

'Mini-Stern' for Manchester

Assessing the economic impact of EU and UK
climate change legislation on Manchester City
Region and the North West

Final report

September 2008

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1 Terms of reference

Project scope

This research is aimed at assessing the potential economic implications of climate change legislation, policy and regulation for Manchester City Region and the North West. The report also highlights policy implications and potential interventions to enhance economic competitiveness of the region (by maximising opportunities and dealing with threats stemming from climate change legislation).

The policy recommendations are based on:

- ⇒ policy and literature review;
- ⇒ data and econometric analysis on a sectoral level;
- ⇒ asset evaluation; and
- ⇒ stakeholder consultations.

Inherent in the topic are issues relating to climate change and the wider sustainability agenda but detailed analysis on the impact of climate change itself is beyond the scope of this study. Moreover this study does not analyse the science of climate change or the specific costs of adaptation or mitigation for business or the public sector. This report or the underlying analysis does not take a view on or attempt to predict the direction of the electoral or lobbying pressure about climate change one way or the other. This analysis deals with the broadly accepted scientific basis as set out by the UK Government and in the Intergovernmental Panel on Climate Change (IPCC) reports.

Whilst this work seeks to provide high level statements on the scale of impacts, it is recognised that further work is likely to be required to establish a detailed climate change action plan. The quantitative analysis of impacts of climate change legislation on business at this stage is high-level and indicative.

Disclaimer

This document, which has been prepared by Deloitte MCS Ltd, a division of Deloitte & Touche LLP, for Manchester Enterprises in accordance with our terms of engagement, has been prepared for the sole purpose of identifying potential economic impacts of the UK and EU climate change legislation for the Manchester City Region and the North West.

The information contained in this document has been compiled by Deloitte MCS Ltd and includes material obtained from Manchester Enterprises and published sources, which Deloitte MCS Ltd use regularly. We have not carried out an audit on this data or the published sources referred to in this document. As such, the conclusions in this document should be reviewed in that context.

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2 Executive Summary

Climate Change is defining a new legislative and policy agenda for the UK and globally. Whilst the overall direction is far from fully defined, there is now clear national and international momentum towards substantive economic intervention to control emissions of Greenhouse gases (GHGs), encourage the use of low carbon alternatives and increasing adaptation to unavoidable climate change. Its impact on the Manchester City Region could be profound with potential loss of £20bn to the economy over the next 12 years if it fails to adapt (£70bn for the North West). However, it is also clear that this agenda could present a significant economic opportunity for the City Region if it takes early action.

There is growing evidence that the Climate Change agenda is altering market conditions and underlying assumptions previously used to determine trends and establish the economic priorities for the Manchester City Region. As new legislation and regulation comes into force the economic adaptation will accelerate.

The economic structure of the Manchester City Region, with its strengths in financial and professional services sectors, together with a growing environmental technology sector, places it in a strong position to compete effectively within markets on a global scale. Furthermore, by creating the right conditions for new and emerging business in this area and ensuring existing businesses have the right support and expertise to enable them to adapt quickly, the City Region has the opportunity to build an international reputation that would attract inward investment.

However, strong leadership is required to oversee the intelligent and selective use of the policy intervention tools the City Region has at its disposal. Moreover, gaining the support and confidence of the business and investment community, by creating economic opportunity and reducing market uncertainty through a consistent policy approach, is also a prerequisite for success.

In 2006, the Stern Review put forward a cogent case that the cost of early action would be far less than dealing with the long term consequences. The report concluded that whilst the short-to-medium-term costs of investing in mitigation are likely to be high (as much as one per cent of global GDP per annum), the longer-term costs of inaction could be as high as 20 per cent of global GDP.

This report focuses on what could be done in the short-to-medium-term to develop strategies to respond to the impact of Climate Change legislation in the Manchester City Region and the wider North West. It assesses the economic opportunities and identifies areas where mitigation response would be required to safeguard against potential negative impacts. Finally the report considers how policy-makers in the City Region and the wider North West could best intervene to assist and promote economic growth in the context of an emerging new low carbon economy.

Policy Impacts

A raft of new legislation, policy and regulation is expected to be introduced over the next ten years in the UK, across Europe and globally. However, Climate Change is a fast moving agenda and inevitably there will be other unanticipated legislative developments that will be brought in to address impacts as they emerge and take account of new scientific evidence. Significant impacts on the City Region and the North West economies are likely, as binding provisions on carbon pricing, trading and associated emissions reduction targets are introduced. It is evident that impacts will vary by sector, sometimes markedly, and by function according to energy usage and emissions profiles.

The economic effects will be both direct and indirect, for example the manufacturing industry is more likely to *directly* emit higher levels of carbon than the service sector, but the service sector will still be responsible *indirectly* for whole-life-cycle emissions due to transmission through the supply chain.

Clearly, if the end user ceases to accept high footprint goods and services then the supplier will stop producing. These market pressures should not be underestimated when it is already evident that customer and shareholder pressure is impacting on business behaviour. It is also clear that cost pressures from increasing energy and fuel prices are driving change in business operating models.

The Impact Assessment Framework

Deloitte has developed a bespoke framework to assess potential impacts on the Manchester City Region within its North West context. The 'traffic light' testing of the economic structure and key sectors in the City Region and North West evaluates those sectors that are the most important because of their current and future contribution to GVA and those sectors that are most likely to be impacted upon by the legislation. We then assess the relationship between the levels of growth and emissions and consider what might happen in future if the economic adaptation fails to occur.

The analysis undertaken as part of this study suggests that in direct terms the following broad areas of economic activity facing significant challenges are likely to be:

- ⇒ **Air Transport:** This sector currently accounts for 1 per cent of direct employment in the City Region and is one of the most energy intensive sectors and therefore potentially vulnerable to legislation. However, the impacts on this sector are complex and subject to international regulation. Evidence confirms the importance of this sector to continued growth of the Manchester City Region and North West economies. In particular there is a strong focus on Manchester Airport as an indirect employment-generator and International Gateway. The airport, as a high energy user, is already part of the first phase of the Energy Trading Scheme (ETS) and plans to be carbon neutral on its energy use by 2015. A further phase of the EU Carbon Trading Scheme is proposed to cover aviation carriage and will financially reward lower carbon emitters. Manchester Airport can clearly exploit this opportunity through early adaptation. It should be noted that the most significant proportion of non-carriage carbon emissions is indirect - from passenger journeys to and from the airport, which accounts for 60% of the total.
- ⇒ **Road / Land Transport:** Land transport (excluding railways) is also exposed to legislation due to high emission levels. It currently accounts for around 4.1 per cent of employment in the Manchester City Region and 4.5 per cent within the North West. It is also projected to be a key driver of growth.
- ⇒ **Energy Intensive Manufacturing:** Accounts for 4 per cent of Manchester City Region and North West employment and refers to those manufacturing industries using the most energy intensive processes to produce goods. This includes, for example, industrial gases & dyes; man-made fibres, glass & glass products; plastics & synthetics and metal forging; and
- ⇒ **Textiles:** This is categorised as a high risk sector due to relatively high levels of energy use and emissions, and although the focus for the local textile industry has shifted lately from production to wholesale / retail (accounting for approximately 0.5 per cent of employment), the sector may still be affected by higher input costs passed up through the supply chain.

Both air and land transport are the most significant of these economic activities and legislative impacts have the potential to be magnified significantly through the supply-chain due to their critical role as a facilitator of individual and business connectivity and knock on costs.

Mitigation of the risks associated with Climate Change also creates an economic and competitive opportunity for the above sectors. Change stimulates innovation and adaptation, and those organisations that embrace the challenge and seek commercial advantage are most likely to survive and prosper. Targeted support can help to realise those opportunities in businesses that would otherwise be slower to adapt.

There is also quantitative evidence that key service sectors – major contributors to the Manchester City Region economy - have already demonstrated the ability to grow without significant increases in direct emissions. Moreover, there is little evidence to suggest that

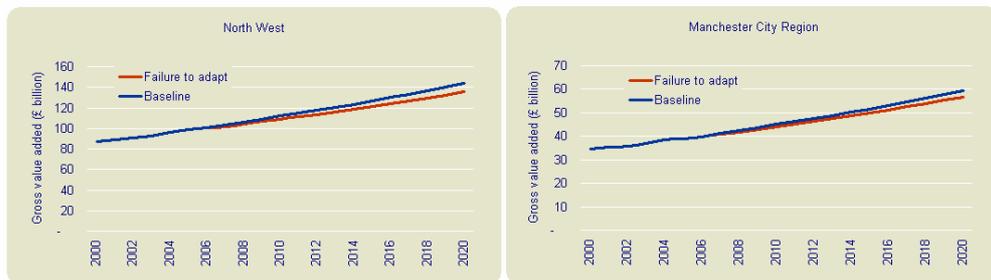
higher output growth in future will lead to growth in direct emissions. Two particularly important sectors for the Manchester City Region are:

- ⇒ **Financial, Business and Professional Services:** This sector is likely to provide a significant proportion of future growth in the area and currently account for 21 per cent of employment in the City Region, when taking into account wider related business services (24 per cent in the North West).
- ⇒ **Public Sector Services:** This sector, which includes health and education, will also provide employment growth in the longer-term and at present supports more than 25 per cent of the City Region's workforce (11.5 per cent within the North West). Influence here over procurement patterns and energy usage is high which means that specific policy and targeted action from public sector organisations can encourage change and provide support.

The Scale of the Challenge

Deloitte analysis indicates that there is likely to be a cost of inaction across all sectors with competitive benefits and cost reduction upsides for proactive business responses to Climate Change legislation, regulation and policy. Without exploiting opportunities, and mitigating effectively, a 'failure to adapt'¹ scenario suggests that the City Region could lose an estimated £20 billion in GVA over the next 12 years (by 2020), whilst the North West as a whole could lose an estimated £70 billion over the same period. This equates to annual growth of 0.3 and 0.4 percentage points below baseline in the City Region and the North West respectively. Thus, unless it achieves significant emissions cuts, improves its resilience to Climate Change, and leverages its assets, the Manchester City Region could fall substantially short of its economic regeneration goals and targets.

Potential economic costs under the 'failure to adapt' scenario



	Baseline CAGR	"Failure to adapt" CAGR	Loss in GVA
UK	2.8%	2.5%	£380 bn
North West	2.6%	2.2%	£70 bn
Greater Manchester City Region	2.9%	2.6%	£20 bn

Source: ONS, OE GMFM, Deloitte Analysis

Early action is therefore needed to respond to legislative drivers by cutting emissions, improving resilience, and adapting economic priorities to take account of Climate Change legislation. In doing so the Manchester City Region has the potential to enhance its competitive advantage over those Cities that are slower to adapt. This is a significant challenge. However, in our view, if the opportunities are seized, Manchester City Region, backed by the North West, would be in a strong position to be at the forefront of a positive response to Climate Change and, in doing so, develop an international reputation in this area.

¹ This analysis is focused on the nature, speed and effectiveness of the response to legislative change and not Climate Change itself.

Challenges

A positive response will require the following challenges to be addressed as the economy reacts to new regulation and legislation:

- ⇒ **Addressing business uncertainty and market failure:** There is business concern about future markets for low carbon products and services, and the robustness of these markets especially in a more uncertain economic climate. It will be necessary to provide business with more certainty (and opportunity) to instil greater confidence that there will be a good return on investment.
- ⇒ **Cost of compliance and changing business models:** Small and medium-sized enterprises with a lack of capacity will have concerns about dealing with compliance / administrative challenges. Businesses will inevitably seek to minimise the risk of under or over-adaptation, which may prove costly and could be a potential threat for smaller firms.
- ⇒ **Demand shifts:** There are already indications that consumers are considering carbon footprint when making buying decisions. This will also impact on business to business transactions as legislation drives behavioural change. The shift in demand is likely to affect all types of businesses and especially those producing high-carbon footprint goods and services. The pressure to source low carbon goods to reduce their whole-life-cycle footprint could increase the costs for business in both supply and production of goods for some organisations.
- ⇒ **Long term returns:** The Climate Change agenda necessitates long term (even generational) thinking that may not be in keeping with business time horizons. Over and above the necessary compliance with regulation, decision makers are likely to be more concerned with short term results, which have an impact on profitability and brand unless they can be convinced of a commercial opportunity or competitive advantage. Clearly, economic conditions can exacerbate this.
- ⇒ **Education and Skills:** Leaders in both the private and public sectors need to be fully competent in the knowledge of Climate Change issues and legislation and its potential organisational impacts in order that they are not competitively or operationally disadvantaged. This will require new skills and competencies. Inevitably there will be skills gaps, which will also present a major challenge. Businesses will need to be alert to the requirement for the new skills they will need to minimise the cost of compliance and exploit potential market opportunities. The higher and further education institutions in the City Region and across the North West will need to play a critical role in meeting those needs.
- ⇒ **Competition:** Carbon trading is designed to minimise the market distorting effects of legislation, but the scale and scope of legislation as a whole could have unforeseen consequences. The issue of international displacement associated with legislation will need to be considered. Redistributing production to other countries outside the legislative sphere will result in the same level of emissions and energy use, but to the detriment of the UK economy.

Opportunities

Whilst the challenges must not be underestimated it is also evident that there are substantial economic opportunities for the Manchester City Region:

- ⇒ **Environmental Technology and Services (ETS):** Niche markets will develop and expand as low carbon demand grows and greater incentives help create new market segments. More carbon acceptable solutions will be required in the public and private sectors which will stimulate local innovation and R&D. Environmental technology which embraces renewable energy; energy efficiency; waste technologies; water and waste water treatment; green IT products and consulting will be in a strong position to benefit.
- ⇒ **Eco-Innovation opportunities:** Within existing sectors and organisations there are innovative organisations outside the ETS sector that can play a major role in helping

to reduce the level of emissions across all sectors of the economy through new products and services. In this context, the public sector has the opportunity to lead by example by demonstrating best-practice in areas such as facilities management and incentivising a more joined-up approach with local businesses in the supply chain.

- ⇒ **Climate change as a cost-cutting mechanism:** Adaptation to deal with the impacts of Climate Change legislation can provide cost-reduction benefits and drive business efficiency improvements that improve competitiveness.
- ⇒ **Spatial planning:** Substantial new planning policy, regulation and initiatives related to the Climate Change and sustainability agenda have been developed by Government over the past five years. This confirms the importance the Government places in using the planning system to deliver carbon reduction. The forthcoming Planning Bill is also expected to include a range of Climate Change inspired measures. This UK legislation and policy backdrop together with the Local Development Framework process being undertaken by Local Planning Authorities presents the Manchester City Region with the opportunity to shape and align planning policy to direct development to deliver carbon efficiencies through improvements to function, infrastructure, design, location and density of major developments.
- ⇒ **Energy Planning:** The Climate Change agenda will drive a reconsideration of the energy needs of the City Region. Planning authorities are already required to establish renewable energy targets which will be embedded within core spatial strategies and therefore have economic impact. The City Region has an opportunity for a collective approach to energy planning that can take advantage of the economies of scale in major development and regeneration projects within and across local authority boundaries. New approaches to energy generation and distribution are required and a more comprehensive approach to energy planning creates a significant economic opportunity for the Manchester City Region.

