainability performance of smaller projects, implementation of the Quick Wins should provide a simple approach to improving their sustainability. Yet more needs to be done to ensure that this message reaches the project teams responsible for specifying the constituent elements of projects.

## There are a variety of reasons why departments are underperforming

**2.22** Our results, set out above, demonstrate a serious and widespread failure on the part of departments and agencies to achieve key targets set out in the Common Minimum Standards – including BREEAM assessment ratings, the Quick Wins; and the cross-departmental targets for sustainable operations (including energy and water consumption). We have identified reasons for this underperformance at both the project level and the cross-government level, as follows.

### 2.23 Departments' perceptions of the utility of BREEAM affects the extent to which assessments are undertaken.

In our interviews with departmental project sponsors and facilities managers, individuals in nine departments (half of the departments interviewed) cited perceived difficulties in undertaking BREEAM, including:

- it is expensive: even though the BREEAM assessment process is not in itself expensive (except as a proportion of the costs of very small projects),<sup>28</sup> the cost premium associated with designing a building to achieve a BREEAM rating can be prohibitive;
  - it is more difficult to achieve a high score for refurbishments: some refurbishments are not sufficiently comprehensive to achieve BREEAM credits across all categories in order to achieve a high score;
  - it does not represent best practice: designers can play to the system to obtain a BREEAM rating at minimum cost, regardless of the level of actual environmental benefits;
  - it does not weight sustainability solutions to the relative needs of specific sites or the environmental issues of different regions; and the score is influenced by location, which may be beyond the influence of the design team; and
- it is hard for the project to receive an 'Excellent' BREEAM rating if it is not in an urban setting, primarily because of the environmental impacts associated with travel to and from the site. However, the location of a project is often beyond the control of the project manager.

Our audit analysis and discussions with construction consultancies echoed these views. In particular, BREEAM's credits-based approach to environmental assessment allows departments to select which aspects of sustainability they will focus on to obtain an 'Excellent' or 'Very Good' rating: project teams therefore tend to focus on achieving the credits with the lowest overall cost. But focusing on the cheapest credits means that the sustainability of the finished building may be compromised.

## CASE EXAMPLE 2

### The effect of a rural location on BREEAM rating

Projects can be awarded many 'transport' credits on the basis of proximity to a major transport node. A building located in a central urban location close to a large train station would therefore receive a higher score than an identical building in a rural location. If a project is not in an urban setting, it is harder for the project to receive an 'Excellent' rating without making up the lost transport credits elsewhere – which can require significant investment. Many departments stated that this was unreasonable.

The Building Research Establishment commented that a failure to achieve transport credits would not prevent a well designed project from gaining an 'Excellent' BREEAM rating, as credits that are difficult to attain in an urban setting can be more easily addressed in a rural setting. But, in practice, some departments and agencies have had difficulties. For example, the Air Accident Investigation Branch (part of the Department for Transport) specified that new facilities to be constructed at Farnborough airfield should receive a BREEAM rating of 'Excellent'. But its rural location, with limited access to public transport and an estimated daily commute for staff of 30 miles in total, meant that there are few alternatives to private car use, and few BREEAM transport credits could be achieved. Though shower and changing facilities were provided to encourage cycling, the project could only aspire to a 'Very Good' rating as a result of its location.

### 2.24 Current guidance allows departments considerable flexibility on whether to conduct BREEAM assessments.

Such assessments are required only 'where appropriate', and there is considerable scope for interpreting this in different ways. Some departments, for example, apply minimum financial thresholds while others may base decisions on the nature of the work being carried out. As a result, compliance with the guidance may appear low, and there is a risk that departments may fail to consider the scope for achieving environmental benefits – particularly in the case of smaller projects.

### 2.25 Departments have few alternatives to BREEAM.

Though departments can choose an 'equivalent' assessment, in practice there are few alternatives to BREEAM. Those which exist are based on BREEAM but have been tailored for use in specific sectors. They include the Schools Environmental Assessment Methodology (SEAM), which was developed by the Department for Education and Skills and has now been superseded by BREEAM Schools,<sup>29</sup> and the Defence Related Environmental Assessment Method (DREAM), which was developed by Defence Estates (Figure 10). Unlike BREEAM, these alternative methods rely on self-assessment and do not involve independent certification.

#### 10 Defence Related Environmental Assessment Method (DREAM)

Defence Estates (an agency of the Ministry of Defence) introduced DREAM in March 2006 to measure the environmental performance of new build and refurbishment projects. The assessment covers four key project stages (pre-design, design, construction and operation) and includes issues for which cross-government targets have been set (such as energy, water, waste, travel and procurement). Defence Estates believe that for Defence construction projects the assessment is in line with OGC's Common Minimum Standards. The web-based approach, carried out by Defence Estates nominated assessors, is tailored to Defence construction projects and designed to raise awareness of environmental issues in Defence Estates' project teams.

Source: National Audit Office

**2.26 There is little enforcement of the policies and standards to which departments and agencies are subject, and underperformance goes unchecked.** This is largely due to the fragmentation of policy responsibility for sustainable construction and refurbishment. Though DTI holds the overall policy responsibility for sustainable construction, its focus is working with the construction industry and it has no specific responsibility for performance on the government estate. Similarly, Defra – while responsible for monitoring sustainable operations on the government estate – has no specific remit in respect of monitoring the sustainability of new construction projects. Moreover, though responsibility for procurement policy lies with OGC and responsibility for sustainable development lies with Defra, it is less clear where the responsibility lies specifically for sustainable construction due to the variety of departments with a policy interest in the built environment (Figure 3).

**2.27 There is insufficient leadership on sustainable construction and refurbishment.** More than half of the departmental project sponsors and facilities managers we interviewed indicated that this was the case. The individuals look mainly to Defra and OGC to provide leadership, but criticised both for not doing enough. Both OGC and Defra have issued guidance on different aspects of sustainable construction, but have limited powers to ensure that this is adopted. They may therefore need to go further to support project sponsors and communicate best practice.

**2.28 There is no central point of expertise** on sustainability in construction and refurbishment, and guidance on sustainability issues was described by departmental representatives as 'piecemeal'. Consequently, departments do not share a common understanding of what constitutes a sustainable building. This particularly affected smaller projects, where project sponsors often have little or no experience and expertise in sustainable construction.

**2.29 There is a widespread perception that sustainable buildings cost more.** In our review of sustainable procurement in central government,<sup>30</sup> we identified that many departments were struggling to reconcile the drive for sustainability and the need to deliver efficiency savings in the form of reduced costs. We therefore examine the way in which departments attempt to reconcile the twin objectives of sustainability and value for money in the procurement of their built environments in Part 3.





## PART THREE

## Departments struggle to reconcile sustainability and value for money

**3.1** In this part of the report, we examine the approach adopted by departments to project appraisal and the extent to which they have assessed long-term operational savings which may result from the adoption of environmentally sound building options. We also highlight the wider social and economic costs and benefits which may be involved.

### Key individuals in departments perceive that sustainability conflicts with value for money

**3.2** Our interviews with departmental representatives involved in estate management and building procurement revealed a widespread perception that sustainable buildings cost more and therefore could not be justified on value for money grounds. Common themes included:

- the relatively high capital costs of sustainable options;
- the long payback periods involved; and
- the difficulty of 'spending to save', given budgetary pressures and the separation of capital and operational budgets.

**3.3** While there was some acknowledgement that sustainable options could be justified on the basis of a sound business case, it was clear that officials considered the scope for doing so to be limited. It was also apparent that PFI funding arrangements could offer greater scope to incorporate sustainable options within projects, as the contractor provided the initial capital in return for a share in the resulting savings.

**3.4** These findings from our interviews were supported by the results of our case study analysis reported below, and were reflected in the views expressed by our expert panel.

### Departments are not carrying out appraisals of the balance between sustainability and value for money

**3.5** In order to investigate how departments were assessing the value for money considerations of building sustainably, we examined five projects from our sample in greater depth. We focused on the way in which sustainability options were appraised at the business case stage. Treasury guidance indicates that in assessing value for money departments should take account of whole life costs. This would involve estimating both costs and benefits over long time periods and using standard economic approaches to appraisal, including techniques such as calculating net present values, to assess the cost-effectiveness of options in present day terms.

