

# Low Carbon Construction

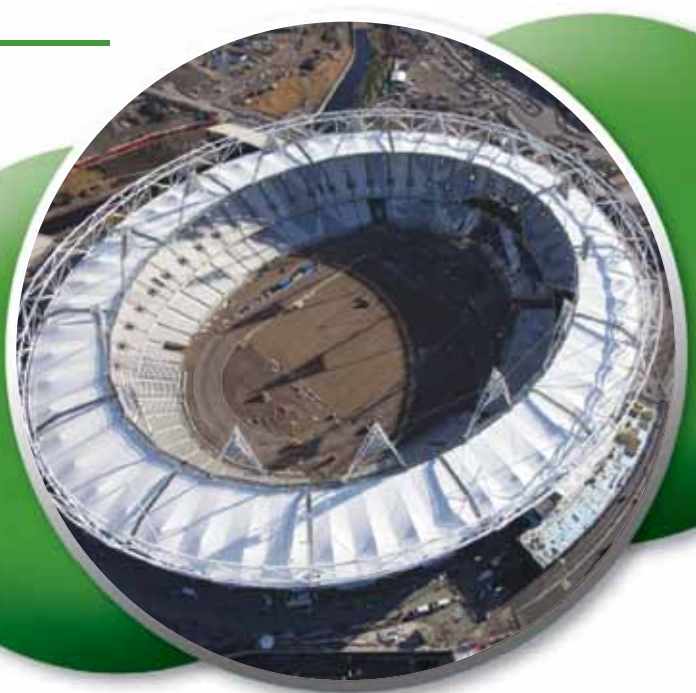
Innovation & Growth Team

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## Final Report

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### Executive Summary



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Projects

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# Executive Summary

This is the final report of an Innovation and Growth Team (“IGT”), drawn from across the UK construction industry to consider how the UK construction industry can rise to the challenge of the low carbon agenda. It follows Emerging Findings published in March 2010, and builds on those findings, as charged by Mark Prisk MP, the Minister for Business and Enterprise in the Department for Business, Innovation and Skills; and the report has also been produced with the support DECC, CLG and DEFRA.

This report wholly replaces the Emerging Findings, with text that is still relevant brought forward to this final report. Unsurprisingly, since it is only 7 months since the publication of that preliminary report, the over-arching context remains much the same:

1. The United Kingdom’s commitment to reduce carbon and other greenhouse gas emissions is now a matter of legal obligation. The strategy by which this might be achieved will reach deep into every aspect of the built environment, and depends for its delivery upon the construction industry working at its best. Over the next 40 years, the transition to low carbon can almost be read as a business plan for construction, bringing opportunities for growth.
2. For companies in the wider construction industry, the task is three-fold:
  - to de-carbonise their own business
  - to provide people with buildings that enable them to lead more energy efficient lives
  - to provide the infrastructure which enables the supply of clean energy and sustainable practices in other areas of the economy
3. This will require innovation – new ways of working and the acquisition of knowledge and skills that will provide competitive advantage at home and internationally, building on the United Kingdom’s reputation as a world leader in sustainable design.
4. These opportunities exist at every scale, and while there remains much to resolve in a 40 year programme of work, there is much that can be done now, particularly in the existing building stock. This work, which extends right across the country, is the daily bread of one million small businesses that operate in the sector, and could provide each of them with a potential springboard to growth, and the country with a maturing supply chain.

5. A concentration on energy and carbon brings simplicity and rigour, and provides a new focus for action and a sense of priority; but carbon reduction is not the only critical issue for the industry, nor the only measure of sustainability, and plans across all measures, addressing both mitigation and adaptation, need to be integrated.
6. There is a general and growing awareness of the challenge, but few businesses have an accurate understanding of the sheer scale of the undertaking ahead; and there is a level of disbelief about whether or when the difficult decisions that will lead to the necessary changes in customer behaviour will be made.