Manchester City Region Assets

To crystallise opportunities into tangible economic benefits it is necessary to build on the significant assets of the Manchester City Region this includes but is not limited to:

- ⇒ **A strong and positive economic structure:** The transformation of the Manchester City Region economy that has taken place over the past twenty years has led to an economy that is favourably skewed towards the sectors that are expected to be the drivers of future growth. This creates a more favourable economic foundation for Climate Change adaptation and opportunity than many other City Regions in the UK and Europe.
- ⇒ **Successful Urban Regeneration:** Economic growth has been matched by a renaissance of the City Region's key urban centres, particularly in its Regional Centre. Better road connectivity and public transport infrastructure has also led to the economic growth in the town centres outside of the Regional Centre which are now attracting significant levels of investment. The City Region has interconnected town centres that both support the economy of the regional centre and are important centres of economic growth in their own right. This mature and modern urban structure means that the City Region is well placed to adapt and take advantage of this new economic opportunity.
- ⇒ **Capacity for Innovation:** The Tyndall Centre and the Joule Centre within Manchester University have established international reputations in the fields of Climate Change and energy. Manchester Metropolitan University is leading research into carbon reduction for the aviation industry and the University of Salford has an established a Centre for Environmental Systems which is working internationally on the impact of Climate Change. The new Bolton University is undertaking research in developing more cost effective ways to generate electricity from solar panels. These are examples of activities being undertaken in Higher Education institutions in the City Region. There is the opportunity to turn this into economic advantage and build

on the historical reputation that the Manchester City Region already has for entrepreneurship and business innovation.

- ⇒ **Strong Higher and Further Education Institutions:** The Manchester City Region has the largest student population in Europe – an economically significant pool of talent. Manchester University has courses covering environmental technologies, Climate Change economics and innovation. Manchester Metropolitan University has a range of specialist courses on Climate Change. Salford University also has a Masters Degree covering this area. The further education colleges are also providing people with environmental technology skills. This substantial educational infrastructure should enable the City Region to meet the growing skills and capacity needs of business and the public sector.
- ⇒ **Improving transport and infrastructure:** Investment in transport infrastructure improvements could lead to the development of a more environmentally friendly and connected system. The City Region is already in a good position to leverage its current strengths in infrastructure and connectivity, particularly through its excellent multi-modal transport links. There is good evidence that the level of investment proposed through the Government approved Transport Innovation Fund would differentiate the Manchester City Region from other City Regions within the UK and internationally.
- ⇒ **Political leadership:** The Manchester City Region has built strong interrelationships between its ten local authorities over the past twenty years through its Association of Greater Manchester Authorities (AGMA) which has been instrumental in delivering agreed approaches on transport, planning and economic development. This has played a significant role in instilling market confidence and certainty. It is this kind of leadership that will be essential in delivering a coherent Climate Change policy.

Policy Intervention considerations

We have identified the following broad strategic priorities for the Manchester City Region. These will need to be explored further before designing implementation strategies. These policy considerations include:

1. Exploiting first mover advantage

A clearly articulated policy position is needed with respect to Climate Change legislation. There is a choice between 'going with the flow' and taking a strategic decision to harness assets to position the City Region at the forefront of the global environmental industry. The latter is more likely to lead to first mover advantage, which is likely to confer greater economic benefits.

2. Leadership aimed at building on international reputation

Strong leadership backed by early success in co-ordinated programmes of action will enable the Manchester City Region to build on its international links and be positioned at the cutting-edge of innovation activity and technologies.

3. Transforming the energy mix to reduce economic cost

The City Region has the potential to develop a more robust and cost efficient energy infrastructure that is based on low and zero carbon technologies. The spatial planning framework will be a critical tool that can be used to shape favourable investment / developer behaviour and create more sustainable energy options through the application of policy. It will also be important for the City Region to work with the utilities and Government to determine the best way for carbon reduction objectives and economic efficiencies to be achieved.

4. Promoting sector growth through targeted procurement strategies

The public sector can have a critical role here through supporting the growth of products and services through the way it procures. With the right processes in place, the public sector can actively support the development of local business offering smarter and greener products and

services. This purchasing power can also be leveraged to support the development of the ETS sector within the City Region and encourage innovation.

5. Reducing uncertainty and risk to encourage business investment

Influencing national policy should be a major focus here. Businesses need to believe that they are investing in change for the right reasons and that they are not going to be burdened with unnecessary or sunk costs. Minimising uncertainty requires Central Government and International level commitment. Lobbying activity could complement more of the City Regional / Regional initiatives highlighted here. The uncertainty around the future carbon prices means that those businesses not currently affected by changing consumer or business behaviour, have no financial basis upon which to make investment decisions. However, development of the right reward structures – through initiatives such as ‘kite-marking’ the best performing businesses could help to encourage business investment.

6. Delivering coherent advice and support to business in general

Targeted business support to businesses affected by Climate Change legislation and regulation will need to be provided. The generic business support in the North West together with activities of Enworks could be tailored to achieve this but the Manchester City Region would need more intensive action if its business community is to mitigate and deliver the economic benefits.

7. Developing sector strategies

Developing specific sector strategies in support of vulnerable sectors as well as opportunity sectors such as ETS should be considered. These strategies should be prioritised into those industries with significant legislative threats such as transport and manufacturing – where emission minimisation and costs associate with under or over-adaptation may be highest. Attention should also be focused on those service sectors that are expected to provide much of the economic growth in the coming years – such as financial and professional services. Building on regional activities such as Envirolink, which provides support for the Environmental sector will also be critical to ensure those operating in sectors related to environmental technologies and services are able to compete in national and international markets.

8. Promoting inward investment

Once the necessary leadership is established and key programmes are in place, MIDAS (the City Region’s Inward Investment Agency), working with the NWDA, would be in a good position to promote Manchester City Region internationally as the ‘location of choice’ for Climate Change-related innovation activity.

9. Policy Alignment

The alignment of spatial and economic policy across the City Region can play an important role in ensuring consistency and avoiding counterproductive internal competition. However, care will be needed to ensure policies do not economically discriminate because of geography. For example a high percentage renewable energy requirement for new development in the north of the City Region would have a different impact on investment decisions than in the south – where land values are higher.

10. Investing in skills and building capacity

Investment in skills development through higher education and research centres can ensure that future employment demands are met in the region. This can also enhance the creation and development of key clusters of new technologies. There is also the opportunity to build on existing collaborative working between universities, energy and environmental consultancies as well as research and development agencies.

Conclusions

Climate change regulation, legislation and policy, presents the Manchester City Region with the challenge of minimising downside economic risk whilst delivering the upside benefits to improve its competitiveness. The Manchester City Region – due to its economic profile - is well

positioned to mitigate against negative effects and deliver upside benefits in the face of Climate Change legislation.

There is some evidence that the Manchester City Region economy is already responding to the challenges and opportunities stemming from Climate Change legislation. However, strong strategic leadership is now needed to direct the key interventions set out in this study to enable the City Region to maximise potential economic benefits - particularly through first mover advantages.

Reputation in this area will need to be earned though and the public sector will need to lead by example through its policies and actions. For example, market and investor confidence will grow if the power of public sector procurement is applied to purchase lower carbon products and services.

The proposed Climate Change Agency for the City Region by AGMA, has the potential to enable the public and private sectors to pool the necessary skills and expertise to enable the delivery of the interventions set out in this report.

This study provides strategic overview of economic implications of Climate Change legislation and sets out the broad areas for intervention. Further work would therefore be required to develop specific strategies and action plans to position Manchester City Region and the North West at the forefront of this challenging policy agenda.

3 Methodology and report structure

This study assesses the economic impact of EU and UK climate change legislation, regulation and policies on the Manchester City Region within the North West. This report seeks to focus attention on what the region could be doing in the short to medium term to address the economic impact of new Climate Change legislation.

3.1 Study methodology

The study methodology had the following key elements:

- ⇒ Literature and policy review;
- ⇒ Desk based economic research;
- ⇒ Stakeholder interviews (public sector and corporate organisations); and
- ⇒ Data analysis (including modelling and econometric analysis).

For full details of the methodology underpinning the scenario analysis section of the study see Annex E.

3.2 Report Structure

The rest of the report is structured as follows:

- ⇒ Chapter 4: The wider sustainability context and climate change policy;
- ⇒ Chapter 5: Impact analysis: framework, energy use and risk profile of various sectors, scenario analysis;
- ⇒ Chapter 6: Challenges and opportunities; and
- ⇒ Chapter 7: Policy implications.

There are also a series of annexes highlighting further the details of some areas of the analysis.

4 Climate change legislation and policy agenda

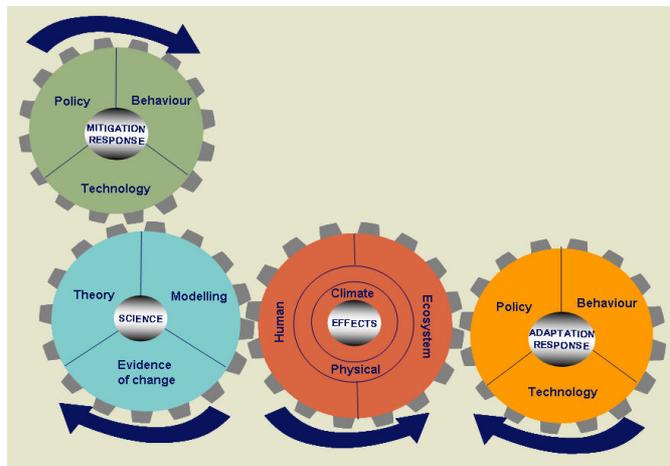
Climate Change is defining a new legislative and policy agenda in the UK and globally, the overall direction and content of which is far from fully defined. The UK climate change bill, the planning policy supplement on climate change and the EU green paper signal significant steps to adapting to, and mitigating the impacts of, climate change. This is altering market conditions and affects the underlying assumptions used to establish the economic priorities of the Manchester City Region within the North West.

This chapter highlights the key legislative measures and policy drivers underpinning the climate change agenda. It sets the context for the study's evaluation of climate change legislation impacts on the City Region and the North West economy which are considered in chapter 5. Further detailed research findings of issues covered in this chapter are presented in Annexes A and B.

4.1 The wider sustainability context

Climate change is one of the most significant global challenges at present. Figure 4.1.a. illustrates the key components of climate change including its science, impacts, mitigation and adaptation. Existing and future legislative changes are aimed at achieving environmental objectives through behavioural change. These can have significant economic implications. This study considers the impact of policies involved in the mitigation and adaptation responses.

Figure 4.1.a – Climate change in the broader sustainability context



Source: Deloitte Analysis

1. Science cog: The theory and evidence from scientific study are used in the future modelling of climate. The model is inherently based on the conclusion that global warming is taking place, although does not assess how.

2. Effects cog: This is driven by the science cog, as shown by the direction of movement of the arrows. The model categorises three 'tiers' of effects: climate effect (e.g. temperature, precipitation); physical effects of climate change (e.g. floods, droughts, melting ice); and both the human and ecosystem effects of both climate change directly and its physical effects (recognising that these also inter-relate, for example through the food chain).

3. Adaptation cog: In the absence of any attempts to reduce the process of global warming, the 'effects' cog drives the need or desire to adapt to the aforementioned changes: for example rising sea levels may necessitate migration of people from coastal areas. As a

further example, the adaptation response to increased flooding of houses on river plains may be for Government to restrict new building in these areas ('policy'); for people to decide not to buy houses in those locations ('behaviour') or for 'technology' solutions such as levies or house defences. Importantly, items in this cog are actions taken to adapt to changing physical conditions, not to try to prevent further change (which exist in the mitigation cog).

4. Mitigation cog: Efforts and actions to reduce the process of global warming are summarised in the mitigation response cog. This definition differs to the adaptation cog and that to gain maximum understanding of the model, care should be taken as to which examples fall into each category. In a number of cases these actions will be around abatement of greenhouse gases, however other technological solutions to global warming, such as encouraging algal blooms in marine environments, or placing mirrors in space to deflect sunlight, are also relevant here.

As discussed, this research is focused on the regulatory impact of climate change. Other factors that will impact on business and the economy are briefly covered where they may affect climate change legislation but are not analysed in great depth. For example, regulation may differ depending on the extent of temperature changes and brand value may determine how resilient firms are to any changes / cost increases.

Inevitably, the need for regulation will vary with the impact of climate change on the environment. The different elements that will contribute to this include changing climate, altered frequencies and intensities of extreme weather, together with rising sea level and other climate change effects. The focus of this study is on the impacts of climate change legislation, although Annex A presents a range of future scenarios for levels of emissions and temperature rises sourced from IPCC – which highlights the uncertainty of future legislation requirements.

4.2 Key legislative measures

The Stern Review of the Economics of Climate Change (2006):

"Climate change presents very serious global risks, and demands a very urgent global response. Climate Change presents a unique challenge for economics: it is the greatest and widest ranging market failure ever seen"

Stern pointed out that the challenge requires a new paradigm of economic policy that must be multi-generational and comprehensive rather than short term. The impacts of climate change are very broad ranging. They interact with other market failures and economic dynamics, giving rise to complex policy challenges.

Over the past fifteen years a range of Climate Change policy, regulation and legislation has been put in place that is already impacting on market behaviour. This is set to continue and indeed accelerate as international agreements are put in place. The key areas at each level include:

- **International** – International legal obligations are reflected in the UK climate change agenda. The adoption of the Framework Convention on Climate Change (UNFCCC) in 1992 was widely considered to be a major step forward in tackling the problem of global warming. The Kyoto Protocol was adopted in 1997 at the third Conference of the Parties to the UNFCCC in Kyoto, Japan. The protocol provided legally binding limits and reductions in GHG emissions within 2008 - 2012. For parties to earn and trade in emission credits Kyoto also introduced three mechanisms; the emissions trading, joint implementation and the Clean Development Mechanism (CDM). And, in December 2007, 187 countries in Bali agreed on a road map aiming to secure an international deal beyond 2012 following the expiry of the Kyoto agreements. Negotiations to finalise a future climate agreement are set to be conducted in Copenhagen in 2009.
- **European** – In response to international obligations, the EU launched the Emission Trading Scheme (ETS). Now the largest asset market ever created, it requires member states to impose carbon dioxide emission caps on their energy intensive industries and power stations. In January 2008 the scheme broadened from only covering CO₂ to including nitrous oxide and perfluorocarbons.

- **United Kingdom** – The Climate Change Programme set out in 2006 delivers the UK Government's plans for meeting its international and European climate change obligations. The government has developed a framework for achieving its long-term aims in mitigating and adapting to climate change through the Climate Change Bill. Moreover, the Energy White Paper (2007) set out a plethora of measures including the Climate Change Levy and Renewables Obligation.

Further details of these measures and other legislative changes are provided in Annex A.

4.3 'Horizon' Issues

Climate Change is a fast moving political agenda and therefore it is difficult to forecast where political or other pressures alter the current plans for legislative intervention, or the shape of that legislation. Consequently this representation is based on the current official position. This section sets out the likely horizon issues and considers impacts on the cost of energy and different sectors of the economy.

Amendments to EU ETS

The EU ETS currently excludes the transport sector at present. However, it will include Air Transport from 2011 / 12 and may also be extended in future phases to include road and rail transport at some indeterminate point in the future.