**3.6** Our key findings from this work were as follows:

- None of the five projects examined considered value for money implications of sustainable building options when developing the business case for the project. Initial business cases generally included 20-25 year cost projections, but these were aimed at achieving approval to spend the capital sums involved. There was relatively little consideration of the trade-offs between capital costs and running costs for the building, or of the impact on these of incorporating sustainable features to a greater degree.
- However, once projects were under way, in most cases both contractors and clients put forward proposals for sustainable options in relation to individual aspects of the project. Innovative approaches were encouraged where client and contractor had a partnering approach to the work.

- The extent to which value for money assessments were undertaken varied. We did not see any explicit appraisals of sustainable options on a whole life costing basis using net present values. In the one case where long term costs and benefits were assessed, the approach was based on years' pay-back rather than net present value. There was also little consistency in the assumptions used across departments for future energy prices.

**3.7** Our 2005 report on construction<sup>31</sup> described the value of whole life costing and recommended that it should be used more widely. Given its importance in terms of promoting a deeper understanding of value for money, we found the results of our case study analysis disappointing as they suggest that there is a continuing failure on the part of departments to implement Treasury guidance<sup>32</sup> in this respect.

**3.8** In the absence of systematic appraisals of costs and benefits, our case examples indicated that the enthusiasm of the project sponsor and the expertise of the contractor were essential in successfully delivering a sustainable building. This was particularly true of 'flagship' sustainable construction projects where the need to adopt such an approach from the outset was paramount. In such cases, the decision to adopt sustainable building options was not usually justified on a value for money basis.

## Departments need clearer guidance on whole life costing

**3.9** Our case study findings raised a number of issues relating to whole life costing. These included the need to ensure a standardised approach, in particular with regard to the key assumptions to be used (such as assumptions about energy prices), the basis for assessment (net present value or payback period), and the timescale over which costs and benefits are evaluated. In particular, the long payback periods involved in some sustainable building options may not be adequately reflected in appraisals based on 25 year discounted cash flows. This may make it difficult to justify the expense of renewable energy options, for example, or other capital-intensive sustainable options such as re-utilising waste water ('grey water') or rain water harvesting.

**3.10** The absence of a standardised approach to whole life costing affects both the public and private sectors. Different organisations have their own approaches, and data is not disclosed for reasons of competitiveness. This also means that there is no robust learning process to inform appraisals more accurately in terms of the benefits which might be delivered.

**3.11** The public sector is in a strong position to lead the way in the development of whole life costing. The Public Sector Construction Clients' Forum has set up a working group specifically to address this issue, responding in part to our recommendations to OGC on whole life value.<sup>33</sup> A central focus of the Forum's work is the clarity of Treasury guidance on whole life costing and the extent to which this might be communicated more effectively to departments; the Forum is now developing a guidance note on whole life costing. Members of the working group are also participating in the development of an international standard on whole life costing, which OGC considers likely to be agreed in 2007.

**3.12** Even where whole life costing approaches are used, there remain wider concerns about the extent to which economic appraisals – in particular, the use of discounting – understate the impact of long-term costs and benefits and militate against incorporating environmental options. In recognition of this, Treasury guidance allows for a stepped reduction in the discount rate for those impacts which are more distant in time.<sup>34</sup> It also points out that departments should take account of impacts which are difficult to quantify in financial terms. The Treasury is therefore producing a simple guidance note for non-expert economists on the meaning of value for money on a whole life costing basis; this will offer an opportunity to assess whether the current approach to appraisal is adequate in view of the scale of environmental challenges we face.

### CASE EXAMPLE 3

#### Construction of house block at Nottingham Prison, National Offender Management Service

Whole life costing of the combined heat and power system concluded that it would not provide value for money: it would be operated for only 12 hours a day and would require 17 hours to make it worthwhile. However, the recent large rises in the price of electricity have improved the commercial viability of such schemes, and the outcome of the appraisal might therefore have been different had forecasts incorporated these higher prices. This highlights the need to appraise critically the key assumptions involved and carry out sensitivity analysis on them.

## Sustainable buildings may have greater capital costs but can have lower running costs

**3.13** Research suggests that the capital costs of building sustainably may be greater, but not significantly so. Analysis conducted by the Building Research Establishment and Cyril Sweett in 2005<sup>35</sup> aimed to challenge the assumption that more sustainable design and construction incurs substantial additional costs. By identifying the costs associated with achieving different BREEAM ratings for a variety of building types, they showed that significant improvements can be achieved for relatively little additional expense (Figure 11). Some examples of the costs associated with measures to gain BREEAM credits and improve the sustainability of an air-conditioned office building are shown in Figure 12 overleaf.

**3.14** While the BRE/Cyril Sweett findings might seem to reinforce the perception that building sustainably costs more, it is important to bear in mind that the operational costs of a building are typically many times the cost of building it.<sup>36</sup> Although the BRE/Cyril Sweett study did not evaluate in detail the whole life costs and benefits of building to higher environmental standards, it highlighted the fact that sustainable building options would result in significant reductions in the costs of water and energy.

### 11 Additional capital costs associated with achieving different BREEAM ratings

Type of building	Additional capital cost to achieve BREEAM ratings of:		
	Good %	Very Good %	Excellent %
Naturally ventilated office	<b>0.3–0.4 saving</b>	2.0	2.5–3.4
Air-conditioned office	0–0.2	0.1–5.7	3.3–7.0
PFI procured health centre	–	0	0.6–1.9
House	0.3–0.9	1.3–3.1	4.2–6.9

Source: Building Research Establishment/Cyril Sweett

#### NOTE

Costs associated with achieving BREEAM 'Good' for the PFI procured health centre were not evaluated.

**3.15** Our case studies revealed several examples where the additional capital costs of sustainable options can be recouped during the life of the building through savings in the cost of energy and water. For example, in the case of the refurbishment of Vehicle Testing Stations by the Vehicle and Operator Services Agency (VOSA, an agency of the Department for Transport), the use of natural ventilation, natural lighting, and a wind turbine will result in significant net savings in financial terms together with large reductions in carbon emissions.

## CASE EXAMPLE 4

### Refurbishment of MOT vehicle testing stations by the Vehicle and Operator Services Agency

#### Natural ventilation

Passive stack ventilation (using chimneys) can be used for natural ventilation cooling rather than mechanical ventilation systems. VOSA estimated that, at the Leeds testing station, a traditional air-conditioning system for the front office would cost £5,000 to install and £450 per year to run, whereas a natural ventilation system would cost £6,000 with zero running costs. Natural ventilation would therefore recoup the additional capital cost in about two years, and also reduce carbon emissions by 2.5 tonnes per annum.

#### Natural daylight

The test stations currently use side windows and electric lighting, but lighting levels are poor. Including sky-lights, which have a minimal capital cost, increases average daylight levels considerably and allows more efficient use of electric lighting. Together with the installation of low energy lighting systems, VOSA estimated that over 25 years this approach saves £12,000 in energy costs<sup>1</sup> and reduces carbon emissions by 2.5 tonnes.

#### Installation of wind turbines

The feasibility of installing wind turbines at some sites was investigated where the location was suitable. The analysis of this option at the testing station in Grantham showed that:

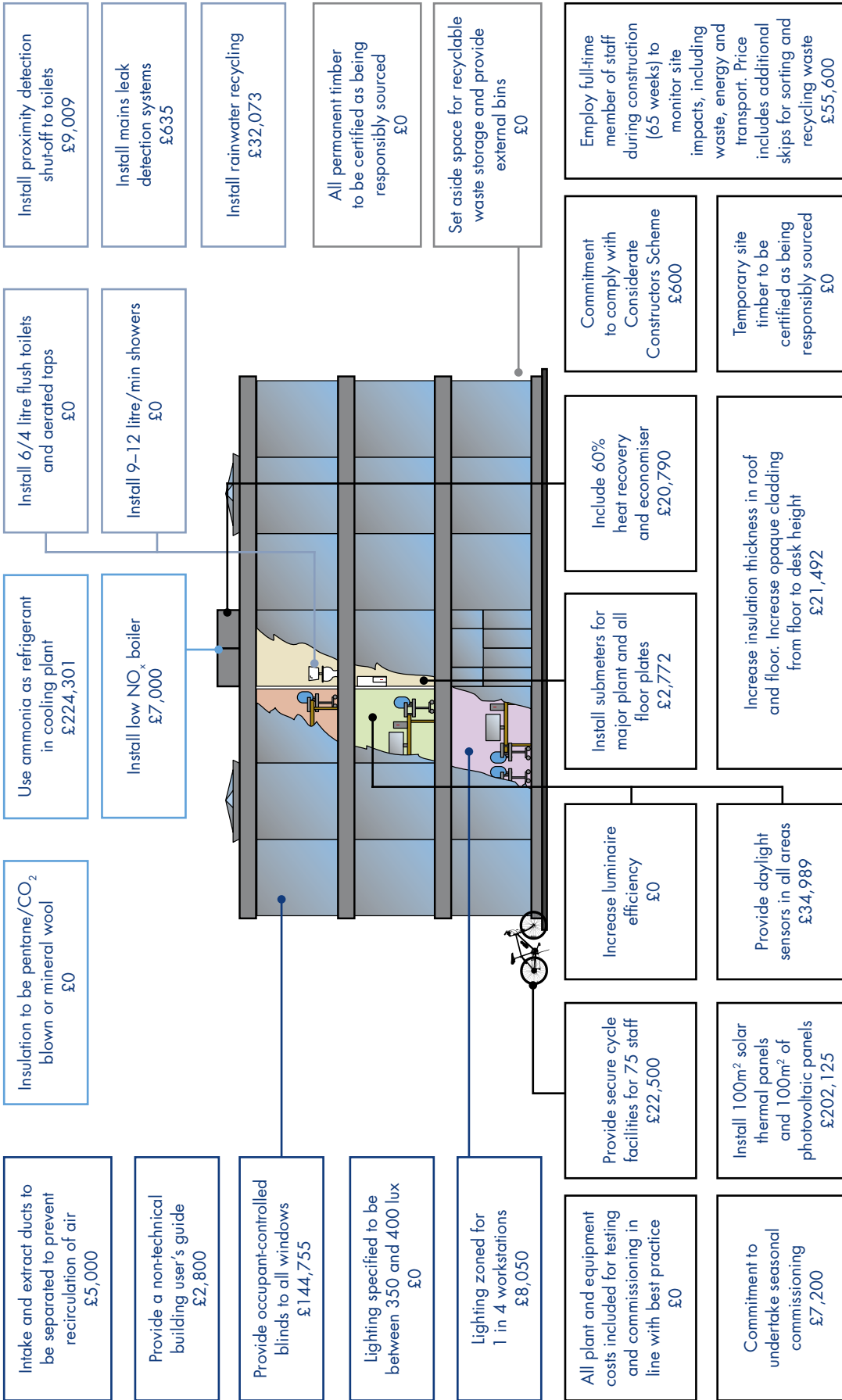
- A unit generating approximately 13,000kWh of electricity per annum would reduce the forecast electricity bill for the station by £1,040 per annum at current electricity prices, and a small surplus of electricity worth £430 per annum could be sold back to the grid;
- At a capital cost of £24,200 and maintenance of £250 per year, the wind turbine would result in a simple payback of 18 years (though this would be reduced if electricity prices increase); and
- A reduction of 5.6 tonnes of carbon dioxide would also be achieved.

So far, VOSA plans to fit wind turbines at two stations: Grantham and Newcastle.

#### NOTE

<sup>1</sup> Estimating that electricity costs will increase at the general rate of inflation.

**12** Additional capital costs for implementing sustainability features in a small-to-medium sized office at the design stage



Source: Building Research Establishment/Cyril Sweett

**NOTE**

These figures are based on an air-conditioned office with a capital cost of £11,430,000 and gross floor area of 10,098m<sup>2</sup>.



**3.16** We have also highlighted in Part 2 of this report the potential for making greater use of the Quick Wins. These represent obvious areas, albeit on a smaller scale, where project teams can use product substitution to achieve environmental objectives at no extra cost. The evidence provided to us by the Waste and Resources Action Programme (WRAP) also indicated that the use of recycled materials could result in savings. For example, WRAP identified that Defence Estates' £1 billion barracks building programme for single living accommodation modernisation could increase its recycled content from 18 to 23 per cent with no increase in cost or risk; Defence Estates is therefore using WRAP's web-based tool to work towards this improvement.

**3.17** However, our results also showed that the extra capital costs of some sustainable building options can sometimes prevent their adoption. For example, when the budget for the construction of a house block at Nottingham Prison was reduced from £14.5 million to £12.4 million, the specification for some options (such as grey water recycling and solar water heating) was removed – with the result that the project only achieved a BREEAM 'Pass' as opposed to the originally specified 'Very Good' rating.

**3.18** Where sustainable options are not integral to the design, it can be particularly easy to remove them again if there is downward pressure on capital budgets. By contrast, where sustainability is incorporated at a more fundamental level within the initial project design it can be difficult to evaluate the extra costs involved. It is even possible that savings in capital costs can be achieved, as the case examples in Part 4 show.

**3.19** In 2004, the Carbon Trust set up a company (Salix) to provide ring-fenced loans for investment in energy efficiency measures, matched by local authority funding, to be repaid from the efficiency savings which would result. The scheme therefore helps local authorities to implement 'spend to save' projects and overcome the barriers arising from limited capital budgets and the low priority assigned to energy efficiency projects. In 2006, the government significantly increased Salix's funding and extended its remit to include central government and the wider public sector.<sup>37</sup> However, financial barriers and accounting issues – particularly in relation to borrowing and the use of revenue savings to repay loans – may limit the extent to which departments can access the Salix fund, and the government is therefore setting up a high level steering group to address barriers to investment.

## Departments are not evaluating wider impacts despite the potential for large savings

**3.20** In addition to the obvious and direct costs and benefits of a building, there are other costs and benefits which are more often than not excluded from departments' evaluations – notably environmental and social impacts. The benefits of reducing a building's greenhouse gas emissions, for example, tend not to be included, even though the benefits to society of doing so can be estimated easily using the 'social cost of carbon'.<sup>38</sup> However, there is no standard approach to quantifying other social and environmental impacts – such as the social benefit of sourcing goods and services locally, which boosts the local economy whilst reducing the carbon emissions associated with transport. As these impacts cannot be quantified easily, they are not included in evaluations of building more sustainably. OGC consider that there is a further barrier in that whilst these wider impacts can be considered as part of construction projects, under European Union rules only social and environmental benefits to the contracting authority can be taken into account in the procurement process. European Union procurement law also prohibits discrimination against suppliers from other Member States, so procurers cannot discriminate in favour of local suppliers.

**3.21** Our case studies indicated that wider economic impacts were also not always evaluated. Better buildings can have significant impacts on staff working within them and their productivity. Only one of our five case examples attempted to take this into account. The financial benefits resulting from improved working environments can be significant. The costs of sickness absence in the Civil Service, for example, amounted to £450 million in 2005. Even a very small reduction in this figure, as a result of a better working environment, would yield considerable savings; while substantial further savings could result from an improvement in the productivity of staff while at work. These benefits are not exclusive to sustainable buildings, but recognising and quantifying them may make it easier to justify sustainable options such as natural lighting and ventilation.

### CASE EXAMPLE 5

#### Driver Vehicle and Licensing Agency's approach to quantifying increases in productivity

For the refurbishment of offices in Swansea, the draft Benefits Delivery Plan called for the refurbishment to achieve a one to five per cent improvement in productivity. But this was omitted from the final document on the grounds that it would be difficult, if not impossible, to attribute any productivity gains to those features of the refurbished building that the contractor would be responsible for, primarily because of the large number of IT and business changes made at the same time.



## Departments need to use specific output-related targets to achieve environmental objectives

**3.22** The current requirement to achieve an ‘Excellent’ BREEAM rating is based on the presumption that sustainability should become a fundamental aspect of project design. In some specific areas, the government has also accepted that environmental objectives are of overriding importance. In September 2000, for example, the Prime Minister announced that all timber used in construction contracts would be procured from legal and sustainable sources.<sup>39</sup> This requirement transcends any cost-benefit analysis and has become successfully embedded within project specifications, as described in Part 2.