*“While buildings offer the largest share of cost-effective opportunities for GHG mitigation among the sectors examined, achieving a lower carbon future will require very significant efforts to enhance programmes and policies for energy efficiency in buildings and low-carbon energy sources well beyond what is happening today.”*

Fourth Assessment Report, Intergovernmental Panel on Climate Change, 2007

7. The construction industry’s pivotal role in any carbon reduction programme creates the opportunity, almost the obligation, for it to take up a position of leadership – going beyond developing innovative products and services designed with carbon reduction in mind.
8. The construction industry has engaged positively with the issue of sustainability, with many examples of leading edge practice, and it stands ready to play its part in responding to the more focused challenge of carbon reduction; but there needs to be a quantum change in the response to that challenge if the commitments of the Climate Change Act are to be met.
9. This calls for active engagement with the process of identifying the main barriers to transformation, and the means of overcoming them – probably the biggest change management programme that the industry and the society it serves has faced since Victorian times.
10. The IGT has addressed these barriers through a series of work streams that represent sectors with essentially different markets, business models or primary drivers. There are, however, a number of common themes that recur throughout the report and which lead to a number of the key recommendations. These major themes, each of which has a corresponding barrier (or array of barriers) to progress, are:
  - **The need for clear leadership.** Leadership is required to set out the objective and identify the means of achieving it, to put in place plans that will do so, and then to

execute or track the progress of those plans. Primary leadership needs to come from Government, because of the degree of market failure and because plans for carbon reduction must reach into every fibre of the built environment, at a scale that is far beyond the reach of anybody other than Government. Beyond that, however, leadership needs to cascade: Local Authorities, as they are the means of releasing private sector action in many key asset areas such as social housing and infrastructure, but also to the construction industry itself, as it is the means of delivering so much of the practical response to the threat of climate change, and then to every level of the industry's supply chain.

- **Co-operation** – Notwithstanding the call for leadership by Government, they and industry should work closely together in developing plans to make the transition to low carbon in a way which will deliver the maximum benefits to the UK economy and create competitive, world-leading businesses.
- **The problem of complexity and confusing language** – There is complexity and over-crowding in almost every aspect of the landscape relating to carbon reduction, including responsibility in Government; the number of special interest groups and advisory bodies; the number of apparently uncoordinated research programmes; the mass of published policies, reports and initiatives, undertaken by a variety of Government Departments, or by NGO's incapable of absorption by businesses who need to focus on the more immediate interests of their clients and shareholders; a host of tools and methodologies, sometimes leading to quite different answers to the same questions; fundamentally different choices between competing technologies, with conflicting advice as to the effectiveness of each; and finally shifting terminology – so that, for example, "carbon" can sometimes mean carbon, sometimes carbon dioxide, and sometimes a carbon dioxide equivalent, and the definition of zero carbon is far more complex than that rightly aspirational term might suggest.
- **The absence of a transparent plan** – There needs to be a series of plans, which will cascade from national to local to individual business and customer level, and do so by sector. This needs to cut through the complexity to establish a basis upon which the industry and its customers can make their own plans and invest, set within a long term, stable framework that is just as vital to carbon reduction as the equivalent macro-economic framework is to economic growth
- **Industry structure and practice.** Reform of the industry and its working practices is generally acknowledged as a necessary part of increasing its competitiveness; but there is a consensus in the IGT that it is scarcely possible that the innovation and change that is essential to deliver effective and affordable low carbon solutions can

be secured through the industry as it is currently structured and engaged, particularly in the lack of collaborative integration of the supply chain, and in the silo-based habits of the industry's institutions.

- **Capacity and skills.** Delivery of a low carbon built environment will make demands on the industry that it is currently under-equipped to meet. It will need new skills and an increased quantity of existing skills from conceptual thinking to operation and use, in all layers of the supply chain – all to be found at a time when the industry has been badly weakened by the fall in its workload.
- **Incentivisation.** Clearly there is little point in setting objectives, making plans, and developing skills and capacity only to find there are no customers; and the almost universal perception in the industry is that only regulation will create mass demand for energy efficient retrofit of the domestic and sub-prime non-domestic building stock. A combination of the removal of barriers and the creation of incentives is therefore critical to the programme, and incentivisation is probably the most repeated word in this report
- **Affordability and funding.** Perhaps the most frequently asked question during the course of the IGT's work has been, "How are we going to pay for all of this?" There is no single answer, but it can only be through a combination of savings in energy bills, now or in the future; consumers placing a higher value on the parallel benefits of energy efficiency – warmth, comfort and wellbeing; avoiding the longer term costs of dealing with the immediate externalities of energy consumption; similarly, avoiding the cost consequences of inaction – a key message of the Stern Review; or subsidy. And the industry can clearly narrow or close an affordability gap by driving down costs through product or process innovation, or through economies of scale in the event of mass demand