Resource Security

Energy security is identified internationally as a serious issue for the next 50-years along with potential limits to the supply of water. Significant media attention has been given to the prospect of future wars being fought over rights to water. Whilst the ramifications of future resource insecurity are not the effects of legislation, they could alter the 'playing field' and lead to significant changes in legislation.²

Carbon Disclosure Rules

Larger firms could be expected to disclose environmental information (such as their carbon footprint) in the same vein that they currently disclose financial information. This would need to be supported by national level legislation but could be a further way for the UK Government to influence business behaviour by regulation complementary to the EU ETS. This would improve transparency for ethical investors to make informed decisions. There is clearly a cost in providing and monitoring this level of information although some companies are already engaged in environmental reporting voluntarily due to Corporate Social Responsibility, customer or shareholder pressures, including AstraZeneca, Vodafone Group, Unilever, Marks & Spencer Group, Tesco, GlaxoSmithKline, and Cadbury Schweppes.³ Government may seek to make this mandatory in the future.

Willingness to Insure

Legislation may be needed where insurers and re-insurers are unwilling to operate in a market where climate change risk premia are shared by those in safe and un-safe areas. Terrorism insurance is one example where this has been necessary. This may occur where there is insufficient incentive for insurers and re-insurers to supply to high risk areas. Equally, if firms do offer insurance policies, but charge this group or all consumers a higher premium to reflect higher risk, affordability issues could result in fewer people taking out insurance. In both cases, there is potential for market failure and thus there may be a need for Government intervention through legislation. Insurance for unexpected environment events – such as large scale flooding / storms caused by climate change may be provided through a pooled fund, similar to the insurance fund for terrorism.

² Discussed in Deloitte's 2008 report – Climate Changes Everything: The Dawn of the Green Economy

³ Carbon Disclosure Project's 'Greenhouse Gas (GHG) Emissions and Climate Change' questionnaire 2008

Measuring carbon footprints in the supply chain

It is Government policy that value for money (VfM) must be assessed over the whole lifetime of a project and not just VfM directly relevant to the purchaser. This will include taking into account disposal (either sale proceeds or decommissioning costs) and estimating the costs and benefits to society as a whole – such as the environmental impact – as set out in the Treasury's Green Book. This principle applies particularly to the Government's Public Finance Initiative Programme (PFI), a mechanism used extensively across the public sector to bring in private finance to deliver major construction projects.

There is currently no legislation which enforces businesses to take longer term impacts into account. The Sustainable Procurement Task Force (set up by the UK Government in 2005) stresses that the efficiency agenda and sustainability are complementary rather than being competitive and recommends the enforcement of whole life costing with non-monetary benefits be properly valued. To accurately analyse the whole life costs and benefits of different suppliers, however, would require business investment in skills and time resources.

The benefits of whole life costs are also not necessarily recognised by consumers. For example, the construction cost of a building that incorporates energy saving features may be higher, but these may be more than offset through lower energy bills and running costs, making it both economic and environmentally beneficial. However, this might not be valued by consumers who may focus on the short term cost.

To maximise impact of GHG reductions, firms would need to focus on areas of highest impact across the product life cycle as the examples set out in Annex A illustrate.

The challenge of measuring carbon emissions in the supply chain should not be underestimated especially when business operations are segmented often with elements of outsourcing.

Uncertainty of carbon price

Decisions on whether or not to continue emitting at current levels or reduce emissions – by cutting production, outsourcing, investing in carbon-cutting solutions such as carbon capture and storage – are complex and the returns often uncertain, when there is a lack of clarity on future carbon price.

Carbon Capture and Storage (CCS) is a type of Carbon Abatement Technology in which the carbon in fossil fuels is captured (as CO₂) and committed to long-term storage in geological formations such as depleted oil and gas fields. The Government is committed to demonstrating this technology on a long term commercial scale. However, uncertainties about the carbon price can affect investment in the take-up of CCS where business may find it cheaper to emit if the carbon price is low enough in the future.

The following sections outline how the price of energy and resources may be affected in future according to changes in the carbon price and how this and climate change legislation might affect business.

4.4 The impact of future carbon prices on energy

The supply of and demand for energy, as with any commodity in a functioning market, are related to each other through price. If there is excess supply, prices will tend to decline, which in turn will eventually encourage operators to withdraw production. Conversely, if the market is tight, prices and profits will rise, thus encouraging new entrants. Similarly, market participants will also respond to the price expectations, based on their expectations of supply and demand.

In addition to impacts through attitudes and regulation, the use of or demand for different types of fuels can be affected by price elasticities of relative fuel prices. For example, higher prices for gas relative to other fuels will result in higher average energy prices and lower overall energy use, but the share of gas in total energy use will also fall.

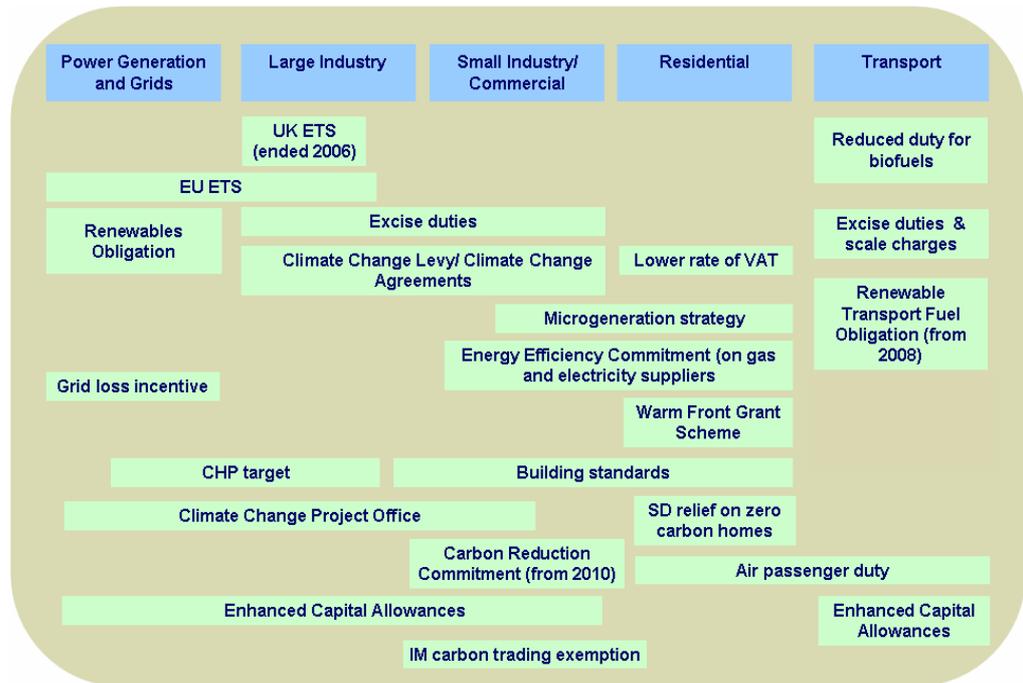
The different sources of energy are inherently linked. For example, relatively cheaper coal compared to gas will increase greenhouse gas emissions as more power production will be based on coal which emits more greenhouse gases per unit of output than gas. In an environment where supply is effectively fixed and energy use is unchanged, higher CO₂ emissions would increase the carbon price.

The carbon price would have implications for the price and usage of other forms of energy. Further detail is provided in Annex B. The impact of variations in the future carbon price will vary for different types of businesses and different sectors, although the businesses which are most likely to be adversely affected are those with a high energy usage and where processes are harder to change.

4.5 Key policy drivers across different sectors

The key sectors that are most likely to be affected by climate change legislation in the UK are outlined in the following table.

Figure 4.5.a Key drivers – policy instruments in the UK and their effects on different sectors



Source: Deloitte Analysis

As highlighted in the illustration above, there are particular areas of legislation that will impact on business and consumers. For example, the Renewable Obligation will affect power generation and grids or the UK ETS will affect large industry. However, it is also clear that some areas will affect businesses across many sectors.

For instance:

- ⇒ **Indirect costs of the EU Emissions Trading Scheme (EU ETS):** Many business offices purchase grid power. This is often subject to price fluctuations due to supply security issues and the impact of the ETS has already added the price of carbon to the cost of electricity.
- ⇒ **EU Directive on the energy performance of buildings:** The EU Directive on the Energy Performance of Buildings provides minimum energy performance requirements. There are requirements for new buildings, existing buildings undergoing renovations, and existing buildings when being sold or rented out if they are over 1000 square meters in size. This will be an important consideration to the future management and investment decisions as there is likely to be additional cost implications for buildings in need of improvement.

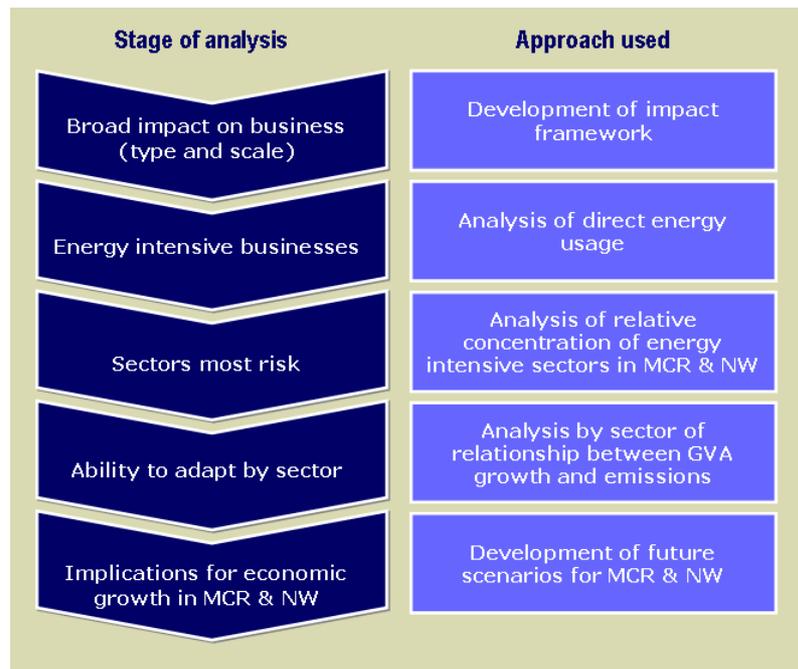
Key points and summary

- ⇒ Climate change lies within the broader sustainability agenda. This research is focused on the impact of climate change legislation but recognises the wider context;
- ⇒ All businesses will be affected by legislation enforced at an international, EU and UK level and therefore the impact on the Manchester City Region and the North West economy must be assessed in order to design the appropriate proactive and reactive strategies;
- ⇒ The complex and uncertain nature of behaviours make it difficult to predict what type of legislation may be required over the longer-term. However, it is possible to anticipate some 'horizon' issues that may need to be addressed in the medium term; and
- ⇒ There is uncertainty around the future levels of carbon pricing which could create difficulties for business in their planning.

5 Impact Analysis

This chapter examines the types of impact that will affect business due to climate change legislation identified in Chapter 4. It describes the impact analysis framework, highlights key findings from the analysis and outlines potential scenarios. The figure below shows each broad stage undertaken in the impact analysis and a brief description of the associated approach for each stage.

Figure 5.a – Process diagram



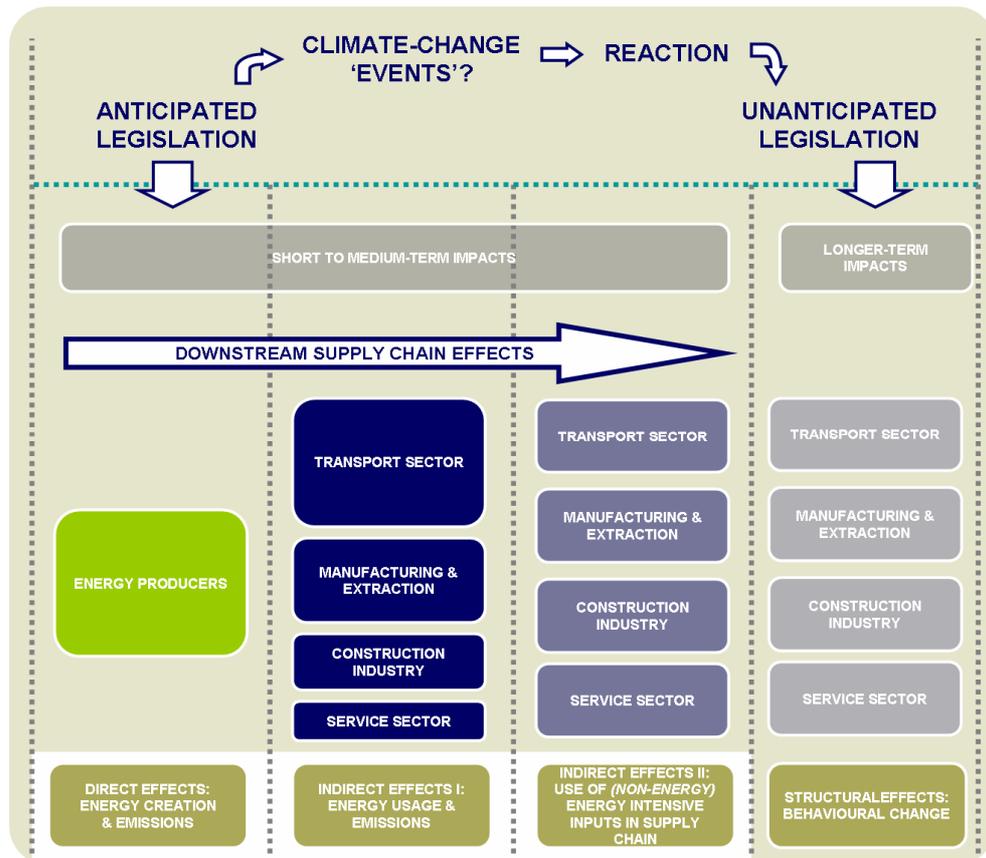
5.1 Impact framework

An impact framework has been developed for this study to assess the effect of climate change legislation on the economic structure of the Manchester City Region and the North West. This sets out the analysis by type and scale of impacts across sectors of the economy to highlight which sectors are more at risk and where opportunities may lie. It highlights the need for the City Region and the North West to build on assets where possible in order to maximise opportunities and minimise risks.

This impact typology or framework has been developed to differentiate between the impacts in the short / medium-term and the long-term:

- ⇒ **The short / medium term** is defined as the period in which the underlying structure of the economy and purchasing patterns are essentially the same as today but the effects of legislation begin to work through the system.
- ⇒ **The long-term** is defined as the period by which the underlying structure of the economy and the way people and businesses behave with respect to climate change has undergone fundamental shift.

Figure 5.1.a – The Impacts of Climate Change on Business



Source: Deloitte Analysis

The rationale for this split is that over time, legislation will work to change relative prices. This will influence business behaviour and change purchasing patterns, increasing incentives to research and innovate to benefit from climate change and together these incentives will result in longer-term structural changes to the way the economy works.

This behavioural and structural change over the longer-term will be driven by three broad areas:

- ⇒ Fear of legislation;
- ⇒ Corporate Responsibility (CR) agenda; and
- ⇒ Hard economic and financial opportunities (including inward investment in cleaner elements of supply chains).

There will be three types of impact on business which will differ markedly by sector as highlighted in the diagram. These are:

- ⇒ Direct effects – affecting energy producers;
- ⇒ First-order indirect effects – affecting major energy users and carbon emitters; and
- ⇒ Second-order indirect effects – affecting all who use energy intensive or carbon emitting products and services through their supply chains regardless of the sector they are in.

There will be differential effects across sectors with those most reliant on energy and carbon emissions affected to a greater extent than those who rely more on goods and services which are themselves energy intensive and carbon emitting.

