



LONDON
climate change
PARTNERSHIP

Adapting to climate change
the role of public procurement



September 2009



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Adapting to Climate change: the role of public procurement

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Final Report - Important Notice

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Foreword

Climate change is happening in London. Summers will be hotter and drier, winters warmer and wetter, and sea level will rise inexorably. The latest climate projections show this in High Definition.

We have a massive and expensive job now to retrofit existing buildings and infrastructure to improve their resilience and maintain the levels of comfort against a changing climate.

It would be foolhardy, at a time when resources are increasingly tight, to add to our retrofit time-bomb by building yet more homes, offices and other developments which will not be fit for purpose over their expected lifetime without the costly retrofits. .

This report shows that much can be done to design for future climate without additional cost today. Even where adaptation measures do cost more up front, they can reduce running costs, improve tenant satisfaction and improve resale value.

In addition, now that the impacts of climate change are reasonably foreseeable, professional advisors (engineers, architects etc) will need to ensure that they are providing appropriate advice to their clients on the risks of cutting corners on a development that will not fit for purpose.

So let's make sure we invest for the long term. Use the latest climate projections (UKCP09) published by the Government in June 2009, to see what the climate is likely to be like over the project's life. Then use the Partnership's *Checklist for Development* and other guidance to make sure you specify your project to be adapted throughout its lifetime. And bring in the right people to evaluate bids against adaptation criteria.

Let's start by making sure that all new schools and hospitals, buildings used by some of the most vulnerable people, are built for the changing climate. This will make them more comfortable and less expensive to run right from the start.

This report shows that in the public sector, procurement processes can be used to ensure that adaptation to climate change can be incorporated in major projects and the steps necessary to do so.

But the decision and drive to make that happen has to come from the top. You have to decide you want this to happen. If you don't, the legacy will be a city of people living and working in buildings beyond their sell-by date, where people are too hot and unproductive for much of the summer months (and during heatwaves hundreds die), where water is scarce and where building managers will dread getting an insurance quote.

Gerry Acher CBE LVO

Chair

London Climate Change Partnership

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1 Key messages

This initial study finds evidence to support the case for using public procurement to increase resilience to climate change, including a range of good practice case studies.

The study focuses on the procurement of publicly-funded construction projects and raises a number of important points of interest for the following key stakeholder groups:

Policy makers	Those who set or seek to influence government policy on climate change adaptation, economic appraisal, procurement, capital investment, construction and management of the public sector estate, planning and building regulations
Contracting authorities	Contracting authorities in central government departments and agencies, local authorities, and the wider public sector. Collaborative procurement organisations and partnerships that support and advise contracting authorities are also included here (e.g. I&DeA, 4ps, RIEPs)
Industry organisations	Design, construction and building engineering organisations who set or influence building regulations and design reference standards and/or have a role to play in training and sharing good practice amongst practitioners
Contractors	Private sector investors, developers, construction companies, facilities managers and consortia

A summary of opportunities for action towards climate change resilient procurement of public construction projects for all stakeholder groups is shown as a roadmap at the end of this Section.

1.1 Key messages for policymakers

Policy development	1. Policymakers need to integrate climate change adaptation objectives with other sustainability, environmental performance, carbon reduction and design requirements; this is how most procurement projects are designed and evaluated in practice.
	2. Policy developments are needed to embed adaptation into both public and private sector-led procurements, and into both new build and existing stock refurbishment (most of which will still be occupied in 2050).
	3. Climate change adaptation could helpfully be embedded throughout the investment appraisal cycle; work is already ongoing to revise HM Treasury's Green Book ¹ .
	4. Some further time is needed to evaluate the success of measures that have recently been introduced to drive adaptation measures such as the Supplement to Planning Policy Statement 1: Planning and Climate Change.
	5. Depending on this success, in the longer term, regulation, other legal requirements or policy mandates (e.g. equivalent to those recently introduced for zero-carbon buildings) may be required to bring all contracting authorities and the market up to standard.
	6. Policymakers should learn from interventions and solutions in other countries, for example as follow-up to the EU White Paper on climate change adaptation.
Guidance and support	7. The Office of Government Commerce (OGC) is considering developing guidance on environmental policy through procurement, including long-term climate change adaptation. This study shows that such practical, consolidated guidance, together with tools and case studies, would be welcomed by central and local government authorities.
	8. The guidance could usefully link with the Government's Sustainable Procurement Task Force's action plan <i>Procuring the Future</i> which provides the current framework for sustainable procurement in government but does not explicitly focus on climate change adaptation. The guidance could also usefully include methods to help a more robust analysis of adaptation options in schemes.
Skills	9. Policymakers should encourage contracting authorities to identify and train up skilled officers to identify climate change adaptation as a core objective in procurements. These officers can also maximise benefits by using collaborative procurement and industry experts, defining specifications effectively and selecting a skilled tender evaluation panel.
Standards & monitoring	10. Government needs to lead by example by setting requirements in flagship programmes such as Building Schools for the Future and capital programmes for hospitals, prisons and public infrastructure.
	11. Policymakers should embed climate change adaptation into: <ul style="list-style-type: none"> • Building standards for both new builds and refurbishments (i.e. Building Regulations and standards such as BREEAM or equivalent); and • Expected standards for public procurement.
	12. Projects should be designed to be climate resilient for their expected lifetime, rather than the procured contract period. This design life will vary from asset to asset. An appropriate timeline over which to consider adaptation measures for public procurement of buildings may be 50 years or more, less for road surfaces and longer for some infrastructure.*
Incentivising the market	13. Monitoring and analysis could help share good practice, mentor contracting authorities, track overall trends in embedding adaptation, and help evaluate the contribution of building standards, planning conditions and the procurement process to the quality and performance of new builds and refurbishments.
	14. It is evident that the case for embedding adaptation, and existing good practice examples, are not widely understood across central government, contracting authorities or those that influence them, contractors or end-users of buildings. Policymakers have a key role to play in raising this awareness.
	15. Stakeholders have suggested financial mechanisms, developing or endorsing awards to encourage embedding climate change adaptation into public procurement, or setting up a challenge fund to encourage innovation.

¹ Guidance since published at http://www.hm-treasury.gov.uk/data_greenbook_supguidance.htm

1.2 Key messages for contracting authorities

Sharing good practice	<ol style="list-style-type: none"> 1. There are several examples where climate change adaptation has been successfully embedded into public procurement. A stronger mechanism is needed for sharing this. Contracting authorities should make best use of the full range of public sector networks on climate change and procurement, including collaborative procurement opportunities. 2. Contracting authorities should seek and share good practice case studies. This should include examples of specifications and evaluations, and capture the full range of adaptation measures (i.e. not just design features, but end-user behaviour measures too).
Guidance & support	<ol style="list-style-type: none"> 3. 4ps is working with Regional Improvement & Efficiency Partnerships to develop a programme of support for local authorities on sustainable procurement. This is expected to include workshops, training, good practice examples and access to expert panels. It is important that climate change adaptation is fully integrated into this. 4. Guidance needs to be made available about the different ways in which climate change adaptation can be embedded in the procurement process. This should include the importance of the specification and evaluation criteria, investment in skills to manage the process and recruitment of an expert evaluation panel. 5. Guidance should highlight the potential benefits of using the Competitive Dialogue procurement process. This process requires significant resource and time investment and any opportunities to 'screen' for climate impacts should be explored. 6. Guidance could also be explored on how best to apportion risk between authorities and contractors and how contracting authorities should reflect their risk appetite in the procurement process (especially after the release of the UKCP09 projections²).
Define and apply the vision	<ol style="list-style-type: none"> 7. Contracting authorities should include climate change adaptation in the vision for the project from the outset. In many contracting authorities this means raising awareness and training people in service directorates that adaptation needs to be a core principle, rather than an "add-on" by the central procurement team at a later stage. 8. Contracting authorities then need to develop clear objectives (in consultation with the market), benchmarks and indicators, and communicate this to stakeholders and potential bidders. Adaptation should be written into procurement documents and contracts.
Engage the market	<ol style="list-style-type: none"> 9. Contracting authorities need to engage the market early and openly to develop a shared understanding with bidders. The market needs to know the authority is serious about adaptation by weighting the evaluation criteria such that it is a significant part of the project. 10. Contracting authorities need to be open to challenge and ready to enter dialogue about relative priorities (e.g. in striking a balance between carbon management and adaptation). 11. Detailed specifications can be overly prescriptive; instead the market should be allowed to innovate based on the contracting authority's defined outcomes. Care must be taken to ensure that risk is spread proportionately between the contracting authority and the contractor, in particular during the current economic climate where contractors tend to be more risk averse.
Corporate priority	<ol style="list-style-type: none"> 12. Increasing numbers of contracting authorities have a high-level climate change strategy including adaptation. The next step is to embed this throughout the corporate decision-making process so those involved in the project commissioning, budget approval and the procurement process itself have the understanding, resources and skills required to deliver climate resilience in practice. Adaptation should be written into standard procurement codes and guidance within contracting authorities.
Think long term	<ol style="list-style-type: none"> 13. Contracting authorities should consider the impacts of climate change on the design over the estimated lifetime of the project, taking account of potential future refurbishment and changes of use, not just the initial length of the contract.* This may mean specifying a 50-year or more design life for buildings and some infrastructure. Decision pathway approaches could help map out options, consider the extent to which features should be incorporated now, and/or how sufficient flexibility and adaptability can be retained such that additional technical or behavioural adaptation measures could be retrofitted in the future.

² Since published at [Hhttp://ukclimateprojections.defra.gov.uk/H](http://ukclimateprojections.defra.gov.uk/H)

1.3 Key messages for industry organisations

Building Regulations and British Standards	<ol style="list-style-type: none"> 1. The relevant industry organisations should consider the case for revising Building Regulations and British Standards to include climate change adaptation. These could helpfully allow flexible adaptation as the climate changes; perhaps linked to the decision pathways concept (see Section 9.8). 2. This needs to be done in a way that attracts international business to the UK. Integration into European and other international standards may also help incentivise the market and create a level playing field.
Design parameters & references	<ol style="list-style-type: none"> 3. Design parameters should incorporate future climate projections (e.g. UKCP09).²
BREEAM and equivalents	<ol style="list-style-type: none"> 4. Work is already ongoing to consider how best to embed climate change adaptation into the Code for Sustainable Homes. Adaptation should be fully integrated into all BREEAM and equivalent standards.
Sharing good practice	<ol style="list-style-type: none"> 5. Industry organisations have a role to play in sharing good practice examples and lessons learnt from previous projects.
Skills development and transfer	<ol style="list-style-type: none"> 6. The industry also has an important role to play in raising awareness and improving skill sets in both contracting authorities and bidders. This includes incorporating climate change adaptation into training, CPD and wider guidance. 7. In the longer term, industry organisations could seek to influence qualification syllabuses and the wider training system, influencing skills development on this subject throughout the curriculum. 8. There is an opportunity for the UK to take the lead in this area and sell our expertise abroad.

1.4 Key messages for contractors

Leadership	<ol style="list-style-type: none"> Contractors could consider raising climate change adaptation with clients if not specified in the initial project objectives. Contracting authorities may not know what they have omitted. Contractors should challenge specifications if adaptation measures are too prescriptive and explore innovative solutions, in particular to tackle twin objectives of carbon management and adaptation. Contractors could consider offering adaptation measures as a standard option.
Standards and codes of practice	<ol style="list-style-type: none"> Contractors should be aware of future revisions to Building Regulations and design standards and consider how best to influence these to ensure they remain flexible and practicable. The industry should consider including adaptation in codes of practice on sustainability.
Investment in skills	<ol style="list-style-type: none"> Contractors should recognise the trend towards well adapted procurement projects of this nature, and invest in the skills needed to meet and exceed their clients' requirements. This will often require embedding climate change adaptation and wider sustainability principles into overall company policies.
Innovation & opportunity	<ol style="list-style-type: none"> Contractors should consider the opportunity for innovation to create a market advantage over their competitors in the UK and beyond. Opportunities could include integrating climate change mitigation and adaptation objectives, and buildings that can be further adapted in the future as the climate changes.
Risk management	<ol style="list-style-type: none"> Contractors and sub-contractors may perceive complex or innovative procurement specifications as difficult and potentially higher risk, perhaps particularly in the current economic climate. The concept of climate change adaptation may fall into this category, at least until such time as awareness, competence and market appetite are more developed. To address this it is important that contracting authorities and contractors work together to spread risks proportionately; for example by sharing good practice and developing skills. Contractors should recognise the emerging market opportunity and seek to develop capacity now to incorporate adaptation measures as they become mainstream.

* Some key terminology

The following terminology is used in this report. It is important to interpret the key messages above and the more detailed findings that follow in this context. Particularly important links are asterisked * above.

Design life is the estimated expected lifetime of an asset. This can be 50 years or more for many public buildings, even longer for infrastructure such as bridges and tunnels, whilst less for other construction projects such as road surfaces.

A **contract period** is the length of time services are procured for. For example under a Design, Build and Operate contract, contractors are responsible for construction and operation of buildings for several years. However, typically, contract periods for public procurements are shorter than the design life. Section 6.2.4.5 and Section 9 in particular discuss the implications in more detail.

1.5 Roadmap of suggested next steps

UKCP09 climate projections available for use by contracting authorities <i>(UKCIP, contracting authorities, 2009)²</i>	Review Building Regulations / BREEAM / Code for Sustainable Homes to include further adaptation measures <i>(CLG, BRE and others, tbc)</i>	Evaluate progress in applying PPS1 and related planning conditions <i>(CLG and others, tbc)</i>	Publish Climate Change Act reporting power and statutory guidance <i>(Defra, 2009)</i>	EU Adaptation Strategy explores conditions and standards for construction <i>(European Commission by 2013)</i>	Revise HMT Green Book to include climate change adaptation in investment appraisal <i>(HMT, 2009)¹</i>
Lead by example by requiring climate change adaptation in all flagship government capital investment programmes <i>(policymakers)</i>	Raise awareness of the case for embedding adaptation & link with authorities' corporate objectives <i>(LCCP, OGC, Defra, 4ps, I&DeA, RIEPs, PfS etc)</i>	Build portfolio of more case studies on adaptation, test universality of study findings <i>(LCCP, Defra and others)</i>	Share good practice case studies including samples of specifications and evaluation processes <i>(OGC, I&DeA and others)</i>	Integrate climate change adaptation into guidance on sustainable procurement <i>(OGC)</i>	Include climate change adaptation in procurement vision, objectives, specifications and evaluation criteria <i>(contracting authorities)</i>
Deliver support programme for contracting authorities including training, workshops, practical help <i>(OGC, 4ps, RIEPs)</i>	Invest in appropriate skills in procurement teams and evaluation panels <i>(contracting authorities with support)</i>	Raise awareness of rising demand and good practice with contractors , encourage training & innovation <i>(LCCP, industry organisations)</i>	Engage the market and maximise benefits from use of competitive dialogue procedure where appropriate <i>(contracting authorities with support)</i>	Review the impact of UKCP09 on the procurement process <i>(LCCP and others)</i>	Pilot the decision pathway approach at the site or project level as a way of future-proofing procurement <i>(contracting authorities with support)</i>
Embed climate change adaptation into industry codes on sustainability <i>(industry organisations)</i>	Encourage climate change adaptation through use of collaborative procurement <i>(OGC, 4ps etc)</i>	Integrate climate change adaptation into qualifications and CPD <i>(industry organisations)</i>	<i>Additional steps as required</i>	Public procurement of climate resilient new build & refurbishment	Drives wider climate resilient procurement in the market



2 Executive summary

2.1 Introduction

Tackling climate change has risen rapidly up the UK agenda in recent years. Adapting to climate change, which seeks to implement appropriate responses to the challenges and opportunities arising from the inevitable climate change already in the system, is gaining traction alongside more established carbon reduction measures as the twin pillars of a responsible climate change strategy. Significant progress has been made in public policy, however there is much more to do to embed climate resilience into practical decision-making across the public and private sector.

Public procurement and supply chain management are increasingly used to influence the market's response to several aspects of sustainable development. This study explores the role of public procurement in this context.

PricewaterhouseCoopers LLP ("PwC") has been commissioned by the Greater London Authority on behalf of the London Climate Change Partnership (the Partnership) to undertake an initial study to explore the extent to which there is an economic and legal case for using public procurement to increase resilience to climate change. The project is co-funded by the Partnership, Defra, the Environment Agency and the City of London Corporation.

This study looks at public procurement in relation to capital investment in new build construction and refurbishment, and the ongoing maintenance of the public sector estate, with a focus on schools, roads, offices, leisure facilities, housing and mixed-use regeneration projects.

2.2 Approach and scope of the study

Three workstreams have been developed in parallel and integrated to produce evidence-based findings.



A stakeholder workshop has helped inform the study. In addition, seven Case Studies, in which contracting authorities have embedded climate change adaptation into procurement projects, provide some practical insights into the opportunities and challenges. These are:

- Case Study 1: Met Office
- Case Study 2: Red Hill CE Primary School
- Case Study 3: Worcester Library & History Centre
- Case Study 4: Jacobs Engineering Ltd
- Case Study 5: Barking Riverside
- Case Study 6: Olympic Park
- Case Study 7: PwC More London Riverside (a private sector comparator)

This is an initial high-level study that is time-constrained. There are therefore several limitations to the extent the findings can be considered universally applicable. Suggestions for further work are included throughout the report for consideration.

2.3 Policy and legal context

There is a wide and growing set of policy instruments and decision-support tools to support climate change adaptation in the UK. The provisions of the new Climate Change Act (2008) include powers to require all public authorities and statutory undertakers to produce reports on how their organisation is assessing and acting on the risks and opportunities arising from the changing climate. A cross-Government Adapting to Climate Change Programme coordinates the development of public sector work on adaptation. Various decision-support materials are provided by the UK Climate Impacts Programme (UKCIP). The recent EU White Paper on adaptation also includes reference to the possibility of making climate impact assessment a condition for public and private investment.

More specifically in relation to construction projects, planning policy, building regulations and design standards are incorporating more environmental performance standards and adaptation requirements, although in relation to climate change their focus remains overwhelmingly on mitigation rather than adaptation.

There is no legal barrier preventing climate change adaptation becoming embedded into public procurement construction projects. Climate change is increasingly viewed as “reasonably foreseeable” in legal terms. Therefore, whilst there is as yet no explicit duty to embed climate change adaptation into public procurement processes, there is a growing body of evidence to suggest that failure to do so would not follow good practice.

There are costs and risks associated with the extent to which contracting authorities specify climate change impacts, measures or outcomes within procurement specifications. Alignment with UKCIP 02 climate change scenarios or the forthcoming significantly more detailed UKCP09 climate projections³, is helpful and can reduce the risk of challenge.

2.4 Public procurement

Public procurement is complex and is governed by EU rules, transposed into UK regulations. The rules were changed in 2006 and there is little immediate scope for influencing further changes in the rules. The focus of this study is therefore on exploring what is possible within current rules and what, if any, good practice can be developed.

Going forward, the two most commonly used types of procurement procedure for public construction projects will be Restricted and Competitive Dialogue. In many cases, project-specific adaptation measures add additional complexity to design and specification processes and may result in more projects following the Competitive Dialogue route, at least initially over the coming years whilst the market matures.

The Competitive Dialogue procedure allows for detailed discussion with pre-qualified bidders whilst they are developing their proposals. This is helpful for embedding adaptation measures into construction projects because it encourages innovation and exploration of different solutions. It also helps contracting authorities and bidders gain experience of achieving climate change adaptation measures and of the interrelationship with other priorities such as carbon reduction, where there can often be compromises to make. However, choosing the Competitive Dialogue procedure can make the process longer and more expensive.

2.5 The economic case

At the macro-economic level, there is a clear case for tackling climate change; the cost of taking action now is far less than the cost of doing nothing (Stern, 2006 et al). There is also a clear rationale for public sector intervention to address market failures linked to adaptation, particularly uncertainty, imperfect information, misaligned markets and financial constraints.

³ Now published at <http://ukclimateprojections.defra.gov.uk/H>

However, there is still significant work to do to ensure contracting authorities understand this high-level case and how to apply it to specific public procurement construction projects. This is something that the Partnership may wish to focus on.

The evidence gathered in this study supports the view that benefits are large and costs need not be significantly higher than standard construction costs. The Case Studies suggest that the upfront cost of adaptation measures need not be more expensive; but rather just a different way of doing things. Adapted infrastructure helps to accrue a number of additional benefits including avoided costs on health and human life, infrastructure damage and lost economic activity.

Rigorous economic analysis of the costs and benefits accruing to different stakeholders was not undertaken by the Case Studies explored for this study. It seems that anecdotal evidence of costs and benefits, reviewed by skilled and experienced team members, can be sufficient for decision-making. There is a question about whether this is universally sufficient, or whether more rigorous analysis will be required to inform decision making in other contracting authorities going forward.

Government is already operating at a number of different levels using a variety of initiatives to incentivise adaptation, many of which are already having or could have an impact on publicly procured infrastructure. It is important to take account of these initiatives when assessing if further intervention through public procurement is necessary.

2.6 Summary of findings

The current public procurement framework, if used to best effect, is capable of embedding climate change adaptation, both directly into individual construction projects and by influencing the market more widely. There are already several good practice examples. However, procurement is not a “single silver bullet” that will drive adaptation in all construction projects; it is a tool that contracting authorities can use if they wish to support adaptation objectives. It remains to be seen what if any impact policy initiatives such as the EU White Paper on adaptation may have in the future.

Procurement can be used as a means to embed climate change adaptation where this is already an objective of the contracting authority. In addition, the size of the public procurement market in the UK for capital projects (in 2007-08 this amounted to £47bn per based on numbers provided by the HMT Public Expenditure Statistical Analysis team), is large enough to influence the market more widely – public sector requirements might be adopted in wider markets and become the norm. It is also worth considering that some public construction projects, such as flood defences, contribute to climate change adaptation in their own right.

Key points arising are:

- **Upskilling:** Embedding adaptation into public procurement across the board may not be easy and requires up-skilling of both contracting authorities and contractors, which in turn requires investment in people and skills. There are opportunities for more good-practice sharing and capacity-building.
- **Decision-making context:** To embed adaptation into procurement, the contracting authority usually needs an overall corporate policy and decision-making process on tackling climate change.
- **An integrated approach:** This study found that developments are influenced by a combination of planning obligations, building regulations, design standards and procurement specifications. The extent to which these include adaptation is therefore important and an integrated approach to embedding climate change adaptation is needed. Several stakeholders felt that embedding adaptation into these building

standards would be more successful than driving adaptation directly through procurement; it would help provide a level playing field and potentially reduce the up-skilling burden on contracting authorities.

- **Costs, benefits and risks:** Few public procurement exercises that incorporate adaptation measures do so through a systematic evaluation of costs, benefits and risks. Decisions are typically based on a balance of experience and affordability. Adaptation measures are not necessarily more expensive; they can cost the same as like-for-like non-adapted equivalent buildings and are often just a different way of doing things. Design life⁴ is key, this study suggests that it can be economically efficient to embed adaptation measures for the next 50 years or more into public procurement.
- **Other drivers for change:** Adaptation is rarely the sole motivation for building to different design standards; this study found it is one of several drivers for change and for flexibility in both building design and operating contracts. Features that have multiple objectives are more likely to be included. In several cases, the real technical challenge arises where a project must be both climate resilient *and* low-carbon.
- **Choice of procurement procedure:** In the main, adaptation can be more easily embedded in Competitive Dialogue procurement processes and in Design, Build & Operate contracts. There is evidence to suggest that use of the Competitive Dialogue process can produce a much higher-performing building within a specified budget than reliance on design standards and traditional procedures alone. The specification / design statement and evaluation criteria weighting are key.

The forthcoming UKCP09 climate projections³ will influence the way in which contracting authorities specify adaptation measures and the way in which potential bidders will respond. The concept of decision pathways may also help produce the longer-term flexibility and future-proofing that is required.

2.7 Conclusion

This study highlights good practice in public procurement of climate-resilient developments from which there is much to learn. There is a good public policy framework and the challenge for the Partnership, member organisations and stakeholders, is to build capability to further develop and apply this good practice more widely.

There is evidence to support the case for embedding climate change adaptation into public procurement. Although there is no explicit legal duty to do so, the economic argument is strong at the macro level, and is increasingly supported by higher-level corporate objectives of contracting authorities, the planning system and building standards. Over and above this, at the individual project level, there is evidence to suggest that the procurement process, if managed effectively with appropriate investment in skills and with a consideration of the appropriate time horizons (e.g. 50+ years), can deliver additional performance in publicly procured construction projects.

Continuous improvement is needed in the application of planning policy, the development of building standards such as BREEAM, and the use of procurement processes together in order to deliver public procurements that are well-adapted to the changing climate. These are all underpinned by awareness-raising, sharing good practice and investment in skills. To avoid maladaptation and to meet the needs of contracting authorities, further work should re-integrate adaptation into wider environmental performance and sustainability objectives.

⁴ Please note terminology explained in Section 1.

3 Introduction

3.1 Objectives and scope for this study

PricewaterhouseCoopers LLP (“PwC”) has been commissioned by the Greater London Authority on behalf of the London Climate Change Partnership (the Partnership) to explore the economic and legal cases for using public procurement to increase resilience to climate change. These cases should be relevant and presentable to both the public and the private sector.

For the purposes of this study, public procurement is defined as:

- Estate strategies and lease arrangements;
- Capital expenditure plans;
- Construction projects for new build and refurbishments; and
- Facilities management, buildings and ground maintenance;

The focus is on in-scope public procurement within national and local government agencies and authorities across sectors such as education, health, transport, housing and regeneration.

The project is co-funded by Defra, the Environment Agency, the City of London Corporation and the Partnership.

3.2 The UK climate change adaptation context

Tackling climate change effectively, whether at the organisational, local, regional, national or, indeed, global level requires a twin-track approach. Reducing greenhouse gas emissions to mitigate against dangerous levels of climate change is an important priority. However, the current concentration of greenhouse gas in the atmosphere has committed us to some degree of irreversible climatic change. It is therefore essential that, in parallel to carbon reduction work, we understand the challenges and opportunities arising from the changing global climate at the local level and adapt where necessary.

The 2007 UK Government Sustainable Procurement Action Plan presented a package of actions “to deliver the step change we need to ensure that Government supply-chains and public services will be increasingly low carbon, low waste, water efficient, respect biodiversity and deliver our wider sustainable development goals”. Your project specification identified that the Action Plan has relatively less coverage on the issue of climate change adaptation.

The Partnership, the Three Regions Climate Change Partnership, the UK Climate Impacts Programme and several other organisations have produced guidance about the practical and technical measures that businesses and organisations can take to increase their resilience to climate change, for example when designing and constructing new development, retrofitting buildings, or future-proofing service delivery. However, despite the availability of measures, and the high-level economic case for early action (Stern, 2006 and others), climate change adaptation is still far from embedded across all major public procurement and investment decisions.

The Government’s The Climate Change Act 2008 now includes requirements to produce a National Climate Change Risk Assessment and a statutory National Adaptation Programme, with associated powers to require all public authorities and statutory undertakers to report on their adaptation progress. This, together with the Adaptation Policy Framework published in 2008, is likely to have implications for public procurement.

More specifically in the local government sector, the 2007 LGA Climate Change Commission report expressed a major opportunity for local authorities to use their procurement power to help embed climate change adaptation into decision-making and to help their communities adapt well to climate change.

3.3 The London climate change adaptation context

In London, the Mayor published a draft Climate Change Adaptation Strategy in August 2008, which concluded that:

- London is not yet very well adapted to the current climate.
- London will experience warmer, wetter winters and hotter, drier summers, whilst extreme weather events such as heat waves and tidal surges will become more frequent and intense.
- London faces increased risk of floods, droughts and heat waves that will endanger the prosperity of the city and the quality of life for all Londoners, but especially the most vulnerable in the city.
- Responsive measures include improving and increasing London's green spaces to help keep the city cool in summer; managing flood risk coming from the tributaries to the Thames and surface water flooding from heavy rainfall; encouraging Londoners to use less water and raising public awareness to flood risk.
- There are opportunities for London's public sector organisations, in particular TfL, to use their procurement power to embed climate change adaptation across design, construction and maintenance.
- London is well placed to help the world adapt to climate change: it has the skills and services to prepare for the predicted changes, and there is a clear economic opportunity to capitalise on this leading position.

3.4 Embedding climate change adaptation into the public procurement process

Most public procurement in the UK is governed by the "Public Procurement Rules" (a generic term which includes the EU Treaty, Procurement Directives, Interpretative Communications⁵, the UK Procurement Regulations that implement them and related case law). Any approach to embedding climate adaptation into the procurement process must be undertaken within the constraints of these rules and the principles which underlie them.

In broad terms, adaptation requirements can only legally be included in a public procurement if it can be shown that any requirements are clearly linked to the subject matter of the procurement. This is not always as easy to achieve with sustainability and adaptation requirements as might be thought.

The key issue from a procurement perspective is how to incorporate the contracting authority's needs for climate change adaptation into procurement processes (including through development of output specifications, project requirements, evaluation criteria & approaches) in a way that is objective and not challengeable.

3.5 Scope and approach of study

There are clearly many ways in which climate change adaptation needs to be embedded in decision making at the organisational, local, national and global levels.

⁵ Including the Commission's Interpretive Communication on the Community law applicable to public procurement and the possibilities for integrating environmental considerations into public procurement

The study looks specifically at the role of public procurement within this context. Specifically, we consider:

- The process of embedding climate change adaptation into procurement; and
- The legal case and the economic costs and benefits of incorporating climate change adaptation into public procurement.

The study's emphasis is on the procurement process itself. For detailed guidance and good practice on adaptation measures in the built environment please refer to previous London Climate Change Partnership publications, in particular:

Existing London Climate Change Partnership publications

- *London's warming – the impacts of climate change on London (2002)*
- *Impact of climate change on London's transport systems (2005)*
- *Adapting to climate change – a checklist for development (2005)*
- *Adapting to climate change – a good practice guide for sustainable communities (2006)*
- *Adapting to Climate Change: Lessons for London (2006)*
- *Adapting to Climate Change: Business as Usual? (2006)*
- *Adapting to climate change – a checklist for development – case study companion (2007)*
- *Your home in a changing climate – retrofitting existing homes for climate change impacts (2008)*
- All available via <http://www.london.gov.uk/lccp/publications/>

This study is an initial high level overview, with the bulk of the research and analysis completed over a four week period.

The following approach has been taken:

Figure 3.1: Approach



The study is informed by case studies and stakeholder discussions, which were limited due to the constraints of the time period for completion. There are therefore limitations to the extent to which the findings can be universally applied and these are outlined alongside the findings of this report, together with suggested next steps.

3.6 Structure of the report

The remainder of this report is organised into sections as shown in **Figure 3.2** overleaf.

Figure 3.2: Structure of Report

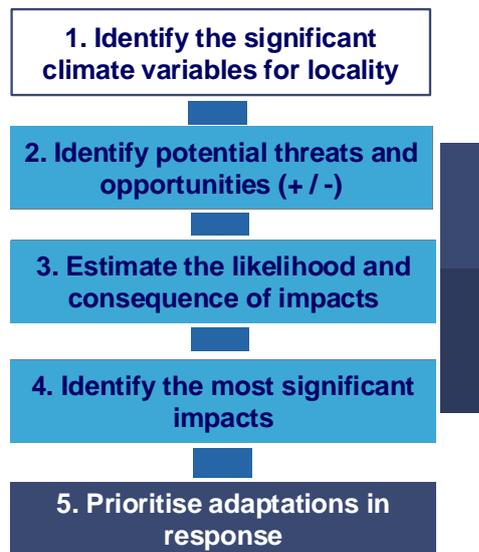
<p>What do we know about climate change variables and their impacts?</p> <p>What current measures are already being taken to adapt? What future measures are already in the pipeline?</p>	<p>Section 4 Adapting to climate change in the UK</p>
<p>When embedding adaptation into public procurement...</p> <ul style="list-style-type: none"> • What is the legality of building climate change into procurement? • Is it currently permissible? • Is there a duty? • What are the grounds for challenge? 	<p>Section 5 Summary of the legal case</p>
<p>What public procurement processes does this study explore?</p> <p>Given the legal and policy contexts described above...</p> <p>When embedding adaptation into public procurement...</p> <ul style="list-style-type: none"> • What procurement processes might be most appropriate? • At what steps in the process might adaptation be embedded? • Who might bear the costs and risks of adaptation in procurement? • Which contract types are most appropriate? • Is procurement an effective mechanism for embedding adaptation into in-scope capital construction projects? Or are there other ways to do this? 	<p>Section 6 Public procurement processes</p>
<p>What is an economic case? What is the approach for this study?</p> <p>Is there an economic case for public sector intervention to address climate change adaptation?</p> <p>What is the base case?</p> <p>Can public procurement add economic value in driving climate change adaptation?</p>	<p>Section 7 The economic case</p>
<p>What is the approach for this study?</p> <ul style="list-style-type: none"> • What were the drivers for embedding adaptation? • How was adaptation embedded into the procurement process? • What adaptation features were incorporated? • What were the costs, benefits and risks? <p>What are the key findings in relation to the process through which adaptation can be embedded into public procurement; and the legal and economic case for doing so?</p>	<p>Section 8 Case studies and stakeholder consultation</p>
<p>Findings & implications</p>	<p>Section 9</p>
<p>Conclusions & next steps</p>	<p>Section 10</p>

4 Adapting to climate change in the UK

4.1 A risk-based decision-making process

The UK Climate Impacts Programme (UKCIP) has led the development of several tools to help UK communities and organisations understand the impacts of the changing climate and take appropriate action to respond. Broadly speaking, the generic decision-making process is that shown below in **Figure 4.1**. Key features include the emphasis on understanding local impacts (climate change impacts vary from place to place and depending on the relative vulnerability of receptors of these impacts); and the emphasis on a proportionate, risk-based approach.

