

carbon reduction

OBLIGATION AND OPPORTUNITY



BY GEOFF WHITE, NICK GARDNER, JENNY SWIFT, GRENDON THOMPSON

CARBON REDUCTION OBLIGATION AND OPPORTUNITY

FOREWORD

Welcome to the first paper in the Viewpoint Series, a new series of 'thought piece' publications produced by SQW Consulting and Oxford Innovation, the operating companies of SQW Group.

The aim of the Viewpoint Series is to share our thoughts on key topical issues in the arena of sustainable economic development, public policy, innovation and enterprise with our clients and others with an interest in the particular subject area of each paper.

In each Viewpoint, we will draw on our policy research and implementation experience to consider key topical issues, and provide suggestions for strategic and practical solutions.

We kick off by tackling a major challenge – climate change and carbon reduction targets – and suggesting how local authorities, regional agencies and other organisations can turn the obligations resulting from targets into opportunities.

We hope you find this paper useful and we welcome your feedback.

Chris Green

Chief Executive Officer, SQW Group

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VIEWPOINT SERIES - FEEDBACK AND MAILING LIST

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EXECUTIVE SUMMARY

The UK government has set out a clear framework for tackling climate change which establishes a carbon reduction pathway to 2050. If, as is claimed, this is the first of its kind anywhere in the world, can the obligation it brings be converted into 'first mover' opportunities for businesses and the economy as a whole? This question will be of heightened importance to the English Regional Development Agencies and local authorities following the government's recently strengthened endorsement of their responsibility for economic growth and efficiency at regional and local levels.

This paper, the first in the Viewpoint Series, considers the policy levers that can help turn the obligation into opportunity and the role that national, regional and local agencies can play in this through spatial planning, innovation, procurement, skills development and enterprise.

THE OBLIGATION

The Government's Climate Change Bill [1] and Energy White Paper [2] reveal its determination to respond to the Stern Report of 2006 [3] and make effective use of carbon - one of our most important resources - at the same time as minimising the downside costs of its use. On the table is:

- a carbon reduction pathway to 2050 with statutory medium and long-term targets
- a system of carbon budgeting for successive five year periods
- a statutory domestic trading scheme, probably in the next year or two
- a carbon emissions reduction target from 2008-2011 with obligations on energy suppliers and large organisations (like banks, supermarkets and local authorities) to reduce carbon emissions through increased energy and resource efficiency.

The draft Bill is silent on the extent to which, and the way in which, the carbon targets and budgets might operate at regional and local levels. However, the White Paper is explicit in identifying a role for the English RDAs and local authorities in supporting national energy policy (for example, by publishing carbon saving projections from their regional and local measures).

Moreover, in the recently published *Review of sub-national economic development and regeneration* [4], the government proposes

that the RDAs will be formally designated as Regional Planning Bodies, subject to the statutory requirements on sustainable development. They will be charged to produce a single integrated strategy, approved by local authorities, which will set out the economic, social, environmental and spatial objectives for the region and its city-regions. The RDAs will be tasked with the economic growth elements of the strategy. Growth will have to provide for *"greater resource efficiency and moves to a low-carbon, low-waste economy to help improve economic efficiency and to tackle climate change"*.

Carbon reduction targets are not yet mandatory at regional and local levels but there is an accelerating trend for target setting. Nearly 150 local authorities now have voluntary targets, arranged through the Carbon Trust Local Authority Carbon Management Programme, aiming to exceed 20% reductions by 2010.

Even where targeting is not adopted, there will be an increasing obligation at regional and local levels to consider carbon-saving in decisions that are made by the RDAs and their partners and to provide projections of the likely effects on CO₂ emissions.