The certainty of impact decreases with both time and the distance along the supply chain. Indicatively it is easier to hypothesise what the impacts on a major industrial energy user may

be, than it is to hypothesise how a service sector player embarking on a capital construction project may be affected through the additional costs of carbon in producing and transporting glass to their premises.

5.2 Understanding sector energy usage in Manchester City-Region

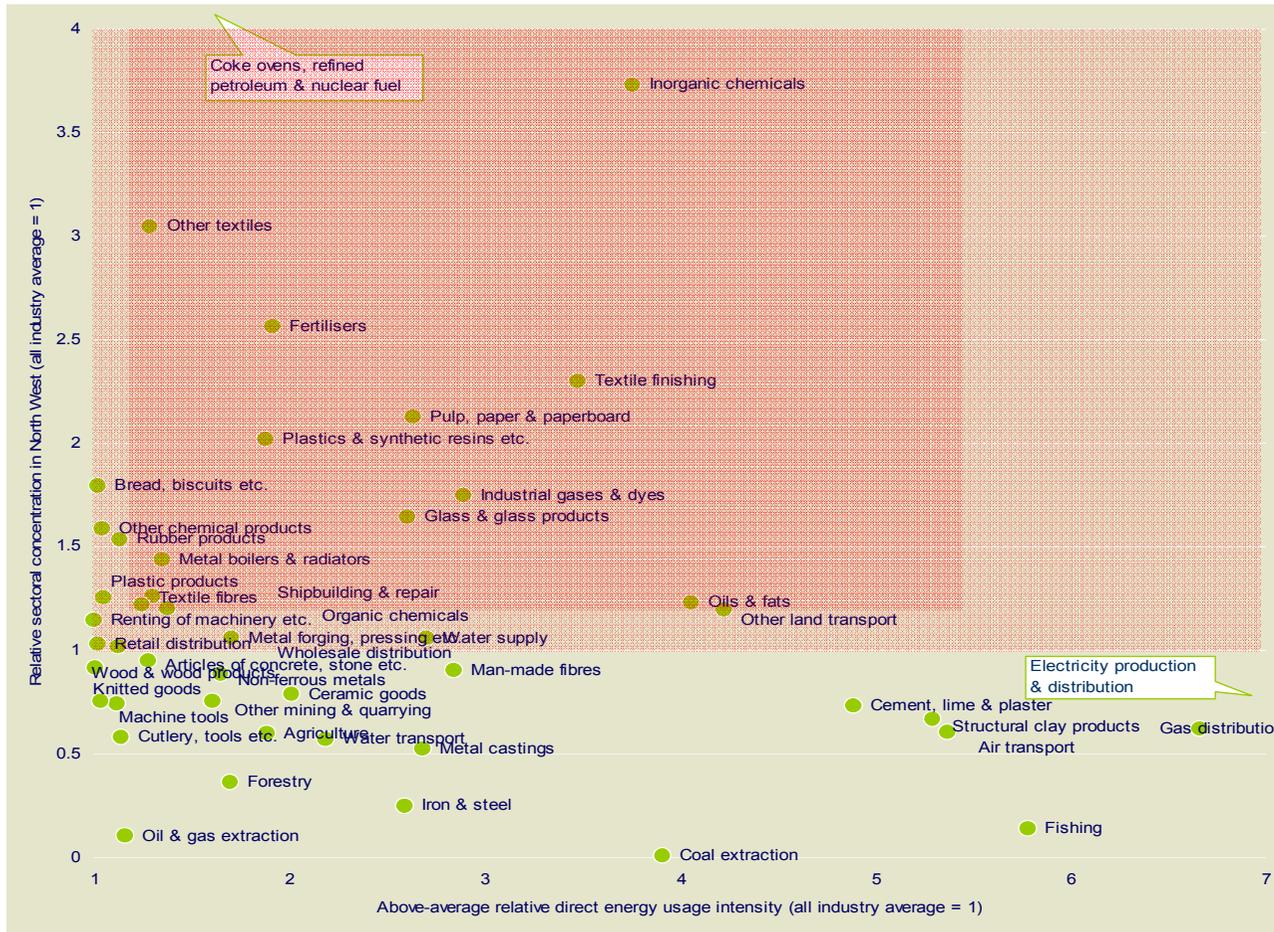
To test and verify the theory that climate change legislation will impact different sectors to different extents, subsequent analysis is based on the impact framework. It assesses the detailed industrial structures in the North West and Manchester City Region and how much those industries tend to rely on the use of energy in their activities.

This is, therefore, an examination of first-order indirect effects – specifically those affecting major energy users in Manchester City Region and the North West.

To put the analysis of the City Region in context of the wider region, the first examination of energy intensity of sectors and their presence in the economy is for the North West. Figure 5.2.a plots the relative sectoral concentration of activity in a given sector in the North West against that sector's relative direct energy usage intensity. This relative intensity measure controls for the value of energy inputs as a proportion of all inputs to the sector – the higher the relative intensity the higher the sector's reliance on energy. Illustratively, the sectors which have a higher relative intensity (or higher than average energy usage) are positioned further towards the right on the chart.

UK averages are represented by point (1, 1) on the chart. Sectors with relative direct energy usage intensity lower than the UK average are omitted from the chart to reduce the complexity. The area shaded in the red and darker red on the chart shows those sectors that are more prevalent in the North West than the national average and also more intensive users of direct energy inputs than the national average, which are more vulnerable to climate change legislation.

Figure 5.2.a – Intensity of Energy Use and Sectoral Presence in the North West, 2006.



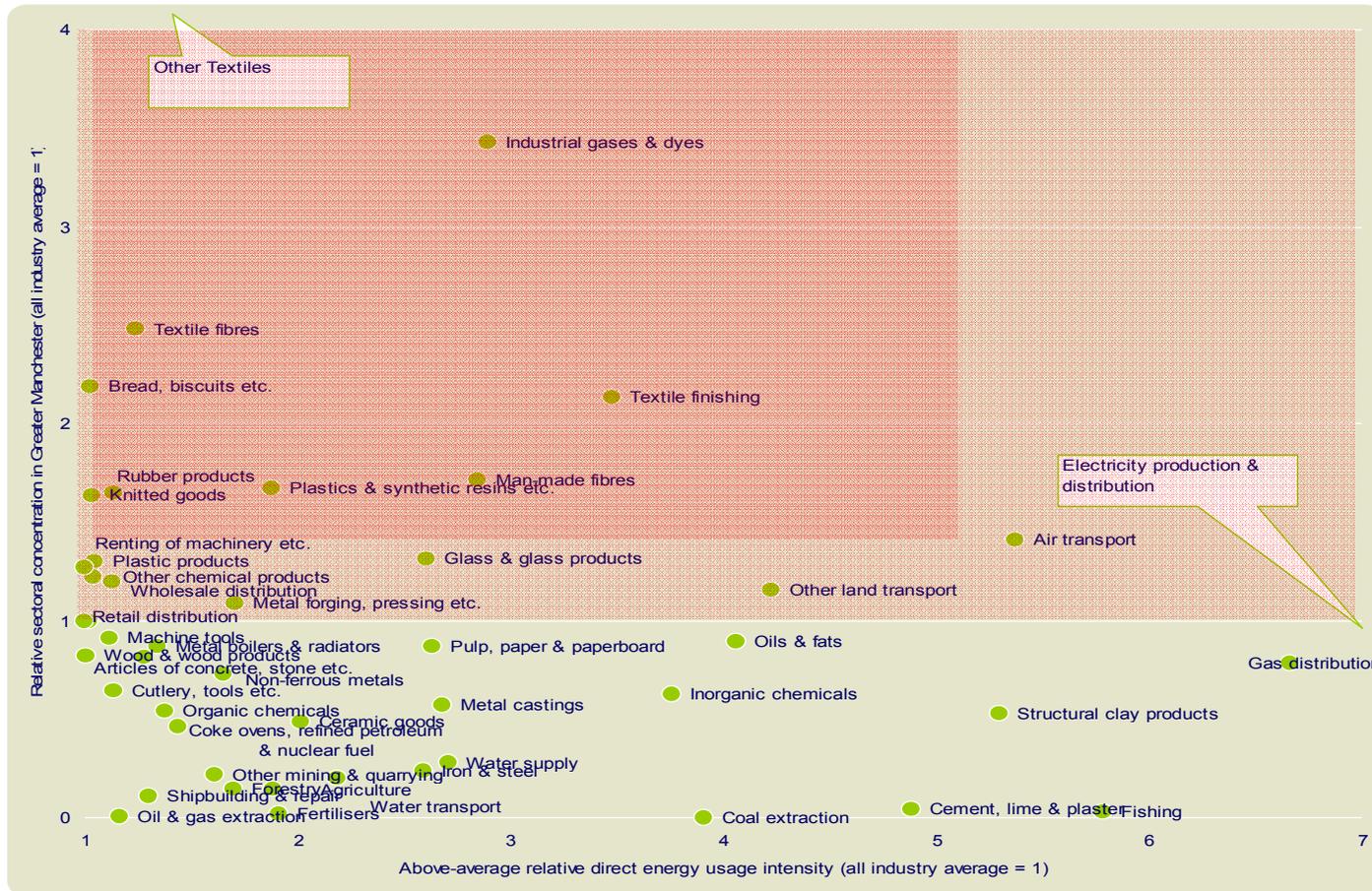
Source: ONS, Deloitte Analysis

As an example, Electricity Production and Distribution uses significant amounts of energy but is underrepresented relative to the national average in the North West. Inorganic Chemicals, however, are much more prevalent in the North West than much of the rest of the country and are also intensive users of direct energy inputs.

The equivalent chart for Manchester City Region within the North West is presented overleaf in Figure 5.2.b, and whilst the positions on the chart in terms of relative direct energy usage intensity do not change, the sectoral concentrations do. Notable differences (effectively shifts up the vertical axis) include the movement of Air Transport into the 'red zone' and Inorganic Chemicals out of the red zone. Some textile industries have also shifted up the scale in Manchester, most notably Other Textiles.

This reflects some of the key differences between Manchester City Region within the North West and the wider North West. The economic structure of the North West, with its higher concentration of more vulnerable sectors suggests that strategies may need to focus on mitigation activities as a priority.

Figure 5.2.b – Intensity of Energy Use and Sectoral Presence in Manchester City Region, 2006.



Source: ONS, Deloitte Analysis

Figure 5.2.c examines the industries that use less direct energy as a proportion of all inputs to production than the national average. This analysis confirms that the industries using relatively lower proportions of energy are primarily service based and light industrial. This contrasts with figures 5.2.a and 5.2.b where, almost exclusively, the sectors included were manufacturing, utilities or transport-related.

Figure 5.2.c - Intensity of Energy Use and Sectoral Presence in Manchester City Region, 2006



Source: ONS, Deloitte Analysis

It is only direct energy use that is represented in the chart. Construction, which features toward the left of the above chart, uses a relatively low proportion of direct energy but is likely to use products that are highly energy intensive in their production.

Whilst this approach is useful and begins to highlight some of the sectors which are more likely to be affected in the City Region, there are other important considerations to account for before relating this to the City Region's sectoral risk profile. For instance high location quotients may fail to consider absolute employment levels which are important when trying to gauge the scale of City-Region level impact for different sectors.

5.3 Manchester City Region within the North West sectoral risk profile

Analysis of sectoral risk in the Manchester City Region uses a traffic light approach to profile sectors that satisfy pre-defined criteria intended to show which sectors are relatively more exposed to the effects of climate change legislation. The quantitative methodology is described in detail below.

The criteria presented in the table from left to right are:

- ⇒ **Relative Direct Energy Usage Intensity** – defined as the proportion of inputs to production as a percentage of all inputs to production relative to UK average levels;
- ⇒ **Relative Emissions** – defined as carbon emission per unit of sectoral GVA relative to UK average levels;
- ⇒ **Relative Sector Presence in City Region** – defined as the employment location quotient for that sector;
- ⇒ **City Region Employment** – defined as the absolute level of employment in the sector as at 2006; and
- ⇒ **Projected Baseline Growth** – defined as the Cumulative Annual Growth Rate (CAGR) predicted by the Greater Manchester Forecasting Model.

Rather than include each of the 123 sector groups featured in UK Input Output analyses, the analysis controlled for sector inclusion on the basis that, sectors were only included as relevant if they:

- ⇒ Display a Relative Direct Energy Usage Intensity greater than 1, with Relative Sectoral Presence greater than 1 AND/OR absolute employment greater than 1,000 persons in Manchester City Region; Or
- ⇒ Display a Relative Direct Energy Usage Intensity greater than 0.5, with Relative Sectoral Presence greater than 1 AND/OR absolute employment greater than 4,000 persons in Manchester City Region;

Thus, sectors which are not energy intensive nor likely to emit carbon in large quantities, or are not relevant to the City Region are filtered out from the analysis. The sectors are then ranked with the highest direct energy usage intensity sectors first.

The remaining sectors then have risk articulated on a traffic light basis, where red signifies a value that is risky with respect to climate change legislation and related regional prospects, amber signifies a more neutral outlook, and green means that the risk is low.

Whilst high energy intensive and emissions-related sectors are designated in red with implied negative connotations, relative sector presence, employment levels and growth prospects are designated in red if current presence, employment levels, and growth rates are high (which have positive connotations generally but not when referenced to climate change in this framework).

This is best described using the first sector in the table, Air Transport, as an example. Moving from left to right each cell is red which suggests that the sector may be vulnerable with respect to climate change legislation because Air Transport:

- ⇒ is one the most energy intensive sector in the City Region that meets the pre-defined criteria;
- ⇒ also emits relatively higher than average carbon emission levels;
- ⇒ is more prevalent in the City Region than the UK average;
- ⇒ accounts for a large number of jobs in City Region;
- ⇒ is projected to be a major driver of growth in City Region; and
- ⇒ satisfies equivalent criteria for the North West Region.

Figure 5.3.a – Sectoral Risk Profile, Manchester City Region and match with the North West, 2006⁴



Source: ONS, Deloitte Analysis

Many of the sectors important to the City Region economy have both high energy use and high emissions relative to other sectors. There are, however, some sectors where relative energy use is high but relative emissions relatively low (metal forging and pressing, for instance) and vice versa – where relative emissions are relatively high but relative energy use is relatively low (textile weaving for example).

In summary, this analysis suggests that those sectors that are at higher risk from climate change legislation due to their importance to the regions current economic activity, (in some cases) future growth prospects and relatively high energy usage and/or emissions are:

⇒ Air Transport;

⁴ This analysis is not aligned with the sector definitions within the North West Regional Economic Strategy. This is due to the sector classifications of official data. However, the data used is more disaggregate and therefore allows a more detailed analysis.

- ⇒ Other Land Transport;
- ⇒ Textile Finishing;
- ⇒ Industrial Gases and Dyes;
- ⇒ Man-made Fibres;
- ⇒ Glass & Glass Products;
- ⇒ Plastics & Synthetic Resins;
- ⇒ Other Textiles;
- ⇒ Textile Fibres;
- ⇒ Knitted Goods; and
- ⇒ Textile Weaving.

Manchester Airport is an interesting example of a business which will need to adapt. However, the impacts on this sector are complex and subject to different types of international regulation. For instance, the airport, as a high energy user, is already part of the first phase of the Energy Trading Scheme (ETS) and plans to be carbon neutral on its energy use by 2015. A further phase of the EU Carbon Trading Scheme is proposed to cover aviation carriage and will financially reward lower carbon emitters. There is a strong focus on Manchester Airport as an indirect employment-generator and International Gateway therefore is important that the relative competitive advantage can be maintained.