**3.23** Our interviews with departments, and our analysis of case studies, revealed a gap between existing policy requirements and the targets to which departments are subject. Though the Common Minimum Standards set out that projects must take account of the departmental targets for sustainability,<sup>40</sup> many projects simply set an output specification for BREEAM ‘Excellent’ or ‘Very Good’ to be achieved. This will not be enough to allow departments to meet the stringent requirements in the revised targets for Sustainable Operations on the Government Estate.<sup>41</sup>

**3.24** These new targets appear particularly stretching when viewed in the light of current performance. For example, the Sustainable Development Commission reported in 2005-06 that more than half of departments had failed to increase the energy efficiency of their buildings, and are very far from meeting the target of a 15 per cent improvement in energy efficiency by 2010 and 30 per cent by 2020. Similarly, 11 departments failed to meet the 2004 target for water consumption, which – at 7.7 cubic metres per person per year – is more than double the level of the new target (**Figure 13**).

**3.25** If departments are to make progress towards achieving the targets for Sustainable Operations on the Government Estate, they will need to focus increasingly on incorporating specific output-oriented specifications in new construction or major refurbishment projects, rather than simply specifying a requirement for BREEAM ‘Excellent’. These should include specifications for water consumption per person per year and for energy consumption and carbon emissions per square metre. Such an approach would also match the trend towards more specific assessments of building performance, such as the forthcoming requirement under the Energy Performance of Buildings Directive for all public buildings to display energy efficiency ratings.

### 13 The need for new technologies to meet targets on water consumption

Unlike energy use, the financial incentives to drive down water usage are weak. However, the stringent operational sustainability targets means that departments and agencies must significantly reduce their water consumption. Departments’ facilities managers and project sponsors feel that the required reductions in water use cannot be met using water-efficient approaches (such as low-flush toilets) and education alone: there is a need to include additional water-saving technologies such as grey water recycling (or to retrofit such technologies to existing buildings) to meet the targets for Sustainable Operations on the Government Estate. Even though measures such as this were mostly deemed not be financially viable at the time of recent projects, and therefore not included, they are now seen to be essential if the targets are to be met.

*Source: National Audit Office*



## Sustainable buildings can deliver tangible benefits but these need to be managed

**4.1** Performance review is an essential part of effective project management in construction; evaluations on completion of a project should look at whether the original assumptions have been borne out in reality, identify any lessons for the future and check whether the project has yielded the expected benefits.<sup>42</sup> In this part of the report, therefore, we examine the extent to which a selection of case example buildings, which were designed and built (or refurbished) to be sustainable, have delivered the benefits expected of them.

### Departments tend not to define clearly the benefits expected of a sustainable building

**4.2** In reviewing a series of case examples, we saw that buildings designed to be sustainable have delivered tangible economic and social benefits as well as reducing environmental impact (**Figure 14 overleaf**). Our case examples indicated, however, that departments tend not to define clearly at the design stage the benefits they expect from building sustainably. In particular, their specifications lacked quantitative targets against key performance indicators (such as annual water consumption per person), which are necessary for the assessment of post-occupancy performance against expectations. Instead, the specifications mostly set a requirement for a high BREEAM rating to be achieved, rather than defining the benefits which the building would go on to deliver over the life of the building. In the absence of these defined expected benefits, we were unable to appraise whether the intended benefits had been delivered.

### The benefits of sustainable buildings are generally not measured or quantified

**4.3** Post-occupancy evaluation of construction and refurbishment projects is a well recognised and powerful tool for bringing about improvements in building design and operation. However, our case examples indicated that departments often do not conduct such evaluations. They are therefore missing opportunities to assess whether the buildings have been built in accordance with their specification, are functioning as well as they might, and are meeting departments' expectations. Our expert panel, and the construction consultancies we interviewed, confirmed that post-occupancy evaluations were significantly underutilised by government bodies, and that this results in a lack of robust data to inform business appraisals for new projects.

**4.4** The requirement for project evaluation is incorporated within OGC's Gateway Review process. Gateway 5 (Benefits Evaluation) is mandatory for all major procurement projects<sup>43</sup> and OGC states that figures for the year to June 2006 show an improvement in the general uptake of Gateway 5 evaluations. However, Gateway 5 is not tailored to the procurement of buildings and may not, therefore, reveal as much as a more specific review. A consortium of construction interests, sponsored by the DTI, has developed a post-occupancy evaluation method tailored to the first twelve months of a building's occupancy, with the aim of promoting the more widespread uptake of post-occupancy evaluation.<sup>44</sup>

## 14 Examples of actual and anticipated environmental, economic and social benefits identified in case examples

### Environmental benefits

- Minimised energy use reduces emissions of greenhouse gases (notably carbon dioxide)
- Reduced impacts on, or enhanced, biodiversity

Treasury: Refurbishment of headquarters in Horse Guards Road (BREEAM 'Excellent')

- Approximately 80 per cent of building is naturally ventilated<sup>1</sup>
- Internal courtyards allow warm air to leave the building; they also act as informal meeting areas and provide natural light for work areas
- High summer temperatures have proved challenging, but the system generally works well: low-energy buildings can run just as effectively as standard buildings

Defence: Construction of Welbeck Defence Sixth Form College (SEAM 'Excellent'<sup>2</sup>)

- No trees removed from the site and sports pitches retained many of their natural hedges to mitigate the potential negative impacts of the construction on wildlife
- Green roofs were installed on some of the College buildings to contribute to site biodiversity and demonstrate Defence Estates' commitment to sustainability to the public and pupils; the watertight green roof also acts as an insulating layer to prevent the loss of heat from the buildings

### Economic benefits

- Reduced energy and water consumption reduces running costs
- Increased staff productivity in good working environments
- Reduced cost of raw materials by reusing construction waste
- Reduced cost (and environmental impact) of disposal in landfill
- Increased market for recycled goods

Department of Communities and Local Government: Facilities management at Eland House (BREEAM 'Very Good')

- Ashdown House, Eland House and Riverwalk House have a combined annual electricity and gas cost of £623,000; Facilities Management contractors, Mitie, identified measures to save energy and reduce running costs
- Measures costing less than £11,000 could save over £28,000 and 300 tonnes of carbon dioxide per annum
- Some measures can be implemented immediately at no cost to the department; some already applied at Eland House (such as reducing boiler operating hours and temperatures)

Treasury: Refurbishment of 1 Horse Guards Road (BREEAM 'Excellent')

- Well-being survey in 2003 measured health, stress and productivity perceptions of staff in the new building; over 75 per cent of respondents said they were more productive in the new building than previous workspaces

Home Office: Construction of building at Marsham Street (BREEAM 'Excellent')

- Reused 50 per cent of the existing buildings' steel and hardcore
- 8,400m<sup>3</sup> crushed concrete reused in the foundations of the new building

Defra: Refurbishment of headquarters at Nobel House (BREEAM 'Excellent')

- 70 per cent recycling of strip-out and construction waste
- Carpet tiles with 80 per cent recycled content for use throughout the building

### Social benefits

- Positive impacts on health and wellbeing
- High levels of comfort and user satisfaction; increased natural lighting provides a pleasant working environment

Treasury: Refurbishment of 1 Horse Guards Road (BREEAM 'Excellent')

- Levels of staff stress have decreased significantly since the 2000 stress audit
- Staff turnover fell from over seven per cent in 2001 to under five per cent in 2003
- Sickness absence fell from 5.2 days in 2001 to 3.1 days in 2003<sup>3</sup>

Home Office: User satisfaction at Marsham Street (BREEAM 'Excellent')

57 per cent of staff at the new Marsham Street office either agreed or strongly agreed that their physical working environment allowed them to work effectively and comfortably (seven per cent increase since 2004 survey) (Home Office survey, 2005)

Source: National Audit Office

### NOTES

- 1 Air-conditioning has been introduced in computer rooms and in areas where open windows near to busy roads would increase ambient noise levels and be a nuisance to building users.
- 2 SEAM is the Schools Environmental Assessment Methodology, developed by the Department for Education and Skills.
- 3 OGC question any direct causal link between behavioural changes and building design; however, 'consistent indications of an improved sense of well-being, especially in areas related to the vision and aims of the project do suggest that the improved accommodation is having a beneficial impact'. OGC, HM Treasury Building in mint condition, 2004.

**4.5** Our case examples also indicated weaknesses in routine monitoring and benchmarking of building performance in terms of measures such as energy and water consumption and waste for disposal. Accurate monitoring is essential for departments to report progress against the targets for Sustainable Operations on the Government Estate and to identify opportunities for reducing operational costs. Participation by departments in the OGC Property Benchmarking Programme was voluntary until mandated under the targets for Sustainable Operations on the Government Estate in June 2006, and the dataset is therefore incomplete. For measurement and benchmarking to be fully comprehensive, all departments will need to make use of the Property Benchmarking service.