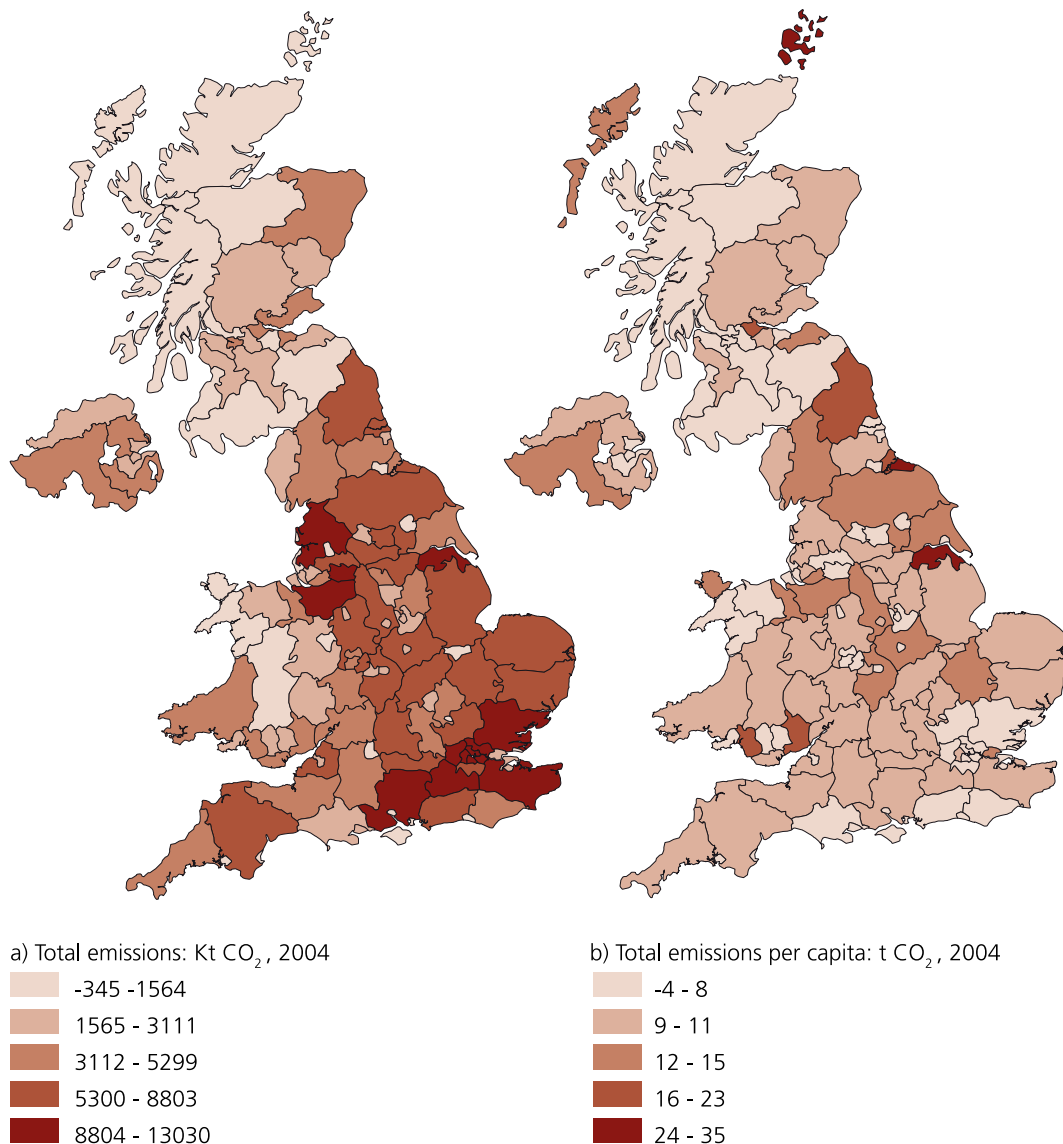
This paper considers the spatial and sectoral implications of the carbon reduction obligation using data from official sources. Measuring CO₂ emissions is not a straightforward matter and it should be noted that the data series is still designated officially as experimental [5].

The spatial dimension

Map a) in **Figure 1** demonstrates how the emissions reduction obligation (if spatially allocated according to current emission levels) would fall on different parts of the UK – i.e. particularly severely on parts of the East and South East, North West and parts of Humberside as a consequence of their residential and/or economic activity concentrations.

Map b) provides a different – and less obvious – picture based on emissions per head of population. It suggests that the obligation would fall disproportionately (relative to population) on a different range of areas within the nations and regions of the UK with a north/south divide in England. This comes about, in part, because of the frequent spatial overlay of relatively low population densities with high energy intensive activities.

Figure 1: CO₂ emissions and emissions per capita in 2004 (including industrial and commercial, domestic, road transport and land use change)



Source: SQW Consulting based on ONS and AEA Energy and Environment

The high emissions per capita in Northumberland, for example, are attributable to the location of an aluminium smelter at Wansbeck fuelled by a local coal-fired power station. It would seem a bit harsh to charge One NorthEast with the task of reducing emissions in the North East against a baseline dominated by figures attributable to a few large operations over which it has little direct control, and that reflect production rather than consumption patterns. Allocation of the emissions reduction obligation to the various spatial levels of government would have to be thought through carefully both as a practical means of reducing emissions and for its impact on regional economies.