Non-transport service sector industries are notable by their absence from the above list. This reflects the fact that as Manchester City Region and the North West have moved toward a service sector economy, these sectors are not likely to be as severely impacted in the first instance as manufacturing, primary and transport-related industries by climate change legislation because they do not use energy as intensively or emit carbon to such an extent. These service sector industries will be impacted through the supply chain, although it is hard to provide equivalent quantitative evidence of secondary effects.

Another concern is that highly carbon intensive sectors such as power generation, base metals manufacture, oil refining and air transport tend to be capital intensive. Consequently, they have relatively high labour productivity levels (as measured by GVA per employee) and contribute more than proportionately to productivity levels in the areas in which they are located. If these are growth industries, as is the case with Air Transport, this also drives productivity growth.

These sectors are dominated by a few significant 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.

The next section uses regression analysis to study the relationship between emissions and GVA growth across different sectors of the economy to assess the potential future impact of climate change legislation on specific sectors of the Manchester City Region and North West economy.

5.4 Quantifying impacts – methodological principles

Scenarios have been developed using time-series data to assess the relationship between GVA and emissions at a UK level for comparative purposes rather for a definitive 'forecast'. This is because they do not take into account future adaptations such as changes in technologies and processes. The methodology is based on linear OLS regression analysis of the historic relationship between growth in output and emissions by broad industry groups. The analysis uses greenhouse gases⁵ emissions data (expressed in units of carbon dioxide

⁵ Includes nitrous oxide (N₂O), methane (CH₄), carbon dioxide (CO₂), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆).

equivalent) and GVA from the Office for National Statistics' Environmental Accounts. The latest data available is for 2005.

This data is grouped into eight broad sectors namely: Manufacturing; Electricity, gas and water; Construction; Distribution and hotels; Transport and storage; Communications; Finance and business services; and Public sector. This recognises the fact that the impacts are likely to differ by sector but does have a shortcoming in terms of spatial coverage. The analysis is based on data for the UK rather than the North West, where the information is not available at the required sectoral detail. Although based on UK level data, the results are likely to be similar for the North West economy assuming the relationship between emissions and output is similar for the same sectors across different regions in the country.

The analysis also assumes the same historic relationship between growth and emissions will continue in the future. Consequently, for some industries, a reduction in future emissions levels would therefore correspond with a decline in growth. There are likely to be other external factors that will influence the level of both emissions and output over time that have not been taken into account in this analysis. Technology, for instance, will help to reduce emissions growth whilst boost growth in output through increases in productivity. The results, therefore, should be treated with caution, due to uncertainties and other variables not taken into account such as technology developments, efficiencies and cost changes in the future.

To tackle these issues, the report presents high-level quantitative forecasts at an aggregate level for the North West and the City Region within the North West and suggests that the results (which are presented relative to the baseline projections in the Spring 2008 version of the Greater Manchester Forecasting Model) are interpreted as indicative as a 'failure-to-adapt' scenario.

5.5 The historic relationship between economic growth and emissions

This section considers the historic relationship between economic growth and emissions for the sectors that are important to the Manchester City Region.

Analysis for this by sector requires time-series data at fairly disaggregated levels which is not available at local or regional level and therefore the analysis has been conducted using UK level data level. This assumes that there are similar relationships with the equivalent sectors within City Region and across the country. The results produced in this analysis are indicative only and are used for developing future scenarios rather than to provide definitive forecasts for the City Region within the North West. The analysis in this section is based on OLS time-series modelling which estimates the relationship between growth and emissions in each of the broad sectors as defined above.

Comparisons for emissions per unit GVA in the Manchester City Region and at the national level have been made – where data is available – which indicate that it is a reasonable assumption to expect similar trends for each sector.⁶

Figure 5.5.a shows historic trends in the level of emissions and GVA across the eight broad sectors in the UK over the past ten years. In some sectors there has been a similar trend movement in emissions and GVA whilst in others the link is less apparent. Whilst data is available over the past 15 years, the analysis assumes that relationships over a decade ago are likely to be less relevant now – a simple 'eyeballing' of the data suggests that the first five years of data is much more volatile, which could indicate problems with the data or a fundamentally different relationship.⁷

⁶ Please refer to Annex E for further details.

⁷ Given that this simple exercise is to provide an estimate of what may occur if relationships between growth in GVA and growth in emissions over the last 10 years were to continue, there is no modelling of the preceding five year period to test for structural breaks in the data. The analysis is a means to an end

Figure 5.5.a – Historic trends in level of emissions and GVA across sectors in the UK



Source: ONS, Deloitte Analysis

Analysis on this time-series data on changes in emission levels and growth in gross value added further highlight that there are variations in the degree of correlation between output and emissions across sectors depending upon the measure used.

rather than representing a detailed econometric and forecasting analysis of economic growth and emissions. It is designed purely to underpin a future hypothetical scenario.

These are shown in figure 5.5.b and 5.5.c below. A higher absolute value in the correlation coefficient suggests a stronger relationship between economic output and emissions in the case below. The strongest correlation is within the transport and storage sector of 0.98 which is incredibly strong and ties in earlier analysis suggesting that transport is the most at-risk sector.⁸

Figure 5.5.b – Relationship between level of emissions and GVA in the UK, 1995 to 2004

	Correlation
Manufacturing	-0.44
Electricity, gas and water	0.48
Construction	0.98
Distribution and hotels	0.88
Transport and storage	0.98
Communications	0.62
Finance and business services	-0.24
Public sector	-0.99

Source: ONS, Deloitte Analysis

Positive values indicate that the two tend to move in the same direction over the time period in question. This means that over the last 15 years GVA and emissions have risen together in:

- ⇒ Construction;
- ⇒ Distribution, Hotels and Catering;
- ⇒ Transport & Storage; and
- ⇒ Communications;

Negative values indicate that the two have moved in opposite directions, so that when GVA is higher, emissions are lower. These sectors are:

- ⇒ Manufacturing;
- ⇒ Electricity, Gas and Water;
- ⇒ Finance and Business Services; and
- ⇒ Public Sector.

It is important to note that although these sectors may demonstrate a reduction in emissions, it may be caused by outsourcing components of the supply chain that have relatively higher emissions, which analysis by sector using this approach does not take into account. The UK and City Region within the North West would indeed have lower emissions but the net global effect is likely to be zero. Nor does this analysis factor in the emissions at previous or subsequent stages in the supply chain – i.e. the carbon footprint of the goods and services in the product or service lifecycle, which is an important consideration. Figure 5.5.c shows the relationship between growth in emissions and GVA in the UK.⁹

⁸ This is so strong this suggests either an almost perfect linear relationship or that GVA has been used in some way by ONS to estimate emissions levels

⁹ Using a log-linear specification.

Figure 5.5.c – Relationship between growth in emissions and growth in GVA in the UK, 1995 to 2004

	Correlation
Manufacturing	0.46
Electricity, gas and water	0.20
Construction	-0.34
Distribution and hotels	0.48
Transport and storage	0.36
Communications	0.28
Finance and business services	-0.46
Public sector	-0.44

Source: ONS, Deloitte Analysis

The correlations are lower than with respect to ‘levels’, which is generally expected for changes in variables relative to their levels, but there is a change of sign in certain instances which suggest that the relationship is not quite as straightforward as implied in the analysis of levels.

For instance in manufacturing, GVA has held steady since 1995 with emissions falling, but when GVA growth has been higher, so has growth in emissions. Likewise when emissions have decreased at a faster pace so has GVA. In distribution and hotels there have been increases in both GVA and emissions over the period and growth is also strongly positively correlated. This suggests that economic growth and growth in emissions in manufacturing and distribution are still interlinked.

Sectors which show a reasonably strong negative correlation between changes in emissions and economic growth are Financial and Business Services and Public Sector Services – as denoted by the red shaded cells and negative values in each table. This suggests that over the past ten years higher levels of GVA growth have been associated with faster reductions in emissions. This does not necessarily mean that these sectors have ‘decoupled’ – as some relationship between GVA and emissions remains – but the data suggests that in future, it should be expected that these substantial service sector industries can continue to provide strong growth for the City Region within the North West without increasing emissions. The real challenge for these industries, of course, is with respect to the carbon footprint of supply-chain inputs.

For other industries, this will not be so straightforward, and subsequent analysis, which uses these growth relationships to create an alternative future where there appears to be no positive relationship between growth and emissions, will lead to a fall in output growth as emissions are forced to fall by legislation.

5.6 Future scenarios

Baseline

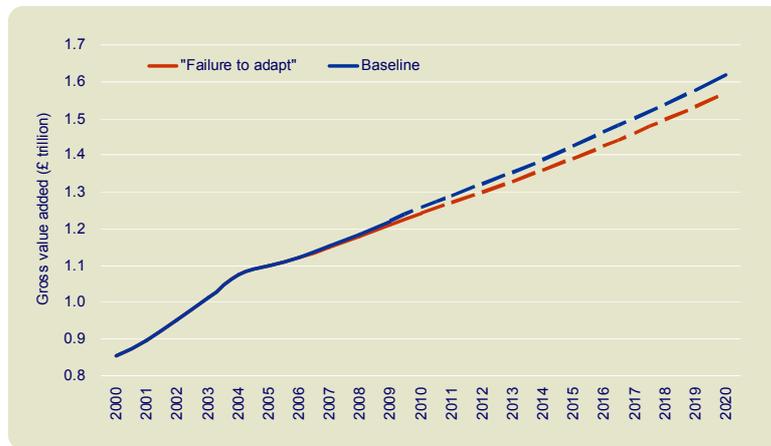
GVA in the baseline case is based on data from the Greater Manchester forecasting model (GMFM) developed by Oxford Economics (OE). The GMFM provides integrated forecasts for GVA, population and households, based on and informed by forecasts of employment change. It is based upon observed relationships between different explanatory variables. There are no specific adjustments for climate change and emissions in the model and this should be viewed as a ‘business-as-usual’ case where firms adapt reasonably well to prevailing climate change conditions and legislation.

The 'failure to adapt' scenario

Forecasts for GVA are based on the regression analysis of the historic links between GVA growth and emissions growth at a UK level, as discussed above.

The 'failure to adapt' scenario assumes that businesses do not adapt to impacts of current and future climate change legislation effectively and growth rates suffer. Crucially, this would occur if, and only if, the historic relationship between GVA growth and emissions growth holds in all sectors apart from Financial and Business Services and Public Sector Services – where no adjustments are made as they already appear to be mitigating effectively – and if White Paper policies for emission targets are met without making the appropriate adaptations to retain growth. Figure 7.3.a shows the results of the analysis at UK level, where over the period 2007-2020 GVA growth would drop by around 0.3 per cent relative to the base case, equating to cumulative GVA over the period of £380 billion.

Figure 7.3.a – Impact of climate change legislation on growth in the UK

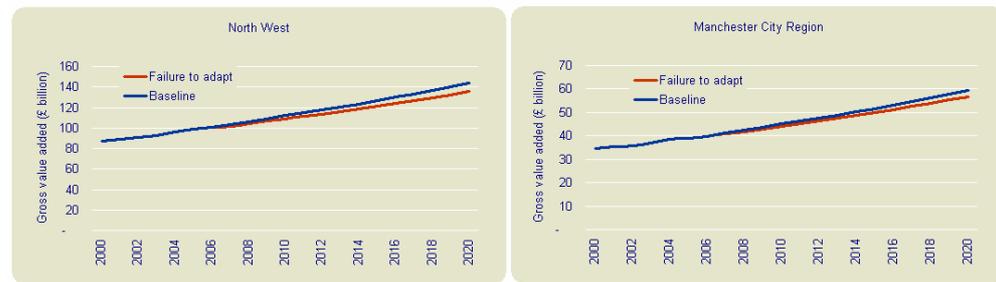


Source: ONS, Deloitte Analysis

Over the period from 2007 to 2020 such effects would equate to a cumulative loss of GVA of £70 billion in the North West and £20 billion in the City Region within the North West, as shown below. It is important to note that in the national, regional and City Region within the North West case, the scenario is not associated with economic contraction, but rather a slowing of growth.

For both Manchester City Region and the North West, the above growth differentials identified at the national level for specific industry sectors are applied to baseline sectoral projections from GMFM to determine the impact of hitting White Paper targets without innovation and at the expense of economic Growth. The impacts of these scenarios are shown overleaf.

Figure 7.3.b – Impact of climate change legislation on growth in the City Region within the North West and North West



	Baseline CAGR	"Failure to adapt" CAGR	Loss in GVA
UK	2.8%	2.5%	£380 bn
North West	2.6%	2.2%	£70 bn
Greater Manchester City Region	2.9%	2.6%	£20 bn

Source: ONS, OE GMFM, Deloitte Analysis

This highlights the fact that even relatively small falls in annual output growth rates caused by inaction can have significant effects in cumulative overall GVA and economic prosperity.

Upside Scenario

Whilst it is logical to assume that under firm targets on emissions, and in the absence of intervention by firms, growth rates could suffer based on previous relationships between output and emissions growth, there is insufficient evidence or rationale to conduct robust analysis into the potential upside of a proactive business response to climate change and its associated legislation.

Furthermore, given the complexities and links between industries through the supply chain and behaviours it is difficult to develop scenarios at this stage. However, potential benefits that could lead to an 'upside' scenario includes:

- ⇒ Efficiency savings through improved processes in manufacturing industries;
- ⇒ More efficient and environmentally friendly supply-chains for all firms and sectors;
- ⇒ Better use of local suppliers create multiplier effects in the local economies; and
- ⇒ Higher growth in the environmental technologies and services sectors relative to other regions in the country and abroad.

It is possible that the potential for the benefits of these 'upside scenarios' are likely to be greater in City Region given its business profile which is predominantly service sector-based and its prominent economic position in the North West economy.

If early action is taken to respond to legislative drivers by cutting emissions, improving resilience, and adapting economic priorities to take account of climate change legislation, the Manchester City Region, which contributes 40 per cent of GVA in the North West, has the potential to boost its economic growth beyond its current ambitious forecasts. This upside – where opportunities are seized and the Manchester City Region and the North West are positioned at the forefront of response to climate change – is hard to quantify. However, it is reasonable to assume that, given the market potential in areas of opportunities, this upside could be very significant. The next section discusses how City Region within the North West can exploit its strong asset base to ensure a path to achieving this success.

Key points and summary

- ⇒ Climate change legislation will have a significant impact on key sectors in the City Region within the North West economy – evident from findings of traffic light analysis for relative energy use and emissions levels of sectors in the Manchester City Region;
- ⇒ Some key sectors – such as transport – are likely to be particularly vulnerable to climate change legislation and therefore in need of risk mitigation strategies;
- ⇒ Other sectors in Manchester City Region – such as finance and business services – are likely to be least adversely affected directly but would be in a good position to exploit the economic opportunities;
- ⇒ Development of the appropriate strategies for mitigation, adaptation and exploration of opportunities will be essential for the growth and success of the Manchester City Region and the North West economies to take advantage of the particular mix of economic and social assets.
- ⇒ Simple regression analysis suggests that there is a strong correlation between levels of and growth in output and emissions in some industries – particularly transport and storage – whilst others, such as finance and business services and the public sector, show no positive relationship;
- ⇒ Scenario analysis highlights that the cost of inaction is likely to be substantial and that even relatively minor falls in annual output growth rates caused by enforced reductions in emissions, will amount to significant losses of output in the long-term: and.
- ⇒ If, the Manchester City Region created the right conditions to take advantage of the opportunities then it has the potential to boost its economic growth beyond its current ambitious forecasts.