## The most sustainably-designed building can still be unsustainable

**4.6** Our expert panel and the stakeholders we interviewed were keen to emphasise that sustainably-designed buildings can still be unsustainable if they are not operated and used in accordance with the design: both the managers and the users of a building can affect its operational performance.

**4.7** Facilities managers in several of our case examples explained that the attitude and behaviour of building users is an important determinant of a building's performance. When building users at the Department of Communities and Local Government's Eland House made manual adjustments to heating and ventilation systems, for example, this reduced the overall performance of the systems and increased the energy demands for temperature regulation. It is therefore important that building users are educated about how they can ensure their own comfort by helping their working environment to function optimally. For example, the facilities management team at the Home Office's building in Marsham Street communicates information about sustainable practices within the building through its intranet and flat screen televisions installed around the building. In several of our other case examples, however, we identified a need for better information sharing with users.

**4.8** We saw in some of our case examples that schemes to incentivise facilities management teams can also improve the building's performance. For example, the Treasury and its PFI contractor, Exchequer Partnership, have agreed a 'gain share' scheme by which any savings made for reduced energy consumption are shared. This acts as a performance incentive for both parties.

**4.9** Two of our case example buildings illustrated the difficulties faced by new contractors when running a sustainably-designed building: after several years of operation, the handover of responsibility to a new company resulted in the loss of organisational knowledge about the how the building should best be run. The BREEAM assessment awards credits for the creation of a detailed operations and maintenance manual produced at the design stage; departments and agencies should specify their requirement for such a manual to militate against the loss of knowledge about the technologies introduced to increase the sustainability of the building.

## Integrated teams increase the chances of benefits realisation

**4.10** Early contractual involvement of facilities management teams during the design phase and advance planning of the building's handover and commissioning are essential. Our case examples indicated that buildings are operated in accordance with the design if facilities management teams are involved throughout construction and refurbishment projects. In the Treasury, for example, early and ongoing dialogue between the refurbishment team and the facilities management team was helpful in this respect.

**4.11** Similarly, we observed the benefits of bringing together all of the building project's stakeholders in an 'integrated team', including the department's project sponsors, designers, building contractors, and the facilities management team, as used by Defence Estates in the construction of Welbeck Defence Sixth Form College. In particular, those with key design responsibility for sustainability need to be involved early in the process. Where all stakeholders were involved throughout the project, and where all stakeholders understood that sustainability was a key objective, we observed that:

- the building was built in accordance with the design (i.e. that the contractor adhered to the design, rather than substituting cheaper alternatives);
- the finished building was managed and operated in accordance with the design (i.e. that facilities management teams understood how the building was designed to work); and
- greater consideration was given to the whole life cost implications of design options, as architects and cost consultants were working as part of a team; this was particularly true of PFI projects, where the importance of whole life cost considerations is heightened.

We saw at the Treasury, for example, how these benefits were achieved where a PFI team successfully brought together the project team responsible for the refurbishment and the facilities management team responsible for the operation of the building.

## New technologies do not always deliver the anticipated benefits

**4.12** Our case examples indicated that there are risks associated with using innovative (and sometimes untried) technologies in sustainable buildings; they do not always work as planned, and may not deliver the anticipated benefits (as seen with the use of solar screens and combined heat and power (CHP) at Eland House). However, the individuals we spoke to in departments recognise that government bodies can lead by example to demonstrate that new technologies work – as seen with the use of chilled beams in Eland House – and thus open up the market for new approaches.

**4.13** Our review of 2005-06 projects indicated that some departments and agencies are exploring options for on-site energy generation, using technologies such as wind turbines and photovoltaic cladding (to generate solar power). These visible statements of 'green intent' do much to demonstrate commitment to sustainability, sending a powerful signal to both the market and the public, and also help departments to meet targets to reduce their carbon emissions.<sup>45</sup> But departments should be aware that greater impacts can sometimes be achieved by adopting less visible approaches. Steps to reduce energy consumption – such as using natural and passive ventilation rather than air-conditioning where appropriate<sup>46</sup> – may be a better option than on-site energy generation. Much will depend on the nature of the building and its location. Government bodies should therefore ensure that options are evaluated effectively in all cases.

## CASE EXAMPLE 6

### Use of innovative designs at Eland House

The specification for Eland House, drawn up by the former Department of the Environment in 1996,<sup>1</sup> indicated that the building should achieve the highest possible environmental standards. Some of the innovative approaches to reduce energy consumption did not deliver the anticipated benefits:

- **CHP** was a new technology at the time, though one which the department was keen to encourage. But as Eland House is a reasonably efficient building, there is limited scope for using the heat produced by the CHP system.
- **Movable solar screens** on the sides of the building were designed to adjust the level of sunlight in the building, thereby reducing the need for cooling in warmer months. But the noise and disturbance of the operation means they are only adjusted several times per year.

Despite the problems with these approaches, other innovative technologies implemented at Eland House were successful, and have now become more mainstream approaches:

- **Chilled beams** on the ceilings were used for the first time in London. This energy efficient cooling mechanism generated significant interest, with many visitors coming to Eland House to view the approach taken.
- **Low-flush toilets:** although regulations to reduce flush volumes were not introduced until 2001<sup>2</sup>, Eland House adopted low-flush toilets throughout.

Source: National Audit Office

### NOTES

1 Eland House is now occupied by the Department for Communities and Local Government.

2 Regulations introduced in 2001 stipulated that flush volumes should not exceed six litres. Department for Environment, Food & Rural Affairs, Water Supply (water fittings) Regulations 1999: WC Suite Performance Specifications, <http://www.defra.gov.uk/environment/water/industry/wsregs99/wcspec/index.htm>.



# APPENDIX ONE

## Detailed recommendations

**Recommendation 1:** Departments and agencies should improve the sustainability of new builds and refurbishments by:

- specifying their requirements for environmental performance in terms of outcomes, including carbon emissions, energy and water consumption in line with the targets for Sustainable Operations on the Government Estate. For example, specifications for new office buildings should require a water consumption level of three cubic metres per person per year.<sup>47</sup> Departments should not simply specify a BREEAM rating as a proxy for environmental performance; and
- conducting post-occupancy evaluations to assess whether completed construction and refurbishment projects have delivered the specified level of performance.

**Recommendation 2:** Departments and agencies should employ integrated teams to deliver construction and major refurbishment projects. Integrated teams should:

- comprise department or agency clients, designers, building contractors, and specialist suppliers and consultants, all of which should be signed up to the need to deliver sustainability in the project;
- ensure that all of the aspects of sustainability included in the original design are delivered, i.e. that 'value engineering' does not result in less sustainable product substitutions or the removal of sustainable design criteria on grounds of cost; and
- engage, throughout the project, those responsible for running the building, in order that the building is sustainably managed and operated in accordance with the design.

**Recommendation 3:** Departments and agencies should implement to a greater extent the 'Quick Wins' and consider adopting other features of sustainable buildings which are cost neutral or have the potential to deliver cost savings in the short term. These might include:

- specifying that buildings should be naturally ventilated rather than air-conditioned, where appropriate, to reduce energy bills and contribute to the goal of a carbon-neutral government estate by 2012;<sup>48</sup>
- accommodating seasonal fluctuations in ambient air temperature, as specifications for building temperature control to within 1°C create unnecessary energy demands for heating and cooling; additional contract flexibility will deliver immediate cash savings; and
- specifying that construction waste is recycled on-site, where possible, to reduce the cost of raw materials, and specifying that materials with recycled content should be used in construction; both measures assist in reducing the volume of waste sent to landfill.

**Recommendation 4:** Departments and agencies should develop a deeper understanding of value for money which takes full account of the government's environmental targets and the wider social and economic impacts which sustainable buildings can bring; in particular:

- exploiting the existing scope afforded by Treasury guidance to take account of whole life costs, including the long-term operational savings which can be achieved by adopting a more sustainable approach; and
- identifying wider potential impacts of sustainable buildings (such as the benefits which can be achieved through reductions in sickness absence and increased productivity) and including these impacts in their options appraisals.