Figure 4.1 Risk-based decision making process



after UKCIP

This section uses the steps in this process to summarise the approach to climate change adaptation in the UK. It is important to consider the case for embedding climate change adaptation into public procurement within this context.

4.2 Identifying the significant climate variables

4.2.1 UKCIP 02 climate change scenarios

The UKCIP 02 climate change scenarios are currently the standard reference for government and industry looking to understand predicted future climatic changes. **Figure 4.2** overleaf provides further detail.

These scenarios are amongst the most sophisticated in the world and, since their release in 2002, have provided a good basis for decision-making. For the purposes of this study, which looks back at case studies and procurement processes in the recent past, decisions have been based on UKCIP 02.

Figure 4.2: UKCIP02 scenarios

The UKCIP 02 scenarios provide four alternative descriptions of how the climate of the UK might evolve over the course of this century. The alternative scenarios describe four alternative futures which reflect uncertainty about future trends and behaviour and how these might influence future emissions of greenhouse gasses. The scenarios range from rapid economic growth with intensive use of fossil fuels (High Emissions) to increased economic, social and environmental sustainability with cleaner energy technologies (Low Emissions).

For each of the four UKCIP02 scenarios, changes are described for three future thirty-year time-slices: 2011 to 2040 (the 2020s), 2041 to 2070 (the 2050s) and 2071 to 2100 (the 2080s).

Changes to the UK climate are reported across a grid with 50km cell size. Information is available in different formats, with varying amounts of detail. Data on a range of climatic variables including the following is available:

- Maximum/mean/minimum temperature (°C)
- Total precipitation rate (mm/month)
- Snowfall rate (mm/day)
- Wind speed at 10m (m/s)
- Humidity
- Soil moisture content

Scenarios produced by UKCIP suggest that, for the UK, climate change means, on average, hotter, drier summers and milder, wetter winters combined with more extreme weather events such as heat waves and periods of heavy rainfall.

UKCIP02 provides climate change scenarios by geographic region. Some regions are likely to experience more climate change impacts than others. Certain features within regions are likely to represent particular “hotspots”, for example floodplains, estuaries and large urban areas. The degree to which a region adapts will also be important in determining its vulnerability to climate change and the impacts it experiences.

4.2.2 UKCP09 climate projections

In summer 2009⁶, the UKCIP 02 scenarios will be replaced by the UKCP09 climate projections. These mark a significant transfer away from a scenario-based approach to a probabilistic approach, and an improvement in localised projections down to a 25km² area. This will have significant implications for the way in which organisations, including contracting authorities, understand local climate variables as a basis for decision-making. These changes are considered later in this report and at Section 9.7.

4.3 Identifying impacts

The Partnership’s *London’s Warming* report found that the effects of climate change on the capital would cover many areas. The impacts, opportunities and challenges are summarised in **Figure 4.3** below.

⁶ Now published at [Hhttp://ukclimateprojections.defra.gov.uk/H](http://ukclimateprojections.defra.gov.uk/H)

Figure 4.3: London climate change impacts

Climate impacts	
Higher temperatures	<ul style="list-style-type: none"> • Likely to be an increase in the demand for cooling and thus for electricity in summer • Against this, there will be a reduction in demand for winter heating
Flooding	<ul style="list-style-type: none"> • Increased risk of flooding expected for many parts of London • Rising sea levels and possible increased winter storminess would require more closures of the Thames Barrier
Water scarcity	<ul style="list-style-type: none"> • Water demand will be heightened during hot, dry summers • Longer summers with higher temperatures and lower rainfall will reduce soil moisture and the chance to replenish groundwater supplies
Consequences	
Health	<ul style="list-style-type: none"> • Poorer air quality poses health problems for asthmatics and causes damage to plants and buildings • Higher levels of mortality related to summer heat stress are expected while less cold-related illness/death in winter is likely
Built environment	<ul style="list-style-type: none"> • Subsidence will worsen as clay soils dry out in summer and autumn • Alternative wetting of clays in winter and drying of clays in summer may cause increased ground movement resulting in increased potential for damage to underground pipes and cables
Transport	<ul style="list-style-type: none"> • Increased temperatures on the London Underground, exacerbated by the urban heat island effect, will lead to passenger discomfort • Hotter summers may damage elements of transport infrastructure, causing buckled rails and rotted roads, with disruption and repair costs
Lifestyle	<ul style="list-style-type: none"> • Outdoor living may be more favoured, although some members of society may be less able to take advantage of this due to lack of local facilities • Green and open spaces will be used more intensively

In line with the draft *Mayor's Climate Change Adaptation Strategy (2008)*⁷, this report therefore focuses on the three climate impacts most applicable to London; flood risk, overheating and water scarcity.

4.4 Taking adaptive action in response

There are several ways in which the UK is making good progress through the risk-based framework in Figure 4.1 above.

Increasing numbers of communities and organisations are taking steps to better understand their vulnerability to climate change and to begin to take adaptive action. However it is fair to say that there is still a lot of work to do before climate change adaptation becomes business-as-usual across all decisions and there are still relatively few examples of where specific adaptation measures have been implemented and evaluated.

Individuals, organisations and communities typically perceive a number of potential barriers to adaptation. Some of these barriers are:

- Uncertainty over climate change projections and the impacts of climate change;
- An unconvincing business case for adaptation – in particular, where benefits of adaptation are not fully captured by the individual/business carrying out the adaptation activity;

⁷ <http://www.london.gov.uk/mayor/publications/2008/docs/climate-change-adapt-strat.pdf>

- Dependency on regulations, codes and standards which focus on climate change mitigation and do not incorporate adaptation;
- The difficulty of locating of useful precedents of examples of best practice in adaptation;
- The absence of support from senior management; and
- Financial constraints.

To address these constraints and encourage adaptation, government has begun intervening at a variety of levels using a mix of strategies.

Figure 4.4: Current and planned Government adaptation initiatives

Initiative		Existing	Future
Research and risk assessment	UKCIP climate change projections, Adaptation Wizard; business assessment tool and other guidance	✓	✓ UKCP09 to replace UKCIP 02 scenarios during 2009 ⁶
	Regular publication of climate change risk assessments to UK		✓ First due in 2011 then every 5 years
	Completion of national Adaptation Economic Analysis of adaptation to complement above risk assessments		✓
Strategy development and communication	Publication of national, regional and local government / government agency climate change adaptation strategies	✓ Defra published England Strategy in 2008; London climate change strategy published in 2008; Environment Agency has had an adaptation strategy since 2005; others vary	
	Development of EU adaptation strategy, including: <ul style="list-style-type: none"> • Exploring the possibility of making climate impact assessment a condition for public and private investment • Assessing the feasibility of incorporating climate impacts into construction standards 	✓ White Paper <i>Adapting to climate change: Towards a European framework for action</i> published April 2009.	✓ Next steps response based on an incremental and responsive set of actions towards an EU adaptation strategy from 2013
	Regular publication of national adaptation progress reports which illustrate how risks have been addressed		✓ First due in 2012
Legislation, regulation and information provision	BREEAM accreditation required by various regulatory and government organisations to demonstrate that buildings have passed a benchmark for environmental assessment	✓ OGC and DCSF already require high BREEAM ratings for the majority of new build projects commissioned	✓ Review to incorporate more adaptation measures ongoing

Initiative		Existing	Future
	New code for sustainable homes ⁸ ; Retrofitting existing homes guidance ⁹	✓ Both initiatives published in 2008	✓ Review to Code to incorporate more adaptation measures ongoing
	Planning and Policy Statement 1 on Climate Change. Provides guidance to local authorities on incorporating climate change into local planning (adaptation is not, however, a major focus)	✓ Currently in operation (published Dec 2007)	
	Allow Government to require public authorities and statutory undertakers to assess, where necessary, the risks of climate change to their work and set out adaptation responses		✓ Reporting power and statutory guidance to be published by 26 November 2009
	Incorporation of adaptation into Impact Assessments (undertaken through Better Regulation Executive in BERR)		✓
	Incorporation of adaptation into HM Treasury Green Book. Provides guidance to policy makers on how to take account of adaptation when appraising and evaluating policy.		✓ Guidance expected later in 2009 ¹⁰
	Provision of guidance on how to undertake a climate risk assessment		✓
	Incorporation of adaptation into various other delivery frameworks e.g. CLG Regeneration Framework	✓ and ongoing	
Engagement and oversight	Establishment of Regional Climate Change Partnerships	✓	
	Introduction of new performance indicator NI 188 on adaptation in the core Local Government Performance Framework for 2008-11	✓ prioritised in 56 / 150 Local Area Agreements	
	Establish Adaptation Sub-Committee to oversee ACC Programme		✓ To be set up by mid 2009

4.5 Summary

There is clearly a rich landscape of policy and adaptation measures already in train, and the question is therefore whether or not, in addition to all these measures, there is a legal or economic case for embedding climate change adaptation into procurement procedures.

⁸ <http://www.planningportal.gov.uk/england/professionals/en/1115314116927.html>

⁹ <http://www.london.gov.uk/trccg/docs/pub1.pdf>

¹⁰ Guidance since published at http://www.hm-treasury.gov.uk/data_greenbook_supguidance.htm

5 Summary of the Legal Case

5.1 Scoping the Legal Case

5.1.1 What is the legality of building climate change adaptation into procurement and how do these considerations link with wider and practical issues?

The primary aim of public procurement law is to regulate the purchase by public sector bodies and certain utility sector bodies of contracts for goods, works or services. The law is designed to open up the EU's public procurement market to competition and to promote the free movement of goods and services. Open, transparent and non-discriminatory procurement processes are also designed to deliver value for money. A contracting authority must award a contract on the basis of either:

- **Lowest price:** The lowest priced tender wins. No other element of the tender may be taken into account; or
- **The most economically advantageous tender (MEAT):** Factors other than or in addition to price (e.g. quality, technical merit and operating costs) can be taken into account.

Given its primary aim, the legal case for embedding climate change adaptation into public procurement processes depends on the extent to which the measures to build in adaptation or adaptive capacity fall within and serve these aims and objectives. This section considers:

- Whether it is currently **permissible** for a contracting authority to include requirements or specifications designed to embed or promote climate change adaptation;
- Whether there is a **duty** to include such requirements or specifications; and
- Whether a procurement processes in which climate change adaptation was a significant or determinative element would be open to **legal challenge** and what steps can be taken to minimise the risk of successful challenge.

5.1.2 The legal context

The legal context for these questions includes a significant increase in challenges to procurement processes or awards. Recent cases have seen disappointed bidders seeking injunctive relief to restrain or set aside the award of contracts not only on procedural grounds, but also by challenging the validity of determinative commercial criteria¹¹. In view of that trend, contracting authorities are understandably concerned to minimise the scope for legal argument and challenge and may tend to shy away from including criteria (e.g. 'climate change resilience') that are perceived as inherently difficult to define, preferring instead to focus on more readily quantifiable and measurable matters (e.g. energy efficiency and reductions in greenhouse gas emissions).

However, if criteria relating to climate change resilience, building adaptive capacity or incorporating specific adaptation measures are explicitly based on recognised evidence or guidance (e.g. UKCIP scenarios or projections, the UKCIP 'Adaptation Wizard' or HM Treasury 'Green Book' guidance) the scope for successful challenge would be greatly diminished, and possibly eliminated.

¹¹ Henry Brothers (Magharafelt) Ltd v Department for Education for Northern Ireland [2007] NIQB 116; McLaughlin and Harvey Limited v Department of Finance and Personnel [2008] NIQB 25; Letting International Ltd v London Borough of Newham [2008] EWHC 1583 (QB); Rapiscan Systems Ltd v Commissioners of HM Revenue and Customs [2007] Eu LR 129.

5.2 Is there any legal barrier to building climate change adaptation into procurement?

To date, there is no judicial authority clearly stating that climate change impacts are 'reasonably foreseeable'. However, it is essential to remember that a court ruling does not make something 'reasonably foreseeable'. Rather, it amounts to a finding by the court that as a matter of fact, based on expert evidence where appropriate, the event or effect was reasonably foreseeable at the date of the act or omission that gave rise to a claim. Crucially, there is an extensive and growing body of data and expert opinion to support the proposition that climate change is now an operative legal concept.

The court's approach is illustrated by decisions on other issues. In *Anthony v Coal Authority* [2005] EWHC 1654 (QB), the court had to consider whether damage caused by the spontaneous combustion of a coal spoil tip was reasonably foreseeable. On evidence that experts had identified and discussed the risk in 1970, and had recommended procedures to manage that risk, the judge found that the event was reasonably foreseeable and that damages were recoverable in nuisance by the owners of neighbouring properties. In *As Laws LJ* said in *Arscott v Coal Authority* [2004] EWCA Civ 892:

an event may be reasonably foreseeable even though the precise mechanics of its causation are not... But reasonable foreseeability must imply some understanding of the chain of events which is putatively foreseen; otherwise we are... looking at... divination...

There is an extremely strong argument that climate change adaptation meets that test.

The Stern Report on the Economics of Climate Change commissioned by the UK Treasury and addressed to the Chancellor of the Exchequer and the Prime Minister opened with:

"The scientific evidence is now overwhelming: climate change presents very serious global risks, and it demands an urgent global response."

Previously, in 2006, the Carbon Disclosure Project issued its report on the 'Adaptation tipping point'. Its premise was:

'Our climate is changing, and we are faced with many years of continuing unavoidable change. Even if we make a significant reduction in greenhouse gas emissions tomorrow, the lag in the climate system means that we will need to cope with a changing climate for the next 40 plus years, due to emissions we have already put into the atmosphere. Businesses and the financial markets need to grasp the reality we face – that we have to both reduce our emissions, and adapt to inevitable climate change. There is no choice between mitigation and adaptation – we have to pursue complementary actions on both.'¹²

As described in Section 4 above, UKCIP 02 climate change scenarios for regions of the UK have been available since 2002.

While these reports do not in themselves make climate change 'reasonably foreseeable', they constitute or reflect a formidable body of expert evidence that would have to be taken into account by the court in any claim where the concept of climate change adaptation was relevant.

¹² Firth, J and Colley, M 'The Adaptation Tipping Point: Are UK Businesses Climate Proof?' Acclimatise and UKCIP, Oxford.

That body of evidence, and the tools to interpret it, will be greatly enhanced by publication of the UKCP09 climate projections later in 2009¹³, as outlined in Section 4.2.2 above. The new projections provide the tools to assess climate change impacts on a geographically specific basis, moving emphatically beyond 'divination' and into a robust probabilistic analysis. Those projections, along with the advice of the Committee on Climate Change, are required to be used as a key evidential base for the reports to Parliament required by section 56 Climate Change Act 2008, in which the Secretary of State must give an assessment of the risks for the United Kingdom of the current and predicted impact of climate change. Those reports, and guidance to 'reporting authorities' issued under section 61 Climate Change Act 2008, are designed to allow reporting authorities to meet their obligations to prepare:

- An assessment of the current and predicted impact of climate change in relation to the authority's functions; and
- A statement of the authority's proposals and policies for adapting to climate change in the exercise of its functions, and the time-scales for introducing those proposals and policies.

These new statutory obligations add to the already extensive range of tools available to contracting authorities, including the UKCIP Risk, Uncertainty and Decision Making Framework¹⁴ and the Nottingham Declaration Action Pack, which was specifically designed for local authorities¹⁵. Taken together, these freely available tools amount to an extremely compelling basis for concluding that a contracting authority seeking to procure buildings, infrastructure or services must take into account climate change impacts projected during the period covered by the contract, or during the reasonably anticipated lifespan of the asset.

Direct support for this proposition is found in the Government's Strategy for Sustainable Development¹⁶, which advocates better procurement practices to reduce costs and to improve value over the life of a project. It also emphasises that the concept of 'good design' includes:

- fitness for purpose;
- the efficient use of resources; and
- adaptability.

These 'whole life' factors would legitimately fall within the specifications for a contract to be awarded on the basis of the 'most economically advantageous tender.'

¹³ Now published at <http://ukclimateprojections.defra.gov.uk/>

¹⁴ [Hwww.ukcip.org.uk](http://www.ukcip.org.uk)H

¹⁵ [Hhttp://www.energysavingtrust.org.uk/nottingham](http://www.energysavingtrust.org.uk/nottingham)H

¹⁶ [Hhttp://www.defra.gov.uk/sustainable/government/](http://www.defra.gov.uk/sustainable/government/)H

5.3 Is there a duty to build climate change adaptation into procurement?

Contracting authorities are subject to a wide range of statutory duties, guidance and performance standards. They include:

- Public Contracts Regulations 2006 (SI 2006/5);
- Utilities Contracts Regulations 2006 (SI 2006/6);
- Local Government Act 1999 (best value authorities);
- Greater London Authority Act 1999 ss 361A and D. – these provisions include statutory definitions of “climate change”, “changes in climate”, “adaptation” and “mitigation” inserted by the Greater London Authority Act 2007;
- Climate Change Act 2008 Part 4 (ss 56-70);
- Planning Act 2008 – in particular ss 181 – 183;
- 2007/52007DC0354/Green Paper from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions - Adapting to climate change in Europe - options for EU action;
- UK Strategy for Sustainable Development (BERR 11 June 2008) – Best practice in procurement. Better procurement should “reduce cost and improve value over the life of a project”. “Good design is synonymous with sustainable construction”;
- HM Treasury Value for Money Assessment Guidance (November 2006) - http://www.hm-treasury.gov.uk/d/vfm_assessmentguidance061006opt.pdf;
- OGC Gateway Reviews/4ps; and
- New performance framework, in particular the new national improvement indicator on planning to adapt to climate change in the Local Government Performance Framework

Although climate change mitigation has tended to figure far more prominently than climate change adaptation in EU and domestic law, policy and guidance, adaptation is now firmly established as an issue that must be taken into account. While this does not amount to a single, specific, duty to ensure that climate change adaptation is explicitly addressed as a factor in procurement processes, the wide range of value for money guidance and best practice advice would make it increasingly difficult for a contracting authority to defend a procurement process that conflicted with, or could show no basis in, that guidance and advice.

5.4 Potential grounds for challenge

However strong the arguments that flow from statute and common law, it is likely that contracting authorities will encounter difficulties in addressing climate change adaptation issues as part of procurement processes. In large part this is because, with the exception of elements such as flood resilience, adaptation measures that depend on behaviour and operational criteria are far more difficult to define, and far less susceptible to quantification, than those relating to mitigation. Consequently, contracting authorities must give careful thought to:

- the stages at which adaptation is considered;
- the extent to which the contracting authority is equipped to prescribe adaptation measures; and
- the extent to which the contracting authority is equipped to evaluate a potentially diverse and even conflicting range of recommendations from bidders.

The risk of challenge that flows from these issues depends in part on the procurement process being followed, and in part on the sophistication and flexibility of the analysis applied by the contracting authority.

As described in Section 6, there are four types of procurement procedures: Open, Restricted, Negotiated, Competitive Dialogue. The type of procedure followed determines the permitted extent of negotiation or dialogue with bidders.

Under the Open or Restricted procedures no negotiation with the bidders is permitted. Consequently, the contracting authority must itself specify any elements of the contract relating to climate change adaptation, mitigation or general environmental performance.

In specifying climate change adaptation measures the principal risks facing the contracting authority are:

- use of discriminatory technical standards;
- challenges to the contracting authority's capacity/competence to identify, assess and give proper weight to relevant impacts; and
- excessive focus on potentially expensive physical adaptation measures (e.g. design, materials, construction) rather than on low cost/'low or no regret' measures¹⁷, which may relate to behaviour or operational issues (e.g. flexible working arrangements, dress codes)¹⁸.

In these circumstances, the contracting authority's best defence would be to base its specifications on the strongest available expert evidence (e.g. the UKP09 climate projections) and to engage the services of suitably qualified consultants and stakeholders to ensure that adaptation measures are based on a robust methodology, and reflect best practice. This approach has been seen in all the Case Studies explored in this report, notably 1 and 2.

Where Competitive Dialogue is used, for example in Case Study 3, it would be open to the contracting authority to address climate change adaptation by requiring bidders to conduct the appropriate risk assessment and to recommend appropriate measures as part of the 'most economically advantageous tender'. In those cases, the most difficult task facing the contracting authority, and the most likely grounds for challenge, would arise from the evaluation of bidders' recommendations and proposals, in particular if those

¹⁷ For an explanation, and examples, of 'low cost/no regret' adaptation measures, see *'Rising to the Challenge: The City of London Corporation's Climate Change Adaptation Strategy'*, January 2007

¹⁸ For an explanation, and examples, of 'low cost/no regret' adaptation measures, see *'Rising to the Challenge: The City of London Corporation's Climate Change Adaptation Strategy'*, January 2007

recommendations produce a significant difference between the projected costs of each tender. Again, though, the contacting authority's best defence would be to base its decisions explicitly on the strongest available evidence and expert advice.

5.4.1 Is there a significant risk of challenge where adaptation is not embedded?

In practice, there is little risk of a direct and successful challenge to a specification or award process that fails to include climate change measures. Remedies under the procurement regime are available in private law proceedings only to 'affected economic operators' – in this case aggrieved bidders. Any such proceedings must be issued within 3 months after the date on which the grounds for bringing proceedings arose; and would therefore rapidly be out of time.

If a challenge were brought, the aggrieved bidder's complaint would have to be based on a defect in process or in the specification or evaluation of bids. The risk is at its greatest in the context of an open or restricted procedure where adaptation measures are included, but cannot be shown to be based on sound evidence or advice. It would be extremely difficult for an aggrieved bidder to show that the absence of specified adaptation measures amounted to a defect, particularly if the process is otherwise regular, and the specification and/or evaluation criteria are reasonable.

The key point is that adaptation measures cover an extremely broad spectrum, from design and construction to working practices and the regulation of occupiers' use of the property once operational¹⁹. Measures that are specified for purposes other than climate change adaptation (e.g. specifications relating to air-tightness or insulation to ensure the efficient running of plant and equipment) can also, albeit incidentally, have a positive impact on climate change adaptation and resilience. The absence of express requirements for adaptation does not mean that a project is necessarily unadapted or maladapted.

5.4.2 The need for a sufficient interest

Recent case law has emphasised the need for a sufficient interest/standing to bring a challenge. It is not enough to be a 'concerned member of the public' – see, e.g., *Austin v Portsmouth City Council* [2009] EWHC 322 (Admin) and *Chandler v Secretary of State for Children, Schools and Families* [2009] EWHC 219 (Admin).

The courts have also leaned against the use of procedures such as judicial review in the context of procurement. Specific remedies (with time limits etc modelled on judicial review) are prescribed by the procurement regulations. The courts do not allow judicial review to be used either as a way of circumventing the rules governing the statutory remedies, or to confer remedies on anyone not covered by those remedies (again, it is not enough to be a 'concerned member of the public').

5.4.3 Administrative challenge

Decisions that do not 'embed' climate change adaptation might be open to question on the grounds that they do not represent 'best value' or 'value for money'. In this context, the consequences are likely to be along the lines of a best value review or inspection, directions from the Secretary of State (or National Assembly in Wales). That would not be a direct challenge to a specific decision.

For local authorities seeking to deliver progress on the relevant performance indicator NI 188 (Planning to Adapt to Climate Change), this is a process-based indicator. This reflects the currently limited understanding of adaptation, and the local nature of climate change impacts.

¹⁹ Green lease toolkit, Better Buildings Partnership: <http://www.lda.gov.uk/server.php?show=ConWebDoc.3154>

Consequently, if a contracting authority can show reasonable progress towards continual risk assessment and monitoring, it is difficult to see meaningful grounds for challenge.

5.4.4 Challenge to contractors

Contractual agreements and warranties would require significant departure for current forms to impose a standard liability on contractors for failure to build in climate change adaptation. A contractor is bound to build the scheme that has been specified. Construction must be in accordance with planning law, Building Regulations and any other obligations that the contractor has accepted; if the contractor has accepted a warranty that the building will be climate change resilient throughout its design life, or up to certain climate thresholds as illustrated in Case Study 1, then liability would be imposed accordingly.

5.4.5 Statutory definitions and causation

A potentially significant basis for challenge, and one that is beyond the reasonable control of a contracting authority, stems from the statutory language used to describe and define climate change and climate change adaptation.

The Greater London Authority Act 2007 amended the Greater London Act 1999 by, amongst other things, inserting a new duty on the Mayor to publish an Adaptation to Climate Change Strategy for London²⁰. The scope and content of that duty is explained by a new set of definitions inserted into the 1999 Act. The key definitions are:

“climate change” means changes in climate which are, or which might reasonably be thought to be the result of human activity altering the composition of the global atmosphere and which are in addition to natural climate variability”

“adaptation” in relation to climate change, means preparation for, or adjustment in response to, any consequences of climate change appearing to the Mayor to affect Greater London”

These definitions represent a significant ‘win’, in that they amount to an explicit statutory recognition that climate change is, to some extent, directly referable to human activity. They also served as an extremely important precursor to the general duties imposed by Climate Change Act 2008. However, the definitions do give rise to some legal difficulty.

The Mayor’s duty is to publish a strategy for adapting to “climate change” as defined. While many of the impacts identified in reports such as London’s Warming might be attributable to changes in the composition of the global atmosphere, it is arguable that others, including stress on water resources or the urban heat island effect, should be attributed to other causes (e.g. demographics, planning policies, changes in land use). While a challenge based on such grounds might be defeated, the costs of engaging in complex procurement processes mean that the possibility of challenge from disappointed bidders cannot be dismissed.

²⁰ Greater London Authority Act 1999, s 361D

5.5 Summary

From our assessment, there is no legal barrier to embedding climate change adaptation into public procurement processes.

There is as yet no specific legal duty to embed climate change adaptation into public procurement processes.

However, given the increasing body of evidence, guidance and performance frameworks, it will be increasingly difficult for contracting authorities to procure in ways that are not in line with that guidance.

The legal case is not therefore in itself a primary driver for embedding adaptation into public procurement. Embedding adaptation into public procurement rests much more heavily on the way in public procurement processes are applied and the economic case; which are covered in the next two Sections.

6 Public procurement processes

6.1 The context for public procurement processes

The law of public procurement (as outlined in Section 5), is primarily set out in EU Procurement Directives²¹ and the Regulations²² that implement them in the UK. Their purpose is to open up the public procurement market and to ensure the free movement of goods and services within the EU. In addition there are other forms of legislation (at the EU and at the National level) that is relevant, for example, competition law and state aid law, which also impact on public procurements.

Generally, public procurements must be advertised, often via a contact notice in the Official Journal of the European Union (OJEU).

There are a number of circumstances in which the public procurement “rules” do not apply (due to subject matter, below threshold limits etc.). However, even in such cases the underlying principles of the procurement rules (including, equal treatment, transparency, non-discrimination, proportionality and mutual recognition) still apply. There is also a general requirement in the UK where taxpayer funding is involved, for the contracting authority to be able to demonstrate that value for money (VFM) is achieved with a presumption that the procurement process will need to be both competitive and efficiency undertaken. Exclusions to the rules are therefore not addressed here.

6.2 Embedding climate change adaptation

6.2.1 The wider decision-making context

It is important to bear in mind the wider decision making context in which public procurement sits. As shown in **Figure 6.1** below, the extent to which a contracting authority will embed climate change adaptation into public procurement exercises will be made within the vertical context of the organisation’s broader objectives and decision-making processes; and also in the horizontal context of planning requirements and other industry standards.

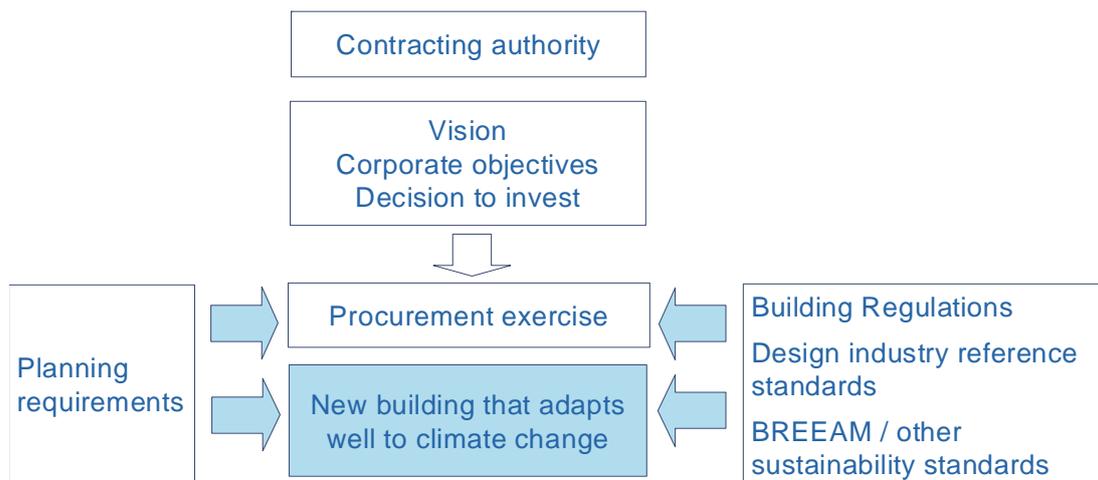
There are many standards and requirements that influence the process of developing a building that can adapt well to climate change. Each of these influences could provide alternative avenues to embed adaptation, beyond public procurement procedures and may well be capable of achieving the same outcomes (e.g. via BREEAM / other sustainable design standards) with the same or lesser cost.

This context is highly relevant in all the Case Studies explored in this study.

²¹ DIRECTIVE 2004/18/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 31 March 2004 on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts and DIRECTIVE 2004/17/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 31 March 2004 coordinating the procurement procedures of entities operating in the water, energy, transport and postal services sectors

²² The Public Contracts Regulations SI 2006 No.5 and The Utilities Contracts Regulations SI 2006 No.6

Figure 6.1 – Wider decision making context



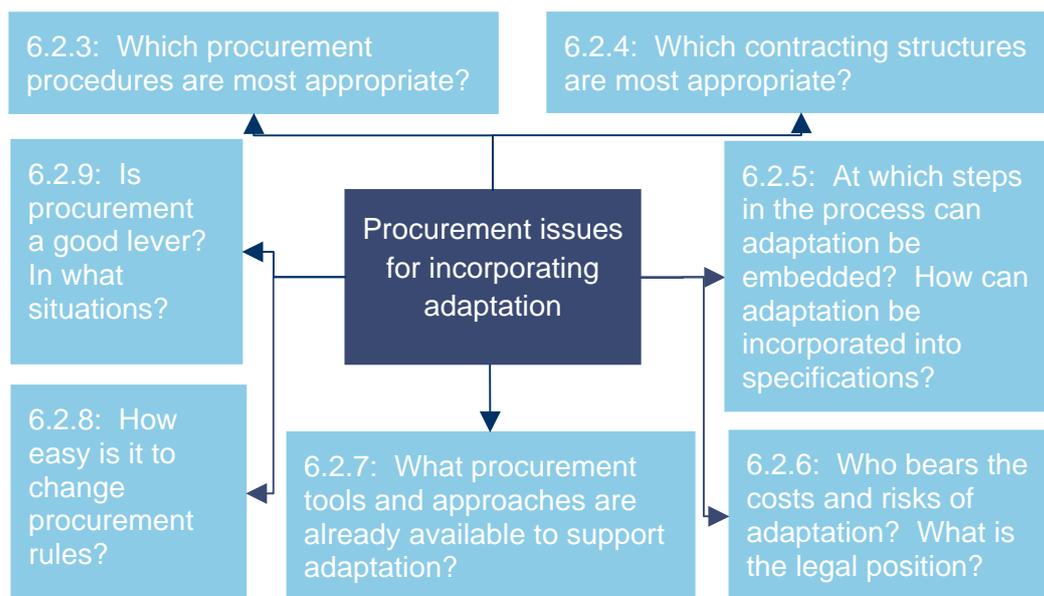
6.2.2 What issues need to be considered in embedding climate change adaptation?

When considering how to embed climate change adaptation into public procurement a number of different issues need to be considered. **Figure 6.2** below sets out the matters which need to be addressed and we expand on each of these below.

Both the subject matter (specifying requirements etc.) and the processes (staying within the rules) of public procurement can be challenging and complex without additional requirements regarding adaptation to climate change. Whilst including adaptation is entirely feasible in most instances, doing so is likely to add additional complexity.

It is therefore important that contracting authorities both understand this complexity and are able to balance the benefits against any costs before undertaking such a course of action.

Figure 6.2 – Embedding climate change adaptation into procurement



6.2.3 Which procurement procedures are most appropriate?

Currently, as touched upon in Section 5 above, there are four primary public procurement procedures – Open, Restricted, Competitive Dialogue and Competitive Negotiated. Different procedures are relevant to different project types and there are restrictions on which can be used depending on the type and circumstances of the envisaged procurement.

One of the main considerations when deciding which procurement procedure is most relevant is the scope of the project, whether or not there is a need to select potential bidders at an early stage in the process and the degree of complexity involved.

Regulation 18 defines what a “particularly complex project” is in relation to the scope of the competitive dialogue procedure. A particularly complex project is one where the contracting authority is not objectively able to:

- Define the technical means of satisfying its needs or objectives; and/or
- Specify either the legal and/or financial make-up of the project, or both
- **And**, it considers that the use of the open or restricted procedures will not allow the award of the contract.