11. Reversing the barriers implicit in the above is a necessary precondition to the required step change in the industry's response to the need to transform the built environment. This is addressed in the recommendations made in this report. But if the industry, with its clients, can overcome the barriers to action, then it stands on the threshold of five great opportunities:

- to carry out a huge programme of work, stretching out over at least the next 40 years
- to make use of that workload to reform the structure and practice of the industry
- to export the products, knowledge and skills of a modernised industry
- to play its part in readying society and the economy for a resource efficient future, beyond fossil fuels

- and to excite future generations of potential recruits into an industry with a noble cause and a secure future
12. The way that these themes impact on the separate work streams, and on the new and existing building stock within each, differs from sector to sector, but a simplified summary of the current status of each them, and their key issues, is set out below:
13. **New housing:** the regulatory framework is beginning to act, and can be expected to continue to do so, given clarity in future standards. Key issues are:
- the need for a practical, workable definition of zero carbon, set on a nationwide basis
  - affordability, and the value attached (or not attached) by purchasers to energy efficiency and broader measures of sustainability
  - addressing the technical constraints associated with smaller sites
  - centralised and distributed energy policy, so that carbon is reduced in the most cost-effective way
14. **Existing housing:** work is in progress to identify appropriate treatments for different forms of construction, and this thinking needs to continue and to be developed at scale. Key issues are:
- a perceived or actual disinclination to act on the part of householders, and the need to stimulate demand
  - the consequent need for a suite of measures beyond the Green Deal finance package, including regulation or fiscal measures, to ensure success
  - the need for an existing homes hub – a research, development, deployment and strategy group which can own the strategic research agenda for the sector, collect and disseminate the learning, and provide leadership for the industry to start planning for delivery
  - the development of practical measures of treatment, from room by room to whole house
  - the development of an accredited supply chain for the retrofit programme, with the necessary skills and practices
  - the use of the social housing stock to kick-start scale retrofit, utilising RMI investment and other funds
15. **New non-domestic buildings:** the picture is similar to new housing, with the regulatory framework expected to produce the necessary improvements in building performance,

and (as far as the commercial market is concerned) probably a higher preparedness to attach some value to energy efficiency, in the interests of future-proofing. Key issues are:

- the need to stimulate market demand for products and works designed for carbon reduction
- a linked need for innovative means of financing the transition to low carbon
- the invariable adoption of project level decision-making on the basis of appraisals founded on a whole life approach

16. **Existing non-domestic buildings:** here there is a broad range of circumstances, varying from prime properties, where the situation is similar to new build, through to older, lower investment grade buildings where the situation is more similar to the existing domestic stock, and the issues are generally the same.

17. **Infrastructure:** this is a diverse sector, but common themes are the need for a new approach to evaluating schemes, so that design and investment decisions are made on a basis that gives sufficient weight to the impact on carbon emissions; skills, and particularly the quest to deliver the work competitively using British resources; and, for infrastructure providers and their consumers, the issue of affordability. As a generalisation, whilst infrastructure is seen as critical to supporting a more energy efficient society, carbon reduction itself does not seem to be a priority in the design and construction of those facilities. This report proposes a very different approach to evaluating infrastructure projects, based on whole life (capital and operational) carbon performance. Other issues are:

- the role of the industry in supporting the development of mission statements by infrastructure owners and operators for their infrastructure, that meet national policy requirements set down in the National Infrastructure Plan and through regulation
- the role of the industry in developing evaluation models, founded on clear and realistic assumptions, that can interpret the mission statements in the language of civil engineering and permit system analyses to be used to confirm the proposed infrastructure solution
- a new approach to the development of best practice, codes and standards, which should move away from a prescriptive to an output-lead basis
- the urgent need to develop quantification methods for the sustainability assessment of infrastructure, supported by research into the opportunities for carbon reduction through better engineering

18. **Major Projects:** the need for a new organisation that can act as an effective knowledge network for the capture and exchange of lessons learned, but also accredit the energy performance and wider sustainability credentials of major projects.