The sectoral dimension

Figure 2 shows carbon intensity, productivity and productivity growth for a number of industry sectors (the size of each bubble in the figure denoting the carbon intensity of the sector). Highly carbon intensive sectors like power generation, base metals manufacture, oil refining and air transport tend also to be capital intensive. Consequently, as shown in **Chart a)** of **Figure 2**, they have relatively high labour productivity levels (as measured by GVA per employee) and contribute to the productivity growth of the areas in which they are located. Even if we exclude these sectors (as has been done in **Chart b)**), it can be seen that several of the remaining carbon intensive sectors experienced growth in carbon intensity at the same time as a growth in productivity (land/water transport, pulp and paper and textiles).

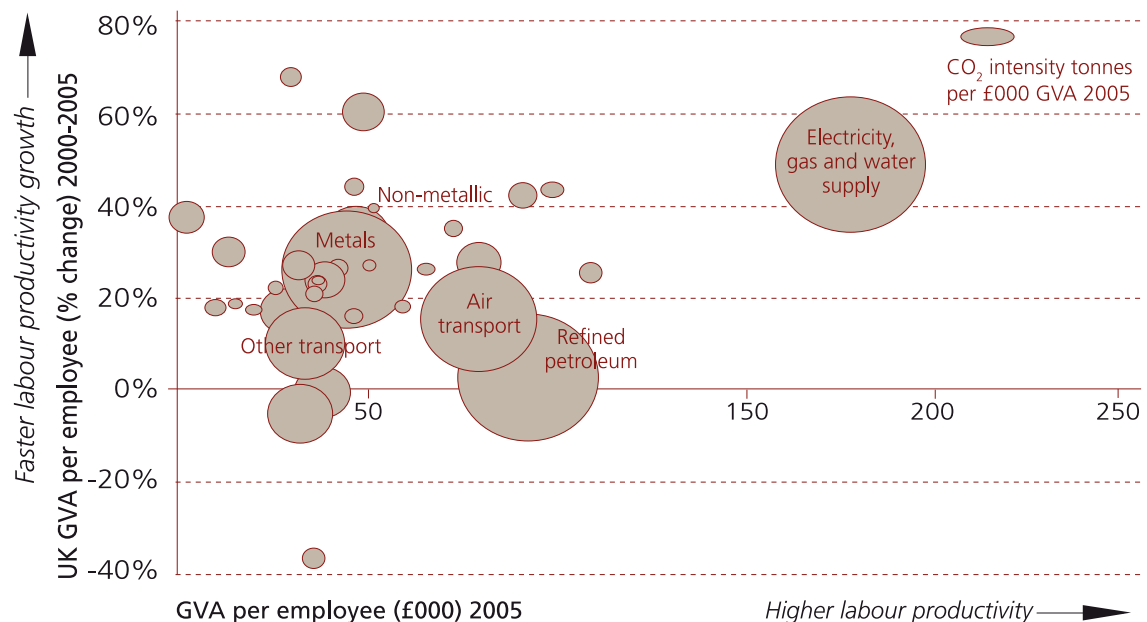
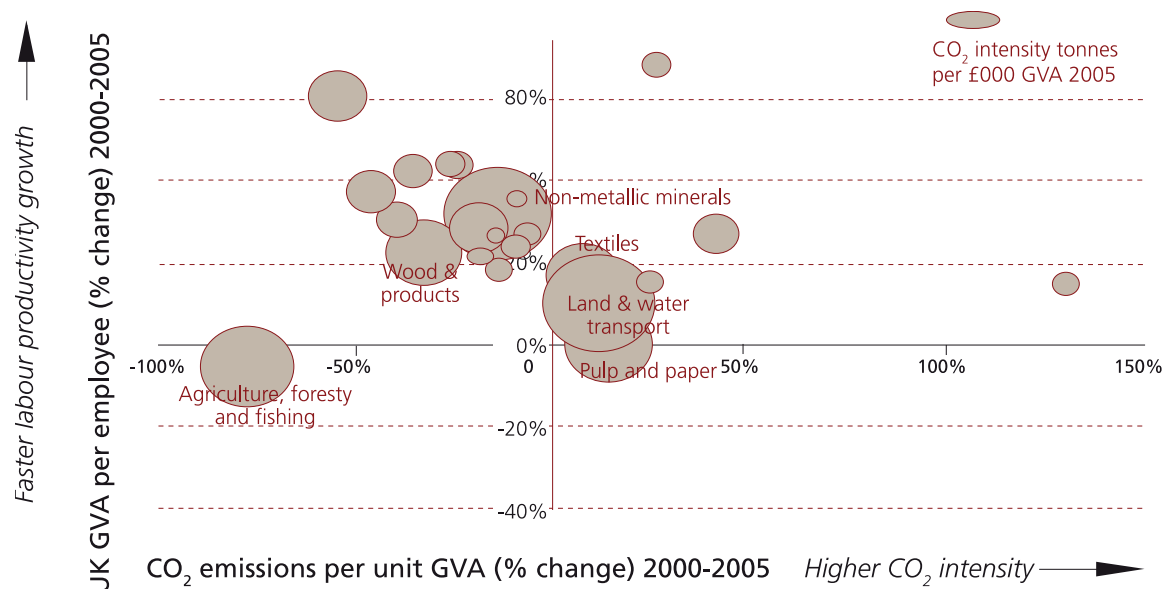
These sectors are dominated by a few players many of whom are major global businesses. They respond to exchange rate movements, differentials in transport, energy and material prices and the relative stringency of international/national regulation. But, they cannot just relocate at will because too much will have been invested in their current location. Whilst they remain in their current locations, they are likely to take a close interest in spatial planning matters as they affect the infrastructure in which they operate. But, their relocation options are global