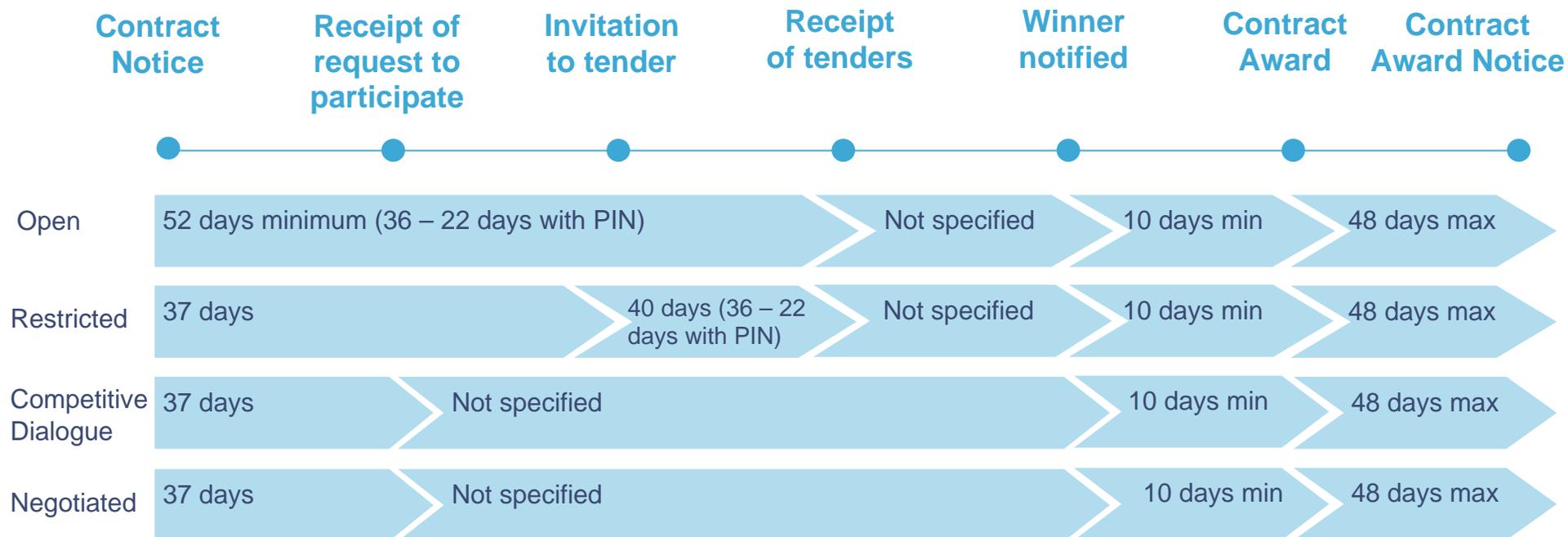
The four key procurement processes are outlined in **Figure 6.3** below, and their relative timescales in **Figure 6.4**.

Figure 6.3: Procurement processes

Open	<p>All interested parties can submit a tender in response to the OJEU notice (albeit only those meeting the contracting authority's selection criteria, if there are any, will be entitled to have their tender assessed).</p> <p>There is no ability to pre-qualify parties so all responses must be evaluated. The open procedure is primarily relevant for relatively simple procurements.</p> <p>No negotiation with the bidders is permitted but there are no restrictions under the Regulations as to when the procedure can be used.</p>
Restricted	<p>In the restricted procedure, a prequalification stage is undertaken during which interested parties can express an interest. Only pre-qualified parties are then invited to submit a tender for the contract.</p> <p>Bids can be clarified, but no negotiation with the bidders is permitted but there are no restrictions under the Regulations as to when the procedure can be used.</p>

Negotiated	<p>The negotiated procedure allows for a process of negotiation with pre-qualified bidders with the contracting authority able to select bidders by applying the stated evaluation criteria to interim bids and final bids. Following appointment of a preferred bidder the authority is able to further negotiate the bid and contractual terms prior to signing the contract.</p> <p>There are two types of negotiated procedure. Under the negotiated procedure without prior advert, the contracting authority is not required to issue an OJEU notice and may negotiate directly with the supplier of its choice. Under the negotiated procedure with prior advert, however, an OJEU notice must be published.</p> <p>All interested parties may express an interest in tendering for the contract but only those meeting the contracting authority's selection criteria will actually be invited to do so.</p> <p>Under the negotiated procedure with prior advert, Tenderers are invited to negotiate the terms of the advertised contract with the contracting authority. The Regulations do not set out any rules to govern the conduct of negotiations, which means that the contracting authority can, within certain parameters, establish its own procedures for the negotiation and tender stage.</p> <p>Whilst widely used in the past, this procedure can only be now used in the limited "exceptional" circumstances described in the Regulations.</p>
Competitive Dialogue	<p>This is a new procedure introduced by the 2006 Regulations which has the advantage of allowing the input of those participating in the tender process.</p> <p>This is the procedure under which the majority of "complex projects" may now be procured; it replaces the negotiated procedure in all except a few very exceptional circumstances (see also Section 6.2.3.above for definition of complexity in this context).</p> <p>Following a pre-qualification procedure bidders are invited to participate in a dialogue with the contracting authority, through which the authority develops one or more alternatives capable of meeting its requirements. Following the closure of the dialogue stage bidders are requested to submit a final bid. The basis of final bids can be clarified, specified and fine tuned but may not be negotiated further.</p> <p>All interested parties may express an interest in tendering for the contract but only those meeting the contracting authority's selection criteria will actually be invited to do so.</p> <p>During the "dialogue" phase, Tenderers are able to discuss all aspects of the contract individually with the contracting authority. Once the dialogue has generated solutions to the agreed requirements, final tenders are invited based on each Tenderer's individual solution. The best tender can then be selected, but there is very limited room for any further changes to be made once submitted.</p>

Figure 6.4. – Timescales for procurement procedures



- If OJEU notice compiled electronically, reduce timescale by 7 days (all procurement routes)
- If unrestricted electronic access is provided to all tender documentation, timescales can be further reduced by 5 days (Open and Restricted procurement routes only)
- Accelerated procedures can reduce timescales for receipts of requests to participate to 15 days (Restricted, Competitive Dialogue & Negotiated) and timescale for receipt of tenders to 10 days (Restricted only)
- PIN = Prior Information Notice

As adaptation to climate change is likely to require relatively complex technical solutions and include more output based specifications, it is possible that embedding climate change adaptation in to public procurement processes will result in some contracts, which might in the past have been procured under the Restricted procedure, being undertaken under the Competitive Dialogue procedure. Those complex procurements which in the past may have been undertaken under the Negotiated procedure will now, in most cases, be procured under the Competitive Dialogue procedure.

Much of this study is based on exploring Case Studies prior to the 2006 Regulations when the Competitive Dialogue procedure was not available. However, the lessons emerging from these previous procurement processes are still relevant for taking forward into the future. More specifically, the Case Studies in this report between them use Open, Restricted, pre-2006 Negotiated and Competitive Dialogue procedures.

6.2.4 Which contracting structures are most appropriate?

6.2.4.1 *Types of Contracts*

There are a wide range of different contract types which are used in public procurement. Many of these are not well defined. The type of structure that is appropriate for a given situation will depend on the specifics of the projects including: its subject matter, whether it is for service provision, asset provision or a combination, the proposed length of the contract, whether provision will be by a single party or require coordinated/integrated delivery and the complexity of the proposed contracting arrangement.

It is possible when considering asset based projects with an associated service provision (which could just relate to the maintenance of the asset or the full delivery of integrated services based on that asset) to classify contracting types into two main groups; those which take an integrated approach between the different stages of the project and those which do not. Most asset based projects include a design stage, a build or construction stage and an operate stage.

6.2.4.2 *Separate Contracts*

Where these different elements are undertaken and procured separately there is reduced opportunity to integrate the elements which relate to one or more stages compared to a structure which combines these. While the contracting authority can seek to ensure that there is joined up thinking and delivery between these different elements, by taking on an overall coordination and integration function, there is no natural incentive for the providers of each of these stages to do so themselves.

The individual specifications for each of the design, build and operation stages may include requirements for climate adaptation which the contracting authority considers to be appropriate but the authority may not be able (through a lack of technical knowledge, experience or insight) to fully understand all of the relevant linkages between the different stages. A bidder, particularly where this consists of a consortium of entities which have specialist knowledge of each stage, may be better placed to determine these linkages and to develop innovative proposals.

6.2.4.3 *Design-Build-Operate Contracts*

If all of the stages are combined within a Design-Build-Operate (DBO) structure the contracting authority is able to more generally specify (in output or outcome terms) what it requires (including its climate adaptation requirements) and bidders can then use their experience and expertise to develop an integrated solution which best delivers the authority's requirements.

A DBO structure also has the advantage that there are strong incentives for the bidder to effectively manage the interfaces between the different elements which could result in a better project, or a project at a lower cost. For example the bidder may be able to undertake some preliminary build work (e.g. ground clearance or prefabrication) while the design stage is being finalised as it is able to manage and integrate both aspects of the work so that some can be undertaken simultaneously.

There is also evidence that DBO structures encourage a whole life costing approach to project development and operation. For example bidders who know that they will be responsible for the costs of undertaking the cleaning of a hospital over the long term have taken this into account in designing the hospital so that the numbers of corners are minimised, as these are time consuming and difficult to clean, and easy to clean build materials are used.

The benefits of DBO contracts as outlined above can be similarly utilised to effectively incorporate climate adaptation into contracts. While it is possible to incorporate climate change adaptation into separate design, build and operate contracts this is more difficult and places more of a burden and responsibility on the contracting authority to both integrate the elements and ensure, through effective contract management, that these requirements are delivered in practice. This is supported in several Case Studies, notably 1, 3, 4 and 7.

While best practice in public procurement encourages the use of design and build contracts (in contrast to separate design and then build contracts) the use of DBO approaches is still relatively limited. This is often because, while the design and build stage can be contracted out to the private sector, the delivery of the service associated with the asset is undertaken by public servants (or private or third sector entities which are contracted to undertake one of maybe several services which are related to or which utilise the asset).

6.2.4.4 Contracts and project funding

The basis of project funding can also vary between projects with some projects being funded directly from public funds (with no or very little funding being provided by the private sector) while others use private funding for the design and build stages with the subsequent payment for services (often referred to as a unitary charge) including a repayment of initial capital funding with an associated funding charge.

Private sector funding can come from bidders' own financial resources (via holding company funding/intergroup loans, working capital provision etc.) or can be from third parties such as banks or financial investors which relates specifically to the project (often referred to as project financing).

The type of funding is often associated with the structure of the bidder as well as the contract structure. Where the bid is led by a single entity, with responsibility for the delivery resting with this entity (even if it uses subcontractors to provide elements of the delivery) any private funding will often be provided from internal company (or group resources). Where the contract is with a consortium of entities, which will often have been formed for the specific purpose of delivering the particular project, then it is not unusual for the bidder to be set up as a Special Purpose Vehicle (SPV) to undertake the project. In this case the main consortia parties may well contribute risk capital (equity) to the SPV (as may financial investors not directly involved in the delivery of the project). Additional loan funding will be provided by banks and other financial institutions via various forms of debt funding.

Design and build contracts are normally funded directly by the contracting authority who will make payments (less retentions) based on the achievement of pre-specified milestone events, usually from their capital budgets. Any private funding will be limited to providing short term working capital. The public sector will then separately pay for the operational aspects of the project under a separate contract (usually to a separate provider) from revenue budgets.

DBO contracts more often utilise SPV bidder structures and private funding which is often provided by a mix of bidder entity funding and third party financing. The most developed form of DBO contract with private financing is the Private Finance Initiative. This contracting approach, which was developed in the early 1990s, is usually primarily funded using third party debt funding with only relatively small levels of equity funding being involved (primarily provided by the main delivery entities in the consortium) typically in the proportions of 90% debt and 10% equity. Under such project financing structures the revenues from the project are used to repay the debt raised to fund the project and provide a return to the equity investors.

Other forms of Public Private Partnership (PPP) contracts are also used which may significantly utilise private funding but may combine this with some public funding of construction costs through milestone payments (for a proportion or all of the construction costs). There are also a range of partnering and joint venture contracting approaches which are used.

There are both advocates of private finance, who emphasise the incentive effects on bidders of not being paid until services are actually provided and the more effective risk transfer under these structures, with financial due diligence being provided by the sources of debt finance, and detractors who emphasise the higher cost of borrowing which the private sector faces compared to the public sector.

The inclusion of climate change adaptation, or not, is not likely to be a major determinant of whether or not private funding is appropriate, although pure project financing approaches are often not appropriate for first-of-a-kind projects with unknown technical risks. Private financing is more generally associated with DBO type structures where there is a long term (and dependable) source of revenues from which debt can be repaid.

6.2.4.5 Contract period and design life

The design life of projects will affect the extent to which they will need to be adapted to future climate change²³. The contracting authority should determine the design life to be used to maximise the margin of benefits over costs. It should consider the costs and benefits of building in adaptation for a relatively long period compared to the costs and benefits of building in adaptation for only a short period and then retrofitting adaptation later²⁴.

For some aspects of design, the costs of retrofitting later may be so large as to be unsupportable (for example, new foundations) while for others they may be relatively small. For some aspects of design, the costs of building in adaptation for a long period are not significantly more than for a short period (for example, larger rainwater downpipes). Some aspects which affect the ability to adapt in the future cannot easily be changed later (for example, orientation, floor-to-ceiling height and position of downstand beams).

Overall it is likely to be necessary to reflect the impacts of climate change over a period of 50 years or more in the design of the project.

The longest initial design life in the Case Studies in this report is Case Study 5 of 60-80 years for housing, followed by Case Study 2, in which a school is procured with a design life of 60 years. The study supports the argument that, for the public sector at least, where there is relative certainty about long-term need for public buildings, it is economically efficient to procure buildings that incorporate adaptation measures into longer design lives.

However, the Case Studies have found that contract periods, and their relationship to the design life, are also a determining factor. Design life and contract period are often not the

²³ Please note terminology explained in Section 1.

²⁴ New HM Treasury Green Book guidance is also relevant here Hhttp://www.hm-treasury.gov.uk/data_greenbook_supguidance.htmH

same; and as Case Study 3 shows in particular, the market does not readily accept the need to incorporate climate change adaptation measures beyond the contract period (to 2036 in that case), at least initially.

There are many different influences on the determination of a contract period. There may be market norms (based on past bidder or authority experience). For some infrastructure-related contracts the contract period will equate to the useful life of the asset (this may not equate to the potential physical life but the period before a major refurbishment or maintenance requirement).

Where private finance is involved (e.g. PFI) there is often also a financial consideration to the lifetime of the contract which is linked to the length of time which funders are prepared to lend for (the "term"). If the initial capital cost can be repaid over a longer period, the annual payments will be lower (although the total cost may be more as there will be more interest). Private finance contracts in the Case Studies were typically 15 to 25 years.

The term of the contract should be considered on a case by case basis depending on the authority's objectives, requirements and constraints, which includes what is acceptable and likely to achieve value for money in the supplier market.

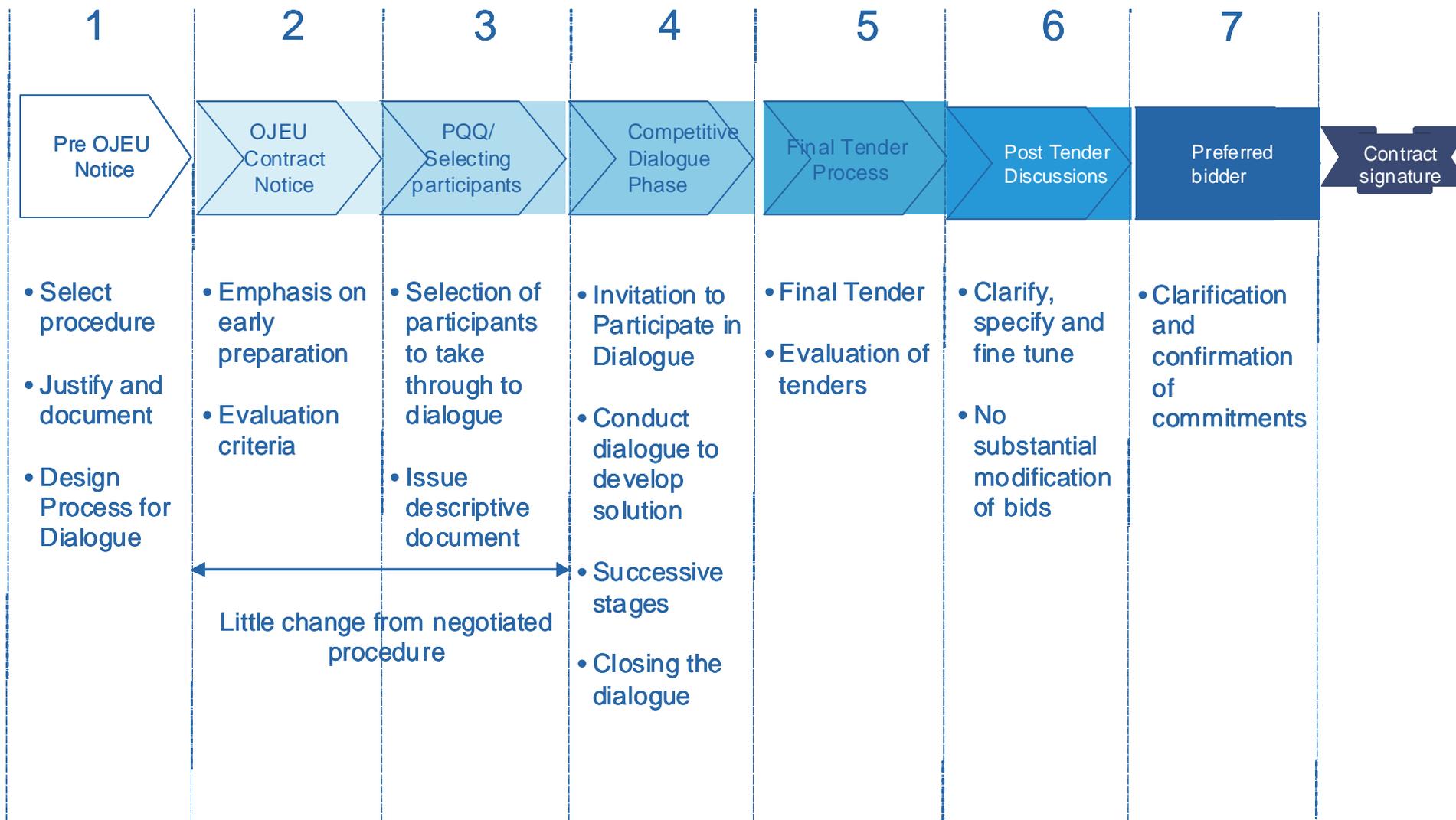
The appropriate choice of contracting structure (and funding approach) will vary from project to project depending on the specifics of the project and the objectives and constraints associated with it. However, it would appear that all things being even, a DBO approach to contracting is likely to be more appropriate to effectively incorporating climate change adaptation into public procurement projects.

6.2.5 At which steps in the process can adaptation be embedded?

When considering how climate change adaptation should be incorporated within a procurement process it is helpful to consider what the various steps are likely to be. These will depend on which procurement procedure is being used and the particular nature of the project. However, it is fair to say that regardless of the procurement procedure, the key stages for embedding climate change adaptation are at the project specification and tender evaluation stages. This is certainly borne out in all the Case Studies.

Figure 6.5 outlines the different procurement stages under the Competitive Dialogue procedure, which as indicated above, is likely to be the likely procurement procedure for many of the projects relevant to this study in the future.

Figure 6.5 – Stages in a Competitive Dialogue procurement



6.2.5.1 Pre OJEU Notice

The need for incorporating climate change adaptation and the costs and benefits of doing so need to be considered, analysed and justified during the investment decision activity which forms part of the Pre OJEU Notice stage. This includes an analysis of the various options and will inform the formation of the authority's objectives for the project, any constraints and be summarised in the Outline Business Case. Adaptation specific objectives will need to be established, defined and agreed at this stage. The appropriate contacting structure (and the basis of funding) will also need to be considered and developed at this stage.

6.2.5.2 OJEU Contract Notice

The development of the business case will continue during the OJEU Contract Notice stage with the high level adaptation objectives being refined into more specific project requirements. The evaluation criteria and outline methodology regarding these requirements will also need to be developed.

It may be important, especially where new approaches, requirements or technologies are being envisaged that effective market testing is undertaken so that the contracting authority can determine whether their specific requirements are likely to be acceptable to suppliers. This will also allow the authority to investigate whether suppliers have any innovative ideas regarding how the procurement could be structured or the requirements developed and to understand what challenges may be involved from the supply side.

6.2.5.3 Pre-qualification

Consideration as to whether there will be any climate change adaptation specific requirements relating to bidder's capability or experience and whether any specific matters need to be included in the pre-qualification questionnaire will need to be determined as part of the Pre-qualification stage. The authority may also want to issue an information memorandum at this time further informing bidders of the project requirements including any adaptation specific issues which may be new or unusual.

6.2.5.4 Competitive Dialogue Phase

It is likely that climate change adaptation aspects of the project will form some of the topic areas which the contracting authority and bidders will wish to discuss during the dialogue stage. The invitation to participate in dialogue will need to clearly set out any relevant requirements in detail along with the evaluation criteria and the approach to evaluating any adaptation specific requirements and the way in which these specific requirements will be evaluated along with all of the other aspects of the project. The authority should be clear as to what it intends to include in the way of adaptation requirements, specifications and associated contractual terms before engaging in discussions with bidders on these issues. The discussions should focus on the specifics and the acceptability of bidders' proposed responses to these.

6.2.5.5 Final tender process

The final bids will need to cover all aspects of the project and will need to detail the adaptation elements of the bid, the detailed contractual clauses which relate to these, the payment arrangements and also any change mechanisms which may be incorporated into the contract which will enable subsequent change to the contract if further (unexpected) climate change adaptation should be needed after the contract has been signed.

6.2.5.6 Post tender discussions and preferred bidder stages

Under the Competitive Dialogue procedure there is very limited scope to enter into further discussion during the post tender process and once the preferred bidder has been appointed. These restrictions will apply to all aspects of the project including climate adaptation aspects.

6.2.5.7 Contract specification

The way in which adaptation can be incorporated into the specification of a project will vary depending on the specifics of a given project. Public procurement requires that contracting authorities are clear and transparent from an early stage as to both what the specification is and how bidders will be evaluated in assessing the degree to which they have responded and satisfied, or not, the required specification. As set out above it is often more appropriate to set specifications in output or outcome terms rather than being specific or prescriptive about the inputs which bidders have to provide. Such an approach generally allows more scope for bidder innovation in response to an authority's needs and as such may be particularly relevant to new areas such as climate change adaptation.

6.2.6 Who bears the costs and risks of adaptation?

Identification of all relevant risk and the appropriate and clear allocation of all risks is an important prerequisite for an effective public procurement. The general rule is that, in order to maximise overall value for money, risks should be allocated to the party, or parties, which are best able to manage and mitigate those risks.

Risk identification and analysis will form an important part of the initial economic analysis. To the extent that risks can be identified and analysed then the allocation (and the payment for taking the risks) should be clearly set out in the contract. If the authority attempts to transfer risks which bidders are not willing to accept then, although through a process of negotiation they may succeed in allocating such risks, the authority will normally pay a significant risk premium as part of the bid price.

The contracting authority may therefore need to undertake some early economic analysis to inform itself as to the appropriate risk allocation and to discuss its views with bidders during any market testing and as part of the subsequent discussions during the dialogue stage.

Where there is a possibility that there will be future risks associated with climate change, but it is not possible to identify these (and therefore an appropriate allocation and reward mechanism) at the procurement stage, contracting authorities should incorporate appropriate change provisions within the contract. This should assist the authority and the bidder to deal with any such unknown risks if and when they arise later in the contract term. By having an agreed change process the authority is likely to be in a better position when negotiating any subsequent change than if there were no such provisions and the authority had to negotiate with an incumbent supplier without the benefit of any competitive tension.

In many contracts the risks of general future legislative change which would affect all/most economic operators in the relevant sector(s) (which may be particularly relevant to climate change adaptation where future changes in legislation are likely) are usually borne by the bidder. However, any legislative change which is specific to a given project (and which could otherwise be seen to be discriminatory) is borne by the authority.

In broad terms, so long as there are no terms in the contract which contravene other legal provisions and the risk allocation is agreed through a transparent and competitive process then there are not likely to be any specific legal issues regarding risk allocation.

The Case Studies in this report have used DBO contracts to share climate impact risk. For example, in Case Study 1, the contracting authority has specified a future weather profile within which the costs of maintaining the internal environment transfers to the contractor.

Beyond the extremes in the profile, the costs of any additional adaptation transfer back to the contracting authority.

6.2.7 What procurement tools and approaches are already available to support adaptation?

As set out above, climate adaptation can, with care, be effectively incorporated within normal public procurement procedures and approaches.

One of the main considerations, regarding both specification and evaluation is the degree to which the contracting authority is looking to achieve minimum, or “hurdle rate” levels of specification, or it wishes to encourage bidders to submit solutions which seek to provide more than a given level of specification.

The minimum approach is much simpler in practical terms. So long as a minimum level can be objectively specified the bidders can develop their proposals in a way which ensures that they satisfy the requirement. There will however be the issue for the contracting authority as to how to specify the minimum requirement. If the hurdle is set too high then this is likely to have cost implications with consequential impacts on value for money. If it is set too low the desired level of adaptation may not be achieved.

There are acknowledged cross sector standard specifications which are relevant to climate change adaptation which includes the BREEAM standards for buildings. Some sectors have specific minimum standards which have to be achieved. It is of course important that the standards used in the procurement phase are effective in achieving the climate change adaptation outcome which is required. This is an issue this study returns to later and requires further discussion.

In practice it can be challenging to objectively specify requirements in terms of increasing levels of quality in adaptation terms and to develop robust evaluation approaches. This can be done by providing different bands of achievement and rewarding, in evaluation terms, the achievement of higher bands of outcome. In many cases contracting authorities may need to combine a minimum standard with a process whereby additional reward (in evaluation terms) is given for increasing levels of achievement but only up to a maximum level when diminishing returns set in.

6.2.8 How easy is it to change procurement rules?

- As set out above there are no legal barriers to incorporating climate change adaptation within the public procurement rules and regulations. The main issue is that the contracting authority needs to ensure that it can show a clear and relevant link between any adaptation requirements and the subject matter of the procurement.
- As the main determinant of the public procurement rules in the UK are the EU Directives any significant change to these rules is likely to require a change in the relevant EU Directive. Given that the Directives were last changed in 2004 (for implementation in Member States by 2006) and that the process of consolidating the previous Directives took the best part of a decade, any desired changes are unlikely to be achieved in the foreseeable future. In principle Member States are able to add additional requirements, over and above the requirements of the Directives but this is likely to require a formal consultation by the Office of Government Commerce. However, behaviours can sometimes be achieved by developing guidance and defining and promoting best practice.
- That said, as set out in Figure 4.4, the EU White Paper on adapting to climate change seeks to explore the implications of making a climate impact assessment a condition for public and private investment. This could, should significant political interest be raised, drive future changes to relevant Directives; though this is purely speculative at this stage.
- Individual contracting authorities are able to change the specific internal rules and standing orders through which they undertake the procurement procedures as set out in national and EU regulations. However, they can only do so within the boundaries set by

these regulations and have to ensure that in doing so they abide by the principles which underlie public procurement.

6.2.9 Is Procurement a good lever? In what situations?

Public procurement is a means through which climate change adaptation can be achieved in relation to particular construction projects where this is an objective of the contracting authority. There are also wider potential benefits in terms of raising awareness and developing experience in private sector contractors.

The degree to which contracting authorities develop tools and approaches which support adaptation, and that these are shown to work, will influence the extent to which they will be adopted by other authorities and become norms for how other organisations (including private sector entities) incorporate climate change adaptation into their own requirements and procurement processes.

Developing robust and practical approaches to specification and evaluation processes that incorporate climate change adaptation and making these widely available is likely to increase the degree to which adaptation becomes more widely adopted.

Similarly, to the extent that adaptation becomes the norm in most/all public procurements, given the scale of public procurement both nationally and in local and regional markets (some £47bn annually), the public sector will be able to influence its supply markets as they will have to respond to requirements which require climate change adaptation. Public sector requirements might then be adopted in wider markets and become the norm.

Therefore the way that public procurement is undertaken may be used as a way that leads others to consider and undertake climate change adaptation. Demonstrating how it can be done, and done well, such in the Case Studies accompanying this report, may encourage others to undertake adaptation. Public procurement is however primarily a tool which allows an authority to deliver its adaptation objectives rather than a lever in itself.

6.3 What practical/implementation issues should be considered?

6.3.1 Capacity and capability

Public procurement can be complex in any event. Incorporating climate change adaptation in public procurement can make this more complex. Also the degree to which such incorporation is new increases the difficulty and perceived risk of undertaking public procurements. While historically there were very few legal challenges in public procurement the risk profile of these projects has changed in recent years.

As illustrated in Case Studies 2 and 3 of this project in particular, contracting authorities should consider what actions they need to take to ensure that they have the necessary resources to undertake such procurements both in terms of:

- the capacity to undertake potentially more complex procurements (including the time taken to develop new specifications and evaluation approaches and the time to undertake market testing and discuss these aspects with bidders during the procurement process); and
- the capability in terms of the experience and skills of their staff and the need to enhance or supplement these through training, experience sharing and utilising advisers where necessary.

Advisory and collaborative procurement organisations have a role to play in sharing good practice and skills development between contracting authorities. This role will become increasingly important in the future given the Government-led emphasis on increased collaborative procurement under the current economic conditions.

Design and construction institutes and organisations can also play an important role in developing capability and capacity in the market.

The recent CABE briefing *Agreeing a Procurement Strategy* outlines the importance of a structured procurement strategy and process and a strong, informed contracting authority in order to improve the quality and performance of development²⁵.

6.3.2 Guidance and standardisation

The development of guidance and, where appropriate, standardisation of documents, contract terms and processes can provide a variety of benefits including:

- improved efficiency arising from ensuring that there is not duplicative “redevelopment of wheels” by many different contracting authorities;
- ensuring more consistency in approach and helping to reduce procurement times and bid costs;
- achieving a more consistent and efficient interaction with the supplier community, who do not have to deal with a plethora of different approaches and terms; and
- As set out in 5.2.9 above, the development of guidance and best practice could also be useful in further promoting climate change adaptation in wider areas.

²⁵ Available via [Hhttp://www.cabe.org.uk/files/agreeing-a-procurement-strategy.pdf](http://www.cabe.org.uk/files/agreeing-a-procurement-strategy.pdf)

6.4 Summary

The current procurement rules and processes, if properly, utilised are capable of allowing for climate change adaptation. Adaptation is best incorporated as part of the objective-setting and specification process. The project objectives should be consistent with the wider objectives and vision of the contracting authority. In addition any adaptation requirements for the project have to be relevant to the subject matter of the procurement.

Incorporating climate change adaptation into a public procurement is likely to increase the complexity of the process. The contracting authority will need to ensure that there is clarity about the objectives and adaptation requirements so that bidders know what they are being asked to do. There also has to be clarity, from an early stage in the procurement process, as to how adaptation requirements will be evaluated and their relative importance against other requirements. Recently there has been increased legal challenge to public procurement processes, especially regarding the evaluation.

Generally, given the need for authorities and bidders to discuss the details of adaptation requirements and responses during the procurement process it is likely that the Competitive Dialogue procedure will be the appropriate procedure in many cases where climate change adaptation is required. Depending on the subject matter of the procurement it will often be appropriate to consider utilising DBO type contract structures in the future so that all aspects of adaptation can be considered and delivered within a single contract.

Given that incorporation of adaptation requirements is still relatively new, and untried by many contracting authorities, and potentially increases the complexity of procurement, there may be significant benefits to investing in improving collective understanding of adaptation requirements and approaches in public procurement. This may include developing practical guidance, standardised methodologies and capacity and capability improvements, as described above and as revisited later in this report.

7 The Economic Case

7.1 Introduction

7.1.1 What is an economic case?

All government interventions should be based on an economic case for investment in line with HM Treasury's Green Book rules. This involves going through a number of key stages:²⁶

- Stage 1: Establish a case for public sector intervention
- Stage 2: Identify objectives for the intervention
- Stage 3: Identify options for meeting intervention objectives specified
- Stage 4: Appraise options to identify one that is most suitable
- Stage 5: Select option and implement it

7.1.1.1 Stage 1: Establish a case for public sector intervention

The first stage in outlining an economic case for government action is establishing that there is a case for intervention. Any government intervention has costs and so it must be demonstrated that the benefits of a government intervention are likely to outweigh these costs at an early stage.

There is a strong case for Government intervention is typically justified on two grounds: intervention for reasons of efficiency or equity²⁷:

- *Efficiency rationale for intervention:* Market failure is a description of a situation where, for one reason or another, the market mechanism alone cannot achieve economic efficiency. The existence of market failures provides a rationale for government intervention. There are many different examples of market failure – for example, externalities, public goods, imperfect information.
- *Equity rationale for intervention:* Whilst a market outcome might be efficient, there may be concern that the social outcomes that result are “unfair” or “inequitable”. In these circumstances it may be justifiable to intervene in markets to correct such “distributional failures”.

7.1.1.2 Stage 2: Identify objectives for the intervention

If there is a clear rationale for government intervention, it is then necessary to set out the desired objectives for that intervention. Objectives should be stated so that it is clear what proposals are intended to achieve. A hierarchy of outcomes, outputs and targets can be identified in setting objectives.

- Outcomes are the eventual benefits to society that proposals are intended to achieve;
- Outputs are the results of activities that can be clearly stated or measured and which relate in some way to the outcomes desired; and
- Targets are measures of progress used to help assess advancement in terms of producing outputs, delivering outcomes and meeting objectives. Targets should be SMART (Specific; Measurable; Achievable; Relevant; and Time bound).

²⁶ HM Treasury's Green Book outlines the Economic Case identified here in far greater detail. *The Green Book: Appraisal and Evaluation in Central Government*, HM Treasury, January 2003

²⁷ A rationale for intervention on grounds of both efficiency and equity may also be made

7.1.1.3 **Stage 3: Identify options for meeting intervention objectives specified**

This stage of the economic case involves identifying the range of different options that government could adopt to meet its objectives specified. Depending on the objectives for the intervention identified, there may be a wide potential range of policy instruments available.