19. Over-arching all of these sector-specific issues, there are specific actions for Government, to set a strategic framework, and for industry, to respond to it.

20. **For the industry**, the key issues are:

- to continue to transform itself in accordance with a well-established agenda for integration and modernisation
- working with its clients, to make the cost savings of 10-30% mooted as the rewards of that transformation, holding out the prospect of delivering zero or close to zero carbon buildings for no more than buildings conforming only to current Building Regulations
- particularly in respect of the existing stock, to develop practical, phased packages of work designed for energy efficiency that can be delivered assuredly and with minimum disruption
- to build the skills and capacity necessary to sustain a modernised industry and to deliver buildings that are both more energy efficient and more affordable

21. And finally **for Government**:

- to send out clear and constant signals, by both word and deed, that being “the greenest ever” will remain a priority for the Government, and that this will be backed by positive plans of action
- to establish regimes for management, cascading from a high level change management and programme management
- within that regime, to make a series of projects, each the subject of the Government’s oversight and governance procedures for Major Projects
- to make a plan for each of those projects: detailed in the near term, grading to conceptual further into the future
- in making those plans, to give energy efficiency the same priority as energy generation – the former reducing the need for the latter, and doing so on a cost-effective basis
- to clarify the organisational landscape, making the greatest possible use of existing organisations, but allowing room for new ones to develop; and to offer a centre of gravity and connectivity, so that anybody seeking to give or receive a good idea knows how to connect
- to work with the industry, so that policy is informed by practical, researched propositions; so that plans are made with full knowledge of the capacity of the industry; and so that the industry can plan and invest with a knowledge of future plans

- to pursue policies that allow and encourage the industry and its customers to be an engine for economic growth, recognising that innovation, the development of skills, and investment in business and industry improvement all feed off workload
- to do whatever it takes to incentivise the market, particularly in the residential and sub-prime non-domestic sectors
- to consider proceeding on twin tracks: planning for regulation, whilst allowing for the possibility that it might not be required
- to recognise that it takes time to develop both the technical proposals and the supply chain to deliver new packages of work – such as “whole house” retrofit, and to take that time, but in the context of an agreed programme
- but also to recognise that there are some packages of work that are already known to be both technically feasible and cost effective, and that these can be implemented straight away – both to develop supply chains for a growing programme, and also to stimulate growth

22. Recommendations to address these issues and the barriers to change are set out in the report, and summarised in Annex A. Fundamental to them, though, is the need to stimulate demand; and if the industry is to lead the transformation of its product, it must first be confident of the transformation of the market. The evidence is that the clearest signal of this will be taken from well-designed regulatory standards, underpinned by the presumption of a stable and realistic price of carbon.

*“Low-tech, green jobs and local services – such as improving building insulation and replacing obsolete heating and cooling equipment – have greater potential to generate jobs than the development of renewable technology solutions. For policy makers concerned with abating carbon emissions in the near term, pushing the adoption and diffusion of low carbon solutions is likely to make a bigger difference than technology production alone.”*

McKinsey Global Institute, March 2010



# Summary of Recommendations

## Carbon and the built environment

**Recommendation 2.1:** That as soon as a sufficiently rigorous assessment system is in place, the Treasury should introduce into the Green Book a requirement to conduct a whole-life (embodied + operational) carbon appraisal and that this is factored into feasibility studies on the basis of a realistic price for carbon.

**Recommendation 2.2:** That the industry should agree with Government a standard method of measuring embodied carbon for use as a design tool and (as Recommendation 2.1 above) for the purposes of scheme appraisal.