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when the re-investment cycle comes round. And, if they decide to leave, it will be absolute – as a physical presence, a source of well-paid employment and a centre of regional supply and knowledge networks.

It makes sense, therefore, for devolved administrations and the RDAs to focus expert resources on managing relations with these businesses to contribute both to delivering the carbon reduction obligation and to securing improved local and regional economic development prospects. Perhaps they should be brigaded strategically for joint consideration of their investment plans and to explore ways of reducing CO₂ intensity, working with each other, universities, research establishments and research and development firms.

Chart b) also shows that there is a group of sectors that have increased productivity while reducing their carbon intensity (i.e. achieving improvements in overall resource efficiency). This cluster of sectors (in the top left-hand quadrant of the chart) is a diverse set that contains both low and high CO₂ intensive businesses. The latter in particular would seem to be an appropriate focus for policies designed to reduce their emissions further at the same time as promoting continued productivity growth.

Figure 2: GVA per employee, growth and CO₂ emissions per unit GVA**a) Sectoral UK GVA per employee (2005), growth (2000-05) and CO₂ emissions per £000 GVA (2005)****b) Change in sectoral GVA per employee, CO₂ emissions per unit of GVA, 2000-05 and CO₂ /GVA intensity***Source: SQW Consulting based on ONS data*

Both charts exclude banking, finance and insurance, real estate and public administration (because of the lack of official productivity estimates) and mineral extraction (as an outlier in terms of very high GVA per employee). **Chart b)** excludes the highly CO₂ intensive sectors of basic metal manufacture, oil refining, power generation and air transport. It also excludes research and development (an outlier in terms of high productivity growth) and TV, and radio equipment (an outlier in terms of poor productivity growth and high growth in emissions).

RESPONDING TO THE OBLIGATION

In assessing an appropriate response to the carbon reduction obligation, it is useful to adopt a segmented approach to policy [6]. This involves comparing a projected Business As Usual (BAU) emissions path against the target path and marking out the required reduction in emissions over time. This required reduction can then be sub-divided into manageable – and comparable – segments of policy action, each contributing its bit to the target reduction. Policy-makers don't have to adopt every action or rely solely on one. Instead, they can deploy the ones that give the best result for the least cost. The appropriate policy portfolio may vary in its mix depending on the scale and nature of the carbon reduction challenge.