Policy instruments available to government, at a generic level, include:

- Provision of information, education and advice;
- Direct intervention to provide goods and services;
- Economic instruments - which change the prices/costs faced by agents e.g. taxes, subsidies, credits, tradable permits, loans; and
- Regulation and legislation.

Of these, direct intervention is the main option in relation to public procurement.

7.1.1.4 **Stage 4: Appraise options to identify one that is most suitable**

This stage involves appraising the options identified to assess which is the most suitable (if any) in meeting the objectives specified for the intervention. This involves identifying the costs and benefits of each option identified and, where possible, trying to value these.

In principle, options appraisal should take account of all costs and benefits that are relevant to the UK. Some of these costs/benefits may be indirect or very difficult to quantify and this can present challenges.

An important point to note here is that the costs and benefits of an option should always be compared with a “do nothing” scenario or “base case” in order to establish the *additional* costs/benefits of the option under consideration. The base case represents the “no-intervention” case, a description of “what would have happened anyway”.

There are a number of other issues that would need to be considered in appraising options effectively – for example, discounting to take account of the fact that costs and benefits may occur in different time periods and consideration of risk and bias.

7.1.1.5 **Stage 5: Select option and implement it**

Following the options appraisal, the best option should be selected. The best option is generally that which has the highest net benefit value (after discounting). To the extent that all costs, benefits and risks have been robustly valued, this guideline can be applied with more certainty.

7.1.1.6 **Other elements to building a business case for intervention**

In addition to the economic case, there are other elements to consider in building a business case for intervention. HM Treasury highlights the 5 cases that need to be made to justify a government intervention²⁸:

- “Strategic case” – intervention is supported by a robust case for change that provides strategic synergy
- “Economics case” – intervention offers value for money
- “Commercial case” – intervention is commercially viable

²⁸ http://www.hm-treasury.gov.uk/data_greenbook_business.htm

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- “Financial case” – intervention is financially viable
 - “Management case” – intervention is achievable

7.1.2 The approach to the economic case for embedding adaptation into public procurement

This project seeks an assessment of whether there is an economic case for embedding adaptation to climate change into public procurement as defined in Section 2. The approach to the economic case will not involve going through the full set of stages outlined in Section 7.1 above. To do so would require that a number of options be considered and compared whilst this study focuses on only one area of possible intervention (public procurement). Alternative policy interventions will not be considered and appraised, therefore it will not be possible to present a full economic case for public procurement. In particular, this project will not be able to provide a full answer to the question of whether public procurement, as opposed to other possible intervention options, is the most appropriate/value for money option. This study will, nevertheless, be able to provide some indication of the benefits and costs of adaptation in capital projects and the impacts that usage of the procurement process may have in delivering adaptation.

It is worth noting that government intervention options to address adaptation in capital projects are potentially numerous (and some are already in operation to some degree – as will be discussed). Example intervention options to address adaptation in capital projects could include:

- Taxes/subsidies – for example, providing subsidies for use of technology which encourages adaptation;
- Information/education campaigns to raise awareness of the benefits of adaptation;
- Adjustment to planning legislation/building codes to increase adaptation requirements;
- Loans for businesses to incorporate adaptation adjustments

Moving forward, this piece of work will therefore focus on the economic case for embedding adaptation into public procurement – which will include an examination of the different ways in which public procurement could be utilised to promote adaptation. This remainder of this Section will now address the following questions:

- Is there a case for public sector intervention to address climate change adaptation in capital projects?
- What is the base case? (i.e. what adaptation activity is occurring now and what initiatives are driving this?)
- Can public procurement add economic value in driving climate change adaptation in capital projects?
- What does our analysis tell us about the overall economic case for incorporating adaptation into public procurement?

7.2 Is there a case for public sector intervention to address adaptation in capital projects?

7.2.1 Introduction

The first stage in our approach to scoping the economic case for embedding adaptation into public procurement (where public procurement is defined as capital projects) involves establishing whether or not there is a case for public sector intervention to address adaptation in capital projects.

This will be addressed in two key stages:

- Firstly, through looking at the **evidence base on the case for adapting to climate change**. Critically, this involves looking at the costs and benefits of adaptation to climate change. If the benefits of adaptation to climate change exceed the costs then adaptation should occur.
- Secondly, through an **assessment of whether there is a need for government to intervene to improve adaptation**. Assuming that the benefits of adaptation are shown to exceed the costs, the question is then whether the private market alone can deliver the degree of adaptation activity that is required. If market failures exist which mean that the private market left alone will not deliver sufficient adaptation, there is a case for government intervention to address adaptation.

7.2.2 Evidence base of the case for adaptation to climate change

Much has been written on the case for adaptation to climate change by government, industry, academics and other stakeholders. In assessing the evidence base, this study first tries to understand what the physical impacts of climate change are going to be – by referring to the UKCIP02 climate change scenarios for London (see Section 4.1.1). Then this study examines the available evidence on the costs and benefits of climate change; while there may be some benefits to climate change, the costs are likely to significantly outweigh these. The main benefit of adaptation is that it should reduce the costs of climate change. However, adaptation will also have costs. The final section examines evidence on the overall case for adaptation by weighing up its costs and benefits.

7.2.2.1 Evidence of costs of climate change

Drawing on the UKCIP02 climate change scenarios for London and the main climate impacts discussed in section 3.2.1, there are clearly both costs and benefits to climate change. However, the available evidence suggests that the costs of climate change to the UK and London will clearly outweigh any benefits.

The Stern Review on the Economics of Climate Change (2006) estimated that without acting, the overall global costs and risks of climate change would be equivalent to losing 5%-20% of global Gross Domestic Product each year, now and forever.

Figure 7.1 provides some indicators of the possible quantitative costs of climate change for four of the main issues likely to face London.

It is important to note that the impacts of climate change in one issue or sector will frequently have indirect implications for others, which means that studies focusing on one issue or sector in isolation may not capture the full extent of the costs or benefits from climate change.

Figure 7.1: Evidence of possible costs of climate change for London

London issue faced	Indicator of possible quantified costs
Overheating	<ul style="list-style-type: none"> • 2003 heat waves where temperatures exceeded 35C in South East England resulted in approximately 35,000 excess deaths across Europe (IPCC Working Group II, Fourth Assessment Report, 2007)²⁹
Flooding	<ul style="list-style-type: none"> • UK floods of 2007 resulted in 13 people losing their lives and about 48,000 homes and 7,000 businesses were flooded (The Pitt Review: <i>Learning lessons from the 2007 floods</i>, Sir Michael Pitt, 2008)³⁰

²⁹ <http://www.ipcc.ch/>

³⁰ <http://archive.cabinetoffice.gov.uk/pittreview/thepittreview.html>

	<ul style="list-style-type: none"> • Government estimates that the value of land and property within the area protected by the Thames barrier and other upstream flood defences is £80 billion pounds (Defra, 2001) • The Environment Agency's National Flood Risk Assessment data can be used to estimate the number of people living in areas with a "significant" chance of flooding (the chance of flooding in any given year is greater than 1 in 75). The South East and Greater London regions have the largest population with "significant" chance of flooding with 217,000 and 145,000 people respectively Environment Agency, National Flood Risk Assessment Results, 2006)³¹ • Flooding losses represent by far the greatest source of climate change impacts on property insurance with increase of almost 15-fold by the end of the century under the UKCIP high emissions scenario, leading to total potential losses from river, coasting and urban flooding of more than £22bn (Financial risks of climate change, ABI, 2005)³²
Storms / extreme wind	<ul style="list-style-type: none"> • Insured wind-related losses from extreme European storms could increase by \$2 - 2.5bn on top of present-day losses of \$30 - \$35bn, representing a 5% increase. This increase excludes any flood costs. (ABI, Financial risks of climate change, 2005) • Claims for storm and flood damages in the UK doubled to over £6bn over the period 1998-2003, with the prospect of a further tripling by 2050 (<i>A Changing Climate for Insurers</i>, Association of British Insurers, 2004)
Water shortages	<ul style="list-style-type: none"> • UK Environment Agency has suggested that a 10-15% increase in reservoir capacity may be required to address potential water deficits, at an estimated cost of £3bn³³

7.2.2.2 Evidence of benefits and costs of adaptation

The main benefit of adaptation is that it reduces vulnerability to climate change and thereby reduces its negative impact, both in terms of financial (e.g. insured/uninsured losses) and non-financial (e.g. loss of life, culture etc) impacts. Adaptation cannot, however, eliminate the impacts of climate change. There will always be some residual impact of climate change.

Adaptation also has itself a cost (for example, construction costs and administrative costs of incorporating adaptation). These costs need to be balanced against the benefits of adaptation to understand if there is an economic case for it.

As illustrated in the chart below, the cost of climate change after adaptation is equal to the residual cost of climate change plus the cost of adaptation.

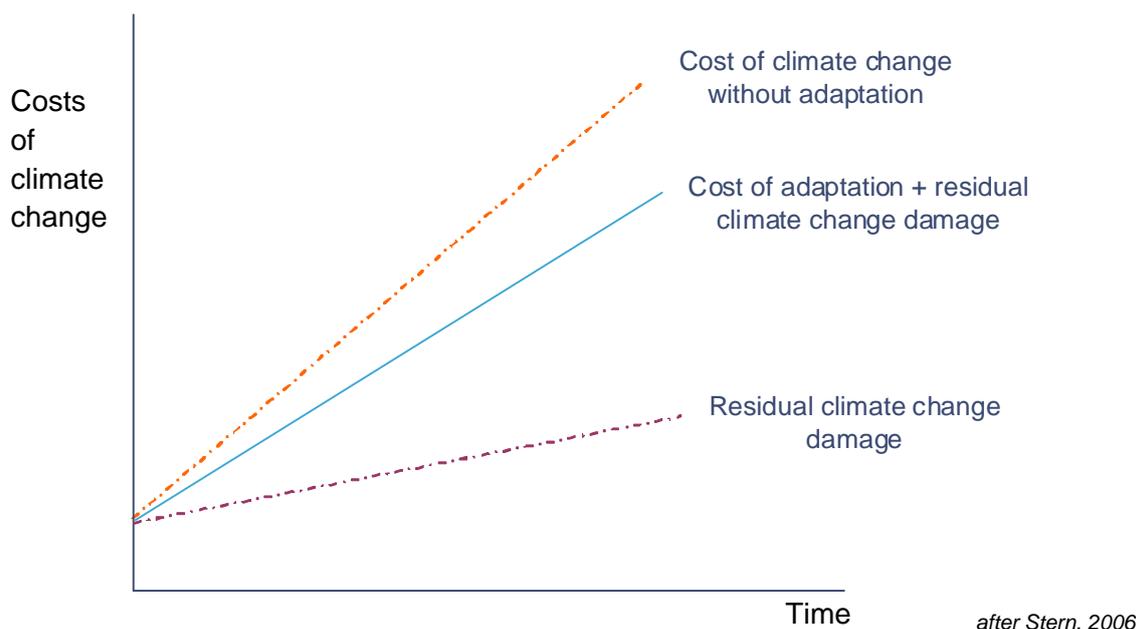
The focus of this project is on adaptation in capital projects and, for this economic case, adaptation costs refer to the costs of adapting capital projects (which includes estate strategies and lease arrangements; capital expenditure plans; construction projects for new build and refurbishments; and facilities management, buildings and ground maintenance).

³¹ <http://www.hrwallingford.co.uk/Projects/MCR4030%20PDS290%20TKM%200707.pdf>

³² http://www.abi.org.uk/Display/Display_Popup/default.asp?Menu_ID=1090&Menu_All=1,1088,1090&Child_ID=552

³³ *Stern Review on the Economics of Climate Change*, Part V, HM Treasury, 2006

Figure 7.2: Costs of climate change with and without adaptation



The costs of adaptation will depend heavily on what adaptation activity is actually undertaken. The costs of using public procurement as a tool for encouraging adaptation will differ from the costs of using adjustments to planning legislation as a tool, for example. At this stage in the economic case, the focus is on assessing the evidence of the **overall benefits and costs of adaptation in capital projects** – the case for *public procurement* as a tool for incorporating adaptation will be examined later.

Whilst studies in climate-sensitive sectors across the globe point to examples of adaptation activity that will provide benefits in excess of costs (e.g. the Stern Review summarises quantitative impact and welfare change estimates resulting from various adaptation in agriculture studies), evidence on the costs and benefits of infrastructure or capital project adaptation is more limited. Evidence on the costs and benefits of economy-wide adaptation activity is also limited.

Despite the lack of quantitative data, the majority of experts in the field and studies conducted support the view that some degree of adaptation is highly desirable. The Stern Review said:

“Adaptation will be crucial in reducing vulnerability to climate change and is the only way to cope with the impacts that are inevitable over the next few years”³⁴

Figure 7.3 below provides some evidence on the benefits and costs of adaptation in capital projects. The evidence provided is extremely circumstance-specific and supports a general finding that the costs and benefits of adaptation depend heavily on the specific geographic and contextual circumstances of the adaptation work undertaken. So, for example, the costs and benefits of adapting a typical home to climate change will differ according to whether that home is in the South East of England or the North West (since climate change risks will be different). Costs and benefits will also vary according to the specific change risks that are being tackled – the costs and benefits of making the home flood-proof will differ to the costs and benefits of making it resistant to over-heating. Finally, the choice of adaptation technique will cause costs/benefits to vary – there are a variety of ways to make a house flood-proof and some will be more resilient and cost effective than others.

³⁴ *Stern Review on the Economics of Climate Change*, HM Treasury, 2006

Nevertheless, the evidence illustrated support the view that the benefits of adaptation are high and that the costs of adaptation are proportionate in comparison. Some of the Case Studies conducted as part of this project also support this view – as illustrated in Section 7.4.3.

Figure 7.3: Evidence on benefits and costs of adaptation in capital projects

Sector / geographic region	Climate change threat	Source	Costs of adaptation	Benefits of adaptation
New infrastructure / buildings in OECD countries	General climate change	Stern Review ³⁵	Additional costs of making new infrastructure and building more resilient to climate change in OECD countries could range from \$15-150 billion each year (0.05-0.5% of GDP), with higher costs possible with the prospect of higher temperatures in the future	
Buildings in US / UK	Storms	ABI ³⁶		If all properties in south Florida were built to meet the strongest local building code requirements, damages from a repeat of Hurricane Andrew would fall by nearly 45%. If design code standards for building in the South East of the UK were upgraded by at least 10% (no further detail provided by ABI), increase in climate-induced damage costs from windstorms could be reduced substantially.
Development planning / flood defences in the UK	Flooding	ABI ³⁷		Taking account of climate change in flood management policies in the UK (including controlling development in floodplains and increasing investment in flood defences) could limit the rising costs of flood damage to a possible four-fold increase (to £53.1bn) rather than 10-20 fold by the 2080s.
Buildings in the UK	Subsidence caused by general climate change	Metroeconomica ³⁸	Various benefits and costs of alternative adaptation options to property subsidence by 2080s provided producing – on balance – a net benefit of adaptation. For example, deeper foundations provide benefits of \$2.7 - \$10.3 bn	Equivalent cost is \$3.7 - \$6.4 bn

³⁵ Stern Review on the Economics of Climate Change, HM Treasury, 2006...

³⁶ Financial risks of climate change, ABI, June 2005

³⁷ Financial risks of climate change, ABI, June 2005

³⁸ Financial risks of climate change, ABI, June 2005

Sector / geographic region	Climate change threat	Source	Costs of adaptation	Benefits of adaptation
Case-study home in the UK	Over-heating	Three Regions Climate Change group ³⁹	Costs vary according to adaptation measure taken (ranging from no cost for natural ventilation through open windows to £3,750 for façade upgrade and painted walls to increase reflectivity)	
Case-study home in the UK	Water stress	Three Regions Climate Change group ⁴⁰	Costs vary according to adaptation measure taken (ranging from £20 for low-flow adapted kitchen taps to £380 for water efficient washing machine)	Payback times vary according to measure taken (and assuming home is water-metered)
Case-study home in the UK	Flooding	Three Regions Climate Change group ⁴¹	Resistance package (for floods up to 0.9m) costs £13,750; resilience measures cost £4,495	0.6 floods pay back the investment in the case of resistance measures; 1.05 floods pay back the investment in the case of resilience measures

7.2.3 Assessment of whether there is a need for government to intervene to improve adaptation

The above section provides strong evidence that the benefits of adapting capital projects to climate change outweighs the costs of doing so. However, this is not a sufficient argument to justify government intervention to address adaptation. It must also be shown that the private market alone cannot deliver the degree of adaptation activity required.

In his review of the Economics of Climate Change, Stern addressed exactly this point. He concluded that a number of failures existed in the market for adaptation which meant that, left alone, individuals and organisations would not adapt sufficiently. This provides an argument for government intervention – to help deliver the degree of adaptation activity required. Stern identified 3 main market failures in his review:

- **Uncertainty and imperfect information.** Lack of information, understanding and uncertainty about the impacts and consequences of climate changes makes it difficult for individuals and businesses to weigh up the costs and benefits of investing in adaptation. This tends to reduce the amount of adaptation activity they undertake.
- **Missing and misaligned markets.** Individuals and business' are most incentivised to undertake adaptation activity when it is in their direct interest to do so. However, in some cases the benefits of adapting could extend beyond those who have paid for them, and provide benefits to the wider economy and society. An example is flood protection for a wider region. In this case, the private sector is unlikely to invest in the amount of adaptation that would be desirable from society's point of view because they cannot capture the full benefits of the investment.
- **Financial constraints.** Social and economic inequalities may limit the ability of certain parts of society to undertake effective adaptation – for example, if disadvantaged groups are not able to afford insurance. At the same time, the impacts of climate change might be most felt by the most vulnerable in society, and might exacerbate these existing inequalities.

³⁹ *Your home in a changing climate*, ARUP, commissioned by the Three Regions Climate Change Group, 2008

⁴⁰ *Your home in a changing climate*, ARUP, commissioned by the Three Regions Climate Change Group, 2008

⁴¹ *Your home in a changing climate*, ARUP, commissioned by the Three Regions Climate Change Group, 2008

7.2.4 Conclusion

Having examined the evidence base on the case for adaptation to climate change it seems that, whilst there are clearly both costs and benefits to climate change, the benefits are expected to very much outweigh the costs – at least from London’s or the UK’s perspective. Looking at evidence on the costs of adaptation in capital projects versus the benefits, although there is not yet much quantitative data available in this area, some degree of adaptation is likely to be very desirable. The existence of market failures means that it is unlikely that private markets alone will deliver the degree of adaptation that is desirable. This provides a case for government intervention to address climate change adaptation.

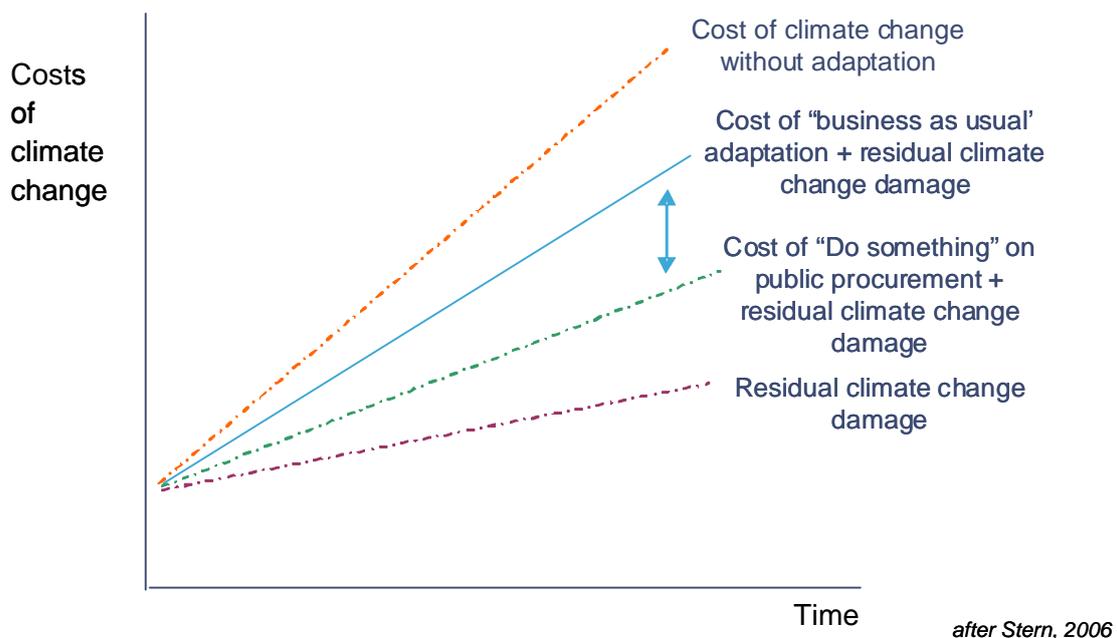
7.3 What is the base case?

7.3.1 Introduction

The next issue that needs to be addressed is that of the base case. The base case or “no intervention” case describes what adaptation activity *would have happened anyway* in the absence of *additional* government intervention; what adaptation activity is occurring now and what initiatives are driving this? It can be described as a “business as usual” scenario. Only by understanding the base case can we understand the *incremental* costs and benefits of additional government intervention (of which incorporation of adaptation into public procurement is one example).

In the chart below, the costs of climate change increase over time. Costs are greatest if no adaptation to climate change occurs and least if the government “does something” in addition to the adaptation that is already occurring (the “do nothing” scenario). In assessing a given intervention option (“do something”), the costs and benefits which must be appraised are those that are *incremental* to the “do nothing” scenario. There will be some “residual” climate change damage regardless of the quantity of adaptation activity that occurs.

Figure 7.4: The “business as usual” scenario



↕ Represents impact of “do something” scenario. In the case of the public procurement option, this would be the net benefit of incorporating adaptation into public procurement in reducing the costs of climate change over and above the impact of adaptation activity that is happening anyway.

7.3.2 What adaptation activity is currently occurring?

More and more communities and organisations are taking steps to better understand their vulnerability to climate change and to begin to take adaptive action. However it is fair to say that there is still a lot of work to do before climate change adaptation becomes business-as-usual across all decisions and there are still relatively few examples of where specific adaptation measures have been implemented and evaluated.

As highlighted in Section 4.4, individuals, organisations and communities typically perceive a number of potential barriers to adaptation, many of which are driven by the market failures described above. Barriers include:

- Uncertainty over climate change projections and the impacts of climate change;
- An unconvincing business case for adaptation – in particular, where benefits of adaptation are not fully captured by the individual/business carrying out the adaptation activity;
- Dependency on regulations, codes and standards which do not incorporate adaptation;
- The difficulty of locating of useful precedents of examples of best practice in adaptation;
- The absence of support from senior management; and
- Financial constraints.

In order to tackle these barriers, Government is intervening with a mix of strategies and policies to encourage adaptation. The effect of these initiatives on adaptation activity, combined with the amount of adaptation activity already being undertaken by private individuals/organisations constitutes the “base case”. In considering the potential impact of incorporating adaptation into procurement, we need to try and assess what *additional* impact procurement would have on adaptation activity above and beyond this base case.

7.3.3 What is the role of Government in promoting adaptation

In order to being to understand what the *incremental* value of public procurement as a tool in driving adaptation might be, it is useful first to think about the role of Government in promoting adaptation. By analysing Government’s current adaptation interventions from the perspective of the role that Government wishes to play in promoting adaptation, we can begin to understand what the additional value of procurement might be .

Adaptation responses to climate change can be divided into two broad categories. *Building adaptive capacity* involves developing an institutional capacity to respond to climate change effectively. *Delivering adaptation actions* involves making real operational responses to climate change. Government intervention to address adaptation has typically been around building adaptive capacity – ensuring that the right policies and processes are embedded to encourage adaptation.

UK Government has set out its adaptation strategy in *Adapting to climate change in England*, published by Defra. In this document, the government describes its role as “*providing the right institutional environment to help enable organisations and individuals to make effective and efficient adaptation decisions*”⁴².

It is possible to highlight 6 key ways in which Government may deliver this role:

- Through providing information and reducing uncertainty on the impacts of climate change (**reduce uncertainty**)

⁴² Page 20, Adapting to Climate Change in England, Defra

- By making the business case for adaptation by raising awareness of its benefits, internalising markets and providing financial incentives to adapt (**make the business case**)
- By providing guidance on how to assess and adapt to climate change (**provide guidance**)
- Through driving forward demand for adaptation services (**drive demand for services**)
- Through leading by example by incorporating adaptation effectively into central and local government operations (**lead by example**)
- By assessing and reporting on progress (**assess progress**)

Based on these characterisations, an assessment of Government’s current/planned adaptation initiatives can begin. **Figure 7.5**, below, does this for the Government’s main current/planned adaptation initiatives (as presented in Section 4 earlier).

Although it is too early to assess what the impact of a number of these interventions will be, it is clear that Government is targeting adaptation in a number of different ways and from a variety of angles. This “integrated” approach to adaptation tackles a number of the key roles highlighted above – in particular, “reduce uncertainty” and “provide guidance”. As expressed above, Government’s focus appears to be on providing information and advice to allow individuals and organisations to make their own decisions about adaptation - in contrast with more enforced approaches to intervention such as use of legislation/regulation or direct provision of goods and services.

Figure 7.5: Adaptation initiatives and interventions

Type of initiative	Initiative	Aim of initiative
Research and risk assessment	UKCIP climate change scenarios / UKCP09 projections, Adaptation Wizard; business assessment tool and other guidance	Reduce uncertainty; make the business case; provide guidance; drive demand for services
	Regular publication of climate change risk assessments to UK	Reduce uncertainty; assess progress
	Completion of national Cost-Benefit-Analysis of adaptation to complement above risk assessments	Reduce uncertainty; make the business case, drive demand for services
Strategy development and communication	Publication of national, regional and local government / government agency climate change adaptation strategies	Reduce uncertainty; provide guidance, make the business case
	Development of EU adaptation strategy	Reduce uncertainty; provide guidance
	Regular publication of national adaptation progress reports which illustrate how risks have been addressed	Assess progress; lead by example
Legislation, regulation and information provision	BREEAM accreditation required by various regulatory and government organisations to demonstrate that buildings have passed a benchmark for environmental assessment	Drive demand for services; lead by example
	New code for sustainable homes ⁴³ ; Retrofitting existing homes guidance ⁴⁴	Reduce uncertainty, make the business case; drive demand for services

⁴³ <http://www.planningportal.gov.uk/england/professionals/en/1115314116927.html>

⁴⁴ <http://www.london.gov.uk/trccg/docs/pub1.pdf>

Type of initiative	Initiative	Aim of initiative
	Planning and Policy Statement on Climate Change. Provides guidance to local authorities on incorporate climate change into local planning (adaptation is not, however, a major focus)	Provide guidance, make the business case; drive demand for services
	Allow Government to require public authorities and statutory undertakers to assess, where necessary, the risks of climate change to their work and set out adaptation responses	Assess progress, lead by example
	Incorporation of adaptation into Impact Assessments (undertaken through Better Regulation Executive in BERR)	Provide guidance; make the business case; lead by example
	Incorporation of adaptation into HM Treasury Green Book. Provides guidance to policy makers on how to take account of adaptation when appraising and evaluating policy.	Provide guidance; make the business case; lead by example
	Provision of guidance on how to undertake a climate risk assessment	Provide guidance; drive demand for services
Engagement and oversight	Establishment of Regional Climate Change Partnerships	Reduce uncertainty; lead by example
	Introduction of new performance indicator on adaptation in the core Local Government Performance Framework	Assess progress; lead by example
	Establish Adaptation Sub-Committee to oversee ACC Programme	Assess progress; lead by example

7.4 Can public procurement add economic value in driving climate change adaptation in capital projects?

7.4.1 Introduction

Section 7.3 outlined the “base case”; a description of “what is already happening now” and, in particular, what government is already doing to incentivise adaptation.

This next step is to address what the *incremental* value of public procurement is likely to be in incentivising adaptation. This is central to the assessment of the extent to which there is a case for the use of public procurement to drive climate adaptation. The following issues are relevant; each is discussed in turn below:

- The size of the government's expenditure in capital projects on an annual basis in contrast with total private expenditure in capital projects
- The mechanisms through which procurement can impact on adaptation in capital projects
- The extent to which the public procurement process has an impact on infrastructure climate change adaptation and is clearly differentiated from that of other adaptation initiatives

7.4.2 The size of the government's expenditure in infrastructure in contrast with total private expenditure in infrastructure

Public procurement in the UK is estimated at £175 billion per annum. Of this some £47 billion relates to capital projects. The Office of Government Commerce (OGC) estimate about 70% of this is spent on local government projects, notably currently including the Building Schools for the Future programme, and the remaining 30% on central government projects. This large quantity of spend indicates that changes to the public procurement process which incorporate adaptation can potentially be very significant in impacting on total capital projects across the UK as a whole.

In addition, to the extent that government is seen as a "leader" and "example of best practice" in procurement, the changes that government makes to its procurement process may spill over into private markets.

7.4.3 The mechanisms through which procurement can impact on adaptation in capital projects

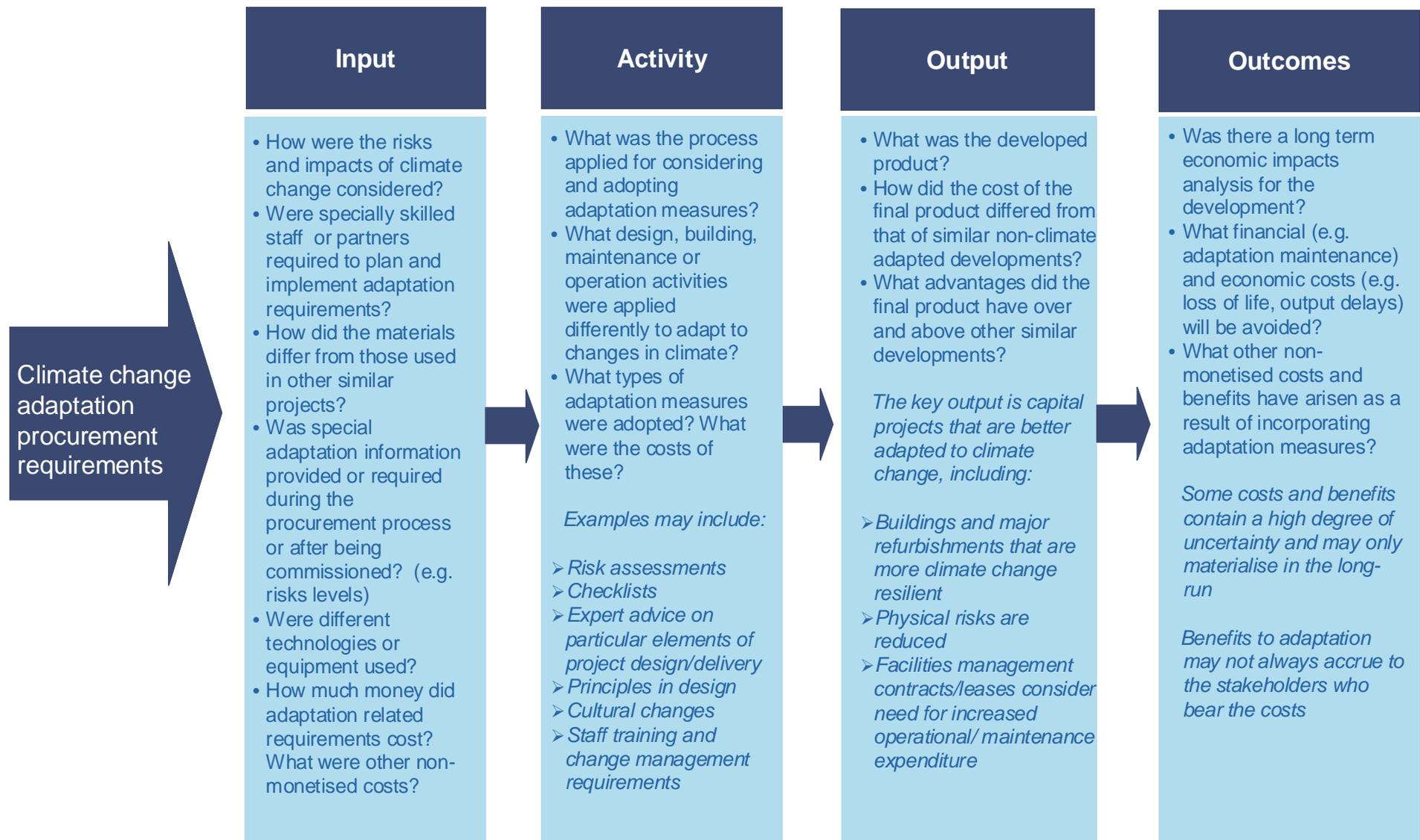
Public procurement represents a stage in the development of new infrastructure/capital. A 'logic chain' of events can help to illustrate how changes to the public procurement process can feed through to adaptation to climate change in capital projects. A logic chain typically contains a description of the situation; priorities arising; inputs and outputs; short, medium and long term outcomes that arise from the chain of events.

In this context, climate change and its impacts is the 'situation' and public procurement could be one of the 'priorities' that drive inputs and outputs, aiming to contribute to the long term change in economic, social and environmental conditions. The drivers for adaptation can be numerous as explained earlier in this section.

Figure 7.6 below is a logic chain that summarises the type of economic questions that have informed the Case Studies in this report. The aim was to get a clearer view of how public procurement has impacted on adaptation in infrastructure projects. It is important here to identify how important the public procurement process has been in driving adaptation to climate change inputs, activities, outputs and, critically, what the economic outcomes of these adaptation changes have been.

Please see Section 8 and Appendix II for more details about the approach to the Case Studies.