## Cross- industry issues

**Recommendation 3.1:** That the Government should treat the transition to low carbon as a series of major projects, subject to independent review, and with the normal controls that exist for Government projects that are so designated.

**Recommendation 3.2:** That Government and industry should establish and publish a transparent, co-ordinated structure for the many organisations involved in research, advice, policy development and delivery for carbon reduction, making clear the role, scope of work and authority of each, and how each connects to Government, whether directly or indirectly.

**Recommendation 3.3:** That the Government should published an adequately detailed programme of actions expected to achieve the 2050 target of an 80% reduction in carbon emissions.

**Recommendation 3.4:** That the programme should include interim (say 5-yearly) milestones to show the expected trajectory of work to achieve the planned reductions, to provide the industry with some visibility of the possible nature and volume of work.

**Recommendation 3.5:** That each Government Department should develop and publish a strategy for producing low carbon buildings of each typology within its programme, consistent with the above programme and trajectory.

**Recommendation 3.6:** That Government (Efficiency and Reform Group, working with the Chief Construction Adviser) should investigate proposals received from the industry for alternative approaches to the procurement of integrated teams, to establish whether they could be developed into workable propositions, and thereafter be trialed, with a view to delivering, over time, a zero or close to zero carbon building for no more than a building built only to current Building Regulations.

**Recommendation 3.7:** That Government, industry and the organisations themselves should investigate the desirability, practicality and means of merging Asset Skills, Construction Skills and Summit Skills, so that the integration that is a theme of this report is also reflected in the skills regime.

**Recommendation 3.8:** That a group comprising representatives from Government, the industry and skills providers is tasked with considering how, in the light of the changing skills landscape, greater collaboration, co-operation and integration between professions, between trades, between trades and professions, and between them and the construction products and materials industry can be promoted to develop a single strategic view on future skills needs.

**Recommendation 3.9:** That Government and industry should agree a full schedule of data needs for the transition to a low carbon built environment, and a method, source of funds and programme for collecting, analysing and disseminating it.

**Recommendation 3.10:** That a joint industry/Government group is formed, charged with making clear recommendations to resolve the difficulties summarised above, and a basis for the long term funding of the development and maintenance of carbon compliance tools.

**Recommendation 3.11:** That the industry should work, through a collaborative forum, to identify when the use of BIM is appropriate (in terms of the type or scale of project), what the barriers to its more widespread take-up are, and how those barriers might be surpassed, leading to an outline protocol for future ways of working.

**Recommendation 3.12:** That Government and the industry should routinely embed the principles of “Soft Landings” into their contracts and processes, so that a building is not regarded as complete until it performs in accordance with its design criteria.

**Recommendation 3.13:** That Government should commission a programme of independently conducted, properly funded, published studies of the energy performance of buildings in the public estate built since the introduction of the 2006 revision of the building regulations by comparison with their design criteria.

**Recommendation 3.14:** That the industry should investigate the scope for setting up a construction-specific accreditation scheme for companies committed to improving their environmental credentials, considering also the different needs and the different business models across the supply chain, to establish the practicality and merits.

**Recommendation 3.15:** That industry should work with Government to address the above questions with a view to developing a proposition that offers consumer protection to those commissioning work financed by the Green Deal.

## Major Projects

**Recommendation 4.1:** That the industry should set up a Working Group to consider the creation of a body (hereafter Major Projects Review Group, or 'the MPRG') which would become the authority whose stamp of approval would provide sustainability legitimacy for major projects, and be responsible for organizing the capture and dissemination of knowledge and experience gained on projects that fall within its terms of reference.

**Recommendation 4.2:** To recognise the urgency and importance of climate change, it is proposed that carbon reduction is given greater prominence in Environmental Impact Assessments, with a mandatory target or 'gateway' of performance derived from the MPRG assessment.

**Recommendation 4.3:** That the industry and Government should work together to use the occasion of the London Olympics as a showcase of how to implement plans for a low carbon built environment, embracing design and engineering; works execution right through the supply chain; materials, product and component manufacture; and all other construction-related services.