6 Challenges & Opportunities

The legislative interventions described earlier will provide businesses with both challenges and opportunities in the future. However, a wide variety of policies and instruments are available to governments to create the incentives for mitigation action. This section outlines some key challenges, interventions and policy implications.

6.1 Challenges

This section highlights likely challenges – both sector specific and other areas of concern for the City Region and the North West.

6.1.1 Sector-specific

As identified in earlier chapters, the following sectors are the most exposed (and relevant) in the North West and City Region.

- ⇒ Air Transport;
- ⇒ Land Transport;
- ⇒ Textiles;
- ⇒ Glass & Glass Products; and
- ⇒ Plastics & Synthetic Resins.

Whilst the first two on the list are expected to deliver significant growth to the area, the remaining industries have been declining. Accordingly the challenges faced are quite different. Service sectors are more likely to be threatened by supply-chain effects as they have less evidence of a direct correlation between GVA growth and emissions, to some extent. However, the opportunities and threats will transcend sectoral boundaries, as highlighted below.

The air and land transport sector is particularly important for the Manchester City Region and North West economies. There is a strong focus on Manchester Airport as an indirect job-generator and International Gateway. The land transport sector is also projected to be a major driver of growth in the City Region and wider North West in future. Legislative impacts have the potential to be much-magnified through the supply-chain due to the critical role of the sectors as a facilitator of individual and business connectivity and knock on costs.

6.1.2 Cross-cutting themes

Although the analysis so far has highlighted some key sectors that may be more exposed, the potential impact of climate change and associated legislation can vary between industries, company size and position in the value chain. These factors have not been considered in the quantitative analysis. The companies at most risk include those:

- ⇒ With high brand exposure;
- ⇒ With substantial environmental impacts;
- ⇒ With natural resource dependence;
- ⇒ Already exposed to regulations;
- ⇒ With increasing potential for regulation;
- ⇒ Operating in competitive markets for specific talent;
- ⇒ With low and or decreasing market power; and
- ⇒ With established environmental reputations.

In addition to competitive forces and regulatory requirements, businesses could face pressure from a larger number of stakeholders in terms of the climate change agenda, including consumers, employees, investors and opinion leaders.

6.1.3 Cost of compliance and changing business models

Multinational and larger businesses often have the resource capability to adapt and be compliant to policy change and social demand. Distribution and supply chains need a ripple effect of greater capacity, investment and leadership for innovation and R&D, learning and resources development.

Business will face compliance and associated costs and some companies may need assistance to deal with this. For instance, some businesses may require assistance with compliance associated with the Climate Change Levy (CCL) and those who may qualify for exemptions must ensure correct certification is held to qualify for CCL relief. Similarly, although the impact may be less direct, the Landfill Tax and Aggregates Levy have compliance and documentation issues. Businesses will also need to ensure they have the correct VAT treatment when trading between companies for the Renewables Obligation Certificates.

SMEs are unlikely to have the inclination or capacity for swift adaptation due to more limited capacity or access to investment. Support schemes for small business are therefore critical. Creating a social and industry culture to accept and support change amongst smaller firms will be very important. This will require a degree of organisational change.

There may, however, be opportunities to establish a set of business standards of operation – which may help to ‘kite mark’ businesses or secure benefits of first mover advantage which are discussed in the opportunities section in this chapter.

6.1.4 Education and awareness

The key challenge in terms of education and awareness is in engaging public and private sector to get buy-in before it is too late. This requires significant investment in education, leadership and marketing and should target all businesses and grades. For example leaders will need to be aware of the implications of climate change to make the necessary strategic decisions but other individuals such as – for example – purchasing managers will also need to be aware to action changes in supply-chain sourcing.

New skills need to be invested in through higher education and technical colleges to ensure employment demands can be met and developed regionally. Specialist skills can be drawn into innovation and R&D forums from regional Universities. The Manchester City Region has an advantage in this area due to the size of student population and young talent pool.

There is a need for clear strategic skills and capacity building support ring fenced to enable industry to react quickly in taking innovation through to large scale production and industry use. In addition, there will be a Learning Skills Council and local authority role (from 2010) in supporting skills development which could be used to help close the skills gap.

6.1.5 Competition

Regulation can hinder competitiveness if companies in a sector are faced with legal / regulatory constraints that do not apply to other firms they may be competing with.

However, this is not always the case and has not been so in the case of EC Utilities Directive (Directive EC 2004/17). This directive regulates the procurement of both public and private utilities in fields concerned with water, energy, transport and postal services, with the aim of opening their procurement markets to EC-wide competition. In doing so, the directive imposes significant restrictions on the policies that utilities can adopt throughout the supply chain. In this instance, the regulation does not create any burdens on business and the savings from increased competition and structured procurement can outweigh the compliance costs.

Climate change and associated legislation has the potential to exacerbate manufacturing decline in the Manchester City Region and the North West unless global pressure against cheaper options from abroad leads to a focus on domestically produced products. The manufacturing sector remains important to both the City Region and the North West and there appears to be policies and support in place to deal with contraction of this sector. However, there is need to explicitly review these in the light of climate change related effects.

Companies in countries such as those on the Pacific Rim and India continue to aggressively compete against western industry, especially manufacturing. The climate change cost burden in the west is not necessarily being matched elsewhere leaving an imbalance in standards and industry either less competitive or uncompetitive with respect to these alternatives.

At present the attitude of Multi National Enterprises (MNEs) is to embrace the change required for effective climate change proofing. There is little evidence of large scale industrial production being shifted to areas outside the EU ETS to remove the associated costs. The CSR agenda and public perception dictates that such a strategy would be frowned upon. This implies that the best strategy for the Manchester City Region and the North West would indeed be to minimise risks in areas that are more exposed to climate change legislation and maximise opportunities in low risk sectors.

The impacts are less transparent in the supply-chain. Whilst firms are keen to be disassociated with the direct implications of energy use and emissions, the linkages to climate change are less noticeable through the supply-chain and the use of non-environmentally conscious inputs from abroad is a possibility in future, especially if cost pressures remain.

6.1.6 Critical energy and water infrastructure

It is essential that the critical infrastructure of transport, power and water is adequate to support the Manchester City Region's and the North West's adaptation and mitigation responses.

There is a need for the provision or incentives to build the right energy and water infrastructure so that businesses can make use of more environmentally friendly fuels and processes. There are currently few incentives to develop new infrastructure to help reduce carbon emissions due to the uncertainty about future demand for these products and services. The Government appears to be responding to growing pressure for a reassessment of the way the energy market works. There is concern that the current regulatory system needs to be better structured to reward carbon reduction efforts.

6.1.7 Transport Infrastructure

An efficient transport infrastructure is crucial to the future prosperity of the area, and a compromise on connectivity could limit the potential for economic growth. Transport will itself be affected as a sector in isolation but the impact has the potential to be much wider due to its importance as a facilitator of individual and business connectivity. Financial support from sources such as the Transport Innovation Fund investment could help to create the right conditions and potentially provide the City Region within the North West with a competitive advantage if used appropriately.

6.2 Opportunities

We have identified a number of actions needed to unlock the business opportunities that exist in tackling the impacts of climate change legislation. All of the challenges discussed in the previous section can also present significant opportunities because change stimulates innovation and adaptation, and those organisations doing so effectively are likely to survive and prosper.

6.2.1 Within existing sectors

The UK, and indeed the North West, has innovative manufacturers who can play a major role in helping reduce the level of emissions. Legislation does not necessarily mean less activity in some sectors with typically higher levels of energy use and emissions. For example, more efficient processes, and technological improvements can reduce energy use and emissions without the need to reduce output. In the case of transport, one of the sectors identified as most vulnerable, making changes such as switching to more carbon-friendly fuels or altering the mode of travel could have a dramatic impact on the sectors' emissions. The sector has been identified as an important asset to the City Region and North West economy due to its economic contribution and forecast future growth and should be at the forefront of innovative development.

A more joined-up approach with local businesses in the supply chain can also provide efficiency savings and reduce carbon emissions. Cutting carbon from the supply chain is a next critical stage in all businesses' contribution to reducing their own carbon emissions and also represents a significant commercial opportunity. Developing credible standards along with

a commitment to helping suppliers achieve best practice, companies could stand to be well rewarded for their efforts as demand for more carbon friendly products increases. It will be important that the SMEs also receive the necessary support so this is an area where the public sector will need to provide support. It is also important that the public sector demonstrates the way forward by acting as a role model on areas such as facilities management.

6.2.2 As a cost-cutting mechanism

Adaptation to deal with the impacts of climate change legislation can provide cost-reduction benefits. For instance, efficiency improvements can result in fuel economy.

Case study – Manchester Rusk Company in Wythenshawe

MRC are a supplier of glazes, marinades, coatings, seasonings and sauces for cooking. They have received a number of awards including:

- ⇒ At the Northwest Food Awards, winning the 'Preserving the Environment' category;
- ⇒ National Energy Efficiency Awards covered by the Independent Newspaper for companies demonstrating nationally the best practice for energy and environment conservation out of 150 entries from companies nationwide; and
- ⇒ Northwest Business Environment Awards for the company demonstrating best environmental practice.

6.2.3 Eco-Innovation – driving new products / sectors

Niche markets will develop and expand as social / 'green' demand grows and greater incentives help create new market segments. More carbon acceptable solutions will be required in aligning future developments in public and private sector with local innovation, R&D and manufacturing. Eco-innovation is a global opportunity, developing proven low carbon sustainable products, production and distribution will increasingly appeal to businesses and consumers alike.

Case study – WhizzGo pay-by-the-hour cars

WhizzGo works in partnership with Manchester City Council to provide low emission cars, available to hire by the hour from convenient on street locations. This creates a cost effective and low emission alternative to car ownership.

WhizzGo has been operational across the UK for over 4 years and is having a significant impact in cutting travel costs for residents and companies, whilst reducing their carbon footprint. Each car club vehicle is typically replacing up to 20 cars.

As motoring costs and other market forces make car ownership less appealing, demand for the network of WhizzGo cars increases and awareness of WhizzGo improves. In Manchester, this has happened more quickly than in other UK cities, with 50% expansion within 18 months of launch.

WhizzGo aims to continue to create sustainable travel solutions for all and will continue to invest in the integration of WhizzGo with other transport systems, smart card systems and the development of pay by the hour bicycle rental schemes. WhizzGo will also continue to invest in low emission technology and sustainable energy sources.

There may be **opportunities for energy consultancies** whereby companies may outsource compliance and advisory services. This will be particularly the case for smaller companies who are less likely to have a Corporate Social Responsibility team or advisor. In addition, moves by companies to change their behaviour will create a boom for climate consultancy services and those involved in carbon trading. This could also include the international consultancy market.

Increased regulation should boost **renewable energy suppliers, companies focused on energy efficiency and green buildings, and automobile companies offering hybrid cars**. There are a number of companies across different countries that could be well positioned to benefit from climate change legislation. Some further opportunity areas include:

- ⇒ Initiatives for **green IT** in data centres such as the all-in-one devices which provide multiple functions – such as printing, copying, scanning and faxing – in one machine. These products are both greener and cheaper for businesses.
- ⇒ There will be an increased momentum to cut emissions from cars, and this will boost carmakers such as Toyota, with its hybrid technology, Honda and Peugeot Citroen, which are introducing **advanced diesel technology**. Also likely to benefit will be parts makers such as BorgWarner (fuel efficiency) and Magna International (vehicle load reduction).
- ⇒ Companies involved in boosting **energy efficiency**, such as Itron, Siemens and Johnson Controls, are likely to benefit from changes in regulation. **Clean-tech companies** make use of leading technologies to use resources more efficiently in a 'greener'. **Clean power companies**, including nuclear power groups such as EdF, Gazprom, the sole exporter of Russian natural gas to Europe, along with wind and solar power groups, are also well placed to profit from the changes climate change legislation will bring.

There may also be an opportunity if the Manchester City Region is able to secure a first mover advantage in any of these areas. It has the opportunity to look ahead of other countries and developing newer products that are more advanced than those currently offered. Likewise, there may be opportunities for SMEs and for higher and further education to boost skills capacity.

6.3 Opportunities to mitigate risks

The mitigation of the risks associated with climate change is also an opportunity. This will need to be a joined-up effort between the public sector and potentially new private sector enterprises specialising in the mitigation of such risks.

An effectively embedded climate change strategy can provide clarity of direction to the market to give confidence to investors and help to put a business in the best competitive position in the face of these challenges. These challenges will vary across different sectors and business.

There is also a need for a joined-up approach between businesses and the public sector which the Manchester has already recognised through business representation on the Northwest Climate Change Partnership, and through initiatives such as the BiTC May Day Network, Northwest Business Leadership Team, and the '100 months and counting club' – see case study below. These initiatives are developing a two-way dialogue with Ministers about the urgency of the climate change issue and how businesses can lead the way. Moreover, there are links with the public and private sector with initiatives to help make business people environmentally accredited.

Case study – The 100 Months Club

The 100 Months Club is a unique high level smart network that aims to raise the aspiration of the city region to take a lead on climate change mitigation and adaptation. It does this by connecting Board members of major companies and public agencies so that they can hear about best practice and discuss areas of common need with policy makers.

The Club takes its name from the UN (IPCC) finding that there are 100 months within which the world has to level off its growth in CO₂ use to avoid the likelihood of irreversible and catastrophic climate change.

The Secretary of State for Environment, Food & Rural Affairs, Rt. Hon Hilary Benn MP launched the Club at an event in March 2008. Senior representatives of the Co-operative Group, Granada ITV, Manchester City FC and the MRI Hospital Trust all spoke to an audience of forty 'movers and shakers', who in turn discussed their reaction to what they heard with Mr Benn. The fact of the network's independence and responsiveness to member's needs was felt to be a great benefit by delegates. Forthcoming events include an evening with local leading Indian entrepreneurs and a discussion between transport leaders on the role of their sector in CO₂ reduction.

However, many companies will be concerned with the impact on cost and profits and so may do the minimum necessary to comply with legislation. Although behavioural aspects might be harder to influence, procurement patterns can be influenced through incentives and with public sector support – through funding for example. There are currently a number of funding opportunities and agencies that can help support business in the region. These are highlighted

in Annex F. It is important that these sources of funding are advertised to businesses so there is greater awareness of mechanisms to support business in developing carbon cutting processes.

6.4 Assets

Both the Manchester City Region and the wider North West have important economic assets which help to drive both the local and wider region's economy. Manchester alone currently accounts for over one tenth of GVA in the North West economy, with the wider City Region within the North West accounting for 40 per cent. However, some sectors could be more exposed to the impact of climate change legislation due to their higher relative emissions levels or energy use, or indirectly through the supply chain.

The assets that are important to the North West region and the Manchester City Region economy have been considered and are outlined in Annex C. This assessment includes assets such as physical capital (tangible assets used in the production process) and human capital as well as factors that define the structure of the economy – which are considered as more intangible assets. These include natural capital and social capital (built through combining strength and knowledge).