Figure 7.6: Logic chain of events driven by public procurement



The following table includes a summary of key potential cost and benefit areas which we have sought to assess through our case studies, key stakeholder interviews and other third party research.

Figure 7.7. Key areas of climate change adaptation: costs and benefits

Costs of incorporating climate change adaptation
I. Costs associated with the procurement process
<ul style="list-style-type: none"> • Administrative/management compliance costs • Contractual implications of incorporation of climate change adaptation criteria e.g. contract management costs, payment mechanisms, handback criteria • Other
II. Costs associated with preparation and design
<ul style="list-style-type: none"> • Administrative/management compliance costs • Purchase • Building specification and associated design/architecture costs • Site remediation costs • Legal/consultancy/specialist advice costs • Other
III. Costs associated with construction
<ul style="list-style-type: none"> • Administrative/management compliance costs • Construction costs (changes in materials and/or techniques) • Loss in floor space • Other
IV. Costs associated with operation / disposal
<ul style="list-style-type: none"> • Administrative/management compliance costs • Operation/maintenance costs • Staff training costs • Cultural change management • Disposal costs (of redundant materials/products/buildings etc) • Other
V. Other costs
<ul style="list-style-type: none"> • Indirect costs e.g. impact on market competitiveness, stakeholder resistance • Wider costs – e.g. issues in the workplace, community or industry sector

Benefits of incorporating climate change adaptation
I. Benefits associated with “future proofing” (i.e. avoiding possible future value loss as a result of better resilience to climate change)
<ul style="list-style-type: none"> • Reduced exposure to weather damage ((flooding, water shortage, freak winds) – measured by, for example, reduced premiums for building/contents insurance or estimated cost savings as a result of damage reduction
<ul style="list-style-type: none"> • Reduced exposure to logistic/workforce disruption
<ul style="list-style-type: none"> • Other
II. Benefits associated with efficiency savings/improved quality
<ul style="list-style-type: none"> • Reduced energy bills
<ul style="list-style-type: none"> • Use of more sustainable materials in construction
<ul style="list-style-type: none"> • Improved quality of buildings (measured by, for example, increases in property prices)
<ul style="list-style-type: none"> • Management/admin savings
<ul style="list-style-type: none"> • Other cost reductions as a result of adaptation measures (e.g. operational cost reductions)
III. Benefits associated with reputational impacts
<ul style="list-style-type: none"> • Contributions to corporate social responsibility policy
<ul style="list-style-type: none"> • Other positive reputation impacts e.g. through positive stakeholder relations
IV. Benefits associated with industry/sector development
<ul style="list-style-type: none"> • Adaptation of new products, services, techniques, technologies
<ul style="list-style-type: none"> • Other
V. Benefits associated with land betterment effects
<ul style="list-style-type: none"> • Enhancement in perceived value of certain geographic areas due to climate change adaptation safety
<ul style="list-style-type: none"> • Other
VI. Other benefits
<ul style="list-style-type: none"> • Other wider benefits e.g. health benefits, morale, new products and services, employment (including boost to economy aggregate demand), open spaces, quality of life
<ul style="list-style-type: none"> • Benefits that relate to the new opportunities that changes in climate present (e.g. tourism, development of new crops, green spaces)

7.4.4 The extent to which the public procurement process has an impact on infrastructure climate change adaptation and is clearly differentiated from other adaption initiatives

This section will draw on the Case Studies and other evidence to evaluate the extent to which the public procurement process has had an impact on climate change adaptation, including whether that impact has been clearly differentiated from any other adaptation initiatives.

Figure 7.8 summarises findings relevant to the development of an economic case. For further details of all case studies please see Section 8 and Appendix IV.

Figure 7.8: Case study examples

Key motivations and role of procurement	Costs of climate change adaptation	Benefits of climate change adaptation	Further observations
Case Study 1: Met Office			
<ul style="list-style-type: none"> High environmental performance within new buildings and operations was a high priority in order to maintain the Met Office's reputation as a world-leading weather and climate change forecaster Resilience to weather events and other risks needed to be extremely high to protect the Met Office's supercomputers Procurement process was a negotiated tender process – design, build and operate (DBO)– acquired through a Public Private Partnership 	<ul style="list-style-type: none"> Additional costs of incorporating adaptation measures was unknown to the contracting authority However, additional build costs considered marginal and affordable 	<ul style="list-style-type: none"> Benefits to the Met Office have been significant Include enabling the Met office to demonstrate BREEAM "excellent" standards Reliance on natural ventilation and heat recycling has reduced energy bills Will also help the Met Office to prepare for the Carbon Reduction Commitment 	<ul style="list-style-type: none"> Letting a single DBO contract meant that the cost of investment was balanced by lower operating costs managed internally by the consortium
Case Study 2: Red Hill CE Primary School			
<ul style="list-style-type: none"> Personal initiative from Council members drove adaptation requirements (using UKCIP adaptation wizard) Traditional procurement process using a framework agreement with external engineers and surveyors managed by Council's architects and mechanical and electrical consultants. 	<ul style="list-style-type: none"> The adaptation measures did not increase the overall cost per square metre of the building Ongoing operating costs are also not significantly different 	<ul style="list-style-type: none"> Future proofing for key changing climate risks Resistance to ongoing extreme weather events Child and staff health and safety Improved adaptation skills in the Council Landscaping 	<ul style="list-style-type: none"> No cost / benefit analysis for the building available Costs and benefits of adaptation seen as difficult to quantify given variety of drivers Costs and benefits of adaptation borne by different stakeholders
Case Study 3: Worcester Library & History Centre			
<ul style="list-style-type: none"> Worcestershire County Council's knowledge from the Red Hill project has been retained in-house and the Council now has the desire to embed climate change adaptation as a core principle into future projects In this case, the library site is located in land that is vulnerable to flooding. Climate change adaptation was therefore a key objective right from the start of the project. Procurement process was competitive dialogue with a PFI contract 	<ul style="list-style-type: none"> Detailed cost-benefit analysis of different options was not undertaken. Instead; extensive previous experience was relied upon to make decisions 		<ul style="list-style-type: none"> Worcestershire's funding is in the lowest quartile for England but has performed very highly in adaptation – proving that it is not only Councils with large budgets are able to invest in adaptation capability
Case Study 4: Jacobs Engineering Ltd, part of the Kent Highway Services Alliance			
<ul style="list-style-type: none"> Open tender procurement process with DBO contract 	<ul style="list-style-type: none"> Building a new road which is adapted to changes in climate costs nothing or marginally more than one that has not been adapted 	<ul style="list-style-type: none"> Reduced costs of future maintenance Future proofing for changing climate risks Increased resistance to ongoing extreme weather 	<ul style="list-style-type: none"> Adapting roads to climate change need not cost significantly extra; it is about doing things differently and transferring

Key motivations and role of procurement	Costs of climate change adaptation	Benefits of climate change adaptation	Further observations
	<ul style="list-style-type: none"> Maintenance of existing roads (which represents the bulk of expenditure) which includes fixings to increase their resilience to climate change would cost maximum 2-3% more than normal maintenance 	<ul style="list-style-type: none"> Reduced likelihood of road damage and associated accidents / vehicle maintenance associated costs 	<ul style="list-style-type: none"> knowledge (e.g. applying specifications used in other parts of the world where climates are warmer)
Case Study 5: Barking Riverside			
<ul style="list-style-type: none"> The London Borough of Barking and Dagenham (LBBD) has a corporate policy on tackling climate change and has historically placed a strong emphasis on design and environmental issues From the start of the project, the vision has been to create a sustainable community at Barking Riverside 	<ul style="list-style-type: none"> Full Cost Benefit Analysis on the range of adaptation measures eventually incorporated was not undertaken. Rather, LBBD negotiated with the range of stakeholders involved in the project to develop solutions that would meet different objectives without being excessive on cost. 	<ul style="list-style-type: none"> Reducing flood risk was a key benefit for LBBD. There is a large elderly population and higher than average rate of depravity in this area. LBBD is very aware of the impacts that flooding can have on these vulnerable parts of society and was keen to do as much as possible to protect them. 	<ul style="list-style-type: none"> BBD and Barking Riverside Limited have remained open to new technologies. As the development progresses, new solutions may be incorporated – allowing the project to maintain flexibility and adapt to the market.
Case Study 6: Olympic Park			
<ul style="list-style-type: none"> Sustainability was at the heart of London's winning bid for the London 2012 Olympic and Paralympic Games Tackling climate change, through carbon reduction and climate change adaptation is one of five sustainability principles applied by the ODA Sustainable Development Strategy Various procurement processes and contract types were applied 	<ul style="list-style-type: none"> All adaptation features are funded from within the overall budget for the Games; there is therefore tight control on costs and measures must be delivered within the standard budget for each project 	<ul style="list-style-type: none"> The Legacy body and end-users will inherit the longer-term benefits of the measures 	
Case Study 7: PwC's More London Development			
<ul style="list-style-type: none"> Private initiative for a set of specific design, engineering and maintenance requirements The building was let to PwC after largely built but early involvement allowed PwC's influence 	<ul style="list-style-type: none"> £2-3 million on the development to move the development from "Excellent" to "Outstanding" BREEAM rated (however this rating does not address adaptation in detail) 	<ul style="list-style-type: none"> Development has improved from an "Excellent" to "Outstanding" BREEAM rating 	<ul style="list-style-type: none"> Various delivery options were assessed for costs and benefits (e.g. payback periods)

In relation to the costs and benefits of incorporating adaptation, case study evidence allows us to make the following observations:

- The number of drivers and motivations that are typically involved in making the decision to incorporate adaptation makes it difficult to isolate the costs and benefits associated with adaptation.
- Little formal cost-benefit analysis has been done to estimate full life costs and benefits of incorporating adaptation for developments. However, there is typically much anecdotal evidence of the costs and benefits of adaptation.

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- The benefits of adaptation are often high and the costs of adaptation need not be significantly large in comparison. Indeed, costs of adaptation seem to be none or relatively marginal when compared to normal costs of infrastructure development in many cases. This is because changes in inputs, such as equipment and technology, and activities/outputs, such as the construction process, are relatively low or none.
 - Adaptation often implies a number of broader costs and benefits
 - Costs: skills development in the public and the private sector, development of information about the expected changes in climate and the risk levels associated to these, and the full assessment of lifecycle costs and benefits associated to infrastructure developments which are crucial when developing an appropriate commercial case for cost/risk sharing between the public and the private sector.
 - Benefits: in addition to the benefits associated with reducing the costs of climate change and ongoing weather events which would usually translate in avoided government costs, health impacts and loss of economic output; adaptation can provide a wide range of other benefits including reputation, health, well-being, educational and commercial value of land and property and benefits arising directly from a changing climate (e.g. landscaping). These benefits accrue to a number of different parties including public procurement agencies, private developers and contractors as well as private individuals and businesses.
 - The literature seems to support some of these observations. For example:
 - Studies in climate-sensitive sectors point to many adaptation options that will provide benefits in excess of cost⁴⁵.
 - The additional costs of making new infrastructure and buildings more resilient to climate change in OECD countries could range from \$15 – 150 billion each year (0.05 – 0.5% of GDP), with higher costs possible with the prospect of higher temperatures in the future.
 - This preliminary cost calculation assumes that adaptation requires extra investment of 1 – 10% to limit future damages from climate change⁴⁶.
 - There is evidence that in flood areas house prices are going down
 - From the commercial perspective, Acclimatise (2005) identify that a changing climate could affect income, operating costs and financing costs for PFI projects, with potential knock-on effects for investor and market confidence.

It is also possible to make a number of observations with regard to the value that procurement has played in increasing adaptation, and what the extent of that value may be in addition to other adaptation initiatives:

- None of the case studies have been fully driven by changes in procurement requirements; however, procurement will always play a role given that it is a necessary step in the development of infrastructure
- Incorporating adaptation into public procurement is likely to strengthen the government's role in promoting adaptation, specifically through the “make the business”, “lead by example” and “drive demand for services” element of its role.
- However, the extent to which public procurement will be able to provide additional value beyond other adaptation initiatives that are already in place will depend heavily on how exactly it is implemented.

⁴⁵ *Stern Review on the Economics of Climate Change*, Part V, HM Treasury, 2006

⁴⁶ For temperature rises of 3 or 4°C, these calculations are likely to scale as a constant proportion of GDP, as GDP grows. But the costs will rise sharply if temperatures increase further to 5 or 6°C, as expected if emissions continue to grow and feedbacks amplify the initial warming effect.

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- The competitive dialogue procurement route can produce higher-performing solutions by developing a specification that the market can respond to and deliver – for example, in Case Study 3.
 - DBO contracts internalise the cost of adaptation and help to make a stronger business case for adaptation.
 - Successful incorporation of adaptation into procurement requires that contracting authorities be intelligent clients - at both the specification and evaluation stages of the procurement process and when setting up the contracts. Internal staff expertise has typically been crucial in driving successful adaptation – for example, in Case Study 2.
 - The literature seems to support some of these observations. For instance the Stern Review: suggests that public procurement could be a useful vehicle for highlighting best practice in incorporating adaptation in investment decisions – and may also drive forward demand for adaptation services to help guide private sector decisions⁴⁷.

⁴⁷ *Stern Review on the Economics of Climate Change*, Part V, HM Treasury, 2006

7.5 What does our analysis tell us about the overall economic case for incorporating adaptation into public procurement?

This section began by describing the various stages to outlining a full economic case for government intervention. The approach has been limited to the extent that this project focuses on only public procurement – and so cannot provide a full appraisal of the different possible intervention options to tackle adaptation.

Despite the above, the approach has taken us through a number of steps in the process for outlining an economic case and has found that:

- There are costs and benefits to climate change but the costs clearly outweigh the benefits.
- It is extremely difficult to find detailed evidence on the costs and benefits of adaptation – however the evidence generally supports the view that benefits are large and costs need not be significantly higher than business as usual costs.
- Individuals/organisations face a number of barriers to adaptation which can explain why the amount of adaptation activity they have historically undertaken is low. These barriers can be explained by the presence of market failures which provides a case for government to intervene and address adaptation.
- Government is already operating at a number of different levels using a variety of initiatives to incentivise adaptation – some of these initiatives are currently in operation and some are planned for the future. These initiatives typically support Government's stated role as "*providing the right institutional environment to help enable organisations and individuals to make effective and efficient adaptation decisions*".
- By incorporating adaptation into public procurement government would strengthen its role in promoting adaptation specifically through the "make the business case", "lead by example" and "drive demand for services" element of its role.
- Nevertheless, the extent to which public procurement will be able to provide *additional* economic value depends very heavily on *how* exactly procurement is implemented. Approaches which favour whole-life costing approaches tend to "internalise" markets and "make the business case" for adaptation.
- The large quantity of UK public procurement spend indicates that changes to the public procurement process which incorporate adaptation can potentially be very significant in impacting on total capital projects, when looked at across the UK as a whole.

7.6 Summary

At the macro-economic level, there is clearly a case for adapting to climate change and the presence of market failures means that government has a role to intervene and address these failures.

Overall, public procurement can help to facilitate appropriate adaptation in capital projects and incentivise private organisations/individuals to adapt through leading by example. However, the extent to which public procurement can provide *additional* economic value over and above what adaptation activity is already ongoing or incentivised depends exactly on how it is implemented.

8 Case Studies and Stakeholder Consultation

8.1 Approach to stakeholder engagement

To inform this study it was important to understand the perspectives of a broad range of stakeholders. The Steering Group was comprised of representatives from:

- London Climate Change Partnership
- Defra
- Environment Agency
- Government Office for London
- City of London Corporation
- London Development Agency

A broader stakeholder mapping exercise was undertaken at the start of this project to identify stakeholders who set the policy framework and who had experience of different types of public procurements. In addition, it was important to engage stakeholders in order to understand the broader context within which procurement and climate change adaptation sit, including higher-level economic appraisal, the planning policy regime and sustainable building codes.

The framework of questions used in stakeholder interviews is at **Appendix I**. It should be noted that this is an initial study undertaken over a short time period. Stakeholder engagement has been limited to priority organisations only, and to those people who were available within the timeframe allocated for this project.

Appendix III is a table of key stakeholders for this project and the extent of their engagement to date; their views are integrated throughout this report. There is considerable opportunity, as outlined in Section 9 on next steps, to use the product of this initial study as a basis for further engagement with these and wider stakeholders.

8.1.1 Target stakeholder audiences

More specifically, this study has identified four groups of stakeholders who have particular potential to influence the extent to which climate change adaptation is embedded into public procurement. The findings of this report are therefore grouped into key messages of relevance for each of these groups, as a basis for further discussion and action. These are:

Policymakers	Those who set or seek to influence government policy on climate change adaptation, economic appraisal, procurement, capital investment, construction and management of the public sector estate, planning and building regulations
Contracting authorities	Contracting authorities in central government departments and agencies, local authorities, and the wider public sector. Collaborative procurement organisations and partnerships that support and advise contracting authorities are also included here (e.g. I&DeA, 4ps, RIEPs)
Industry organisations	Design, construction and building engineering organisations who set or influence building regulations and design reference standards and/or have a role to play in training and sharing good practice amongst practitioners
Contractors	Private sector investors, developers, construction companies, facilities managers and consortia

8.1.2 A stakeholder workshop

A stakeholder workshop was held on 24 April 2009. Attendees are listed in **Appendix III**. The objectives were:

- To bring together procurement and climate change adaptation stakeholders together to better understand the issues and work towards consensus
- To learn more about how the interim findings of this study were reached
- To test out and refine the interim findings based on their experiences

The output of this workshop has been used to shape this report, in particular the key messages for target stakeholder audiences in Section 10.

8.2 Approach to selection of case studies

8.2.1 Why use case studies?

Although engaging with stakeholders at a generic and hypothetical level is important, to build a robust evidence base for this study it is important to understand the extent to which climate change adaptation measures have featured to date in publicly-funded construction projects. It would be impossible to do a comprehensive analysis of all such projects over the last few years within the study timeframe. Instead, a representative sample of case studies have been selected and examined in some detail.

The purpose of these case studies is to provide some recent good practice examples where adaptation measures have been incorporated into public procurement. As explained in Section 2.5 above, the Partnership has previously published several reports and sets of case studies on adaptation measures, which this report does not attempt to duplicate. Different case studies are used here and have a different emphasis. They are focused less on the adaptation measures themselves, and more on the drivers for implementation, the costs and benefits of doing so, and how this was achieved through the procurement process, complementing the earlier publications.

8.2.2 Selection methodology

Potential case studies were mapped against the following criteria that set out the scope for this study.

Figure 8.1: Case study criteria

Type of build	<ul style="list-style-type: none">• Schools• Leisure facilities• Offices• Hospitals	<ul style="list-style-type: none">• Housing• Mixed use regeneration• Roads• Prisons
	<ul style="list-style-type: none">• New build (greenfield and brownfield sites)• Refurbishment or maintenance	
Contracting authority	<ul style="list-style-type: none">• Government department or agency• Local authority or their outsourced service providers• Private sector company	
Procurement route	<ul style="list-style-type: none">• Open tender• Restricted tender	<ul style="list-style-type: none">• Negotiated• Competitive dialogue

Contract type	<ul style="list-style-type: none"> • Design & Build • Design, Build & Operate 	<ul style="list-style-type: none"> • Contracting authority's own capital expenditure • PFI • PPP • Private sector
Applicability of adaptation measures to London	Measures to adapt to changes in the following climate impacts: <ul style="list-style-type: none"> • Flooding • Overheating • Water scarcity 	
Completion date	Ranging from <ul style="list-style-type: none"> • New building operational in 2004 • Preferred bidder announced in 2009 	
Value	Ranging from <ul style="list-style-type: none"> • £2.7m primary school • £130m multi-use resource centre • Multi-million regeneration scheme • £9.3bn total for the London 2012 Olympic and Paralympic Games 	

A best-fit representative sample were selected that could be delivered within the timeframe set for this project. The final set of case studies are shown below.

Figure 8.2: Final set of case studies

Case study 1	Met Office	Headquarters, Exeter
Case study 2	Worcestershire County Council	Red Hill CE Primary School
Case study 3	Worcestershire County Council and the University of Worcester	Worcester Library & History Centre
Case study 4	Jacobs Engineering Ltd (Kent Highways Services Alliance)	Highways network in Kent
Case study 5	London Borough of Barking & Dagenham Barking Riverside Company	Barking Riverside: mixed use regeneration including 10,800 new homes
Case study 6	Olympic Delivery Authority	Olympic Park
Case study 7*	PricewaterhouseCoopers	Office, More London Riverside

** as a private sector comparator*

A matrix that shows how these case studies map across the selection criteria is at **Figure 8.3** overleaf. The case studies provide good coverage across the selection criteria as far as possible.

Good practice examples that incorporated adaptation measures for hospitals and prisons were not forthcoming within the timeframe for this project. However, in broad terms, the current motivations and requirements for new builds in these sectors will be equivalent to other public buildings such as schools, which we have covered.

Figure 8.3: Case study matrix

Case study		Contracting authority	Procurement route	Contract type	Applicability to London	Completion date	Value	Build
1	Met Office headquarters	Government agency	Negotiated	DBO, PPP	Overheating Drainage Water conservation	2004	£82m build £150m total	New build Greenfield
2	Red Hill CE Primary School	Local authority	Restricted	DB, Public	Overheating Drainage Water conservation	2007	£2.7m	Replacement Brownfield
3	Worcester Library & History Centre	Local authority & University & partners	Competitive dialogue	DBO, PFI	Flood risk Overheating	Ongoing	£50m build £130m total	New build Brownfield
4	Jacobs Engineering Ltd: Highways network	Local authority outsourced service	Open (framework)	DBO, Public	Flood risk Drainage Overheating	Ongoing	£30m annually	Resurfacing
5	Barking Riverside	Government agency / local authority	Non-standard – joint venture formed	Various	Flood risk Drainage Overheating	Ongoing	£1.9 m	New build Brownfield
6	Olympic Park	Government agency	Various	Various	Flood risk Drainage Overheating Water conservation	Ongoing	£9.3bn total budget	New build Brownfield
7	PwC More London Riverside	Private sector	Lease from developer	DBO, Private	Flood risk Drainage Overheating	Ongoing	~£130m build	New build Brownfield

Looking forward, in *Saving Carbon, Improving Health*, published by the NHS Sustainable Development Unit in 2009, a commitment is made for all new NHS healthcare buildings to be low carbon by 2015 and to be built to adapt to the changing climate and withstand severe weather events, based on the forthcoming UKCP 09 projections. The NHS will therefore be an important stakeholder with whom to engage going forward.

Together, the case studies provide an opportunity to track the progress made in embedding climate change adaptation into public procurement projects during the latter half of this decade, including in response to:

- Changes in EU Procurement Rules;
- Increasingly sophisticated UK climate change projections, including UKCIP02 and the forthcoming UKCP09 climate projections⁴⁸;
- Overall development of public sector organisational awareness, legislation and performance management on adapting to climate change;
- Different drivers for action leading to differences in maturity of thinking across the public sector, for example the highways sector is already routinely embedding adaptation into road resurfacing projects, whilst for some other sectors this is still the exception;
- New planning policy requirements and design standards and the extent to which these include specific reference to adaptation;
- Trends in funding public procurement projects, including the growth in PFI contracts; and
- Wider trends influencing the way people use buildings, including changes in how we use technology, that favour particular types of contracts.

8.2.3 Case study details

Appendix II is the framework of questions used to gather information for each case study.

Appendix IV provides full details of each case study and an initial matrix that shows how outputs from the case studies have been clustered into key findings to inform this study.

Some attempts have been made to triangulate findings wherever possible by developing hypotheses arising from one case study and testing these at interview with others. However this has been limited with the constraints of this project. The sample size is too small for the findings from these case studies to be considered universally representative of these procurement exercises as a whole, but they do provide a useful starting point to test more widely as part of further work.

⁴⁸ Since published at <http://ukclimateprojections.defra.gov.uk/>



9 Findings & implications

9.1 Context

The questions to be answered by this study are:

- Is there a legal case for incorporating climate change adaptation into public procurement?
- Is there an economic case for incorporating climate change adaptation into public procurement?
- How is climate change adaptation best embedded into procurement, now and in the future?

9.2 Limitations

This is an initial study, based on relatively limited research and stakeholder discussion. There are limitations to the scope of this report. It is important to understand these, and place findings in this context as a basis for further discussion and investigation. Some of the most important limitations are below:

- A full economic case was not possible within the timeframe.
- A representative case study range has been attempted, but this was constrained by time and availability of people in organisations. The case studies should probably be considered as the leading edge of good practice in certain sectors rather than universally applicable. Only limited triangulation of findings was possible between the case studies; compounded by the fact that all the case studies are from different sectors. With more time beyond the scope of this study it would be interesting to undertake a broader survey of current practice.
- This study has focused on public procurement projects on new build construction, with the exception of road resurfacing in Case Study 4 and an office procurement in Case Study 7. It is important to remember that the vast majority of existing publicly-procured buildings will still be in operation in some form in 2050 and beyond. With more time it would be interesting to undertake a broader review of procurement of refurbishments, change of use and sale of publicly procured building and infrastructure assets.

9.3 Legal case

Evaluating the legal case for climate change adaptation involves drawing together an extremely disparate range of authorities and guidance.

The emerging body of law on climate change adaptation is both more diffuse and difficult to apply than that relating to climate change mitigation.

The law relating to climate change mitigation is driven by targets for the reduction of greenhouse gas emissions. It is couched in quantitative terms, and operates at points in the lifecycle of a building that either already involve or lend themselves to intervention by government or other agencies. The law on climate change mitigation is also a more direct and pressing concern for those within its scope. Many of the obligations stemming from the EU Directive on the Energy Performance of Buildings are in force, and the draft CRC regulations are out for consultation.

Climate change adaptation, by contrast, is often couched in qualitative terms, not least because the details are variable from project to project, dependent on multiple climate variables, locality and vulnerability. With the exception of some physical features such as solar shading, orientation of new builds and sustainable drainage that can be specified in

particular circumstances, adaptation measures are more difficult to define, often more focused on capacity-building, and far less susceptible to quantitative analysis. Consequently, they are significantly more difficult to formulate as elements of a project specification or as obligations (e.g. as elements in a 'Green Lease' schedule, or to monitor than mitigation measures.)

Compounding the more elusive nature of climate change adaptation measures is the generic and prospective nature of the current statutory law on adaptation. Existing duties (both those of the Greater London Authority and the more general duties in Climate Change Act 2008 that came into force in January 2009) require only evidence gathering, and the development of policies and programmes. In practice, those matters are readily seen as a lower priority than addressing current statutory obligations.

The preliminary findings from this workstream are therefore that:

- There is no legal barrier to embedding climate change into public procurement
- There is a mounting body of evidence to suggest that embedding climate change into public procurement is to be expected; however the economic case for doing this is likely to be the driving and defining factor, rather than the legal case.

9.4 Economic case

In many cases, market forces are unlikely to lead to efficient adaptation because of uncertainty and imperfect information about climate change and its impacts, missing and misaligned markets and financial constraints. As was discussed earlier there is an economic rationale for the involvement of the public sector in the promotion of adaptation. However, it should be noted that while information is getting better, it will never be possible to predict the future with certainty and policy makers also have imperfect information and their own organisational challenges.

According to Stern (2007) adaptation policies will be more efficient if they encourage private individuals and firms to take explicit account of the economic costs of climate change in their decision-making, rather than simply imposing prescriptive design standards. A developer can then make a rational decision about whether to increase the long-term resilience of infrastructure or to design buildings with shorter lifespan if required to consider the impacts of climate change over the lifetime of the property.

HM Treasury's Green Book, OGC guidance and specific supplementary guidance like the one being developed with HMT's support will play a role in facilitating progress in that direction. However, guidance continues to be best practice rather than a requirement; which means its implementation will require "carrots" and "sticks" which will to be transferred from policy makers to procurement agencies and to private contractors. Skills development, guidance and knowledge transfer between and within the public and the private sectors will play an important role in facilitating the consideration of the economic costs and benefits of climate change adaptation in investment decisions.

Overall, major public procurement decisions will require greater foresight and planning. A key area of intervention for government is land use planning and performance standards. As an intermediate step in the development of infrastructure public procurement will be one of the necessary means rather than a core driver of adaptation. Public procurement will need to be used in specific forms for different types of infrastructure, including to:

- Communicate the input or output requirements to implement a 'preferred' option following a full options appraisal which has considered the full lifetime costs and benefits of adaptation
- Provide information to bidders about climate change that helps to reduce the imperfect information and uncertainty suffered by private agents

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- Develop financing/delivery models that account for the need for the public sector to cover development and operation costs when these offer a 'public good' effect (e.g. public areas associated with housing, road or school developments)
 - Promote private partners involvement throughout the lifecycle of infrastructure developments which can better facilitate the realisation of benefits to contractors; overall this approach can help internalise other environmental impacts as well and to avoid maladaptation.

The preliminary findings from this workstream are therefore that:

- There is a high-level economic case for building capital projects that include climate change adaptation measures.
- However, the extent to which there is an economic case for using procurement as a lever is varied and is highly dependent on continued development and implementation of other levers for change, including planning policy and design standards. Public procurement is perhaps less a driver and more a means of embedding climate change adaptation.

9.5 Case study findings

The case studies have explored and tested various aspects of this study, including different procurement and contract processes and the extent to which contracting authorities are driven by an economic or legal case.

9.5.1 Overview

The current public procurement framework, if used to best effect, is capable of contributing to climate change adaptation. There are already several good practice examples. It is not the single silver bullet but rather is one of many drivers for embedding climate change adaptation into public construction projects of this nature and it is important to set the role of procurement in this context.

Procurement can be used as a means to embed climate change adaptation where this is already an objective of the contracting authority. In addition, the size of the public procurement market for capital projects, estimated at £47bn, is large enough to influence the market more widely – public sector requirements might be adopted in wider markets and become the norm. It is also worth considering that several public construction projects, such as flood defences, contribute to climate change adaptation in their own right.

9.5.2 Guidance and support

There is already considerable general guidance on sustainable design and construction. Adaptation needs to be fully integrated into this, and also into procurement guidance. Additional support and good practice examples should be provided so that contracting authorities and contractors alike can see how it is applied in practice.

This needs to be accompanied by clear communication about the case for embedding climate change adaptation; guidance alone is not sufficient to gain traction in the market.

9.5.3 Capability and skills

Embedding adaptation into public procurement across the board may not be easy and requires up-skilling of both contracting authorities and contractors, which in turn requires significant investment in people and skills. There are opportunities for more good practice-sharing and capability-building. Put another way, it is unlikely that contracting authorities will be able to manage complex procurement processes that embed climate change adaptation effectively without investing in skilled and experienced procurement and design teams.

Equally, in the current market, bidders often need to make an investment in skills and innovation to meet clients' requirements.

Skills development begins early; ultimately this is about making sure that climate change adaptation is embedded throughout the education system.

9.5.4 The decision-making context

Procurement is only one step, towards the end of the decision-making process around adaptation. To embed adaptation into procurement, the contracting authority usually needs a higher-level corporate policy and decision-making process on tackling climate change. This usually includes some kind of sustainability impact appraisal for all decisions.

Local authorities are becoming influenced by the high-level requirements under the Comprehensive Area Assessment, in particular local government performance improvement indicator NI 188 on planning to adapt to climate change. The Use of Resources assessment for local authorities may also be relevant in the future. It follows that, as the provisions of the Climate Change Act are applied, other contracting authorities may be similarly influenced.

9.5.5 The role of the planning system

The planning system influences the extent to which climate change adaptation is embedded into these kinds of construction projects. Several of the case studies were strongly steered by planning requirements, in particular on flood risk and drainage. To date it is less clear what impact the wider adaptation requirements in the PPS 1 supplement on climate change has had in practice, these requirements are still filtering down through Local Development Frameworks to individual projects. It may be that further measures are necessary to support climate variables in the round – a standardised prescribed way of weighing up the risks and taking appropriate action, perhaps expanding the PPS 25 flood risk sequential test concept, could yield better adapted buildings as a result.

Meanwhile, anecdotal evidence from this study, in particular Case Study 3, suggests that whilst planning conditions have the potential to provide a good baseline or minimum set of requirements with which contracting authorities must comply, the procurement process adds additional project-specific adaptation benefits.

9.5.6 The role of building regulations and design standards

There are several tiers of standards and regulations, including:

- Standard Building Regulations with which the building must comply;
- Additional industry reference standards that are developed by experts and widely applied, such as the CIBSE design standards for heating and cooling of buildings; and
- Environmental performance standards, such as the BRE Environmental Assessment Method (BREEAM) or equivalent. BREEAM is a series of sustainable building codes for different sectors which are then independently assessed and certified. Minimum BREEAM code levels are often stipulated in procurement specifications and as planning conditions. Broadly speaking, to date the emphasis has been on sustainable construction, overall environmental performance and carbon management, in particular in the run up to Government requirements for zero-carbon buildings.

These standards were applied in the Case Studies for several reasons:

- Compliance with Building Regulations and planning conditions;

- A desire by the contracting authority to be able to demonstrate to end-users, communities and stakeholders that the building has high environmental performance to a recognised industry-wide standard; and
- Simplicity; it is far easier to specify these standards in a procurement exercise than work out a detailed bespoke design statement

These reasons are prevalent in both the public and private sector, but are even stronger in the private sector. This is in part because there is currently no increase in capital value for well-adapted buildings (although they do not depreciate as fast). If contractual obligations to adapt are not transferred to the buyer, there are no commercial reasons for developers to build adapted buildings.

Therefore several stakeholders felt that further work to embed and integrate climate change adaptation into these standards, and to enforce their practical application, is a critical step towards procurement of climate resilient buildings. However, these standards should be flexible to cover spatial and temporal differences; different projects will be vulnerable to different climate variables in the first instance and may need to be further adapted over time.