## Housing

**Recommendation 5.1:** That Government should publish a working nationwide definition of zero carbon and allowable solutions for new homes that takes full account of the real cost of delivery.

**Recommendation 5.2:** That further pilots and trials should be encouraged through greater collaboration, and monitored throughout to increase learning and experience, and to ensure the right roll-out strategy is delivered.

**Recommendation 5.3:** That a consensus on both modelled and actual performance improvement data should be established from the various previous and current studies, through a knowledge-sharing process, to inform what actions need to be taken to deliver the overall target.

**Recommendation 5.4:** That the industry and Government should develop the very preliminary route map drafted by the IGT into as detailed a plan of action as possible, looking at what needs to be delivered and how.

**Recommendation 5.5:** That Government, in formulating the Green Deal customer offering, should take full account of all relevant current trials, customer research and feedback from Energy Companies and Retailers.

**Recommendation 5.6:** That Government, in addition to the Green Deal finance package, should introduce a suite of measures including regulation, fiscal incentives and penalties to ensure success.

**Recommendation 5.7:** That the industry should establish a Platform or Panel with public-sector funders, to form a collective view on strategic research, development and deployment priorities, creating and owning a Strategic Retrofit Research Agenda.

**Recommendation 5.8:** That social housing stock should be used to kick start larger-scale retrofit using RMI investment and other funds.

**Recommendation 5.9:** That Government, with the industry, should set up an Existing Homes Hub to bring together the key participants to formulate and monitor delivery of the retrofit programme, all in accordance with the principles set out above.

**Recommendation 5.10:** That, based on the assumption that a major programme of refurbishment will start over the next five years, the industry should start by carrying out a full assessment of its ability to deliver.

**Recommendation 5.11:** That the industry should develop standardised solutions for the refurbishment of existing stock, covering the key processes that will be needed.

**Recommendation 5.12:** That the industry should, with insurance providers, investigate an assurance and insurance package that meets the needs of consumers.

## Non-Domestic Buildings

**Recommendation 6.1:** That Government should commission research to understand how the market values low carbon buildings – both today and looking into the future, and how incentives interact with the decisions made by owner occupiers, property investors and tenants to build lower carbon buildings and use them more efficiently.

**Recommendation 6.2:** That Government should review the application of the Building Regulations to refurbishment and tenant fit-out, with a view to introducing more rigorous requirements.

**Recommendation 6.3:** That Government should support research into the level of non-compliance associated with the EPBD and Part L of the Building Regulations, and the impact of this non-compliance on carbon emissions; to review compliance mechanisms to ensure the greatest impact at the lowest cost to business; and to amend the EPBD and Part L compliance mechanisms accordingly.

**Recommendation 6.4:** That Government should institute a programme of long term monitoring to review the practical outcomes associated with the EPBD and Part L, to inform future revisions.

**Recommendation 6.5:** That Government should introduce minimum standards for existing buildings by mandating that all non-domestic buildings should have an EPC-rating of F or better by 2020.

**Recommendation 6.6:** That Government should signal its intention to use fiscal incentives to create market demand for low carbon buildings, and incentives to operate buildings better.

**Recommendation 6.7:** That Government should create a low cost loan and/or “pay-as-you-save” scheme to finance investments in capital intensive energy efficiency measures in non-domestic buildings.



**Recommendation 6.8:** That Government should create an “energy efficiency obligation” scheme obliging energy suppliers to drive uptake of low capital cost measures among smaller energy users, funded through a levy on energy bills.

**Recommendation 6.9:** That Government should require landlords and tenants co-operate to agree an Energy Management Plan for their buildings, to accompany the DEC.

**Recommendation 6.10:** That Government should mandate the use of “Green Leases” for buildings occupied by the public sector.

**Recommendation 6.11:** That Government should address barriers to district heating networks by requiring public sector buildings to act as anchor loads, and encourage the private sector to do the same.