To crystallise opportunities into tangible economic benefits it is necessary to build on the assets of the City Region. These include but are not limited to:

Positive economic structure

The economic structure of the Manchester City Region is skewed towards sectors that are expected to provide future growth. This includes:

- ⇒ **Sectors that have a significant economic contribution** to the Manchester City Region in terms of gross value added. These include Financial and Professional Services, Manufacturing, and the Life Science Industries. These sectors are critical to growth and therefore the long term economic prosperity of the City Region's residents.
- ⇒ Sectors that are also important due to the **high levels of per worker productivity** (GVA per employee) they support include Logistics, Manufacturing, Financial and Professional Services, ICT Digital / Communications, Aviation, Creative / Digital / New Media and Life Science Industries.
- ⇒ A position for Manchester as the only UK city outside of London in the **top 20 European business destinations** which is currently the largest commercial centre outside of London. This is underpinned by its financial and professional services, media production, digital communications, high value manufacturing and a regional retail, cultural and sporting offer. Manchester is now ranked as the UK's **best City for business**.

Strong Higher and Further Education Institutions

The climate change legislation drives the need to source staff capable of meeting the induced demand for specific skills. Sufficient skills, which match the changing needs of employers, are crucial to the successful development of the City Region's economy. Manchester City Region's current skills base has many positive features. This includes:

- ⇒ A relatively **highly skilled economically active workforce** with over three quarters (77.8 per cent) economically active population in the City Region, marginally lower than the UK rate (78.3 per cent).
- ⇒ Existence of **universities cluster** (including University of Bolton, University of Salford, University of Manchester and Manchester Metropolitan University)

Innovative capacity

The Manchester City Region has a historical reputation for entrepreneurship and business innovation. Assets that help to build on this include:

- ⇒ **Science Parks** are important drivers of the Manchester City Region economy with University links increasing the **knowledge flow within the Science Parks**.

- ⇒ The Universities also undertake **research linked to major companies** – e.g. Astra Zeneca. University of Manchester has the 5th largest research budget provided by HEFCE2 of any English University and the scale of HEI research activity in Manchester is larger than in any city in the Midlands or North of England.
- ⇒ The Tyndall Centre and the Joule Centre within Manchester University have **established an international reputation in the fields of Climate Change and energy**.
- ⇒ Manchester Metropolitan University is leading research into carbon reduction for the aviation industry and the University of Salford has an established Centre for Environmental Systems which is **working internationally on the impact of climate change** on rainforests.
- ⇒ The City South Implementation Plan aims to establish the initiative as an **'international location for study, research, innovation and public service'**. This level of investment, particularly along the Oxford Road Corridor, is likely to create a climate for innovation and the embedding of innovative capital and mainstream projects.

A strong brand

The City Region's industrial, cultural and sporting heritage affords a significant brand that can be leveraged in international terms to place the region on the climate change map. Sectors that **reinforce the area's global image and branding** include:

- ⇒ Sport and Hospitality; and
- ⇒ Tourism.

Regenerated Cities and Towns

Recent Economic growth has been matched by a **renaissance of the City Region's urban centres**, particularly in its regional centre (Manchester and Salford). Most of the other Town Centres outside of the Regional Centre including Bolton, Wigan, Bury and Stockport are now attracting significant levels of investment and these will provide focal points for growth for all sectors, with environment-related activity no exception. These provide focal points for growth for all sectors, with environment-related activity no exception. For instance, the redevelopment of Salford Quays has created a world-class business and cultural area of great national and regional significance.

Infrastructure improvements

Investment in transport infrastructure improvements could lead to the development of a more environmentally friendly and connected system. There is good evidence that the level of investment proposed through the Government approved Transport Innovation Fund (TIF) would differentiate its offer from other City Regions with the UK and internationally. The City Region is already in a good position to leverage its current strengths in infrastructure and connectivity, particularly through its excellent multi-modal transport links. The City Region might also position TIF as a mechanism to help businesses respond to the demands of climate change legislation.

Similarly, the North West has a diverse range of assets and it particularly benefits from excellent infrastructure and connectivity, through multi-modal transport links. At the North West level the region currently benefits from building networks from Global Gateways to within the heart of local communities as well as centres of employment, and seats of learning and innovation. These include:

- ⇒ A **number of airports** including those in Manchester, Liverpool, Carlisle and Blackpool;
- ⇒ Its position at the **cross roads of two key development and transport axes** within the country – the M62/M60 and trans-Pennine rail links as well as the M6;
- ⇒ Extensive **rail network** helps to create and maintain links with organisations associated in rail service and infrastructure provision; and
- ⇒ Major trading links into Europe through a number of **small-scale ports** as well as bulk tonnage through the Channel Tunnel and the Dover/Haven ports, and also through the Humber ports.

However, it should be noted that the economic structure of the North West region suggests a greater concentration of sectors with higher energy use compared to the City Region. The region may therefore be more vulnerable to potential negative impacts of climate change legislation.

Key points and summary

Key areas of concern include:

- ⇒ Uncertainty about future markets for low carbon products and services;
- ⇒ Cost of compliance and changing business models;
- ⇒ Procurement led demand shifts which will especially affect those producing high-carbon footprint goods and services;
- ⇒ Long terms returns;
- ⇒ Future skills gap; and
- ⇒ Excessive regulation which would stifle competitiveness.

Whilst opportunities may arise from:

- ⇒ Eco-innovation - new products and sectors;
- ⇒ A more joined-up approach with local businesses in the supply chain or from the public-sector demonstrating best-practice in areas such as facilities management;
- ⇒ Climate change as a cost-cutting mechanism;
- ⇒ Leveraging local HE and FE institutions.

To crystallise opportunities into tangible economic benefits it is necessary to build on the assets of the City Region within the North West.

7 Policy implications

Climate change regulation (legislation and policy) presents the Manchester City Region with the challenge of minimising downside economic risk whilst delivering the upside benefits to improve its competitiveness. The Manchester City Region – due to its economic profile – is well positioned to mitigate against negative effects and deliver upside benefits in the face of climate legislation. The economic structure of the North West, with its higher concentration of more vulnerable sectors suggests that strategies would be better focused on mitigation activities.

This chapter sets out the type of policy interventions that could work to maximise the opportunities and deal with the challenges outlined previously.

At a macro level the *Stern Review* highlighted a number of policy measures for an effective global response, including:

- ⇒ Pricing of carbon, implemented through tax, trading or regulation;
- ⇒ Policy to support innovation and the deployment of low carbon technologies; and
- ⇒ Action to remove barriers to energy efficiency and to influence behaviour.

This chapter recommends policy themes that may be influenced / delivered at the Manchester City Region level and also indicates North West Region policy opportunities.

The report also identifies a number of essentials that will underpin national level legislation and allow regions such as the North West and Cities such as Manchester to achieve sustainable growth through more focused and localised interventions. The national level interventions can be expected to impact by moderating energy consumption and the demand for carbon emissions; however, it is clear that supply side responses can be influenced at regional, sub-regional and local level. The key policy themes relevant at regional and local level include:

- ⇒ SME support;
- ⇒ Education & skills;
- ⇒ Leadership;
- ⇒ Alignment of economic development, spatial planning and public sector procurement policies; and
- ⇒ Championing behavioural and cultural change.

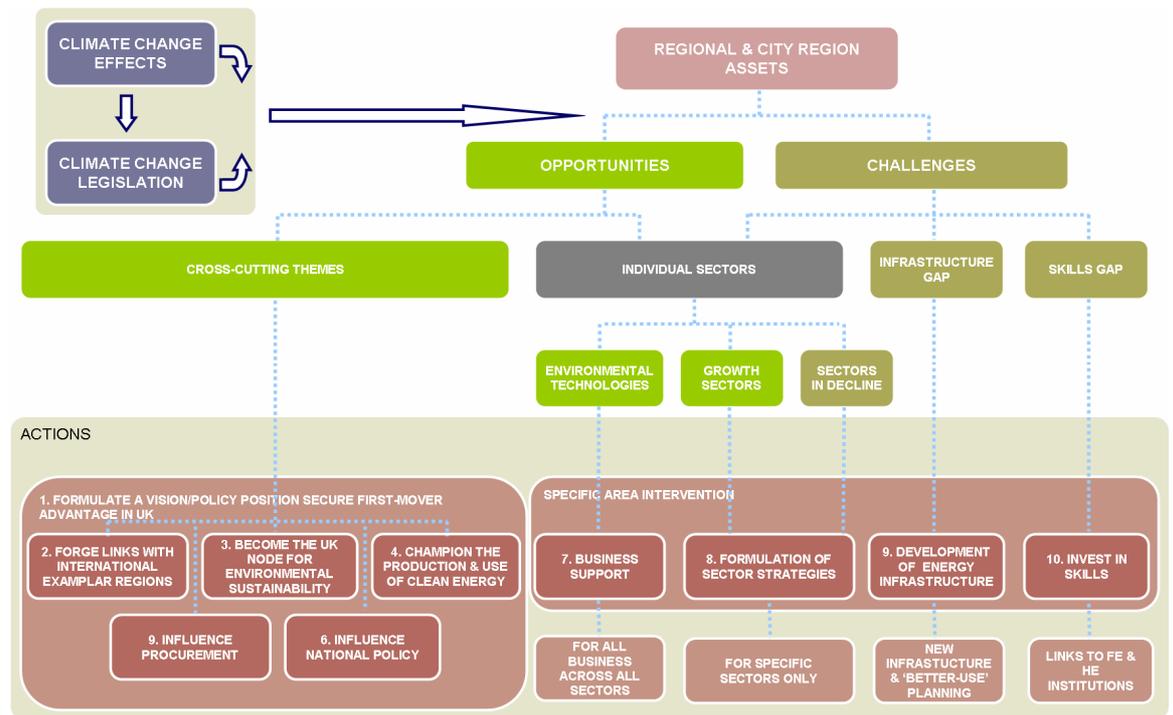
These themes are embodied in the remainder of this section, within the context of the analysis and with reference to the City Region and the North West region.

7.1 Policy framework and options

The schematic overleaf, shows how the analysis conducted throughout the project links with, the key findings and identified opportunities and challenges to interventions in broad categories.

The identification of opportunities and challenges – based upon legislation and local assets – gave rise to the identification of cross-cutting themes, the need for sectoral interventions and the need to close both the infrastructure and skills gap with respect to climate change and associated legislation.

Figure 7.1 – Policy Framework: Project Findings and Potential Actions



Source: Deloitte Analysis

This analysis has led to the identification of ten major actions which are described in more detail below:

7.1.1. Cross-cutting interventions

We have identified the following broad strategic priorities for the Manchester City Region. These will need to be explored further before designing implementation strategies. These policy considerations include:

1. Exploiting first mover advantage

A clearly articulated policy position is needed with respect to Climate Change legislation. There is a choice between ‘going with the flow’ or taking a strategic decision to harness assets to position the City Region at the forefront of the global environmental industry. The latter is more likely to lead to first mover advantage, which is likely to confer greater economic benefits.

2. Leadership aimed at building on international reputation

Strong leadership backed by early success in co-ordinated programmes of action will enable the Manchester City Region to build on its international links and be positioned at the cutting-edge of innovation activity and technologies.

3. Transforming the energy mix to reduce economic cost

The City Region has the potential to develop a more robust and cost efficient energy infrastructure that is based on low and zero carbon technologies. The spatial planning framework will be a critical tool that can be used to shape favourable investment / developer behaviour and create more sustainable energy options through the application of policy. It will also be important for the City Region to work with the utilities and Government to determine the best way for carbon reduction objectives and economic efficiencies to be achieved.

4. Promoting sector growth through targeted procurement strategies

The public sector can have a critical role here through supporting the growth of products and services through the way it procures. With the right processes in place, the public sector can

actively support the development of local business offering smarter and greener products and services. This purchasing power can also be leveraged to support the development of the ETS sector within the City Region and encourage innovation.

5. Reducing uncertainty and risk to encourage business investment

Influencing national policy should be a major focus here. Businesses need to believe that they are investing in change for the right reasons and that they are not going to be burdened with unnecessary or sunk costs. Minimising uncertainty requires Central Government and International level commitment. Lobbying activity could complement more of the City Regional / Regional initiatives highlighted here. The uncertainty around the future carbon prices means that those businesses not currently affected by changing consumer or business behaviour, have no financial basis upon which to make investment decisions. However, development of the right reward structures – through initiatives such as ‘kite-marking’ the best performing businesses could help to encourage business investment.

6. Delivering coherent advice and support to business in general

Targeted business support to businesses affected by Climate Change legislation and regulation will need to be provided. The generic business support in the North West together with activities of Enworks could be tailored to achieve this but the Manchester City Region would need more intensive action if its business community is to mitigate and deliver the economic benefits.

7. Developing sector strategies

Developing specific sector strategies in support of vulnerable sectors as well as opportunity sectors such as ETS should be considered. These strategies should be prioritised into those industries with significant legislative threats such as transport and manufacturing – where emission minimisation and costs associate with under or over-adaptation may be highest. Attention should also be focused on those service sectors that are expected to provide much of the economic growth in the coming years – such as financial and professional services. Building on regional activities such as Envirolink, which provides support for the Environmental sector will also be critical to ensure those operating in sectors related to environmental technologies and services are able to compete in national and international markets.

8. Promoting inward investment

Once the necessary leadership is established and key programmes are in place, MIDAS (the City Region’s Inward Investment Agency), working with the NWDA, would be in a good position to promote Manchester City Region internationally as the ‘location of choice’ for Climate Change-related innovation activity.

9. Policy Alignment

The alignment of spatial and economic policy across the City Region can play an important role in ensuring consistency and avoiding counterproductive internal competition. However, care will be needed to ensure policies do not economically discriminate because of geography. For example a high percentage renewable energy requirement for new development in the north of the City Region would have a different impact on investment decisions than in the south – where land values are higher.

10. Investing in skills and building capacity

Investment in skills development through higher education and research centres can ensure that future employment demands are met in the region. This can also enhance the creation and development of key clusters of new technologies. There is also the opportunity to build on existing collaborative working between universities, energy and environmental consultancies as well as research and development agencies.

7.1.2. The spatial dimension

Collaboration between both private and public sector is essential to address challenges of climate change and associated legislation. Local government and business can play a leading role to co-ordinate the direct resources where there is currently market failure or missed opportunities.

The immediate priorities associated with formulating a policy position and vision for the City Region within the North West are not particular to either Regional or City Regional spatial areas, but local stakeholders' ability to influence outcomes does differ markedly between other themes.

This work concludes that there are areas where the City Region stakeholders and Regional stakeholders can and should work together closely, namely:

- ⇒ Sector-based interventions;
- ⇒ Forging links with other exemplar regions; and
- ⇒ Championing the use of clean energy.

And there are areas where the City Region within the North West will need to take the lead, namely:

- ⇒ Using brand to become a node for environmental sustainability;
- ⇒ (in the longer-term) Creating the necessary infrastructure; and
- ⇒ In linking to the City Regions educational establishments.

7.2 More detailed policy considerations

To complement the above strategic analysis, which identified broad strategic priorities for the Manchester City Region, other policy considerations that are also important are shown below. These are also based on economic analysis, literature review and consultations with industry experts. Many of these considerations overlap and developing a comprehensive action plan would deliver synergistic benefits.

- ⇒ Sector & Business Support;
- ⇒ Infrastructure; and
- ⇒ Education and Skills.

With the right strategies the Manchester City Region can be proactive in creating the right conditions for economic growth and carbon emissions decoupling. However, detailed implementation and action planning is outside the scope of this study and therefore should be considered as part of the next phase of development by Manchester Enterprise and NWDA.