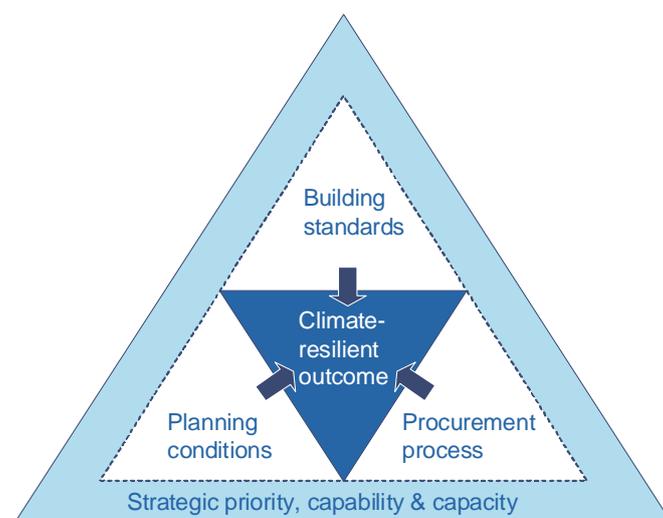
This could be a quicker win than just driving adaptation directly through procurement; it would help provide a level playing field and potentially reduce the up-skilling burden on individual contracting authorities. This potentially implies a shift of emphasis away from influencing and supporting individual contracting authorities towards the organisations responsible for developing and reviewing the standards.

However, again, anecdotal evidence from this study, in particular Case Study 3, suggests that whilst standards can yield some good adaptation measures, the procurement process adds additional project-specific adaptation benefits.

9.5.7 An integrated approach

The findings of this study suggest that a productive way forward would be to take forward actions to improve the extent to which adaptation is embedded in planning conditions, building standards and the procurement process itself. All three have a part to play, as shown below:

Figure 9.1



9.5.8 Costs, benefits and risks

Few public procurement exercises that incorporate adaptation measures do so yet through a systematic evaluation of costs, benefits and risks. Decisions are based on a balance of experience and affordability and are highly dependent on the expertise and leadership qualities of those involved.

From the evidence gathered so far, adaptation measures are not necessarily net upfront capital costs, but rather just different ways of doing things. There are several examples where like-for-like capital projects have cost the same as non-adapted equivalents. For example, in Case Study 2, Red Hill CE Primary School was built at the same time as another school in the same area and there was no difference in costs.

The design life and contract period have an important role to play when considering costs and benefits⁴⁹. This study found that:

- The market is generally comfortable with factoring in changes to the climate about 10 – 25 years ahead, usually in line with the contract period. The market is less comfortable, for PFI projects in particular, about incorporating design features that provide additional adaptation benefit beyond the length of the contract.
- However, most contracting authorities expect to keep their building in some form of use beyond the initial contract period or specified design life. This suggests further adaptation features may need to be retrofitted, alongside expected adjustments to building use, in the future. It is therefore often economically efficient for the contracting authority to design in adaptation features for a longer period at the start that will help keep their building in use for longer. A decision pathway approach (see below) could help strike the right balance between initial adaptation measures and longer-term retrofitting.
- Only a few projects were able to secure design lives in excess of 25 years. Case Study 2, was able to secure a design life of 60 years; this is easier to do in a restricted procedure with capital funding than in a complex PFI procurement. Case Study 5 was able to consider a design life of 60-80 years for housing. Broadly speaking, to fully realise the economic benefits and encourage more innovative designs, this study is of the view that projects should be designed to be climate resilient for their expected realistic total lifetime, rather than the procured contract period. This design life will vary from asset to asset. An appropriate timeline over which to consider adaptation measures for public procurement of buildings may be 50 years or more, less for road surfaces and longer for some infrastructure.
- Care must be taken, therefore, to balance the trend (in the private sector at least) towards shorter contract periods and leases in order to secure a return on investment and because tenants increasingly want increased flexibility in their estate rather than being tied to a particular building for a long time. However, developers who lease buildings to organisations expect to re-lease buildings several times and therefore do take a longer-term view. Each re-lease can provide the developer with an opportunity to update the building and introduce further adaptation features.
- Care must also be taken to avoid an adaptation retro-fitting timebomb; there is enough work to retrofit the majority of existing buildings that will still be in use in 50 years' time, let alone new builds from now on.

⁴⁹ Please note terminology explained in Section 1.

9.5.9 Other drivers for change

Adaptation is never a sole motivation for building to different design standards; it is one of several drivers for change and for flexibility in both building design and operating contracts. Features that have multiple objectives are more likely to be included. And, put another way, a lot of features in buildings incorporated for other reasons will have win-wins with adaptation.

Several Case Studies, perhaps most notably Case Study 3, found balancing climate change mitigation and adaptation measures together challenging. It is important to understand the interaction and potential win-wins between measures. For example, given the upcoming Carbon Reduction Commitment, it may be that measures to insulate or ventilate buildings to reduce energy used in heating also help adapt to the changing climate.

9.5.10 The choice of procurement procedure

Climate change adaptation is still a relatively new concept in public procurement. Measures are highly dependent on the development's specific vulnerability, a function of locality and end-use. This is perceived to increase the complexity of the procurement, at least until such time that climate change adaptation becomes mainstream, and therefore the Competitive Dialogue procedure is often an appropriate choice.

Although the Competitive Dialogue process can be resource-intensive, in general, adaptation measures can be embedded into Competitive Dialogue procurement processes to better effect than the alternatives. There are several features of the Competitive Dialogue process that are highly beneficial, including market-testing and ongoing conversations between contracting authorities and contractors about adaptation measures, and about the relative priority between adaptation measures and other priorities, in particular for carbon reduction. Case Study 3, in particular, suggests that the Competitive Dialogue process can produce a much higher-performing building within a specified budget that reliance on design standards and traditional procedures alone.

The specification / design statement and evaluation criteria weighting are key. Bidders will only be incentivised to produce a high-performing climate resilient building if the design criteria weighting is sufficiently high.

Evaluation is one of the most active area of legal challenge against contracting authorities, therefore this is a particular area where contracting authorities welcome good practice examples and guidance.

The case studies have found that adaptation measures can be best be embedded in Design, Build, Operate (DBO) contracts because this creates an incentive to incorporate adaptation measures now to improve operational performance in the future.

9.6 Implications of the recession

The focus of this study is on the medium term and aims to not be unduly distracted by the current economic downturn. In addition, the case studies were all conceived prior to the current economic situation, although some are still at early stages.

However, it is worthwhile acknowledging that, in the short-term at least:

- There is likely to be less capital or private finance available for these projects
- Contracting authorities are likely to wish to defer as much cost as possible

A current All Party Urban Development Group inquiry⁵⁰, due to report in summer 2009, is taking stock of conditions in the regeneration industry, including an examination of the viability of current financing models and the scope for introducing alternative arrangements. It will be useful to bear the output of this inquiry in mind.

9.7 Future implications of UKCP09 for procurement

As described in Section 4 and elsewhere, the standard tool to support decision-making about future climate trends in the UK are the UKCIP 02 climate change scenarios. Published in 2002, these provide information about future trends based on scenarios of different greenhouse emissions. The climate over the next 40 years or so is already determined by past greenhouse gas emissions, and so there is less variability in predicted trends. However, beyond this period, predicted trends vary widely depending on which emissions scenario is selected; if international negotiations are successful in controlling greenhouse gas emissions, there will be less change than if global emissions continue to rise.

This has the following implications for contracting authorities:

- A decision must be taken about which scenario to base future climate predictions upon; this is commonly the Medium-High emissions scenario.
- However, once this decision is made, it is relatively straightforward to combine this with standard industry reference standards; for example to specify that the ambient internal temperature should not exceed an appropriate temperature even if the outside temperature rises in line with that predicted in the chosen scenario, and design and operate the building accordingly. The risk burden, and responsibility for maintaining the building within the specified range, can then fall to the contractor up to the point that the external environment exceeds that predicted in the chosen scenario, at which point the risk is transferred back to the contracting authority.

During 2009 these scenarios will be replaced by the UKCP 09 climate projections⁵¹. These mark a significant transfer away from a scenario-based approach to a probabilistic approach, and an improvement in localised projections down to a 25km² area.

This has the following implications for contracting authorities:

- The new projections are more complex to interpret and will require some training in order to interpret the data in a meaningful way. This includes understanding the limitations of the data; what they can and cannot be used for. Several of the leading-edge case study organisations interviewed for this project mentioned that they were already preparing for UKCP 09; how many other organisations are doing this routinely?
- The new projections will give a probabilistic distribution of the range of possible values for a climate variable at a point in time. The contracting authority will need to make a decision

⁵⁰ See [Hhttp://www.allparty-urbandevelopment.org.uk/H](http://www.allparty-urbandevelopment.org.uk/H)

⁵¹ Since published at <http://ukclimateprojections.defra.gov.uk/>

about risk appetite and whether to specify standards in relation to the most likely value, or the highest (risk averse) or the lowest (most risky).

- The decision about risk appetite will vary from project to project, depending on the vulnerability of the building and its occupants, and even for different variables within the same project, for example in an area prone to flash flooding, the contracting authority may be more risk averse in relation to the rainfall variable than temperature.
- As before, the range of values for particular climate variables will be smaller for the near future but, beyond 2040, will present broad distributions, with larger differences between extreme highest and lowest values. This will make the decision about risk appetite even more important. Decisions about buildings with design lives until about 2040 will be reasonably straightforward but, as we move into the next decade and contracting authorities begin to consider design lives into the future, the new UKCP 09 projections may make decision-making much more difficult upfront, potentially increasing the case for procuring buildings to which further adaptation measures could be retrofitted in the future.
- However, once these decisions are made, the contracting authority will have greater confidence in the probability of the value occurring, and it may provide more contractual certainty for all parties involved in the procurement process.
- There will be a steep learning curve for procurement exercises.

It is recommended that this study is supplemented in six months' time with some early assessments of how UKCP09 is being used in public procurement processes.

9.8 Adaptation pathways

Decision-making around large infrastructure projects that need a 100 year time horizon, such as the approach to flood risk management in the Thames Estuary post the Thames Barrier, are increasingly taking an *adaptation pathway* approach. This is based on the fact that adapting to climate change is a moving target not a one-off measure. Initial adaptation measures are implemented now to adapt to the foreseeable, more certain future until, say, 2030. However, when evaluating options for this initial adaptation, options are selected which do not preclude further cost-effective adaptation measures in the future beyond 2030, as and when they should be required. It is possible that this kind of approach could be incorporated more frequently into buildings for which the design life is into the second half of this century.

The decision-pathway tool is currently developed as a tool for spatial planners⁵². It is possible that such a decision-pathway approach could also be applied at the project level to support climate change adaptation in public procurement projects. This is particularly relevant where contracting authorities set up an initial contract for a relatively short period and may need flexibility to retrofit additional adaptation measures in the future should they become necessary (see Section 8.5.8 above).

The decision-pathway tool could help contracting authorities specify and evaluate measures in their longer-term context, such that they can be confident that the original building design is within a best-fit pathway that can be further adapted in the future if necessary. Decision pathways could be developed for major adaptation themes; flood risk, water scarcity and overheating, integrated with other objectives, and used to inform decision-making about the procurement process.

It could be interesting to test the scope for this kind of approach and the extent to which the procurement process could accommodate this within current procurement rules.

⁵² Environment Agency & Halcrow (2008), *Climate change impacts and spatial planning: Decision-support guidance*, ESPACE project, available via http://www.espace-project.org/publications/Extension%20Outputs/EA/Espace%20Final_Guidance_Finalv5.pdf

10 Conclusions and next steps

10.1 Overview

This study has found evidence to support the case for embedding climate change adaptation into public procurement. Although there is no explicit legal duty to do so, the economic argument is strong at the macro level, and is increasingly supported by higher-level corporate objectives of contracting authorities, the planning system and building standards. Over and above this, at the individual project level, there is evidence to suggest that the procurement process, if managed effectively with appropriate investment in skills, can deliver additional performance in publicly procured construction projects.

Continuous improvement is needed in the application of planning policy, the development of building standards such as BREEAM, and the use of procurement processes together in order to deliver public procurements that are well-adapted to the changing climate. These are all underpinned by awareness-raising, sharing good practice and investment in skills. To avoid maladaptation and to meet the needs of contracting authorities, further work should re-integrate adaptation into wider environmental performance and sustainability objectives; it should be viewed as a lens through which wider sustainability objectives need to be proofed.

More specifically, this study offers the following messages for the following target stakeholder audiences, as originally outlined in Section 8.1.1. above:

- Policymakers
- Contracting authorities
- Industry organisations
- Contractors

10.2 Policymakers

Policy development	<ol style="list-style-type: none">1. Policymakers need to integrate climate change adaptation objectives with other sustainability, environmental performance, carbon reduction and design requirements; this is how most procurement projects are designed and evaluated in practice.2. Policy developments are needed to embed adaptation into both public and private sector-led procurements, and into both new build and existing stock refurbishment (most of which will still be occupied in 2050).3. Climate change adaptation could helpfully be embedded throughout the investment appraisal cycle; work is already ongoing to revise HM Treasury's Green Book⁵³.4. Some further time is needed to evaluate the success of measures that have recently been introduced to drive adaptation measures such as the Supplement to Planning Policy Statement 1: Planning and Climate Change.5. Depending on this success, in the longer term, regulation, other legal requirements or policy mandates (e.g. equivalent to those recently introduced for zero-carbon buildings) may be required to bring all contracting authorities and the market up to standard.6. Policymakers should learn from interventions and solutions in other countries, for example as follow-up to the EU White Paper on climate change adaptation.
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⁵³ Since published at http://www.hm-treasury.gov.uk/data_greenbook_supguidance.htm

Guidance and support	<p>7. The Office of Government Commerce (OGC) is considering developing guidance on environmental policy through procurement, including long-term climate change adaptation. This study shows that such practical, consolidated guidance, together with example tools and case studies to make it happen in practice, would be welcomed by central and local government authorities.</p> <p>8. The guidance could usefully link with the Government's Sustainable Procurement Task Force's action plan <i>Procuring the Future</i> which provides the current framework for sustainable procurement in government but does not explicitly focus on climate change adaptation. The guidance could also usefully include methods to help a more robust analysis of adaptation options in schemes.</p>
Skills	<p>9. Policymakers should encourage contracting authorities to identify and train up skilled officers to identify climate change adaptation as a core objective in procurements. These officers can also maximise benefits by using collaborative procurement and industry experts, defining specifications effectively and selecting a skilled tender evaluation panel.</p>
Standards & monitoring	<p>10. Government needs to lead by example by setting requirements in flagship programmes such as Building Schools for the Future and capital programmes for hospitals, prisons and public infrastructure.</p> <p>11. Policymakers should embed climate change adaptation into:</p> <ul style="list-style-type: none"> • Building standards for both new builds and refurbishments (i.e. Building Regulations and standards such as BREEAM or equivalent); and • Expected standards for public procurement. <p>12. Projects should be designed to be climate resilient for their expected lifetime, rather than the procured contract period. This design life will vary from asset to asset. An appropriate timeline over which to consider adaptation measures for public procurement of buildings may be 50 years or more, less for road surfaces and longer for some infrastructure.</p> <p>13. Monitoring and analysis could help share good practice, mentor contracting authorities, track overall trends in embedding adaptation, and help evaluate the contribution of building standards, planning conditions and the procurement process to the quality and performance of new builds and refurbishments.</p>
Incentivising the market	<p>14. It is evident that the case for embedding adaptation, and existing good practice examples, are not widely understood across central government, contracting authorities or those that influence them, contractors or end-users of buildings. Policymakers have a key role to play in raising this awareness.</p> <p>15. Stakeholders have suggested financial mechanisms, developing or endorsing awards to encourage embedding climate change adaptation into public procurement, or setting up a challenge fund to encourage innovation.</p>

10.3 Contracting authorities

Sharing good practice	<p>1. There are several examples where climate change adaptation has been successfully embedded into public procurement. A stronger mechanism is needed for sharing this good practice. Contracting authorities should make best use of the full range of public sector networks on climate change and procurement, including collaborative procurement opportunities.</p> <p>2. Contracting authorities should share and seek out good practice case studies. In particular this should include examples of specifications and evaluations, and capture the full range of adaptation measures (i.e. not just technical design features, but behavioural measures that apply to end-users too).</p>
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Guidance & support	<p>3. 4ps is working with Regional Improvement & Efficiency Partnerships to develop a programme of support for local authorities on sustainable procurement. This is expected to include workshops, training, good practice examples and access to expert panels. It is important that climate change adaptation is fully integrated into this.</p> <p>4. Guidance needs to be made available about the different ways in which climate change adaptation can be embedded in the procurement process. This should include the importance of the specification and evaluation criteria, investment in skills to manage the process and recruitment of an expert evaluation panel.</p> <p>5. Guidance should highlight the potential benefits of using the Competitive Dialogue procurement process. This process requires significant resource and time investment and any opportunities to ‘screen’ for climate impacts should be explored.</p> <p>6. Guidance could also be explored on how best to apportion risk between authorities and contractors and how contracting authorities should reflect their risk appetite in the procurement process (especially after the release of the UKCP09 projections⁵⁴).</p>
Define and apply the vision	<p>7. Contracting authorities should include climate change adaptation in the vision for the project from the outset. In many contracting authorities this means raising awareness and training people in service directorates that adaptation needs to be a core principle, rather than an “add-on” by the central procurement team at a later stage.</p> <p>8. Contracting authorities then need to develop clear objectives (in consultation with the market), benchmarks and indicators, and communicate this to stakeholders and potential bidders. Adaptation should be written into procurement documents and contracts.</p>
Engage the market	<p>9. Contracting authorities need to engage the market early and openly to develop a shared understanding with bidders. The market needs to know the authority is serious about adaptation by weighting the evaluation criteria such that it is a significant part of the project.</p> <p>10. Contracting authorities need to be open to challenge and ready to enter dialogue about relative priorities (e.g. in striking a balance between carbon management and adaptation).</p> <p>11. Detailed specifications can be overly prescriptive; instead the market should be allowed to innovate based on the contracting authority’s defined outcomes. Care must also be taken to ensure that risk is spread proportionately between the contracting authority and the contractor, in particular during the current economic climate where contractors tend to be more risk averse.</p>
Corporate priority	<p>12. Increasing numbers of contracting authorities have a high-level climate change strategy including adaptation. The next step is to embed this throughout the corporate decision-making process so those involved in the project commissioning, budget approval and the procurement process itself have the understanding, resources and skills required to deliver climate resilience in practice. Adaptation should be written into standard procurement codes and guidance within contracting authorities.</p>
Think long term	<p>13. Contracting authorities should consider the impacts of climate change on the design over the estimated lifetime of the project, taking account of potential future refurbishment and changes of use, not just the initial length of the contract.* This may mean specifying a 50-year or more design life for buildings and some infrastructure. Decision pathway approaches could help map out options, consider the extent to which features should be incorporated now, and/or how sufficient flexibility and adaptability can be retained such that additional technical or behavioural adaptation measures could be retrofitted in the future.</p>

⁵⁴ Since published at <http://ukclimateprojections.defra.gov.uk/>

10.4 Industry organisations

Building Regulations and British Standards	<ol style="list-style-type: none"> 1. The relevant industry organisations should consider the case for revising Building Regulations and British Standards to include climate change adaptation. These could helpfully allow flexible adaptation as the climate changes; perhaps linked to the decision pathways concept (see Section 9.8). 2. This needs to be done in a way that attracts international business to the UK. Integration into European and other international standards may also help incentivise the market and create a level playing field.
Design parameters & references	<ol style="list-style-type: none"> 3. Design parameters should incorporate future climate projections (e.g. UKCP09⁵⁴).
BREEAM and equivalents	<ol style="list-style-type: none"> 4. Work is already ongoing to consider how best to embed climate change adaptation into the Code for Sustainable Homes. Adaptation should be fully integrated into all BREEAM and equivalent standards.
Sharing good practice	<ol style="list-style-type: none"> 5. Industry organisations have a role to play in sharing good practice examples and lessons learnt from previous projects.
Skills development and transfer	<ol style="list-style-type: none"> 6. The industry also has an important role to play in raising awareness and improving skill sets in both contracting authorities and bidders. This includes incorporating climate change adaptation into training, CPD and wider guidance.
	<ol style="list-style-type: none"> 7. In the longer term, industry organisations could seek to influence qualification syllabuses and the wider training system, influencing skills development on this subject throughout the curriculum.
	<ol style="list-style-type: none"> 8. There is an opportunity for the UK to take the lead in this area and sell our expertise abroad.

10.5 Contractors

Leadership	<ol style="list-style-type: none"> 1. Contractors could consider raising climate change adaptation with clients if not specified in the initial project objectives. Contracting authorities may not know what they have omitted.
	<ol style="list-style-type: none"> 2. Contractors should challenge specifications if adaptation measures are too prescriptive and explore innovative solutions, in particular to tackle twin objectives of carbon management and adaptation.
	<ol style="list-style-type: none"> 3. Contractors could consider offering adaptation measures as a standard option.
Standards and codes of practice	<ol style="list-style-type: none"> 4. Contractors should be aware of future revisions to Building Regulations and design standards and consider how best to influence these to ensure they remain flexible and practicable.
	<ol style="list-style-type: none"> 5. The industry should consider including adaptation in codes of practice on sustainability.
Investment in skills	<ol style="list-style-type: none"> 6. Contractors should recognise the trend towards well adapted procurement projects of this nature, and invest in the skills needed to meet and exceed their clients' requirements.
	<ol style="list-style-type: none"> 7. This will often require embedding climate change adaptation and wider sustainability principles into overall company policies.
Innovation & opportunity	<ol style="list-style-type: none"> 8. Contractors should consider the opportunity for innovation to create a market advantage over their competitors in the UK and beyond.
	<ol style="list-style-type: none"> 9. Opportunities could include integrating climate change mitigation and adaptation objectives, and buildings that can be further adapted in the future as the climate changes.

Risk management	<p>10. Contractors and sub-contractors may perceive complex or innovative procurement specifications as difficult and potentially higher risk, perhaps particularly in the current economic climate. The concept of climate change adaptation may fall into this category, at least until such time as awareness, competence and market appetite are more developed.</p> <p>11. To address this it is important that contracting authorities and contractors work together to spread risks proportionately; for example by sharing good practice and developing skills.</p> <p>12. Contractors should recognise the emerging market opportunity and seek to develop capacity now to incorporate adaptation measures as they become mainstream.</p>
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10.6 Suggested areas for further study

The Partnership has a key role to play, in particular developing capability in contracting authorities in London. This initial report, while relevant nationally, also contains some lessons that could be applied at the international/European level. Building on this initial report, potential areas for follow-up work that the Partnership may wish to take forward include:

10.6.1 Understanding adaptation in the procurement process

- Further stakeholder consultation to test and refine the findings of this report.
- Collation of wider case studies or a survey of contracting authorities, including perhaps from other European cities.
- More detailed analysis of procurement spend in different contracting authorities to better understand the size of the market and where to prioritise embedding climate change adaptation into particular sectors.
- A subsequent review of the impact of UKCP09⁵⁴ on the procurement process.
- Expansion into other areas of public procurement beyond capital construction and refurbishment.
- Integration with work on private sector commercial building stock.

10.6.2 Capability-building: adaptation in practice within public procurement

- Programme of events, training and networks to share good practice, monitoring of progress in contracting authorities. The Partnership has a good opportunity to promote knowledge sharing and good practice within and between their member organisations. This could be integrated with more general training in complex procurement⁵⁵.
- A pilot of the decision-pathway approach at the project level (see Section 9.8).
- Development of guidance for contracting authorities and bidders on how to embed adaptation, including sample project visions, design statements, specifications, evaluation criteria and contracts. This could be delivered in conjunction with the OGC Centre of Excellence for Sustainable Procurement, RIEPs and others.

⁵⁵ For example http://www.pwc.co.uk/eng/events/271108_project_finance_for_ppp_pfi_projects.html

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- Integration with future European-wide work in response to the recent EU White Paper on adaptation. This report is very timely and, as described above, raises some similar issues, in particular sharing good practice, climate-proofing EU-funded infrastructure projects, making climate change impact assessment a condition for investment; incorporating climate impacts into construction standards, and encouraging the sharing of investment and risk between the public and private sector. There is an opportunity for the Partnership to engage with others across Europe.

10.7 Roadmap

Drawing together the key messages and suggested next steps, **Figure 10.1** overleaf is a suggested roadmap towards embedding climate change adaptation into public procurement.

Figure 10.1: Moving towards climate resilient public procurement

UKCP09 climate projections available for use by contracting authorities <i>(UKCIP, contracting authorities, 2009)</i> ⁵⁴	Review Building Regulations / BREEAM / Code for Sustainable Homes to include further adaptation measures <i>(CLG, BRE and others, tbc)</i>	Evaluate progress in applying PPS1 and related planning conditions <i>(CLG and others, tbc)</i>	Publish Climate Change Act reporting power and statutory guidance <i>(Defra, 2009)</i>	EU Adaptation Strategy explores conditions and standards for construction <i>(European Commission by 2013)</i>	Revise HMT Green Book to include climate change adaptation in investment appraisal <i>(HMT, 2009)</i> ⁵⁴
Lead by example by requiring climate change adaptation in all flagship government capital investment programmes <i>(policymakers)</i>	Raise awareness of the case for embedding adaptation & link with authorities' corporate objectives <i>(LCCP, OGC, Defra, 4ps, I&DeA, RIEPs, PfS etc)</i>	Build portfolio of more case studies on adaptation, test universality of study findings <i>(LCCP, Defra and others)</i>	Share good practice case studies including samples of specifications and evaluation processes <i>(OGC, I&DeA and others)</i>	Integrate climate change adaptation into guidance on sustainable procurement <i>(OGC)</i>	Include climate change adaptation in procurement vision, objectives, specifications and evaluation criteria <i>(contracting authorities)</i>
Deliver support programme for contracting authorities including training, workshops, practical help <i>(OGC, 4ps, RIEPs)</i>	Invest in appropriate skills in procurement teams and evaluation panels <i>(contracting authorities with support)</i>	Raise awareness of rising demand and good practice with contractors , encourage training & innovation <i>(LCCP, industry organisations)</i>	Engage the market and maximise benefits from use of competitive dialogue procedure where appropriate <i>(contracting authorities with support)</i>	Review the impact of UKCP09 on the procurement process <i>(LCCP and others)</i>	Pilot the decision pathway approach at the site or project level as a way of future-proofing procurement <i>(contracting authorities with support)</i>
Embed climate change adaptation into industry codes on sustainability <i>(industry organisations)</i>	Encourage climate change adaptation through use of collaborative procurement <i>(OGC, 4ps etc)</i>	Integrate climate change adaptation into qualifications and CPD <i>(industry organisations)</i>	<i>Additional steps as required</i>	Public procurement of climate resilient new build & refurbishment	Drives wider climate resilient procurement in the market



Appendix I – Stakeholder interviews aide memoire

The following sets of questions were used as a menu from which to draw out stakeholder views for this study.

High level initial stakeholder semi-structured discussion questions

For use in guiding discussion with stakeholder contacts (please drill down to the more detailed case study aide-memoire for more detailed engagement on specific case studies).

- Introduce project context (exam question, plus make sure are clear on definition of adaptation, and on scope of public procurement exercises we are looking at)
- what sort of projects/procurements are in scope?

Key Questions	
1.	What is your initial response to the question we have been set? Is there, in your view, an economic or legal case for embedding climate change adaptation / resilience into these types of public procurement exercises? Why? Is public procurement the right lever / process or is it something else?
2.	Does your organisation have any policies or strategies or ongoing thinking / are you aware of any discussions around embedding climate change adaptation into the public procurement exercises you are involved in? (Can we see?)
3.	Do you have any examples / are you aware of any examples of where (a) public procurement exercises have taken account of climate change adaptation to some extent (b) or where there was an attempt to do so but in the end it was not applied; or (c) where climate change adaptation was not taken into account and this has subsequently caused some problems? (If talking to specific sectors can mention a couple of relevant examples from our research)
4.	Do you think that public procurement already takes sufficient account of climate change adaptation where appropriate into decisions? Or do you think more could be done? Do you see this happening organically over time or do you think there is some further work that needs to be done to influence public procurement exercises to do the right thing? What needs to happen and who needs to lead it?
5.	Under what situations do you think there is an economic case for embedding climate change into procurement exercises? How would you quantify the economic case and make an investment decision for or against? How would you measure costs and benefits? What would happen if benefits accrued to someone other than the contracting authority directly?
6.	Do you think there are legal requirements that are driving embedding climate change into public procurement? What about the risk to the contracting authority if adaptation is not embedded?
7.	Which steps in the procurement process do you think are appropriate for embedding climate change adaptation? Do you think the existing procurement process is fit for purpose in enabling climate change adaptation to be taken account of when needed, or do you think any changes need to be made to the rules, or to how they are applied in practice?
8.	More broadly do you see any other barriers to embedding climate change adaptation into public procurement?
9.	Details on any specific case studies / contacts to follow up (and any pictures?)
10.	Would you be interested in coming to a broader workshop in London in April where we will present back our interim findings and seek input to test and refine these?



Appendix II – Case study aide memoire

We used the following framework to help guide discussion of potential case studies with lead contacts.

Introductory high-level questions (for example in emails)

1	What were / are the drivers behind the idea to embed climate change adaptation into this development / procurement exercise? Who is leading and driving the process? How did / do you present your case for doing so?
2	How did / are you assessing the local climate impacts on the development?
3	How did / are you using that information to inform what adaptive measures should be included in the development?
4	How did / are you making the investment decision about appropriate levels of adaptive measures, balancing the costs of doing so, the benefits of doing so, and the risks of not doing so?
5	At what specific steps in the procurement process did / will you make the link with climate change adaptation? Are you comfortable with the extent to which current procurement processes can be used to embed climate change adaptation measures into developments like these? If not, what are the barriers or challenges, what needs to happen to improve them?
6	Overall, do you think there is a legal or economic case for embedding climate change adaptation and resilience into public procurement projects? Do you think procurement is the right lever, or does it sit somewhere else?
7	<ul style="list-style-type: none">• Level of interest in study?• Level of interest in being cited as a case study?• Any documents or information we can see?• More in-depth conversation with contact or others?

We then used the following framework for more detailed interviews.

Case-study interviews – aide memoire

Questions will obviously need to be adapted depending on the case-study and type of organisation/interviewee involved

Further detail (e.g. checklists) have been included to aid interviewer for prompts – it may not be necessary to include all this detail when carrying out the interview.

Background

- 1 Can you please provide some background to the project? (What did the project involve? Who commissioned the work? Who were the main stakeholders? What was the approximate size (revenue) of the project? What was the timeframe (inception to completion etc)?)
- 2 What was the procurement process? (PFI/PPP/other; competitive/non-competitive/framework agreement; main organisations bidding for work; timescales involved) How did the procurement process consider sustainability/climate change adaptation issues? (if at all)

Motivations for incorporating adaptation to climate change into the project

- 3 Why did you decide to explore embedding climate change adaptation into this project? Who needed to agree this before you began?
- 4 What role did the public procurement process play in motivating adaptation considerations? If it played a role, what level of importance: 0 (none, there were other motivations) – 100% (procurement was the only motivation), somewhere in between would mean that public procurement was only part of the motivations.
- 5 What would have happened if motivations for adaptation driven by the public procurement process had not been there? (i.e. no adaptation would have been taken (0%), little adaptation (25%), half of the adaptation actions (50%), most adaptation actions (75%), all (100%).
- 6 What climate change risks were identified and how were impacts and risks considered? Where did you get the data/information from to make these assessments? Did any external experts/consultants/organisations e.g. the UKCIP play a role?
- 7 What was the “risk appetite” of the decision making organisation considered to be? What assumptions (e.g. on forecast climate changes) underlined any considerations made?

Checklist: climate variables, impacts and receptors

Climate variables: temperature, rainfall, wind speed etc.

Climate impacts: (particularly focusing on those applicable to London (*))

- Climate trends – within which the peaks and troughs are extreme weather events
- Flooding (all types) including tidal surges, river flooding, groundwater flooding (rising water tables), surface water drainage / heavy rainfall (= “pluvial” flooding) (*)
- Overheating (*)
- Water scarcity (lack of water availability, subsidence etc) (*)
- (Other variables could include coastal erosion, increased storminess / wind, fog etc)

Consequences on different “receptors” of climate change e.g.:

- Roads (flooding, melting, landslips etc)
- Buildings (flooding, overheating, subsidence etc)
- People (e.g. users of buildings e.g. students, elderly etc)
- Particular locations / communities
- Infrastructure / logistics / supply chains on which our procurement projects might depend (e.g. delivery of supplies, transport of people etc)

- 8 To what extent did any current government legislation/guidelines incentivise incorporation of climate change adaptation into the project?
- 9 What other motivations were there for incorporating climate change adaptation into the project? (e.g. organisational policy, corporate social responsibility, shareholder/other stakeholder pressure, financial/business pressures, etc)

Activities: process for adapting to climate change

- 10 What was the *process* applied for considering and adopting adaptation measures? How was this process agreed? What were the main drivers and who were the decision makers? What was the decision making criteria?
- 11 What types of adaptation measures were eventually adopted? To what extent was adaptation built into the “institutional” capacity of the organisation (developing skills, training and awareness within the organisation) versus more ad-hoc responsive actions (involving delivering hard adaptation measures on the ground)? Examples of adaptation measures may include:
 - risk/impact assessments
 - checklists
 - principles in design
 - expert advice on particular elements of project design/delivery
 - cultural change
- 12 How were adaptation measures implemented? Were there any practical/other difficulties encountered in implementing these measures? Were there any additional staff training requirements to ensure these measures were implemented effectively?
- 13 Were climate change risks monitored on an ongoing basis through the life of the project? What processes for ensuring that additional adaptation measures were implemented (should they become necessary as a result of unexpected further climate change) were in place?
- 14 How were the possible costs and benefits of adaptation to climate change considered through the above? How was value for money considered?