**Recommendation 5:** Improving sustainable construction is a government-wide responsibility and central government departments should take far more action to address the serious and widespread failure to achieve the targets set. Whilst precise responsibilities for sustainable procurement are still to emerge, it is clear that some key organisations including Defra, OGC and possibly DTI have a role for providing leadership and direction on the government estate. Between them these organisations should:

- establish a clear understanding on the division of policy responsibilities for sustainable construction in the public sector, in such a way as to ensure clear accountability for this area of policy;
- work with other departments with a role in promoting sustainable construction to ensure a joined-up approach;
- establish a source of expertise available to all departments to provide advice on sustainable construction for smaller construction and refurbishment projects;
- identify and promote cost neutral or low cost approaches – which nonetheless provide whole life value – which build on the Quick Wins to help make smaller construction and refurbishment projects on the government estate more sustainable;
- define the level of performance required on the government estate and revise and promote the sustainability requirements in the Common Minimum Standards;
- develop outcome-based performance targets for individual buildings (for example in terms of energy and water use) which departments can include in specifications for construction and refurbishment projects, which will help departments meet the targets for Sustainable Operations on the Government Estate; and
- monitor and report on progress, including monitoring compliance at the project level, to help understand and hold departments to account for performance.

**Recommendation 6:** Defra and OGC should also:

- advise departments on the factors to consider when assessing whether it is appropriate for a BREEAM assessment or alternative assessment method to be undertaken, particularly for refurbishment projects, as a basis for promoting greater uptake and rigorously assessing departmental performance. The factors to consider should be broader than financial thresholds, and the range of assessment methods more flexible, in order to capture all cases where significant environmental benefits might be achieved; and
- commission lighter-weight alternatives to a full BREEAM assessment, for use on smaller projects or minor refurbishments. This might involve, for example, a user-friendly web-based tool which would be less onerous than a full BREEAM assessment, and could build on Defence Estates' work in developing its own environmental assessment tool.

**Recommendation 7:** The Treasury and OGC should:

- clarify their guidance on the use of whole life costing, and promote this standardised approach to all construction and refurbishment projects by departments and agencies; and
- ensure that the development of sustainability targets for government under the High Performing Property initiative incorporates appropriate environmental benchmarks and measurement mechanisms.

# APPENDIX TWO

## Methodology

This study considered the construction and major refurbishment of buildings by central government departments (both in Whitehall and other regions) and some executive agencies. This allowed us to align broadly our coverage with that of the sustainability targets set for government departments, and with government's own reporting of its progress, kept the number of audited bodies to a manageable level, and excluded parts of the public sector outside our remit.

This report draws on a wide range of sources of evidence, including literature and data review, interviews with departments, a survey of construction and refurbishment projects on the government estate in 2005-06 and analysis of a sample of projects, detailed analysis of case example projects, consultation with a variety of stakeholders and an expert panel. The main methods used in our examination are set out below.

The fieldwork was assisted by our consultants, Arup, working with a team from the National Audit Office. As Arup has previously provided consultancy advice to public sector bodies, potential conflicts of interest were managed by ensuring that our consultancy staff were not involved in any of the projects reviewed in the course of this study.

### Literature and data review

We reviewed and analysed centrally held and compiled data, including:

- data on public sector expenditure collated by DTI;
- data collated by Defra and the Sustainable Development Commission for the annual Sustainable Development in Government reports, which provided context and (to a limited degree, because of changing data requirements) some evidence on historical trends in performance on the government estate; and

- data collated by the Building Research Establishment on energy use on the government estate.

We also reviewed relevant parliamentary, departmental, academic and consultancy reports (identified as endnotes in the report).

### Interviews with departments

We conducted semi-structured interviews with representatives in eighteen departments, including project managers, project sponsors, facilities and estates managers, sustainable development managers, PFI representatives, and an architect. The interviews enabled us to assess the views of departmental representatives on the challenges associated with building and refurbishing more sustainably, as well as identifying the factors for success. The structured approach to our interviews allowed us to conduct quantitative analysis of the recurrent themes.

### Collection of data on construction and major refurbishment projects in 2005-06

We contacted eighteen departments (listed in Appendix 3) to find out how many construction and major refurbishments<sup>49</sup> they, or their agencies, had begun or completed in 2005-06; we also established the cost and the BREEAM (or equivalent) rating of the project. When collecting this data, we excluded:

- projects costing less than £50,000; and
- minor refurbishments and cosmetic upgrades.

This work revealed that 441 construction and major refurbishment projects were begun or completed in 2005-06 across 12 departments and 12 executive agencies. These projects included a wide range of building types including offices, courts, laboratories, storage centres, vehicle testing centres, health and welfare centres, job centres, call centres, detention centres, a chapel and a conference centre. In recognition that not all buildings on the government estate are wholly owned, buildings sourced through alternative procurement routes (such as leasing, PFI and prime contracting) were also included within the study scope.

## Analysis of a sample of construction and major refurbishment projects

We assessed the sustainability of a sample of the construction and refurbishment projects under way in 2005-06 using a detailed questionnaire. We analysed the questionnaire responses to provide a rating of the project that would be indicative of the BREEAM rating, in order to provide a likely indication of the sustainability of the entire population of projects under way in 2005-06.

## Sample selection and response

In consultation with our consultants, we selected a judgmental sample of 75 construction and refurbishment projects from the population of projects under way in 2005-06, constituting 17 per cent of the population. We received responses for 45 projects (a 60 per cent response rate) across seven departments and ten agencies, listed in Appendix 4. This represents a sample of nine per cent of eligible projects in 2005-06.

The sample size was chosen to ensure the response rate was statistically viable, despite our questionnaire being circulated in August when many key project contacts were on annual leave. The 45 responses we received were satisfactorily completed despite the tight schedule and reduced staff availability. We validated the questionnaire responses to ensure that the responses were true and fair, adopting a risk-based approach to validate the performance of projects which had not undertaken a BREEAM assessment.

A comparison between the 45 projects in our sample and the population of 441 eligible projects indicates that our sample reflects broadly the project costs and building types of the population. However, our sample contains a higher proportion of construction projects, office buildings and projects which had undertaken (or planned to undertake) BREEAM assessments than the population (although the high proportion of BREEAM-rated projects was partly driven by our need to calibrate the sustainability rating of the projects, as described below).

## Project sustainability ratings

The BREEAM system is widely regarded in the design and construction sector as the most comprehensive mechanism for assessing the environmental performance of a building. However, a full BREEAM assessment takes approximately one week to complete; it was therefore impractical to conduct a full BREEAM assessment for the sample projects. Our evaluation system, developed with Arup, used a questionnaire to assess many of the aspects of good performance covered in BREEAM assessments, and was therefore devised to provide a BREEAM-indicative rating.

Though BREEAM focuses on environmental issues, we included a wider range of socio-economic issues to present a broader view of building sustainability. The questionnaire also assessed performance against additional aspects of the Common Minimum Standards (the use of legal and sustainable timber, uptake of the Quick Wins, and progress in following best practice in the 'Achieving Excellence' guides) which is not assessed in a BREEAM assessment. The issues covered by our questionnaire included the following:

- energy (including demand issues such as lighting, heating and cooling and supply issues such as renewable energy);
- health and wellbeing (such as lighting and ventilation);
- transport (such as cycling facilities, green travel planning and access to public transport);
- water (such as water efficient appliances, sustainable urban drainage and water metering);
- materials (such as the specification and procurement of 'green' goods and services, including the items listed in the list of Quick Wins);

- biodiversity (such as management and monitoring strategies and previous use of land);
- social issues (such as local employment, crèche facilities and community engagement); and
- waste issues (such as recycling of construction waste).

Points were awarded to each issue and the scores for each topic area were weighted in the same manner as BREEAM assessments (whereby choice of materials accounts for approximately 10 per cent of the overall score, for example). Not all questions were answered in some questionnaires (due to a lack of data or the nature of the refurbishment, for example); in these situations no points were awarded. Although this leads to a lower overall score, this approach was selected in order to maintain comparability with BREEAM assessments.

The projects in our sample which had undertaken full BREEAM assessments were used to calibrate the scores and to indicate the levels of achievement required to achieve a 'BREEAM-indicative' rating of 'Excellent', 'Very Good', 'Good' or 'Pass'.

## Review of case examples

Our consultants conducted a further five structured interviews with project sponsors and estates managers to establish the mechanisms used by departments and agencies to reconcile sustainability with value for money for a sub-sample of the projects undertaken in 2005-06.