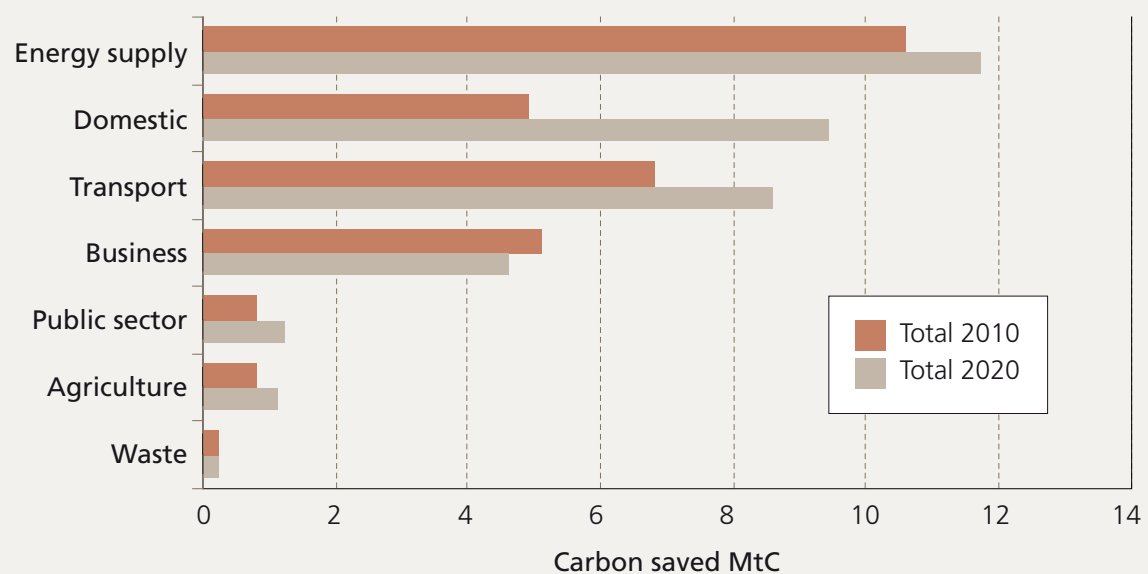
This segmented approach is essentially the one that has been adopted in the UK government's Climate Change Programme with its portfolio of different interventions by a wide range of agencies.

The National Audit Office (NAO) [7] estimated the contribution of each of the interventions in terms of projected carbon savings in 2010 and 2020 and grouped them according to the broad sectors in which they occurred (**Chart a**) in **Figure 3**. What is noteworthy is the relatively modest savings attributed to the public and business sectors, especially in terms of projected savings in 2020. Given the high carbon intensity for certain industries shown in **Figure 2**, could more be done to support and prompt greater energy efficiency within the business sector (and the public sector itself)?

This question seems even more pertinent when it is observed that the cumulative carbon savings projected by the NAO are not expected to meet the reduction target for CO₂ emissions in 2010. Would it be cost-effective to give more priority to the business and public sector? The NAO assessment presented in **Chart b**) in **Figure 3** suggests that it might be.

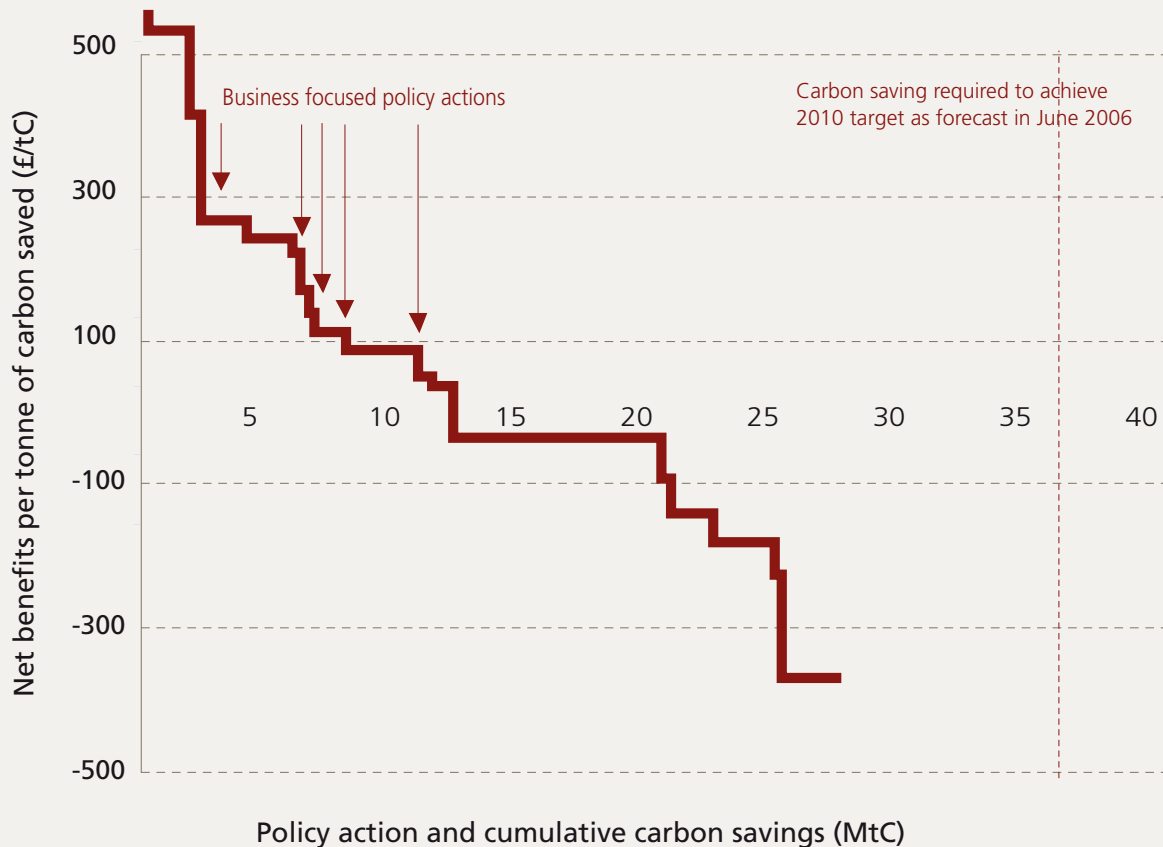
Figure 3: Projected carbon savings and cost-effectiveness of interventions of the UK Climate Change Programme