Outputs

- 15 What were the main project design/delivery changes to occur as a result of the adaptation measures incorporated?

Checklist: outputs of adaptation measures

- Buildings and major refurbishments are more climate change resilient (e.g. orientation to minimise solar gain, sustainable drainage systems, passive ventilation, rainwater harvesting)
- Physical risks to public sector estate, their occupants and functions are reduced (e.g. transport and logistics disruption, on-site floods, landslips, impacts on work force productivity from over-heating)
- Facilities management contracts and lease agreements take into account the need for increased operational and maintenance expenditure because of climate risks (e.g. public gardens need to be drought tolerant, gutters and drains may need to be upsized to cope with excessive rainfall)
- Redundant products/materials/buildings are disposed of
- Providers of services make appropriate adjustments to their supply chain to ensure that climate change adjustments are comprehensively incorporated right across the value chain
- Also see climate change and retrofitting checklist publications of The Partnership e.g. http://www.climatesoutheast.org.uk/images/uploads/Adaptation_Checklist_for_Development_Nov_2005.pdf

Outcomes (costs)

16 What were the main costs of incorporating climate change adaptation? (Make a link to public procurement wherever possible).

Cost area	Cost (£'s)	Timing	Bearer	Overlaps	Role of public procurement in driving adaptation costs	
Costs of incorporating climate change adaptation	If exact figure is not available then ask for an estimation (probing may be necessary) or at least get a sense of significance	Immediate, long-term, ongoing?	(Government, industry, consumers, other stakeholders?)	Does the cost interrelate/overlap with other costs/benefits identified?	What role did the public procurement process play in driving the adaptation cost? If it played a role, what level of importance? 0% (none, other motivations drove the adaptation cost; 100% (public procurement was the only motivation); somewhere in between would indicate that public procurement played some role in driving the adaptation cost	What would have happened if motivations for adaptation driven by public procurement had not existed? 0% (no element of the adaptation cost would have taken place); 100% (all elements of the adaptation cost would have taken place); somewhere in between would indicate that some element of the adaptation cost would have been expended in the absence of public procurement motivations
I. Costs associated with the procurement process						
<ul style="list-style-type: none"> Administrative/management compliance costs 						
<ul style="list-style-type: none"> Contractual implications of incorporation of climate change adaptation criteria e.g. contract management costs, payment mechanisms, handback criteria 						
<ul style="list-style-type: none"> Other 						
II. Costs associated with preparation and design						
<ul style="list-style-type: none"> Administrative/management compliance costs 						
<ul style="list-style-type: none"> Purchase 						
<ul style="list-style-type: none"> Building specification and associated 						

Cost area	Cost (£'s)	Timing	Bearer	Overlaps	Role of public procurement in driving adaptation costs	
design/architecture costs						
• Site remediation costs						
• Legal/consultancy/specialist advice costs						
• Other						
III. Costs associated with construction						
• Administrative/management compliance costs						
• Construction costs (changes in materials and/or techniques)						
• Loss in floor space						
• Other						
IV. Costs associated with operation / disposal						
• Administrative/management compliance costs						
• Operation/maintenance costs						
• Staff training costs						
• Cultural change management						
• Disposal costs (of redundant materials/products/buildings etc)						
• Other						
V. Other costs						
• Indirect costs e.g. impact on market competitiveness, stakeholder resistance						
• Wider costs – e.g. issues in the workplace, community or industry sector						

Outcomes (benefits)

17 What were the main benefits of incorporating climate change adaptation? (Make a link to public procurement wherever possible.)

Benefit area	Benefit (£'s)	Timing	Bearer	Overlaps	Role of public procurement in driving adaptation benefits	
Benefits of incorporating climate change adaptations	If exact figure is not available then ask for an estimation (probing may be necessary) or at least get a sense of significance	Immediate, long-term, ongoing?	(Government, industry, consumers, other stakeholders?)	Does the benefit interrelate/overlap with other costs/benefits identified?	What role did the public procurement process play in driving the adaptation benefit? If it played a role, what level of importance? 0% (none, other motivations drove the adaptation benefit; 100% (public procurement was the only motivation); somewhere in between would indicate that public procurement played some role in driving the adaptation benefit	What would have happened if motivations for adaptation driven by public procurement had not existed? 0% (no element of the adaptation benefit would have been realised); 100% (all elements of the adaptation benefit would have been realised); somewhere in between would indicate that some element of the adaptation benefit would have been realised in the absence of public procurement motivations
I. Benefits associated with "future proofing" (i.e. avoiding possible future costs as a result of better resilience to climate change)						
<ul style="list-style-type: none"> Reduced exposure to weather damage ((flooding, water shortage, freak winds) – measured by, for example, reduced premiums for building/contents insurance or estimated cost savings as a result of damage reduction 						
<ul style="list-style-type: none"> Reduced exposure to logistic/workforce disruption 						
<ul style="list-style-type: none"> Other 						
II. Benefits associated with efficiency savings/improved quality						
<ul style="list-style-type: none"> Reduced energy bills 						
<ul style="list-style-type: none"> Use of more sustainable materials in 						

Benefit area	Benefit (£'s)	Timing	Bearer	Overlaps	Role of public procurement in driving adaptation benefits	
construction						
<ul style="list-style-type: none"> Improved quality of buildings (measured by, for example, increases in property prices) 						
<ul style="list-style-type: none"> Management/admin savings 						
<ul style="list-style-type: none"> Other cost reductions as a result of adaptation measures (e.g. operational cost reductions) 						
III. Benefits associated with reputational impacts						
<ul style="list-style-type: none"> Contributions to corporate social responsibility policy 						
<ul style="list-style-type: none"> Other positive reputation impacts e.g. through positive stakeholder relations 						
IV. Benefits associated with industry/sector development						
<ul style="list-style-type: none"> Adaptation of new products, services, techniques, technologies 						
<ul style="list-style-type: none"> Other 						
V. Benefits associated with land betterment effects						
<ul style="list-style-type: none"> Enhancement in perceived value of certain geographic areas due to climate change adaptation safety 						
<ul style="list-style-type: none"> Other 						
VI. Other benefits						
<ul style="list-style-type: none"> Other wider benefits e.g. health benefits, morale, new products and services, employment (including boost to economy aggregate demand), open spaces, quality of life 						

-
- 18 In any of the above cost/benefit areas identified, is there a danger that “over-adaptation” occurred? (i.e. adaptation measures that went beyond what was required and could be reasonably considered value for money)
- 19 Please could you provide us with any documentation/evidence on any cost/benefit analysis conducted

Overall evaluation of experience

- 20 Overall, have adaptation translated into savings, increased turnover and profit increases? If so, how much and during what period? How significant is that (e.g. enough savings to invest in business growth / increase employment, employee training, other)
- 21 Thinking more broadly, do you think that the overall benefits outweighed the costs? Over what timescale is your answer dependent? (for example, costs may outweigh benefits when evaluating over only a short-term time frame)
- 22 What was your overall experience of the incorporation of adaptation measures in this project?
- 23 Were there any instances of disparity between which stakeholders bore costs for adaptation versus those who received the benefits?
- 24 Do you think the adaptation measures implemented offered value for money?
- 25 Would you do anything differently regarding incorporation of climate change incorporation measures if you played the same role again on this project?
- 26 Has the project left behind any embedded processes/legacies which will be used in future decision-making? Are you now attempting to embed adaptation into more public procurement exercises or ways of working, in particular in relation to your estate? Are you making any further modifications to processes applied?

Views on impact of potential new procurement procedures

- 27 Overall, how do you feel that the process for adaptation, outputs and costs/benefits achieved would differ if this project had been through a procurement process which included more specific requirements for climate change adaptation? [obviously this will depend heavily on what the requirements actually are]
- 28 What challenges do you think there may be to incorporating requirements for climate change adaptation into government procurement processes?
- 29 If the government decides to include or to recommend organisations include their own requirements for climate change adaptation in future procurement, how do you think these would best be delivered? (e.g. should government specify in some detail how measures for adaptation should be assessed/delivered or should decisions regarding implementation of the requirement be left to bidding organisations?; should government consult with the bidding community on the approach being developed?; should government issue practical guidance, tools, case precedents to assist bidders?)

NB: It may not be appropriate to ask all interviewees the above questions.

Appendix III – Stakeholders

This section lists key stakeholders identified for this project and the extent to which it has been possible to engage them during the limited time period available for this initial study.

Sector	Organisation	Area of interest	Source of information	Key target audience	Attended workshop?
Steering Group	London Climate Change Partnership	Client	✓	✓	✓
	Defra	Climate change adaptation	✓	✓	✓
	Environment Agency Thames Region	Climate change adaptation	✓	✓	✓
	Government Office for London	Climate change adaptation		✓	✓
	City of London Corporation	Climate change adaptation		✓	✓
	London Development Agency	Procurement		✓	✓
Central government policy	HMT	Green Book revision to incorporate adaptation	✓	✓	Invited
	OGC	Policy through procurement including adaptation		✓	✓
	CLG	Planning policy Code for Sustainable Homes revision to incorporate adaptation	(✓)	✓	Invited
Government agency contracting authorities	NHS	All new hospitals to be designed to adapt to climate change		✓	Invited
	Homes & Communities Agency	Procurement of regeneration and housing schemes	(✓)	✓	Invited
	Partnerships for Schools	Procurement of schools, in particular Building Schools for the Future (BSF)		✓	✓
	Highways Agency	Embedding adaptation into road building and resurfacing	✓		Invited
London contracting authorities	Greater London Authority	Applicability to London		✓	Invited
	Transport for London (TfL)	Embedding adaptation into procurement	✓	✓	✓

Regional & local authorities	4ps	Supporting local authority procurement	✓	✓	✓
	Regional Improvement & Efficiency Partnerships (RIEPs)	Supporting local authority collaboration, innovation and efficiency		✓	
	Regional Development Agencies (RDAs)	Range of procurement activity and relevant policy at the regional level		✓	
Motivations for adaptation	UK Climate Impacts Programme	Definitive source of advice on climate change adaptation	✓		-
	BRE	BREEAM standards and ongoing work to revise to include adaptation	✓	✓	Invited
	Association of British Insurers (ABI)	Extent to which incorporation of adaptation measures impacts insurance premium	✓		-
	Commission for Architecture & the Built Environment (CABE)	Good practice standards and guidance e.g. http://www.sustainablecities.org.uk/	(✓)	✓	
	RIBA, CIBSE, RICS, RTPI and other industry organisations	Industry standards, training, good practice sharing		✓	

Private sector contractors and consortia were engaged through the Partnership's Commercial Building Stock programme in relation to the case studies, in particular Case Study 3.

Appendix IV – Case studies

Full details of each case study are presented here.

Case Study 1:	Met Office
Case Study 2:	Red Hill CE Primary School
Case Study 3:	Worcester Library & History Centre
Case Study 4:	Jacobs Engineering Ltd
Case Study 5:	Barking Riverside
Case Study 6:	Olympic Park
Case Study 7	PwC More London Riverside

Each case study draws out the following:

- A summary of key facts
- Background to the project
- What were the drivers for embedding adaptation?
- How was adaptation embedded into the procurement process?
- What adaptation features were incorporated?
- What were the costs, benefits and risks?
- Key messages to draw from the case study to help answer the question of how to embed climate change adaptation into public procurement; and which inform the economic and legal case

Matrix of key findings

A cluster analysis of key findings from these case studies, that has informed Section 8 of the main report, is also included.

Case Study 1: Met Office

Project	To relocate the Met Office to new, purpose-built accommodation in Exeter
Contracting authority	Met Office
Type / sector	Government agency (trading fund) Office buildings including research centre and housing for two supercomputers of international strategic importance
Dates	Project began 1999 Met Office relocated 2003
Funding	Capital budget (considered PFI but not pursued because as a trading fund had accrued savings. Chose to use own budget due to lower whole-life-cost and greater flexibility)
Procurement process	Negotiated tender process
Contract type	Public Private Partnership
Value	Capital investment in construction £82m Total contract £150m
Design life	DBO 15-year contract with option to extend. Expect to remain in building for foreseeable future. Flexible design to accommodate expansion, contraction or change of use.
See also	http://www.metoffice.gov.uk/corporate/csr/environment.html

Figure CS1: Met Office with drainage pond adaptation feature



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Background

In 1999, the Met Office decided it needed new, purpose-built premises. The existing site and location were no longer fit for purpose. The overall objective was to re-house the Met Office in a building that met the changing needs of the organisation with space for further expansion, and to involve employees throughout in order to maximise staff retention during relocation. A nationwide search began for appropriate sites with planning permission and a greenfield site in Exeter was selected. A contract was let in 2001 and the building became operational in 2003 with more than 80% of staff relocating to the new site.

What were the drivers for embedding adaptation?

The Met Office provides world-leading weather and climate change forecasting. High environmental performance within the new buildings and operations was a high priority in order to maintain a credible reputation. Achieving a high standard in a well-known, certified scheme was therefore important.

A particular challenge was how to house the Met Office's supercomputers within the new building. Resilience to weather events and other risks needed to be extremely high; the computers are of international importance. They also consume significant amounts of energy and need to be kept cool.

This is the oldest case study in this report. In 1999 climate change adaptation was not an issue that was widely discussed. Future climate change scenarios for the UK were not yet well-developed or widely-applied; however the Met Office used its own in-house modelling of future climate change and made sure that the specification reflected this. The site was not in a known fluvial flood risk area; however a condition of planning permission was that changes in surface water run-off did not increase risk of flooding elsewhere.

The main issues that influenced building specification were therefore:

- A positive new working environment for staff
- Resilient, high-security housing for supercomputers
- Environmental performance to BREEAM "excellent"
- Need to maintain indoor working environment within specified ranges

How was adaptation embedded in the procurement process?

The following conditions were included in the specification for this procurement process:

- BREEAM "excellent" standard, which was later certified. At the time this was the highest standard available. The focus is on environmental performance, but several measures, including those to reduce mains water consumption, support adaptation.
- Sustainable drainage systems that met planning conditions.
- Internal ambient temperature range and other industry design reference standards within which the building would need to operate, regardless of future changes in outside temperature. This was supported by the contracting authority's own analysis of how the external temperature would be expected to change over the design life of the building.

After issuing the initial pre-qualifying questionnaire, nine consortia were invited to submit proposals. These were evaluated and negotiations continued with a further three. A contract to design, build, operate and maintain the building was let in November 2001 to a consortium led by GSL (now G4S) in a joint venture with Skanska and Costain.

The maintenance of the building is managed by G4S on-site, therefore keeping a strong ongoing relationship with the contracting authority. This has proved important in making best

use of the flexibility within the contract to make operational changes during the lifetime of the contract.

What adaptation features were incorporated?

The following features in the building, whilst not all driven specifically by the need to adapt to climate change, will have a positive effect on the contracting authority's ability to do so:

- New landscaping including two balancing ponds to control the rate of surface water run-off from the site
- Channelling rainwater from around the site, which is then treated and reused to flush the toilets.
- An artesian well to top up the ponds and toilets and to provide cooling water for chilled systems in order to cope with predicted future extended dry spells
- Using heat from the site's generators and supercomputers to warm or cool the rest of the building
- A "TermoDeck Ventilation System" – passive heating and cooling by making use of the cool air at night and the heat from the building during the day to heat and cool the building

What were the costs, benefits and risks?

The additional costs of incorporating these measures, and the extent to which these are apportioned between the design, build and operate phases of the contract, are unknown to the contracting authority. The key point for the contracting authority is that overall the preferred bidder considers the project a worthwhile contract to pursue and therefore inherently must be cost-effective, and the specification has been met within the affordability envelope.

Costs and risks are apportioned between the contracting authority and the contractor. The building is designed to be resilient to weather extremes, including flash floods, as specified by the contracting authority. If the building fails to cope within these limits then the contract requires that G4S make any necessary changes. If the building experiences weather beyond the specified extremes, the contracting authority will need to fund any necessary repairs or improvements. If, despite operating the building within the contractual environment, the Met Office wishes to make changes, they will need to fund the additional measures.

The benefits to the Met Office arising from the environmental performance and adaptation features in this procurement exercise have been significant and include:

- The building has enabled the Met Office to demonstrate high environmental performance, including BREEAM "excellent" and an ISO 14001 compliant environmental management system, therefore enhancing its reputation with its client base.
- The reliance on natural ventilation and heat recycling has reduced energy bills, and also will now help the Met Office prepare for the Carbon Reduction Commitment, reducing the financial burden that this mandatory scheme will pose.
- The Met Office is confident that its new headquarters, and its occupants, are able to adapt well to the changing climate for the design life of the building.

Key messages

- Contracting authorities with a corporate vision or requirement to tackle environmental issues are more likely to voluntarily include requirements with their procurement; it is product of a broader set of values and decision-making.
- Contracting authorities want to procure around certified standards that their customers will recognise; BREEAM is well-known and therefore well-used although it currently has few measures directly on adaptation.
- Using defined standards such as BREEAM excellent and CIBSE design reference standards are simpler and contractually tighter than including a long list of detailed requirements in specification. Embedding adaptation into these projects therefore requires influencing the bodies that develop these standards; institutionalising adaptation.
- Contracting authorities need in-house expertise in order to be intelligent clients at both the specification and evaluation stage of the procurement and when setting up the contract.
- Additional build costs were marginal and affordable and have resulted in lasting benefit including better ability to comply with subsequent legislation and forthcoming financial impacts such as the Carbon Reduction Commitment.
- Letting a single DBO contract means that the cost of investment in measures is balanced by lower operating costs managed internally by the consortium. Contracting authority need not concern itself with the build versus operating costs.
- An operating contract can be drawn up such that changes to keep the building inside specified tolerances are the responsibility of the contractor who bears the cost; the risk of any additional costs (e.g. changes within contractual limits or in response to extreme weather beyond those defined in the specification) are borne by the contracting authority.

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Case Study 2: Red Hill CE Primary School

Worcestershire County Council is one of the leading local authorities in tackling climate change and was awarded Beacon Status in 2008. The authority has a recent history of taking opportunities to embed climate change adaptation into capital projects. Over time, this in-house expertise has grown and been applied in ever-more ambitious contexts, telling a good story about the longer-term benefits in investing in skills. Red Hill CE Primary School was the first time Worcestershire County Council embedded climate change adaptation into a project.

Project	Red Hill CE Primary School: new school built on the site of the old one
Type / sector	Worcestershire County Council: Local authority
Dates	New school opened 2007
Funding	Capital expenditure
Procurement process	Restricted tender
Contract type	DB
Value	£2.7m
Design life	60 years
See also	http://www.ukcip.org.uk/index.php?option=com_content&task=view&id=153&Itemid=282

Figure CS2: Red Hill CE Primary School



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Background

Red Hill CE Primary School was not fit-for-purpose and the decision was taken to rebuild on the existing site.

What were the drivers for embedding adaptation?

As described above, Worcestershire County Council identified adapting to climate change as a corporate priority to be embedded in all decision-making processes. The new school was to have a design life of 60 years, during which time climate change impacts are expected, and therefore was a good pilot project for the Council to explore how this might apply in a building project. The Council was fortunate that a UKCIP specialist was seconded to help develop capability, and was motivated to innovate and experiment architecturally.

The Council recognised the educational, pupil and staff wellbeing, and wider community value of designing a school that included adaptation features. It was important that the school provided the best possible learning environment and also provided scope for pupils and parents to gather and to become an important hub for the local community.

How was adaptation embedded into the procurement process?

The project applied the UKCIP Adaptation Wizard. This is a simple decision-making tool developed by UKCIP to help organisations understand specific climate impacts in relation to particular policies, programmes and decisions, and to take a proportionate and risk-based approach to adapting in response. The project relied on UKCIP 02 climate change predictions for the region for the design life of the building, supplemented by some additional UKCIP research at a more local level.

Worcestershire County Council is relatively unique in that it has retained significant in-house expertise within its Property Services function, including architects and consultants. Other engineers and surveyors were brought in as needed under a framework contract. A traditional local authority restricted procurement process was therefore used. In this case, the approach provided lasting value because skills were developed and retained in-house and have since been transferred into other larger projects using more complex procurement routes, such as the Worcester Library & History Centre below.

What adaptation features were incorporated?

Win-win benefits for pupil wellbeing, educational value and multiple climate variables were incorporated wherever possible. For example, large overhangs provided shade, shelter from rain, focal points for pupils and parents to gather, and overall improvements to the feel of the building. A wide range of features were included; some are listed below. The detailed features are well-documented as good practice examples in a wide range of publications and are not repeated here.

- Higher winter rainfall, more intense rainfall and driving rain: sustainable drainage, wide gutters, large overhangs for shelter, rainwater harvesting
- Milder winters: good ventilation
- Hotter drier summers: Shade, natural ventilation, air cooling of the ICT suite from a ground source heat pump system
- Increased storm events: Aerodynamic with zinc sheet roof that may be more resilient than roofing tiles

What were the costs, benefits and risks?

Red Hill CE Primary School was designed and constructed at the same time as another primary school in the County. There was no difference in cost per m² of the building; the emphasis was on a different way of doing things. In fact, any measures that would have led to significant increased costs would have needed to be designed out because there was no additional budget allocation for adaptation measures, even for this pilot.

The contracting authority did not need a comprehensive cost-benefit analysis for this project. The analysis was more qualitative and subjective within the affordability envelope. There were multiple motivations for the design features and therefore it is difficult to assess the incremental costs and benefits for climate change adaptation alone. Ongoing operating costs are also not significantly different.

In discussion for this project the contracting authority emphasised that the 60 year design life is significant. Had this been a PFI project under a, say, standard 25-year contract, after which the school would be handed back to the Council, the costs and benefits of adaptation measures designed to cope with the climate in 60years' time would accrue to different stakeholders. That said, many PFI school projects now include some requirements that relate to climate change adaptation in which many of the measures in this case study are now incorporated⁵⁶.

Key messages

- Local authorities that have made tackling climate change a corporate priority and have a strategic approach to embedding climate change adaptation across all service areas have a stronger framework in which to embed adaptation into public procurement exercises.
- Local authorities find it beneficial to embed climate change adaptation measures into public procurement, although to do so for the first time they may need some external expert advice.
- Local authorities that have retained in-house design expertise within their Property Services function may be better equipped to become intelligent clients than those who have not.
- Starting with a relatively small project from own capital funding gives contracting authorities the opportunity to develop in-house skills and test what is possible.
- Using a decision-making process such as the UKCIP adaptation wizard, combined with climate scenarios such as UKCIP 02 can give the contracting authority a sound, risk-based specification for the procurement process.
- Adaptation is not the only driver for changing the way public buildings are designed, built and operated; there are several other factors such as changes in ways of working; and the procurement exercise must specify, balance and evaluate all of these together.
- Therefore win-wins between adaptation measures and other objectives for the building (e.g. environmental impact, positive learning environment for pupils, and developing the role of the school as a community hub) are more likely to be included.
- Embedding adaptation measures into new build need not cost any more than conventional builds, or cost any more to operate.

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⁵⁶ See good practice examples of sustainable schools built under the Building Schools for the Future programme via http://www.partnershipsforschools.org.uk/library/Sustainability_CS.jsp

Case Study 3: Worcester Library & History Centre

Project	Worcester Library & History Centre
Type / sector	Worcestershire County Council and the University of Worcester, supported by Worcester City Council, Advantage West Midlands, DCMS, WRAP, UKCIP and HEFCE. Mixed public sector commercial development of an integrated public and university library, archive and history centre, restaurant, retail and hotel facilities.
Dates	Project began in 2004 Preferred bid consortium confirmed 2 April 2009 Construction due to start autumn 2009
Funding	PFI
Procurement process	Competitive dialogue
Contract type	DBO Preferred bidder Galliford Try Investments with architects Feilden Clegg Bradley, sustainability consultants Max Fordham, engineers Hyder.
Value	Capital investment in construction ~ £50m Total contract ~ £130m
Design life	Contract and adaptation until 2036. Longer further useful life expected.
See also	http://www.wlhc.org.uk

Figure CS3.1: Worcester Library & History Centre



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Background

Worcestershire County Council's corporate knowledge from the Red Hill project has been retained in-house and applied to several other projects. The most recent and complex project is the Worcester Library & History Centre, which is being developed in Partnership with the University of Worcester. This is an ambitious new landmark to support the regeneration of Worcester. Covering over 10,500m², it aims to create a ground-breaking new development that will be a global model of good practice. Worcestershire County Council is the contracting authority.

What were the drivers for embedding adaptation?

The Project Partners agreed to embed climate change adaptation as a core principle for this project. Worcestershire County Council has subsequently adopted NI 188 (Planning to adapt to climate change) as one of its national performance indicators. Specifically in this case, the project is located in the centre of Worcester on land that is vulnerable to flooding and that did indeed flood in 2007. Climate change adaptation was therefore a key objective right from the start of the project alongside other wider variables around service delivery and regeneration.

How was adaptation embedded into the procurement process?

As much market testing as possible was undertaken to develop an understanding of the extent to which the PFI market would respond. The contracting authority recognised the value of its own in-house expertise in leading this process in an informed way.

An output specification was developed that had a number of measurable environmental performance targets. BREEAM "excellent" was the baseline upon which additional requirements such as 50% renewable energy use, 50% reduction on Building Regulations Part L2 for carbon emissions, and 30% recycled content for construction were built. The Project Partners took expert advice from UKCIP to provide the bidders with a weather profile for 2020 based on a combination of UKCIP 02 data and more local knowledge. The bidders were asked to design an operational building within the weather ranges given by UKCIP for 2020.

The competitive dialogue process was highly valuable in encouraging the bidders to develop iteratively more innovative and more effective solutions, and in helping the contracting authority understand how far to challenge the market and to understand where compromises need to be made.

After an initial process, three consortia were shortlisted and provided with a highly detailed design statement of some 140 pages. The contracting authority specifically stated it wanted to be challenged at that stage. There was no supplementary allowance for environmental performance; it had to be delivered within the overall business case and £ per m² cost.

Another key point was the unusually high design weighting within the evaluation criteria; this was set at 45% where as usually in PFI projects it is set at no higher than 20%. Bidders were therefore incentivised to invest in developing a high-quality building design because the importance was clear to the contracting authority.

Care was taken to recruit an evaluation team that included a broad range of skills in order to evaluate the schemes, including a climate change adaptation expert from UKCIP.

In the end there were two affordable, well adapted and low carbon schemes, from which one preferred bidder was selected. The contracting authority is convinced that the competitive dialogue process produced a far higher-performing building within the available budget than would have been possible through a standard procurement route and application of generic design standards such as BREEAM alone; and provided greater value for money than most

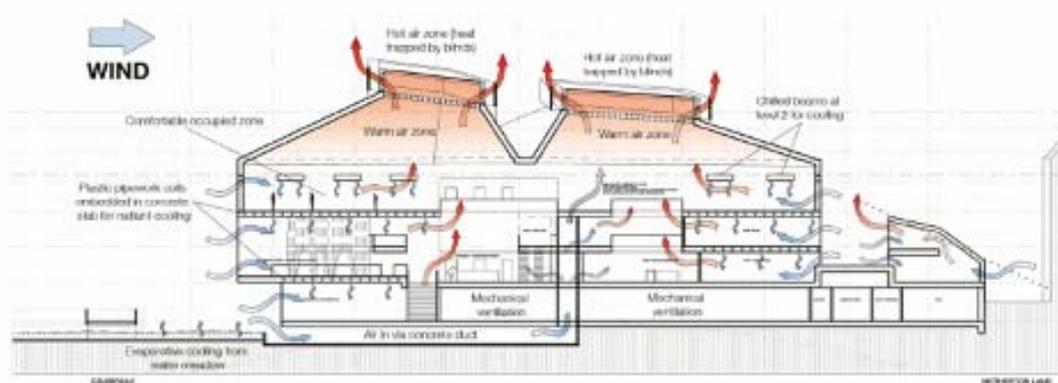
PFI projects in terms of environmental benefits. It will be important to share the experience with other contracting authorities in order to bring this approach into the mainstream.

What adaptation features were incorporated?

The contracting authority is confident that the scheme has sufficient adaptation in its design to not require any further adaptive measures for the duration of the contract period to 2036. In addition, the building is designed in such a way that the contracting authority hopes it could take comfortable conditions in the building significantly beyond that date. However, quite understandably, the market did not have the appetite to identify at this point the further changes to the building envelope that would be needed beyond the contract period from 2036 onwards and to include those in the PFI now.

The building is five storeys and has seven truncated pyramids that create lightwells and natural ventilation. Natural ventilation coupled with exposed thermal mass will maintain comfortable conditions throughout most of the building for the majority of the year.

Figure CS3.2: Natural ventilation



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Additional cooling at peak temperatures will be achieved by circulating cold water through chilled beams and pipework embedded in concrete soffits; the River Severn is used for heat rejection. Rainwater harvesting reduces dependency on mains water. The surrounding soft landscape is designed to flood in a controlled way.

What were the costs, benefits and risks?

The biggest challenge was embedding adaptation whilst keeping carbon emissions low and the project affordable. Detailed cost-benefit analysis of different combinations and options was not undertaken by the contracting authority but relied on extensive previous experience to evaluate what felt appropriate.

The Project Partners invested heavily in staff capacity and capability to deliver this project; it was highly dependent on having the right people in post from day one, and continuity of corporate knowledge from previous projects. This is in line with the corporate objectives for the County Council and the University and is therefore considered value for money in the longer term.

More specifically, the cost of producing the detailed design statement were significant to the Project Partners. However, within that, the two sections that are perhaps most important for adaptation, relating to project vision and objectives and to sustainability, could be developed on any project at reasonable cost.

Having learnt from experience in previous contracts, the contracting authority understands the importance of getting the operational contract right, so that there is an appropriate split of climate risk and related costs between the contracting authority and the contractor.

It is not necessarily true that only Councils with large budgets will be able to afford the investment in capability to embed climate change adaptation; Worcestershire is a high-performing local authority but its funding is in the lowest quartile for England.

Key messages

- Soft market testing is very valuable to engage with potential bidders and develop a specification that the market can respond to and that delivers a project within affordability limits.
- Market-leading bidders recognise that embedding climate change adaptation is a growth area for the future and are prepared to invest in the competitive dialogue process to develop their own in-house expertise regardless of whether they win the contract.
- The competitive dialogue procurement route can produce a far higher-performing building within the available budget than is possible through a traditional procurement route and application of generic design standards.
- Contracting authorities need to invest in significant staff resource to embed climate change adaptation into a project of this size; these client costs are significant although leave an up-skilled legacy for the future.
- The detailed design statement together with a high design weighting in the evaluation criteria (45% rather than the usual 15 – 20%) is critical to embedding climate change adaptation into PFI projects of this nature.
- Contracting authorities can be confident that building envelopes can be designed to cope with future climate change. However, based on experience from previous projects, it is important that maintenance contracts have flexibility to respond to changes in building use requirements.
- Current procurement rules are sufficient to permit the flexibility that the contracting authority requires to make further changes to the operation and use of the building during the contract lifetime.

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Case Study 4: Jacobs Engineering Ltd, part of the Kent Highway Services Alliance

Project	Road resurfacing
Type / sector	Local authority outsourced highways service: Kent Highway Services is a partnership between Kent County Council, Jacobs and Ringway.
Dates	Ongoing
Funding	Capital expenditure
Procurement process	Open tender
Contract type	DBO Jacobs subcontracts construction and maintenance work to other contractors
Value	~ £30m spent annually on road resurfacing in a large local authority such as Kent
Design life	Roads are typically resurfaced on average every 11 years

Background

Responsibilities for building and maintaining roads are varied in England. The Highways Agency is responsible for motorways and trunk roads; top and single-tier local authorities for other roads. In London, TfL is responsible for red routes, although delegates responsibilities in some areas to local authorities. In turn, many local authorities have outsourced all or part of their Highways Services functions to consortiums of external partners.

Jacobs is a large international engineering firm with a strong track record in highways construction and maintenance. They are partners in local authority highway management in several parts of England. This specific case study relates to their strategic oversight role as a partner in Kent Highway Services' Alliance.

What were the drivers for embedding adaptation?

Maintaining a vital asset, published in 2005, is a definitive summary of requirements and codes of practice for all highways authorities in the UK. This includes a statement that, 'authorities should consider the likely effects of climate change for the delivery of highways maintenance services, taking into account their geography, topography and geology. They should identify risks particular to the authority and plan, as far as practicable, to mitigate them.'

Deterioration of road surface quality is strongly correlated to weather. If roads are not adapted well to the climate, deterioration is quicker, resulting in greater risk of accidents and resurfacing schedules need to be brought forward, with cost implications. A standard road surface typically lasts somewhere between 8 and 20 years, with an average resurfacing cycle of 11 years. There is evidence that the extremes for which roads in the UK were designed to tolerate in the 1960s and 1970s are not fit-for-purpose for today's climate and it has become cost-effective to adjust the composition of materials and the way in which roads are built and maintained to adapt to the changing climate.

Looking forward, it is relatively easy for international companies such as Jacobs to combine UK climate predictions with knowledge transfer from other climates that today mirror the expected UK climate of the future, such as the Loire Valley. Given the regular resurfacing regime required for roads, there is time to adapt the entire highway network over 20 year cycles as the climate changes.

Roads are therefore perhaps a unique example in this study of a sector for which there is a clear and direct motivation for embedding adaptation into the procurement process, in particular where local authorities and the Highways Agency have outsourced strategic oversight to the equivalent of a DBO contract that covers a large part of the whole life-cycle.

Many of Kent's roads are rural rather than urban and so there is a question about the extent to which this case study is directly applicable to London, particularly in relation to overheating. The Partnership report *Climate change and London's transport systems (2005)*, found no evidence of problems with London's road network in the hot summer of 2003 and noted that most of the problems recorded occurred in surrounding counties.