**Recommendation 6.12:** That the industry and its clients should recognise the critical importance to the adoption of modern methods of construction of a design freeze date that is set at the start of a project and rigorously adhered to, and consider how this can be routinely embedded into the practices of the industry.

**Recommendation 6.13:** That the industry should work with Buildoffsite to update its lexicon for inclusion in contracts used by the industry, adopting terminology relevant to a 21<sup>st</sup> century industry, to facilitate the transition to low carbon.

**Recommendation 6.14:** That Government should mandate the use of Building Information Modelling for central Government projects with a value greater than £50 million.

**Recommendation 6.15:** That the industry should develop a “Comparator” tool which allows companies to assess accurately the lifecycle cost of different methods of construction and the levels of risk implicit in that assessment.

**Recommendation 6.16:** That Government should extend the right to claim Enhanced Capital Allowances to low carbon whole building structures.

**Recommendation 6.17:** That Government should reinstate, or even increase, Industrial Buildings Allowances for low carbon buildings or components, including pre-manufactured, to reduce the cost base and encourage more efficient construction processes.

**Recommendation 6.18:** That Government should allow pre-acceptance of research and development proposals for R&D tax credits.

**Recommendation 6.19:** That the industry should explore the potential for Accreditation Schemes, such as those operated by BSI and Lloyd's Register, to be adopted more widely.

**Recommendation 6.20:** That Government should bring forward the mandatory requirement for the posting of Display Energy Certificates in all non-domestic buildings as quickly as possible, and in advance of the July 2013 date required by the EPBD, with ratings and accompanying recommendations made widely available.

**Recommendation 6.21:** That Government should commission a review of the benchmarks used to calculate DEC ratings in order to ensure that they are consistent and robust, and that they effectively differentiate on energy performance for buildings of different types; and that the process should be simplified to the greatest practical degree.

**Recommendation 6.22:** That companies operating in the construction and property sectors should, as an act of leadership but also to aid transformation of the market, commit to the voluntary posting of Display Energy Certificates in their own buildings, following the practice mandated for public sector buildings and applying the same principles.

**Recommendation 6.23:** That Government, working with the industry, should ensure that businesses have access to independent, objective advice and support on the implementation of energy efficiency measures.

**Recommendation 6.24:** That Government should require EPCs to be displayed at the point of marketing for non-domestic buildings in order to maximise their influence on buyers' decision-making.

**Recommendation 6.25:** That Government, through the ERG, should mandate a requirement for post-occupancy evaluation on all central Government projects, implemented through the procurement process and requiring the involvement of design and construction members beyond the point of practical completion.

## Infrastructure

**Recommendation 7.1:** That infrastructure owners, policy makers and regulators should set out clearly the policy context and performance requirements for their infrastructure needs and engage with the industry to agree optimal conceptual infrastructure solutions that facilitate substantive carbon reduction before determining any specific approach.

**Recommendation 7.2:** That the industry needs to develop models to support the evaluation of optimal conceptual infrastructure solutions and detailed approaches that take a systems engineering approach to the balancing of the capital and operational carbon costs and benefits.

**Recommendation 7.3:** That the industry should research opportunities to achieve substantive reductions in carbon from better engineering of infrastructure (through design, standards, specifications and measurement) and roll out the new evaluation models and approaches through industry-wide programmes of training and professional development.

## 2050 Group

**Recommendation 8.1:** That a multidisciplinary consultation platform should be established now, with Government support, to bring together all of the professional, practical and academic energies of the built environment.

**Recommendation 8.2:** That Government and industry should work towards greater shared knowledge with other countries and become more unified in their approach to reducing emissions.

**Recommendation 8.3:** That, to avoid the risk of a new generation of sick buildings, the promotion of the health and well-being of occupiers should be placed on an equal footing with the current emphasis on carbon reduction.

**Recommendation 8.4:** That the industry should agree and implement Indoor Air Quality standards to include Indoor Air Quality plans, and enforceable targets for a maximum allowable concentration of toxic contaminants and emissions in interior environments for buildings with sealed envelopes.

**Recommendation 8.5:** That the 2050 Group should continue to work together after the completion of the IGT's final report.







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