a) Projected carbon savings from policy interventions by broad sector



Note: The allocation by sector was made according to whether the policies were most likely to reduce CO₂ emissions in that sector. For example, the projected savings from the Renewables Obligation were allocated to energy supply.

b) Net benefits per tonne of carbon saved for policy actions within the UK Climate Change Programme and their projected carbon savings cumulated to 2010



Note: The observations relate to policy actions within the Programme (such as the UK ETS). The chart presents the actions in descending order of the net present value of their net benefits and shows the contribution of each to the projected cumulative savings to 2010. Net present value was estimated by the NAO on an assumed social cost of carbon of £70/tC.

Source: Adapted from NAO

Though some business-focused policy actions (such as promoting energy saving to SMEs) have not yet achieved large carbon reductions, they generally tend to be cost effective. Moreover, only modest reductions are cited for the public sector – with no mention of the RDAs.

We suggest (**Table 1**) that a distinctive role could be played at regional levels within the UK in reducing CO₂ emissions. Similarly **Table 2** shows that there are a number of planning, economic and other

instruments that are available to the devolved administrations and RDAs to support the trading and regulatory regimes introduced by central government, especially as both the RDAs and local authorities will in future have a spatial planning remit.

THE OPPORTUNITY

Our recent study for Defra [8] showed that, depending on its form, regulation can prompt faster and more extensive diffusion of existing technologies and make firms more efficient. It can also stimulate innovation, enabling firms to shift to new technologies, reinforcing competitive pressures on less efficient firms and encouraging new entries.

End-of-pipe technologies are defined in Kuehr [10] as methods to minimise or neutralise harmful effects from the processes of production or service delivery without having to alter the nature of the original process (e.g. a catalytic converter attached to an exhaust pipe or flue gas desulphurisation units). **Cleaner technologies** are defined by the same source as modifications to existing processes to minimise or eliminate the generation of effects harmful to the environment (e.g. combustion chamber design).

A second SQW Consulting study for Defra [9] on environmental technology and competitiveness concluded that 'cleaner' technologies were more likely to have this positive effect on productivity and competitiveness than so called 'end-of-pipe' technologies. This was simply because the latter tended to add to the costs of those businesses adopting them whilst cleaner technologies often required transformations of production processes into which could be engineered more general resource efficiency improvements.

The study found that the UK had comparative strengths in the more mature end-of-pipe technologies (such as waste and waste-water treatment, waste management and air pollution control) although it faced severe competition from Germany, France and some Scandinavian countries. In more infant segments (such as cleaner technologies and renewables), the USA, Japan and Germany were at the forefront of the

"lack of effective supply chains may act as a constraint on the adoption of cleaner technologies..."

market. Moreover, there was some evidence that the UK had less developed supply chains linking users and suppliers of environmental goods and services. This lack of effective supply chains may act as a constraint on the adoption of cleaner technologies by commercial users who may prefer end of pipe technologies which can be bought off the shelf and 'bolted on' to existing systems with minimal disruption.

Yet, as the recent NESTA report [11] concluded, we need disruptive forms of innovation in order to shift to a lower carbon society - *"cheaper, easier-to-use alternatives to existing products or services often produced by non-traditional players that target previously ignored customers"*. It estimated that the eight 'Disrupter' businesses it showcased had already saved 5.8 million tonnes of CO₂ per year.