We also examined a sample of five projects completed between 1996 and 2005, where the buildings were designed and built to be sustainable, to see whether the buildings had delivered the anticipated benefits. These case examples included site visits and semi-structured interviews with project sponsors, architects, consultants, facilities managers, sustainable development managers and PFI contractors.

## Stakeholders' views and expert panel

During the scoping and fieldwork stages of this study we consulted both public and private sector bodies. We conducted several meetings with each of the key central government bodies with responsibility for promoting sustainable construction and refurbishment on the government estate:

- Office of Government Commerce – Smarter Construction Team and Government Relocation and Asset Management Team;
- Department of Trade and Industry – Construction Sector Unit;
- Department for Environment, Food and Rural Affairs – Sustainable Development Unit; and
- Sustainable Operations Board.<sup>50</sup>

We also assessed the views of stakeholders from:

- Association for the Conservation of Energy;
- Building Research Establishment;
- Commission for Architecture and the Built Environment;
- Carbon Trust;
- Constructing Excellence;
- Environment Agency;
- Public Sector Construction Clients' Forum;
- Salix;
- Sustainable Development Commission;
- Sustainable Procurement Task Force; and
- Waste and Resources Action Programme.

To assess the industry perspective on sustainability in construction and refurbishment in central government, and to find out how costs and benefits (both financial and non-financial) of projects are assessed, we interviewed representatives from several construction consultancies and contractors:

- Turner & Townsend;
- Cyril Sweett Limited;
- Faber Maunsell; and
- Willmott Dixon Construction Limited.

At the conclusion of our field work we conducted a series of meetings with an expert panel, drawn from the organisations listed above, to test the reasonableness of our emerging conclusions.



## APPENDIX THREE

### Departments within the scope of this report

We contacted 18 departments to gather data about all construction and major refurbishments under way in 2005-06. The departments were also asked to respond on behalf of their executive agencies. We also conducted interviews with each department. The departments are as follows:

- Cabinet Office;
- Crown Prosecution Service;
- Department for Constitutional Affairs;
- Department for Communities and Local Government;
- Department for Culture, Media and Sport;
- Department for Environment, Food and Rural Affairs;
- Department for Education and Skills;
- Department for International Development;
- Department for Transport;
- Department of Health;
- Department of Trade and Industry;
- Department for Work and Pensions;
- Foreign and Commonwealth Office;
- Her Majesty's Revenue and Customs;
- Her Majesty's Treasury;
- Home Office;
- Ministry of Defence; and
- Office for National Statistics.

## APPENDIX FOUR

### Departments and executive agencies in our sample of projects

Our sample of construction and major refurbishments projects in 2005-06 was taken from the following departments and agencies:

- Central Office of Information (an agency of the Cabinet Office);
- Crown Prosecution Service;
- Defence Estates (an agency of the Ministry of Defence);
- Department for Communities and Local Government;
- Department for Environment Food and Rural Affairs;
- Department for Trade and Industry;
- Department of Culture Media and Sport;
- Driver and Vehicle Licensing Agency (an agency of the Department for Transport);
- Foreign and Commonwealth Office;
- Highways Agency (an agency of the Department for Transport);
- Her Majesty's Courts Service (an agency of the Department for Constitutional Affairs);
- Her Majesty's Prison Service (an agency of the Home Office);
- Job Centre Plus (an agency of the Department of Work and Pensions);
- Maritime and Coastguard Agency (an agency of the Department for Transport);
- Office for National Statistics;
- Vehicle and Operator Services Agency (an agency of the Department for Transport); and
- Veterinary Laboratories Agency (an agency of the Department for Environment, Food and Rural Affairs).

# ENDNOTES

- 1 OGC set out the Common Minimum Standards for sustainability in the procurement of built environments, including construction and refurbishment, in 2005.
- 2 Energy consumption (gas and electricity) across departments and agencies costs £150 million per year. If energy consumption is reduced in line with targets by 15 per cent by 2010 and by 30 per cent by 2020, this will save £22.5 million per year by 2010 and £45 million per year by 2020, or more. Water consumption across the central government estate reached nearly three million cubic metres in 2004-05. Reducing consumption to the target level of three cubic metres of water per person per year would more than halve this consumption, delivering savings of up to £1 million per year.
- 3 HM Government, *Securing the Future – The UK Government Sustainable Development Strategy*, March 2005, Chapter 1.
- 4 HM Government, *Securing the Future – The UK Government Sustainable Development Strategy*, March 2005.
- 5 HM Treasury, *Government Accounting*, Annex 22.1, 2000.
- 6 This figure excludes public housing construction and refurbishment as spend on these areas is not related to central government expenditure.
- 7 DTI surveys approximately 12,000 large construction firms and a sample of small construction firms every quarter. Projects with a value of less than £2 million are not included, so the actual expenditure figure is likely to be higher than the DTI estimate. Our estimate is based on the data provided by departments in response to our survey, the methodology for which is described in Appendix 2.
- 8 Reports include:
  - NAO, *Modernising Construction*, HC 87, Session 2000-2001, January 2001, [http://www.nao.org.uk/publications/nao\\_reports/00-01/000187.pdf](http://www.nao.org.uk/publications/nao_reports/00-01/000187.pdf).
  - NAO, *PFI: Construction Performance*, HC 371, Session 2002-2003, February 2003, [http://www.nao.org.uk/publications/nao\\_reports/02-03/0203371.pdf](http://www.nao.org.uk/publications/nao_reports/02-03/0203371.pdf).
- 9 NAO, *Improving Public Services through better construction*, HC 364-I, Session 2004-2005, March 2005, [www.nao.org.uk/publications/nao\\_reports/04-05/0405364.pdf](http://www.nao.org.uk/publications/nao_reports/04-05/0405364.pdf).
- 10 NAO, *Improving Public Services through better construction – Case studies*, HC 364-II, Session 2004-2005, March 2005, [http://www.nao.org.uk/publications/nao\\_reports/04-05/0405364case\\_studies.pdf](http://www.nao.org.uk/publications/nao_reports/04-05/0405364case_studies.pdf).

11 Launched by the Treasury in January 2007, *Transforming Government Procurement* sets out the scale, complexity and diversity of public procurement. It offers a clear mandate – and challenge – to raise public sector skills to develop innovative procurement methods and solutions, thereby ensuring that procurement drives the delivery of public services in a way that matches the high expectations of the public. [http://www.hm-treasury.gov.uk/media/4EA/89/government\\_procurement\\_pu147.pdf](http://www.hm-treasury.gov.uk/media/4EA/89/government_procurement_pu147.pdf).

12 The Sustainable Procurement Task Force published its recommendations to government in June 2006. The Task Force, led by former Carillion chairman Sir Neville Simms, was established by the Secretary of State for the Environment, Food and Rural Affairs and the Chief Secretary to the Treasury to devise a National Action Plan to make the UK a leader in the European Union in sustainable procurement by 2009 (an objective set out in the UK Sustainable Development Strategy in 2005). Construction procurement (both building and refit) was identified by the Task Force as a priority area for action. The Task Force developed a 'Flexible Framework' to help organisations understand and take the steps needed to make sustainable procurement happen; the UK Government Sustainable Procurement Action Plan encourages departments to make use of the Flexible Framework but states that the Government expects it to be superseded by a new procurement framework being put in place by OGC. Defra, *Procuring the Future, Sustainable Procurement National Action Plan: Recommendations from the Sustainable Procurement Task Force*, June 2006, <http://www.sustainable-development.gov.uk/publications/procurement-action-plan/index.htm>.

13 HM Government, *UK Government Sustainable Procurement Action Plan*, March 2007, <http://www.sustainable-development.gov.uk/publications/pdf/SustainableProcurementActionPlan.pdf>.

14 OGC, *Common Minimum Standards for the procurement of built environments in the public sector*, September 2005, Part 6, [http://www.ogc.gov.uk/documents/Common\\_Minimum\\_Standards\\_PDF.pdf](http://www.ogc.gov.uk/documents/Common_Minimum_Standards_PDF.pdf).

15 OGC, *Achieving Excellence in Construction – Procurement Guide 11 – Sustainability*, <http://www.ogc.gov.uk/documents/CP0016AEGuide11.pdf>.