Points to consider are:

- Both rural and urban roads suffer from weather-driven deterioration, although the impacts of specific weather events can vary.
- The high average air temperature in urban areas has the effect of making warmer temperatures penetrate deeper into the flexible road fabric, which can reduce the strength of the asphalt paving materials. However, most of the major roads, managed by TfL, are based on concrete foundations, which are relatively unaffected.
- The effects of rutting, caused by overheating, are concentrated on north-south roads that are exposed to extreme heat. The key factor is surface temperature which, in unshaded areas, can be twice the average temperature; surface temperatures of 60°C or above can cause problems. Many rural roads are open to high surface temperatures in this way; in urban areas, whilst the average temperature is higher due to the urban heat island effect, the surface temperature can be offset by shading.
- That said, given that air temperatures in London are predicted to reach 36°C for up to three days at a time by the 2080s, it will be important to learn from the experience of other parts of the UK and to undertake an assessment of north-south aligned roads, in particular those with a south-facing incline that are unshaded, in London that are potentially at risk in the future.
- Materials are also important. Surface dressing is more common on county roads to create a rough surface for higher speed traffic. This is prone to fatting up in hot weather, causing an unpleasant experience for pedestrians and creating a skidding risk after rain, but is low-cost and visually-appealing. London streets have less need for a rough surface because traffic speeds are lower. The bitumen Macadam mixtures used in past times are less temperature sensitive, but as traffic volumes and truck usage increases, and traffic speeds remain low, they will increasingly tend to deform at the predicted higher temperatures. In the last ten years, London Boroughs have tended to move over to modern heat resistant specifications for major resurfacing which are more subject to water damage than Hot Rolled Asphalt (HRA) mixtures. HRA generally has always been prone to deformation and this will increase, but it is water resistant. These different material performance needs to be reflected on the anticipated risk to the network; it will be important to consider flood and overheating risk together.

This case study is therefore applicable to London in that it highlights the importance for a local risk-based approach and draws out transferable lessons about road aspect and materials mix, the challenge of designing for several climate variables, and the importance of learning from good practice in other parts of the world.

How was adaptation embedded into the procurement process?

Kent Highways Services approved a high-level policy that roads should be resurfaced to avoid increases in the speed of deterioration due to the changing climate. Jacobs has in-

house expertise and experience about the specific recipe that is appropriate for specific sections of road depending on its exposure to the elements and other factors such as weight and speed of traffic. The requirements are listed in the specification and contractors resurface the roads on this basis.

What adaptation features were incorporated?

Jacobs use different mixes of materials to make the roads more temperature resistant and water resistant as required. The general trend is towards surfaces with harder bitumen binder which were traditionally avoided because they are more difficult to apply in cold weather.

What were the costs, benefits and risks?

In the vast majority of cases, resurfacing roads to a different specification to adapt to the changing climate results in little or no added cost.

There are a few niche situations where there is a more significant additional cost to adaptation.

- For example, the A252 from Charing to Canterbury is an example of where, historically, a low viscosity (i.e. softer) bitumen has been used for multiple surface-dressing applications over the years to maintain skid resistance. In the cooler weather of recent decades this was no problem, but in the recent hot summers the bitumen has come to the surface, which has rutted and deteriorated rapidly. Simply redressing the surface does not address the cause of the problem and in regular hot summers the problem just reoccurs. The engineering solution requires replacing all the bitumen with a harder mix which is significantly more expensive in the short-term (£9 / m² instead of £2 / m²) but prevents continued deterioration in the future.

Figure CS4: Climate-resilient road resurfacing on the A252 in Kent



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- Another example is when planning authorities require enhanced sustainable drainage systems (SuDS) for new housing developments to prevent additional surface water runoff and avoid raising the risk of surface water flooding in heavy rain. The usual requirement is to incorporate capacity to cope with predicted increases in rainfall under the UKCIP 02 predictions. Permeable road surfaces are being required in more and more cases, which cost significantly more to build and maintain. The cost is passed on to the developer and can easily run to £10,000 per property.

Overall, the costs of adaptation are minimal compared to the costs of rising labour and energy costs. Construction is also a well-known carbon-intensive sector and in recent years there has been much focus in companies like Jacobs on understanding carbon emissions and taking steps to reduce it. The real ongoing challenge for companies like Jacobs is developing low-carbon technologies that can produce resilient road surfaces; that is where the significant costs lie.

There are significant benefits to embedding climate change adaptation into the procurement of road resurfacing, including:

- Stabilisation of the maintenance regime; no advanced deterioration
- Avoiding early deterioration eases congestion, avoids accidents and provides wider societal benefits

Key messages

- Adapting roads to climate change need not cost significantly extra; it is about doing things differently (e.g. to specifications used in other parts of the world) and transferring knowledge.
- The way contracts are set up by local authorities incentivises climate change adaptation because it is cost-effective, reduces road deterioration and therefore potentially avoids accidents and saves lives.
- The challenge arises when roads need to be adapted to climate change *and* be low-carbon. The costs of investing in new technology to build roads using less energy are very significant.
- The highways industry is preparing for use of UKCP09 climate projections, which will give probabilities for climate variables to a much more localised level. The industry welcomes this because it will allow specification of measures to greater accuracy, however, since interpretation of the probabilistic projections requires an assessment of risk-appetite, there may be a risk of challenge for contracting authorities if, for example, adjoining local authorities choose different levels of risk.

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Case Study 5: Barking Riverside

Project	Barking Riverside
Type / sector	A sustainable community development in the Thames Gateway, housing 26,000 people, creating 1,500 jobs, with integrated community facilities, amenities and transport. 350 acres. A joint venture partnership between the Homes & Communities Agency and Bellway Homes to form Barking Riverside Limited (the developers)
Dates	Joint venture announced 2003 Outline planning permission granted 2007 4 phases of development over ~20 years, Phase 1 due for completion 2012, Phase 4 due for completion 2025.
Funding	Joint venture
Procurement process	Non-standard- joint venture formed
Contract type	Various
Value	£1.9 million
Design life	80 years
See also	www.barkingriverside.co.uk http://www.barking-dagenham.gov.uk/5-work/regeneration/riverside/barking-riverside/barking-riverside.html

Background

Barking Riverside is the largest housing development in the Thames Gateway. The project is at a relatively early stage but provides some good insights into how climate change adaptation can be embedded at site level in large community regeneration projects in London.

Bellway Homes originally held an option to develop the site and joined forces with the Homes & Communities Agency in a joint venture to progress the development. Barking Riverside Limited, a private company, was set up to deliver the project.

Planning permission (at a broad level) for the development has been granted and more detailed “phase” planning continues as the project progresses. As construction completes, control of the development will be passed to a community development trust owned by the new residents.

Broad principles for sustainability and adaptation were scoped out at an early stage and continue to be developed into more detailed plans over time.

What were the drivers for embedding adaptation?

The London Borough of Barking & Dagenham (LBBDD) is the local planning authority. The council has a corporate policy on tackling climate change and has for several years placed a much stronger emphasis on design and environmental issues than is usual in relatively deprived communities that are seeking to regenerate. LBBDD has a long tradition in tackling sustainability issues and was awarded Beacon Council status for tackling climate change in 2008. For example, it first introduced planning advice for green roofs (which are a strong element of the Barking Riverside project) in 2003/04.

From the start of the project, the vision has been to create a sustainable community at Barking Riverside. This was driven by a strong political leadership from LBBDD, commitment to the sustainability vision from Barking Riverside Limited and close interaction and input from other stakeholders throughout, for example the Environment Agency.

Although LBBB will report on the National Indicator 188 (which is designed to progress preparedness in assessing and addressing the risks of climate change), this was not a strong driver – since LBBB had agreed planning permission for the project long before this government indicator was introduced.

How was adaptation embedded into the procurement process?

LBBB has designed, together with the developers and Building Research Establishment, an Environmental and Energy Strategy and Assessment Tool (EESAT) to set the environmental standards for all developments. This bespoke tool has been designed to meet the specific needs of the Barking Riverside and incorporates adaptation measures to a greater degree than typical BREEAM guidance.

The tool will be updated after every 2,000 units of build. The lowest standard that can be achieved will always be higher than the current regional and national standards. Planning permission for individual developments will only be granted if an overall score of 70% is achieved.

Understanding of future climate conditions was based on the UKCIP 02 climate change scenarios, supplemented by additional Thames Estuary 2100 flood risk scenario work. UKCIP 02 scenarios produced climate change scenarios at regional, rather than site, level and so had to be supplemented with further risk scenario work. UKCP 09 will provide climate change projections at a more local scale and are likely to be incorporated by LBBB as they continue to plan phases of the development.

What adaptation features were incorporated?

So far the following features are incorporated at site level:

- 40% open space, reducing the heat island effect and providing flood storage
- ‘Green bracelets’ will be developed around each development to reduce the microclimate impacts. This is an original idea developed by Barking Riverside Limited and LBBB and involves streets that will be lined with trees to minimise overheating in the summer. Wind-resistant trees will shield open spaces from strong south-westerly winds; species selection will also be resilient to climate change. Tree species have not yet been selected.
- Land raised by approximately 5-7m, using waste soil from the London Channel Tunnel rail link and reducing the risk of flooding from the Thames. Barking Riverside Limited has also committed to a programme of communication with the future residents of the area to make them aware of flood risk and what to do in case of a flood. This represents a good balance between technical and behaviour adaptation measures.
- Surface water attenuation strategy which has taken into account climate change. Measures include a variety of living roofs, which also reduce the urban heat island effect, and a range of sustainable drainage systems – for example “soakaway” areas. Many of these solutions will be implemented on non-raised land areas within the development – and will therefore mitigate the risk of flood risk being displaced from raised to lower areas of land within and outside the development. The future maintenance burden has been considered and a Community Development Trust will be formed to help manage and maintain certain elements.
- Water efficiency standards will be higher than ever achieved in the UK, following European best practice.

These measures are integrated with wider environmental performance measures including a requirement for all homes and facilities to have a 50% smaller carbon footprint than that required by the 2006 Building Regulations. The developer must progressively reduce carbon emissions in each phase such that Phase 4 will achieve an overall 80% carbon reduction target. This approach allows for future proofing and new technologies.

What were the costs, benefits and risks?

Reducing flood risk was a key benefit for LBBB. There is a large elderly population and higher than average rate of deprivation in this area. LBBB is very aware of the impacts that flooding can have on vulnerable communities and was keen to do as much as possible to protect them.

Full Cost Benefit Analysis on the range of adaptation measures eventually incorporated was not undertaken. Rather, LBBB and Barking Riverside Limited negotiated with the range of stakeholders involved in the project to develop solutions that would meet different objectives without being excessive on cost. This often involved meeting environmental/engineering experts and building relationships with local businesses to scope out ideas.

LBBB and Barking Riverside Limited have remained open to new technologies. As the development progresses, new solutions may be incorporated – allowing the project to maintain flexibility and adapt to the market. An example includes a joint project between LBBB and the University of London which involves developing innovative solutions to source seed for the living roofs using local companies.

Key messages

- Developing adaptation strategy for a large-scale regeneration project requires long-term vision and planning. Agreeing broad principles for sustainability objectives provides a clear framework under which the sustainability specifications for individual projects/phases of development may sit.
- Full cost benefit analysis for incorporation of adaptation features may be an unrealistic expectation. A more typical process is gradual negotiation and exploration of potential solutions to meet the needs of all stakeholders.
- Maintaining flexibility and openness to new technologies allows developments to reap the most that the market has to offer and to “future proof” themselves.
- The best solution can often be a balance between upfront climate change adaptation measures, behavioural change measures (e.g. flood awareness for residents) and retrofitting additional measures in the future.
- By obtaining input from a variety of stakeholders – including environmental/engineering experts and local organisations – it is possible to develop innovative solutions that meet the needs of the local community and do not exceed on costs

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Case Study 6: Olympic Park

Project	Olympic Park, London
Type / sector	Olympic Delivery Authority and partners Sports venues built for community reuse A portfolio of new build construction and landscaping projects: this case study focuses on the principles applied to permanent venues and parkland
Dates	Ongoing Due for completion in time for the London 2012 Olympic and Paralympic Games
Funding	Government with private sector sponsorship
Procurement process	Various
Contract type	Various
Value	Total budget £9.3bn 75p in each £1 to result in permanent infrastructure
Design life	Various beyond 2012
See also	http://www.london2012.com/ http://www.cslondon.org/programme/report.aspx

Background

The London 2012 Olympic and Paralympic Games will take place in three years' time, with a comparable climate to today. However, much has been made of the longer-term sustainability of the games, leaving a legacy use to regenerate east London. The design life of the permanent buildings and landscaping is therefore beyond the Games. On current plans there is a Transition period scheduled to end in 2014 after which a Legacy body will manage the site for the first 10-15 years of community use.

What were the drivers for embedding adaptation?

Sustainability was at the heart of London's winning bid for the London 2012 Olympic and Paralympic Games. The Olympic Delivery Authority (ODA) Sustainable Development Strategy and Procurement Strategy, and the London 2012 Sustainability Plan, all published in 2007, contain programme-wide commitments to sustainability and identify procurement as an important area for action.

Tackling climate change, through carbon reduction and climate change adaptation, is one of five sustainability principles within the ODA Sustainable Development Strategy. Venues and housing must be designed, as far as practicable, to adapt to future climate change. The ODA specifies that the contractors developing each venue should provide information on how the design of the works allows adaptation to the changing climate by using the Partnership's *Adapting to climate change – a checklist for development*.

Planning conditions and section 106 conditions have also been an important influence for flood risk management and surface water drainage in particular.

Figure CS6: Aerial view of the Olympic Park with the Olympic Stadium at the back of the picture.



Picture Anthony Charlton. Copyright ODA.

How was adaptation embedded into the procurement process?

The scale of construction of the Olympic Park and permanent venues is large, delivered through a portfolio of about 30 different projects and procurement processes. In many cases Legacy contractors have not yet been appointed and the contractual focus is on Design, Build and initial Operate during the Games.

The procurement process typically comes after the project has been worked up to RIBA Stage D (Scheme Design). Early work and decisions are therefore taken prior to the procurement process, handing the detailed design onwards over to the preferred bidder. It is worth noting this requires a considerable investment in in-house skills, with the support of expert panels, such as use of an independent CABE panel to scrutinise building design.

An integrated approach is taken to delivering the sustainability principles collectively at site level; sustainability requirements are embedded as relevant into individual projects and procurements within the framework. Incorporation of specific adaptations in relation to flood risk, drainage, water use and overheating as appropriate has been favoured over use of the phrase 'climate change adaptation'.

Sustainability is incorporated into procurement in the following ways, depending on the nature of the contract and its sustainability impact:

- Sustainability standards and objectives included in specifications and evaluated for compliance
- Sustainability impacts evaluated as part of the competitive process (in which it is important to recognise that time and cost are also particularly critical for Olympic projects)
- A sustainability section in the balanced scorecard which recognises other features in the suppliers tender. This scorecard is evaluated by professionals from each area of assessment

Where contractors go beyond the sustainability criteria set out in the Invitation to Tender, the ODA has included these commitments in the contract to ensure they will be delivered.

The Commission for a Sustainable London 2012 scrutinises the implementation of sustainability objectives. Two recent reviews are particularly relevant to this project. *Procuring a Legacy* is a review of the extent to which procurement has been used to deliver sustainability objectives, whilst *Eco Chic? Sustainable Design* focuses on the extent to which design of venues and their legacy uses will deliver sustainability objectives⁵⁷. Both these reports find that some good progress has been made on sustainability as a whole, although there is little mention of specific evidence on climate change adaptation at this stage.

What adaptation features were incorporated?

Climate change adaptation is a programme-wide issue for which the relationship between the individual buildings and the surrounding landscape is important. Across the site as a whole, features have been incorporated to address flooding, surface water drainage and overheating in particular. Features include:

- Climate-tolerant plant species in the parkland
- Green and brown roofs
- Surface water drainage strategy that is a neutral impact on the catchment as a whole
- Temperature control in buildings linked to low-carbon on-site heating and cooling schemes

What were the costs, benefits and risks?

There is a strong governance and performance management system. The status of each project and the extent to which progress is made on delivering each of the Sustainability Principles as a whole is monitored monthly against a series of Key Performance Indicators. There are clear escalation and remediation mechanisms should any issues be raised.

All adaptation features are funded from within the overall budget for the Games; there is therefore tight control on costs and measures must be delivered within the standard budget for each project. The Legacy body and end-users will inherit the longer-term benefits of the measures in many cases.

The Olympic Delivery Authority are confident that embedding the sustainability principles into procurement processes has challenged the industry to produce higher-performing responses on sustainability issues than would have been achieved through planning conditions and Building Regulations alone.

⁵⁷ Both available via [H<http://www.cs london.org/reports/reports.aspx>](http://www.cs london.org/reports/reports.aspx)

Key messages

- In large developments comprising a portfolio of projects, sustainability and climate change principles can usefully be adopted right from the start at the site-wide level. This provides a clear framework under which the sustainability specifications for individual projects can sit.
- Different aspects of sustainability can usefully be integrated, climate change adaptation is not treated as a separate issue.
- Underneath this, strategies on specific climate variables can be developed, for example on surface water drainage, to set the context for individual schemes within it. At the individual project level, specifications can then include relevant specific measures that can arguably be evaluated more readily than more strategic outcomes, for example “to deliver a well-adapted building”.
- A balanced scorecard approach to evaluating tenders can be a good framework. However it requires significant investment in in-house skills and expert panels.
- A strong governance, performance management and scrutiny system is important to ensure contracting authorities and contractors alike implement sustainability and climate change adaptation principles. The use of KPIs and a regular reporting mechanism can be effective in driving progress, escalating any issues early and building the confidence of wider stakeholders.

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Case Study 7: PwC More London Riverside

Project	45,000m ² new office building in the More London Riverside development
Type / sector	Private sector
Dates	Building work in progress Due for completion 2010
Funding	Private sector
Procurement process	Lease of building
Contract type	DBO
Value	~ £130million total construction cost to the developer
Design life	Whilst PwC has taken out a 25 year lease, the developer envisages the building structure lasting in excess of 100 years with periodic replacement of various components and upgrading of the building for new adaptation technology and measures in between leases.
See also	http://www.sustainabilityatwork.org.uk/casestudies/view/35

Background

This is a private sector case study that is included as a comparator and to support the case for embedding climate change adaptation into public procurement, planning and building standards as a way of incentivising the wider market.

PricewaterhouseCoopers LLP (PwC) has pre-let a ten storey, 45,000m² proposed office building, the latest in the More London Development, located on the River Thames.

In common with many private companies seeking new premises within developments, the wider More London Development within which the property is located was already in progress at the time PwC expressed interest in leasing the building. The shape of the development as a whole had therefore already been determined. As the future tenant, PwC has influenced the orientation, layout and detailed design of the building itself and the immediate landscaping and access around it.

What were the drivers for embedding adaptation?

The overall objective is to provide PwC with fit-for-purpose offices that reflect changes in ways of working and technology. The firm is thinking ahead about the needs of current and future generations of employees and clients, including the “social-networking generation” who want more flexible workspaces, including touchdown areas and breakout areas. Surveys across the firm tested staff conceptions of what was most important to them in a building and workshops were held with client-facing staff. Anticipating and adapting to these changes have been the primary driver behind PwC’s specifications for the building.

In parallel, PwC has a corporate sustainability strategy that recognises the importance of minimising their own environmental impact; because the firm believes it is the right thing to do and because, as a large professional services firm, it needs to meet the expectations of both existing and potential future clients. It is therefore important that new premises meets high standards of environmental performance in ways that would be recognisable to clients, for example through a certified standard such as BREEAM. A more recent additional financial incentive for high environmental performance is the Carbon Reduction Commitment.

In common with several of the public sector procurement exercises described above, climate change adaptation was not considered as a stand-alone objective; rather several of the measures incorporated in the building have adaptation benefits. A broader approach to environmental performance and sustainability, as outlined in the BREEAM standard and as defined by the local planning authority, was taken.

How was adaptation embedded into the procurement process?

PwC developed a Standard Specification which detailed the firm's specific performance requirements in terms of engineering design, mechanical and public health engineering, maintenance contract considerations, sustainability benchmarks and overall design team approach to sustainability. Some of these requirements related specifically to adaptation, for example low water-usage requirements and building orientation to minimise solar gain.

Although the More London Development was already in progress when the building was let to PwC, involvement in the build at an early stage meant that PwC were able to commission changes to meet its specification requirements. The proposed rating for the development was BREEAM "excellent"; PwC specified that this should be improved to achieve BREEAM "outstanding" (the newly-available highest rating) and an Energy Performance Certificate A rating. PwC were willing to pay more to achieve this, not least because of the payback in lower operating costs.

PwC commissioned design and engineering consultants to work in conjunction with their in-house team to incorporate sustainability requirements into the building. The UKCIP 02 climate change projections for London were used to highlight climate change risks and drive adaptation requirements. Additional flood risk, solar gain and wind studies were undertaken.

PwC has taken a 25-year lease and is confident that the building will remain fit-for-purpose for their business needs during this period. There is also relative certainty about climate impacts and extremes within which the building will need to operate during this period, compared to further into the future. By purchasing a lease rather than the building outright, and by setting this lease at 25 years, PwC can keep options open about any decisions about business requirements beyond this point, including any further physical or behavioural measures to adapt to climate change. However, the property developer takes a longer term view; expecting to re-lease the property after the initial 25 year term and expecting the structure of the building to be capable of lasting 100 years or more. The interrelationship between this and the opportunity for taking a no-regrets decision pathway approach to adapting to climate change is beyond the scope of this initial study.

What adaptation features were incorporated?

The development includes a number of measures that support adaptation to climate change and which will help ensure the internal area is not adversely affected by the changing climate:

- Orientation to minimise solar gain and maximise solar shading
- Low-carbon heating and cooling system, including heat recovery
- Fluvial, surface water and groundwater flood risk management measures had already been built into the development as a whole; in this building rainwater pipes have been future-proofed to a larger capacity
- A living roof for passive cooling and surface water drainage
- Rainwater harvesting to provide water for the garden area, low water consumption fittings

What were the costs, benefits and risks?

The design and engineering consultants commissioned by PwC conducted cost-benefit analysis on different options for delivery. Some initiatives were rejected on the grounds that

their pay-back timeframe was too long. Overall PwC estimates it has spent an additional £2-3 million on the development in order to improve the development's rating from BREEAM "Excellent" to "Outstanding". From the developer's perspective, this is an additional cost of £5-6 per sq.ft. in construction cost to protect their asset value in the future – occupiers will increasingly switch to more sustainable buildings.

Key messages

- Responsible private sector organisations are keen to demonstrate high environmental performance and are focused on carbon management in anticipation of the Carbon Reduction Commitment. They are prepared to pay a bit more to achieve higher environmental standards
- The planning system, combined with what is included in certified industry standards, is a strong influence over environmental performance measures. For example, in this case, the planning authority specified drainage requirements for the development. PwC specified a recognisable BREEAM performance rating. At present, there are few explicit references to climate change adaptation in BREEAM standards so the focus is on other aspects of environmental performance. On this basis, if adaptation measures were included, responsible private sector organisations would be keen to take them up.
- Climate change adaptation is not often considered as a stand-alone theme by private sector companies, but as a lens through which environmental performance and sustainability standards are considered.
- Private sector companies need buildings that can respond to changing workforces and ways of working – this is the biggest motivation for designing buildings differently. In many cases this has resulted in private sector companies taking short-term (25 years or less) leases on suitable buildings rather than build premises themselves. However, it is important to emphasise that the developers of such buildings take a longer view and envisage re-leasing buildings again in the future –the building structure is expected to last 100 years or more.
- In the public sector there are usually clear long-term needs for buildings (e.g. for schools and hospitals) and therefore an economic efficiency argument for buildings to last as long as possible without the need for substantial refurbishment or replacement, typically at least 50 years. Whilst this argument also applies to private sector companies that build their own premises, it is perhaps less applicable for private sector companies that lease property over short periods for the reasons described in the point above. However, the argument does still apply to the developers and property owners, who usually envisage re-leasing the buildings again and take a longer-term view. However, even in these cases, the economic argument still potentially applies to the property owners charged with finding another use for the building and maximising value after the lease expires. The opportunities for embedding climate change adaptation into commercial property are complex, outside the scope of this study and are being explored by another Partnership programme.
- This case study therefore shows that, if the public sector takes a lead in embedding climate change adaptation over longer time horizons, there is an opportunity to incentivise the market more widely, in particular for commercial developers who take a longer term view.

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Summary of case study findings

Summary of case study findings in relation to:

- The process of embedding climate change adaptation into procurement; and
- The legal case and the economic costs and benefits of incorporating climate change adaptation into public procurement.

Theme		Supporting findings from case studies	Case studies						
			1	2	3	4	5	6	7
Corporate priority	High organisational commitment and investment in skilled staff is needed within contracting authorities in order to embed adaptation into public procurement.	<ul style="list-style-type: none"> • Contracting authorities with a corporate vision or requirement to tackle environmental issues are more likely to voluntarily include requirements with their procurement; it is product of a broader set of values and decision-making. • In large developments comprising a portfolio of projects, sustainability and climate change principles can usefully be adopted right from the start at the site-wide level. This provides a clear framework under which the sustainability specifications for individual projects can sit. 	✓	✓	✓	✓	✓	✓	✓
	They need to become intelligent clients, especially when developing the specification, evaluating tenders, and setting up contracts.	<ul style="list-style-type: none"> • In large developments, a strong governance, performance management and scrutiny system is important to ensure contracting authorities and contractors alike implement climate change adaptation principles. 							
		<ul style="list-style-type: none"> • Local authorities that have made tackling climate change a corporate priority and have a strategic approach to embedding climate change adaptation across all service areas have a stronger framework in which to embed adaptation into public procurement exercises. • Local authorities find it beneficial to embed climate change adaptation measures into public procurement, although to do so for the first time they may need some external expert advice. • Local authorities that have retained in-house design expertise within their Property Services function may be better equipped to become intelligent clients than those who have not. • Starting with a relatively small project from own capital funding gives contracting local authorities the opportunity to develop in-house skills and test what is possible. 		✓	✓		✓		

Theme		Supporting findings from case studies	Case studies							
			1	2	3	4	5	6	7	
Procurement		<ul style="list-style-type: none"> Contracting authorities need in-house expertise in order to be intelligent clients at both the specification and evaluation stage of the procurement and when setting up the contract. 	✓		✓	✓			✓	
		<ul style="list-style-type: none"> Contracting authorities need to invest in significant staff resource to embed climate change adaptation into a project of this size; these client costs are significant although leave an up-skilled legacy for the future. 		✓						
	<p>Market-testing is valuable for both the contracting authorities and potential contractors.</p> <p>The Competitive Dialogue process is resource intensive for contracting authorities and bidders but can result in a higher-performing project</p>	<ul style="list-style-type: none"> Soft market testing is very valuable to engage with potential bidders and develop a specification that the market can respond to and that delivers a project within affordability limits. Market-leading bidders recognise that embedding climate change adaptation is a growth area for the future and are prepared to invest in the competitive dialogue process to develop their own in-house expertise regardless of whether they win the contract. The Competitive Dialogue process as a whole can result in the market producing a higher-performing project within the available budget than would be possible through a traditional procurement route and application of planning conditions and design standards alone. 			✓					
	<p>The specification and evaluation process and weighting are key to influencing the market to deliver</p>	<ul style="list-style-type: none"> The detailed design statement together with a high design weighting in the evaluation criteria (e.g. 45% rather than the usual 15 – 20%) is critical to embedding climate change adaptation into projects, in particular PFIs. A balanced scorecard approach or integrated assessment tool for evaluating tenders can be a good framework. 			✓		✓	✓		

Wider context	BREEAM and other design standards are recognised standards, simplify procurement and have the potential to create a level playing field.	<ul style="list-style-type: none"> Contracting authorities want to procure around certified standards that their customers will recognise; BREEAM is well-known and therefore well-used although it currently has few measures directly on adaptation. 	✓							
	BREEAM is currently relatively weak on adaptation but review work is ongoing.	<ul style="list-style-type: none"> Using defined standards such as BREEAM excellent and CIBSE design reference standards are simpler and contractually tighter than including a long list of detailed requirements in specification. Embedding adaptation into these projects therefore requires influencing the bodies that develop these standards; institutionalising adaptation. 	✓							
	Embedding adaptation into BREEAM and other standards is likely to reduce the burden on up-skilling contracting authorities.	<ul style="list-style-type: none"> The planning system, combined with what is included in certified industry standards, is a strong influence over environmental performance measures. For example, in this case, the planning authority specified drainage requirements for the development and a BREEAM performance rating. At present, there are few explicit references to climate change adaptation in BREEAM standards so the focus is on other aspects of environmental performance. 								✓
	Many contracting authorities, including in the private sector, focus on meeting planning requirements, BREEAM and other standards; these may therefore be the most effective ways to influence.	<ul style="list-style-type: none"> Responsible private sector organisations are keen to demonstrate high environmental performance and are focused on carbon management in anticipation of the Carbon Reduction Commitment. They are prepared to pay a bit more to achieve higher environmental standards. 								✓
Economic	Incorporating adaptation measures does not always mean higher capital costs; it is about doing things differently.	<ul style="list-style-type: none"> Additional build costs were marginal and affordable and have resulted in lasting benefit including better ability to comply with subsequent legislation and forthcoming financial impacts such as the Carbon Reduction Commitment. 	✓							
		<ul style="list-style-type: none"> Embedding adaptation measures into new build need not cost any more than conventional builds, or cost any more to operate. 		✓						
		<ul style="list-style-type: none"> Adapting roads to climate change need not cost significantly extra; it is about doing things differently (e.g. to specifications used in other parts of the world) and transferring knowledge. 				✓	✓			

Economic	DBO contracts do not distinguish between building versus operating costs for contracting authorities	<ul style="list-style-type: none"> Letting a single DBO contract means that the cost of investment in measures is balanced by lower operating costs managed internally by the consortium. Contracting authority need not concern itself with the build versus operating costs. 	✓		✓				✓
Economic / legal	Contracts can share climate impact risk. For example, where the contracting authority specifies a future weather profile, costs of maintaining the internal environment transfers to the contractor. Beyond the extremes in this profile, the costs transfer back to the contracting authority.	<ul style="list-style-type: none"> An operating contract can be drawn up such that changes to keep the building inside specified tolerances are the responsibility of the contractor who bears the cost; the risk of any additional costs (e.g. changes within contractual limits or in response to extreme weather beyond those defined in the specification) are borne by the contracting authority. 	✓		✓				
	The risk appetite of the contracting authority is key.	<ul style="list-style-type: none"> The highways industry are preparing for use of UKCP09 climate projections, which will give probabilities for climate variables to much more localised level. The industry welcomes this because it will give allow them to specify measures to greater accuracy, however, since interpretation of the probabilistic projections requires an assessment of risk-appetite, there may be a risk of challenge for contracting authorities if, for example, adjoining local authorities choose different levels of risk. 				✓			
		<ul style="list-style-type: none"> Contracting authorities can be confident that building envelopes can be designed to cope with future climate change. However, based on experience from previous projects, it is important that maintenance contracts have flexibility to respond to changes in building use requirements. Current procurement rules are sufficient to permit the flexibility that the contracting authority requires to make further changes to the operation and use of the building during the contract lifetime. However, market testing suggests that contractors are not comfortable with contracts which seek to include now clauses for future adaptation measures should these become necessary at the end of the contract lifetime to help prepare for the next contract period; that is something that should be discussed at the time in the future. For large regeneration projects, future phases can be left open and flexible to allow for future proofing for climate change and new technology. There can then be a better balance between upfront climate change adaptation measures, behavioural change measures (e.g. flood awareness for residents) and retro-fitting additional measures in the future. 			✓	✓			

		<ul style="list-style-type: none"> The way highways contracts are set up by local authorities incentivises climate change adaptation because it is cost-effective, reduces road deterioration and therefore potentially avoids accidents and saves lives. 				✓			
Legal	There is sufficient data available for contracting authorities to embed adaptation into specifications	<ul style="list-style-type: none"> Using a decision-making process such as the UKCIP adaptation wizard, combined with climate scenarios such as UKCIP 02 can give the contracting authority a sound, risk-based specification for the procurement process. The new UKCP climate projections will provide even further data. 	✓	✓	✓	✓	✓	✓	
Win-wins	Adaptation is never the sole driver for change. Measures are more likely to be taken where they provide win-wins.	<ul style="list-style-type: none"> Adaptation is not the only driver for changing the way public buildings are designed, built and operated for the future; there are several other factors such as changes in ways of working; and the procurement exercise must specify, balance and evaluate all of these together. 							
	Climate change adaptation is often integrated with other sustainability and environmental performance issues which is the reality on projects	<ul style="list-style-type: none"> Therefore win-wins between adaptation measures and other objectives for the building (e.g. in the case of a school, wider environmental impact, positive learning environment for pupils, and developing the role of the school as a community hub) are more likely to be included. 		✓					
		<ul style="list-style-type: none"> Private sector companies need buildings that can respond to changing workforces and ways of working – this is the biggest motivation for designing buildings differently. 							✓
		<ul style="list-style-type: none"> Climate change adaptation is not often considered as a stand-alone theme, but as a lens through which environmental performance and sustainability standards are considered. 	✓		✓			✓	✓
	Building low-carbon solutions that are also climate change resilient can be challenging. Low carbon solutions can be expensive where they require changes in technology.	<ul style="list-style-type: none"> The challenge is when roads need to be adapted to climate change <i>and</i> low-carbon. The costs of investing in new technology to build roads using less energy are very significant. The competitive dialogue procurement process enables contracting authorities and contractors to work together to decide optimum decisions (e.g. between low carbon technologies and appropriate adaptation measures. The balance needs to be on a case-by-case basis. 			✓	✓			

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