The opportunities for business in responding to the carbon obligation will vary in shape and form across the nations and regions of the UK. But, they are likely to require adoption of cleaner technologies that prompt new ways of doing business *and* changes in behaviour that promote new technologies or new uses of old technologies. They will require stronger connections between users and suppliers (even as the supply chains become ever more global) and the development of new networks (in NESTA's words, *making unusual connections*) that enable business to break out of the legacy of incumbent technologies and market structures. The new comparative advantage will not just be found in developing fast growing cleaner and renewable technologies, goods and services but in putting them to creative and innovative uses.

MAKING THE MOST OF THE OPPORTUNITY

Making the most of these business opportunities means ensuring that public policy adopts the ‘*pollution prevention pays*’ principle in designing and delivering carbon regulation, targetry and supportive measures. Unlike the ‘*polluter pays*’ principle (with its implicit invitation to pollute as long as it is paid for), the pollution prevention pays principle seeks to discourage pollution from occurring in the first place. As such, it prompts the adoption of cleaner rather than end-of-pipe technologies. All environmental regulation should pursue the route of pollution prevention wherever feasible. It should be supported by complementary policy measures (through spatial planning, innovation and diffusion, public investment and procurement, skills development and learning, and enterprise and competition).

Activities to stimulate and facilitate carbon saving can be prompted by spatial planning. For example, the ‘Merton Rule’ on the requirement for renewable energy provision onsite for all new major development projects, pioneered by the London Borough of Merton, is now considered best practice in low carbon planning and has been adopted widely, despite recent challenges from developers. Examples of local authority involvement in the delivery of green energy projects include the combined heat and power (CHP) system in Woking town centre, which is larger than conventional systems and is a good example of demonstrating the potential for developing ‘community-scale’ energy; and the inclusion of a boiler that runs on locally grown wood in the new Barnsley Digital Media Centre, the latest in a series of biomass-heated buildings pioneered by Barnsley Council.

Ample opportunities for diffusing and adopting good practice of this kind will be available in the planning and design of the proposed eco-town developments. More generally, it will be for the RDAs and local authorities to ensure that such

opportunities are built into the new integrated regional strategies and local development frameworks in ways that prompt innovation in low carbon solutions (e.g. through carbon reduction zones). The government’s ‘Climate Change’ Planning Policy Statement, to be published later this year, is expected to include a range of means by which spatial planning can play its part in reducing CO₂ emissions.

Innovation policy should also play a central role in breaking out from the lock-in of incumbent high carbon technology trajectories. Scale and learning economies are needed to bring down the prices of alternative technologies, but the pathway to scale tends to be blocked by those same prevailing prices and the risk aversion of existing business players. New technologies may need a kick-start, through R&D support, seed funding and/or through demonstrating potential markets. As energy becomes more expensive, what is ‘smarter’ will change. For example, buying bulk over long distances may become less viable and flexible IT-enabled local supply more viable. There could be a public sector role in stimulating the creation and use of knowledge and innovation networks to enable firms to become aware of these new business realities and to learn from each other about how best to adapt.

For activities that are already occurring but show significant potential to further reduce carbon emissions, the job of the public sector could be in raising awareness about opportunities and demonstrating possibilities. This will help to tackle

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“the key challenge for public agencies will be to foster an enabling environment that assists organisations, large and small, to face up to the challenge and make the transition to lower carbon impact operations...”

market failures in the form of imperfect information that limit the diffusion of existing technologies even where they are commercially proven. The public sector could also have a role in shaping markets and countering imperfect information on ‘green’ solutions and practices such as unscrupulous labelling and ‘offset’ schemes.

It will also be important to understand and support the carbon saving potential of the other key drivers of productivity – investment, skills, enterprise and competition. Investment in early upgrade of capital equipment may need to be encouraged in order to break the constraints of the capital investment cycle and allow firms to take advantage of new technologies that offer both commercial returns and carbon saving. Public sector purchasing policies can play an important role here, with support from the RDAs and local authorities, in encouraging better understanding and reduction of the carbon content of the supply chain. New learning, capacity and skills in carbon-awareness and management, and in identification and assessment of alternative energy options will also be required. Increased priority has already been assigned to climate change in research spending in central government and the research councils. Mechanisms will need to be in place to ensure that the knowledge and understanding thus generated are transferred to and adopted by business.