16 [http://www.ogcbuyingsolutions.gov.uk/environmental/products/environmental\\_quickwins.asp](http://www.ogcbuyingsolutions.gov.uk/environmental/products/environmental_quickwins.asp).

17 This was set out in Defra's *Sustainable Development in Government* Report in 2002. <http://www.sustainable-development.gov.uk/publications/report2002/index.htm>. The Common Minimum Standards state that 'Where BREEAM is used, all new projects are to achieve an 'Excellent' rating and all refurbishment projects are to achieve at least a 'Very good' rating, unless site constraints or project objectives mean that this requirement conflicts with the obligation to achieve value for money.

18 This was set out in the new targets for Sustainable Operations on the Government Estate.

19 Defra, *Sustainable Operations on the Government Estate: Targets*, June 2006, <http://www.sustainable-development.gov.uk/government/estates/targets.htm>.

20 Defra, *Procuring the Future, Sustainable Procurement National Action Plan: Recommendations from the Sustainable Procurement Task Force*, June 2006, <http://www.sustainable-development.gov.uk/publications/procurement-action-plan/index.htm>.

21 We defined major refurbishments as projects where the building is completely refitted, rather than just having one type of refurbishment (i.e. new lighting or heating systems, or cosmetic upgrades). This approach was adopted rather than narrow cost-based definitions, as many high-value refurbishments do not have sufficient works to justify a BREEAM assessment. Due to the difficulties in defining what constitutes a 'major' refurbishment, we asked departments to apply their judgement as far as practical.

- 22 10 departments or 71 per cent. (CPS, DWP, DFT, DCA, DEFRA, HO, DCMS, DCLG, FCO, and Defence).
- 23 Defra, *Sustainable Development in Government: Third Annual Report, 2004*, <http://www.sustainable-development.gov.uk/publications/report2004/partg.htm>.
- 24 NAO, *Sustainable Procurement in Central Government*, September 2005, [http://www.nao.org.uk/publications/nao\\_reports/05-06/sustainable\\_procurement.pdf](http://www.nao.org.uk/publications/nao_reports/05-06/sustainable_procurement.pdf).
- 25 [http://www.ogcbuyingsolutions.gov.uk/environmental/products/environmental\\_quickwins\\_home.asp](http://www.ogcbuyingsolutions.gov.uk/environmental/products/environmental_quickwins_home.asp).
- 26 Paints and varnishes for indoor use should have a content of volatile organic compounds not to exceed: wall paints: 30 g/l; other paints: 250 g/l ; all other products: 180 g/l.
- 27 Fridges, freezers, washing machines and dishwashers should be rated EU Energy Label class A.
- 28 The cost of using BREEAM varies according to the company used to undertake the assessment. The Building Research Establishment sets recommended assessment fee scales for different types of property; they recommend that BREEAM assessments for offices, for example, should cost £135 per 1,000m<sup>2</sup> (with a base cost of £2,735 and a maximum cost of £10,000).
- 29 Schools fall outside the scope of this report, although Welbeck Defence Sixth Form College (as part of the Defence Estates) is included as one of our case examples in Part 4. All government-funded schools projects over a certain cost/area threshold, including both new build and refurbishment, should achieve a BREEAM schools rating of 'Very Good' or 'Excellent'.
- 30 NAO, *Sustainable Procurement in Central Government*, September 2005, [http://www.nao.org.uk/publications/nao\\_reports/05-06/sustainable\\_procurement.pdf](http://www.nao.org.uk/publications/nao_reports/05-06/sustainable_procurement.pdf).
- 31 NAO, *Improving Public Services through better construction*, HC 364-I, Session 2004-05, March 2005, [www.nao.org.uk/publications/nao\\_reports/04-05/0405364.pdf](http://www.nao.org.uk/publications/nao_reports/04-05/0405364.pdf).
- 32 HM Treasury, *The Green Book – Appraisal and Evaluation in Central Government*, January 2003.
- 33 NAO, *Improving Public Services through better construction*, HC 364-I, Session 2004-05, March 2005, [www.nao.org.uk/publications/nao\\_reports/04-05/0405364.pdf](http://www.nao.org.uk/publications/nao_reports/04-05/0405364.pdf).
- 34 Treasury guidance states: 'Where the appraisal of a proposal depends materially upon the discounting of effects in the very long term, the received view is that a lower discount rate for the longer term (beyond 30 years) should be used. The main rationale for declining long-term discount rates results from uncertainty about the future. This uncertainty can be shown to cause declining discount rates over time.' The recommended discount rates are: 0-30 years: 3.5 per cent; 31-75 years: 3.0 per cent; 76-125 years: 2.5 per cent; 126-200 years: 2.0 per cent; 201-300 years: 1.5 per cent; 301+ years 1.0 per cent. HM Treasury, *The Green Book – Appraisal and Evaluation in Central Government*, Annex 6 Para 10-12, 2003.
- 35 Building Research Establishment and Cyril Sweett, *Putting a price on sustainability*, BRE Trust, 2005.
- 36 US Green Building Council/ Public Technology Inc., *Sustainable Building Technical Manual: Green Building Practices for Design, Construction, and Operations*, 1996, <http://smartcommunities.ncat.org/pdf/sbt.pdf>.



- 37 HM Government, *Climate Change: The UK Programme 2006*, CM6764, Session 2005-06, March 2006, Chapter 6, paragraphs 25-28, page 110, <http://www.defra.gov.uk/environment/climatechange/uk/ukccp/pdf/ukccp06-all.pdf>.
- 38 As an illustrative estimate for the global damage cost of carbon emissions, Defra guidance indicates that a social cost of carbon of £70 per tonne of carbon should be used. <http://www.defra.gov.uk/ENVIRONMENT/climatechange/carboncost/index.htm>. However, the 2006 Stern Review on the Economics of Climate Change suggested £60 to £200 per tonne. [http://www.hm-treasury.gov.uk/independent\\_reviews/stern\\_review\\_economics\\_climate\\_change/sternreview\\_index.cfm](http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/sternreview_index.cfm).
- 39 UK Government Timber Procurement Policy: Timber Procurement Advice Note, November 2005, <http://www.sustainable-development.gov.uk/government/estates/documents/Timber%20Procurement%20Advice%20Note%20November%202005.pdf>.
- 40 The Framework for Sustainable Development on the Government Estate, now superseded by the targets for Sustainable Operations on the Government Estate.
- 41 Defra, *Sustainable Operations on the Government Estate: Targets*, June 2006, <http://www.sustainable-development.gov.uk/government/estates/targets.htm>.
- 42 Committee of Public Accounts, First report 1994-95, *Ministry of Defence: Management of Capital Works Programme*, referenced in NAO, *Modernising Construction*, HC 87, Session 2000-2001, January 2001, [http://www.nao.org.uk/publications/nao\\_reports/00-01/000187.pdf](http://www.nao.org.uk/publications/nao_reports/00-01/000187.pdf).
- 43 [http://www.ogc.gov.uk/introduction\\_to\\_procurement\\_gateway\\_5.asp](http://www.ogc.gov.uk/introduction_to_procurement_gateway_5.asp).
- 44 Building Research Establishment, *Post occupancy evaluation – key early checks*, October 2003, <http://projects.bre.co.uk/earlypoe/POEinDLP.pdf>.
- 45 The targets for Sustainable Operations on the Government Estate require carbon emissions to be reduced by 12.5 per cent by 2010-11 and by 30 per cent by 2020 (relative to 1999/2000 levels) and for central government's office estate to be carbon neutral by 2012.
- 46 For example, HM Revenue and Customs' Estates Projects team have recently devised an air cooling policy which stresses the importance of natural and passive controls to deal with excess heat. This will apply to all future builds to ensure that the default position of installing air-conditioning will not be seen as the norm.
- 47 As set under the targets for Sustainable Operations on the Government Estate, <http://www.sustainable-development.gov.uk/government/estates/targets.htm>.
- 48 Air conditioning is necessary in parts of some buildings. As identified by technology consultants Gartner, data centres with high-density IT equipment generate a great deal of heat and need to be cooled in order to prevent the equipment from malfunctioning. <http://www.gartner.com/it/page.jsp?id=496819>.
- 49 We defined major refurbishments as projects where a building is completely refitted, rather than just having one type of refurbishment (such as new lighting or heating systems or cosmetic upgrades).
- 50 The Sustainable Operations Board includes representation by key departments at Management Board level and includes the Sustainable Development Commission.

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