Change creates business opportunity, and enterprise and competition should be nurtured and encouraged. The carbon-reduction obligation presents opportunities for enterprise across the business and social spectrum, in particular around helping business and society migrate to new ways of living and working that consume less energy. The early focus is likely to be as much about the application of existing technologies to new and

emerging markets as the development of new technologies. Competition in the green business arena is already being stimulated, as major players respond to consumer demand and introduce ethical ranges and advertising. However, climate change remains low on the radar of many businesses to date. A recent KPMG survey [12] showed that only 14% of the FTSE 350 companies could demonstrate a serious strategy for tackling climate change.

A serious economic opportunity is emerging to meet the demanding national carbon reduction obligation. Within national, regional and local economies, the key challenge for public agencies will be to foster an enabling environment that assists organisations, large and small, to face up to the challenge and make the transition to lower carbon impact operations whilst achieving improved productivity and growth.

Table 1: Carbon reduction policy options and their spatial dimension

The focus at the international and national scale will be largely on energy mix whilst individuals will be focused on their consumption and transport choices. At the levels in between, a wide variety of interventions may be appropriate, ranging from sectoral support at the regional level to a focus on spatial and land use planning for the RDAs and local authorities.

	Energy and electricity generation				Sinks	Business support			Planning			Information
	CO ₂ capture and storage (CCS)	Nuclear fission	Renewable electricity (e.g. photo-voltaics, wind, wave)	Alternative fuels (wood, other biomass, biogas)	Forests and other carbon sinks	New technologies and processes ¹	(Public sector) Purchasing policies and decisions	Sustainable agriculture	Energy efficient buildings ²	Spatial / land-use planning	Transport mode shift	Energy consumption (awareness-raising measures)
International	•	•	•	•	•							
National (UK)	•	•	•	•	•	•	•	•	•		•	•
Devolved - Regional			•	•	•	•	•	•	•	•		•
City-region			•	•					•	•	•	•
Local Authority			•	•	•	•	•		•	•	• ³	•
Community			•	•					•		•	• ⁴
Individual			•	•					•		• ⁵	•
Individual Business			• ⁶	•		•		•	•		• ⁷	•

Source: SQW Consulting

¹ At national level, the focus is more likely on support for R&D into new technologies; support for innovation and new business development is more likely at regional / LA scales

² At the national level this includes building regulations (and strengthening uptake of the Code for Sustainable Homes) for new-build dwellings; at the community and individual levels this can include retrofit and upgrading – e.g. installing loft and wall insulation and energy-efficient appliances

³ e.g. congestion charging

⁴ Ashton Hayes in Cheshire aims to become England's first carbon neutral village; Chew Magna in Somerset has taken up the Go Zero campaign as part of its Parish Plan; Modbury in Devon has become the first plastic-bag free town in Britain

⁵ including travel to work

⁶ Micro-generation – e.g. solar panels; small-scale wind turbines

⁷ Travel for work only

Table 2: Policy instruments for carbon saving

	Measurement instruments	Command and control instruments	Economic instruments	Voluntary instruments	Supporting instruments
Sustainable consumption	Carbon footprinting Ecolabelling Encouragement of uptake of smart utility billing, etc.		Sustainable public procurement	Offset schemes Individual carbon allowances	Awareness raising exercises (marketing & information to consumers)
Sustainable production	Reporting and auditing Carbon trading Carbon budgeting	Industry regulation Spatial planning & development control (including carbon sinks, forestry) Transport planning (infrastructure) Building regulations	Taxes, e.g. aviation fuel tax Charges, e.g. congestion charge Financial incentives, e.g. leisure travel initiatives, transport planning (non hard infrastructure), Environmental Stewardship (sustainable agriculture), housing incentives R&D support, investment in alternative technologies (energy generation)	Certification	Awareness raising exercises (marketing & information to producers, business support and advice) Capacity building and training Appropriate sector skills & other support (non direct financial)

Source: SQW Consulting, building on concepts from UNEP, UNWTO and GEF

A package of measures is likely to be the most effective approach. The NAO review reported that both Sweden and Denmark shared its conclusion that more general and flexible policies (such as emissions trading schemes) tended to be more cost-effective than specific, targeted schemes. However, the Swedish view was that targeted instruments can create awareness of new carbon abatement opportunities. Their experience was that the effectiveness of actions could be increased by combining general and targeted instruments. SQW Consulting's report for Defra on the relationship between environmental regulation and competitiveness came to the same conclusion.

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