SECTOR & BUSINESS SUPPORT

1. Corporate Sustainability - The major challenge for business

Conforming to legislation and adapting to new market paradigms is likely to be a costly business in the interim. Although the report has highlighted that some of the major legislation (such as the EU ETS) is restricted to directly impacting big producers and users of energy, costs will be transmitted through the supply chain and other legislation will impact smaller business directly. In such an environment it will be difficult to maintain or improve the quality of final product / service for given input costs.

Accordingly specific support geared towards cost minimisation and resource efficiency should be provided to local SMEs in sectors that are important for the future vitality of the region.

This could involve guidance and advice to help support businesses who may not have the expertise within their firms to fully understand the issues facing them. For instance, this may be particularly useful to SMEs, businesses who have different types of legislation to comply with and those who are eligible for exemptions. This would help to promote transparency among the businesses in the region and could be developed at a local or regional level.

2. Managing 'Decline'

Decline can be managed in part by carrying out diagnostics in those industries that are expected to be affected to identify limiting factors in willingness to change and then tackling those factors.

This could help businesses target areas of their operations that have particularly high energy usage. To do this it is important that individual businesses and sectors develop strategies based on the challenges they face.

3. Meet emerging customer demand for 'green' products and services

There is evidence that consumers will increasingly seek to purchase 'green' products not only from an altruistic and environmentally conscious perspective, but also because it is 'trendy' to do so. Recent conspicuous consumption has been about 'bling' but in future years it could well be about explicitly demonstrating individual environmental credentials.

Big business will be well tuned into this although there may be a regional and City-regional challenge associated with SMEs. Those that move first are more likely to reap the benefits and as such an awareness campaign or series of events could prove useful as a start to this process.

Although many businesses are 'going green' their actions are likely to be aimed at more short-term results – of increases sales and brand – rather than longer term measures which may have a more damaging effect on profit levels. This might fade if the trend changes but the public sector can help to ensure that the right incentives remain over the longer term.

4. Voluntary Disclosures and Targets

In the United States voluntary disclosures of organisations' carbon footprints have taken off in a big way. Carbon labelling on a per product basis for intermediate and end-consumers is also an option. There is the opportunity to promote a scheme at regional, City-regional, or more local level. This would work by allowing local firms to demonstrate their environmental credentials, and potentially provide firms with a (non-binding) incentive to start making the changes before they are forced through the legislation outlined in this research.

Currently some firms do present details of how they are acting in a socially responsible way. Although this is a good first step to promoting transparency, there is no set criterion to define social responsibility which limits comparability. However, if the value of this can be demonstrated effectively there may be opportunities for businesses. For example, this might be achieved through effective life-cycle analysis value for money (VfM) must be assessed over the whole lifetime of a project and not just VfM directly relevant to the purchaser.

5. Climate Change Innovation & Cluster Support

Enterprise Hubs and Centres of Excellence can support innovation and bring ideas from the table to the market place. The existence of clusters can help to identify new opportunities for product innovation by bringing together, developing and encouraging supplier groups supported by Universities and R&D organisations.

Research into innovative solutions to tackle climate change has been carried out but much of it may not be widely known to business if they do not have the resource to review these. There is a need for the public sector and businesses to 'join-up' so that the important messages filter through to the business community. Further to this, connections between businesses and climate change technology funds could help the City Region and North West region position itself to be a location of choice and centre of excellence in the environmental technology and services industry.

As an example strategically aligned innovation and R&D investment from partnerships between the public and private sectors to create clusters of targeted demand driven opportunity. Envirolink North West are considering Resource Recovery Parks as one example of such a cluster. There may be others to exploit in the area.

6. Public sector procurement

Public sector procurement policies can also help to encourage changes in behaviour and bring about carbon reductions in the supply chain. This would help to provide certainty and create markets for future products and services that might otherwise not exist. In addition as energy becomes more expensive, procurement patterns may change. For example, buying from non-local or overseas suppliers may become less viable if transportation costs rise.

7. Climate Change Networking

Stakeholder buy-in and partnerships are fostered by creating and supporting links with market opportunity. At a regional level this is the remit of Envirolink North West (ENW). The Manchester City Region is to establish a new Climate Change Agency which can collaborate with ENW to provide enhanced networks for SMEs. One means may be to foster Regional or Sub-regional Centres of Excellence to channel, integrate and leverage the public and private sector in integrating standards in carbon reduction, carbon neutral and low carbon developments, and waste management programmes.

Within the Manchester City Region the '100 months and counting club' has brought together businesses with shared environmental values and objectives. There is the opportunity to use this existing network together with the Manchester Chamber of Commerce to establish a business consensus on the key environmental issues they face.

8. Climate Change Supply-Chain Support

There is a need for high carbon intensive businesses to stimulate supply chain adaptation, capacity growth and possibly capture new markets. Providing greater investment into capacity within supply chains often supports growth and diversification of products and services.

In addition, Government procurement can help to drive innovation by creating lead markets for innovative products and services. The Sustainable Procurement Action Plan identified ways of utilising public sector purchasing power to make innovative and sustainable solutions more widely available and affordable to others. There is the opportunity for this to be developed at local authority and City Regional level where it could be promoted at a local and regional level. This – as with the procurement consideration – can help to provide certainty and create market for future products.

9. Climate Change FDI & Export support

There is the opportunity to attract public sector and leverage inward investment by delivering a more coordinated and powerful proposition for the City-region and the North West and marketing it internationally on the back of a genuine offer, as the place for environmental businesses.

SKILLS AND EDUCATION

10. Leadership Coaching for SMEs

Evidence suggests that this is already underway in and amongst major multinationals where manufacturers, retailers, and financial institutions are seemingly tripping over themselves to achieve carbon neutrality.¹⁰ However, there will be a need to influence the mindset of business

¹⁰ Examples across a range of sectors include: Wal-Mart – who in the wake of Hurricane Katrina pledged to achieve three ambitious goals, to use 100 per cent renewable energy, to create zero waste, and to sell products that sustain resources and the environment; Dell who have committed to neutralising the carbon impact of its Worldwide operations; and SwissRe who have pledged to become greenhouse neutral.

leaders of SMEs who are less concerned with brand building and corporate social responsibility issues.

Overall, as the case studies set out in Annex G illustrate, companies are increasingly wising-up not only to the direct environmental impacts of their actions but the environmental impact as transmitted through earlier elements of the production process. This, coupled with changes in consumer preferences, suggests that mindset change may be a pre-requisite for future success in the business world. Developing such forward looking leadership may not come naturally and may be assisted by specific support mechanisms.

11. Filling the skills gap

Leadership is not the only major skills issue. There are also likely to be significant skills gaps in technical and non-technical occupations. Whilst there is a move toward demand-led training and skills provision, this is made harder with respect to climate change because of the current levels of uncertainty about how legislation will play out. However, the growing market response in advance of legislative clarity suggests that significant gaps will emerge as skills demand in this area increases.

INFRASTRUCTURE

12. Strategic Transport Investments

An efficient transport infrastructure is crucial to the future prosperity of the area, and a compromise on connectivity could limit the potential for economic growth. The transport sector will be affected as a sector in isolation but the impact has the potential to be much wider due to its importance as a facilitator of individual and business connectivity.

As a major contributor to climate change transport is a key area of concern. The challenge is in supporting and advocating the necessary infrastructural investments to support economic growth in the North West and the Manchester City-Region. There is a need to ensure necessary new but low-carbon-impact infrastructure is available and 'better-use' measures, as identified in the *Eddington Review*, are implemented.

13. 'Smart' Planning

Spatial planning and its application in guiding investment and market behaviour can be one of the most effective intervention tools available to the public sector in reducing carbon emissions. Local Planning Authorities already have the necessary statutory guidance under which they can act positively. PPS1, Planning and Climate Change, which was published by Government in December 2007 states that:

"Planning authorities should expect new development to take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption, including maximising cooling and avoiding solar gain in the summer; and overall, be planned to minimise carbon dioxide emissions through careful consideration to how all aspects of development form, together with the proposed density and mix of development, and support opportunities for decentralised and renewable or low carbon energy supply"

Spatial planning should aim to direct market investment in a way that maximises efficient use of public transport infrastructure assets; provides a critical mass of services in concentrated locations to reduce the need to travel and makes more intelligent linkage between residence and workplace.

It should be borne in mind that the implantation of spatial planning policies in a blunt way across the Manchester City Region could have unforeseen economic consequences and will need to take account of market conditions and land / property values. It is therefore recommended that further work will be needed in this area to ensure interventions are tailored to have the desired impact on competitiveness and inward investment.

7.3 Conclusions

Climate change regulation, legislation and policy, presents the Manchester City Region with the challenge of minimising downside economic risk whilst delivering the upside benefits to

improve its competitiveness. The Manchester City Region – due to its economic profile - is well positioned to mitigate against negative effects and deliver upside benefits in the face of Climate Change legislation.

There is some evidence that the Manchester City Region economy is already responding to the challenges and opportunities stemming from Climate Change legislation. However, strong strategic leadership is now needed to direct the key interventions set out in this study to enable the City Region to maximise potential economic benefits - particularly through first mover advantages.

Reputation in this area will need to be earned though and the public sector will need to lead by example through its policies and actions. For example, market and investor confidence will grow if the power of public sector procurement is applied to purchase lower carbon products and services.

The proposed Climate Change Agency for the City Region by AGMA, has the potential to enable the public and private sectors to pool the necessary skills and expertise to enable the delivery of the interventions set out in this report.

This study provides strategic overview of economic implications of Climate Change legislation and sets out the broad areas for intervention. Further work would therefore be required to develop specific strategies and action plans to position Manchester City Region and the North West at the forefront of this challenging policy agenda.

Annex A – Legislation

This section contains further information in relation to the following areas of legislation:

- ⇒ Policy and legislation timeline
- ⇒ Policy and legislative drivers: A 10-year analysis
- ⇒ The Climate Change Bill
- ⇒ Emissions trading: the EU ETS & the UK Carbon Reduction Commitment
- ⇒ Tax policies: The Climate Change Levy & other mechanisms
- ⇒ Energy Sourcing: Renewables Obligation, Supplier Obligation & other measures
- ⇒ The Renewables Obligation
- ⇒ The Renewable Transport Fuels Obligation
- ⇒ Planning policy framework & building regulations
- ⇒ Climate-driven factors in other policy, Acts and regulation
- ⇒ 2008 Budget
- ⇒ Carbon footprints – product example

Policy and legislation timeline

Proposed actions: 2008 - 2011

	Carbon aim	2008				2009				2010				2011			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Carbon Reduction Commitment	-1.1mt p.a. by 2020	Energy Co's send out info				Covered parties submit data											
Climate Change Bill	-26-32% by 2020	Shadow committee appointed	Target for royal assent			DB22 budgets in preparation	Gov plan for meeting budgets				First committee report on progress					Adaptation risk report, & programme	
Climate Change Levy	-2.5mt p.a. by 2010	Travellers community rates raised															
Renewables Obligation	renewable energy supply to 15.4% by 2015/16						Preliminary consultation deadline										
Renewable Transport Fuels Obligation	5% renewable fuel by 2010	Scheme comes into force															

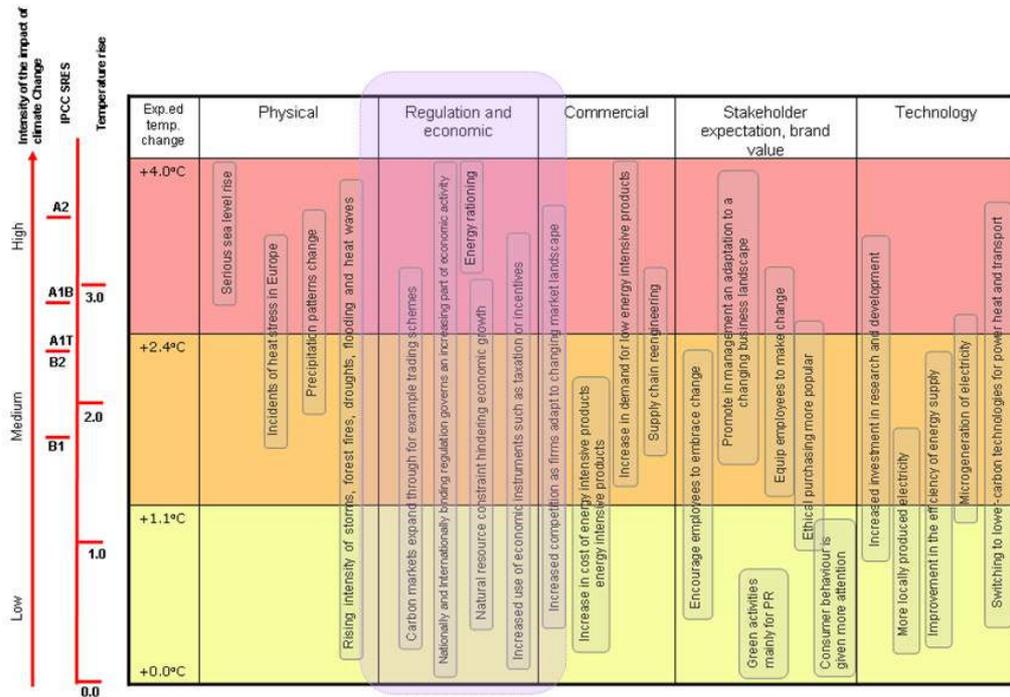
Phase periods: 2008 - 2020

	Carbon aim	2008				2009				2010				2011				2012				###		###				
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	
Kyoto Protocol	-5% by end of 2012	Phase II																										
EU ETS	-20-30% by 2020	Phase II																										
Carbon Reduction Commitment	-1.1mt p.a. by 2020	Coverage baseline				Preparation				Introductory Phase				End of first commitment period				Phase II		Phase III - Fully open market								
Climate Change Bill	-26-32% by 2020	Budget Period I																Phase I		Budget Period II								
Climate Change Levy	-3.5mt by 2010																											
Renewables Obligation	15.4% by 2015/16																											
Renewable Transport Fuels Obligation	5% by 2010	Scheme starts				End of first target period																						
Building regulations	0 by 2010					End of first target period																						

Source: Deloitte Analysis

The diagram below illustrates the impacts on the physical, regulatory, commercial, stakeholder and technological environments of different levels of temperature change. As discussed earlier, the focus of this study is on the regulatory and economic impacts segment.

Climate change in the broader sustainability context



Source: IPCC Special Report on Emissions Scenarios and Deloitte Analysis

Policy and legislative drivers: A 10-year analysis

International

UK climate change policy reflects international legal obligations. The adoption of the Framework Convention on Climate Change (UNFCCC) in 1992 was a major step forward in tackling the problem of global warming. The convention obliges all of the 192 countries that ratified the convention to:

- ⇒ Gather and share information, national policies and best practices;
- ⇒ Launch national strategies for addressing greenhouse gas emissions including the provision of financial and technological help to developing countries; and
- ⇒ Cooperate in the preparation for adaptation to the impacts of climate change.

Greenhouse gas (GHG) emission levels continued to rise around the world giving rise to the need for a more binding and integrated commitment. The Kyoto Protocol was adopted in 1997 at the third Conference of the Parties to the UNFCCC in Kyoto, Japan. The protocol provided legally binding limits and reductions in GHG emissions within 2008 - 2012. Although the USA did not ratify the protocol, 38 countries including the UK agreed to a reduction in six GHG's (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride). The UK accepted a target reduction of 12.5 per cent.

For parties to earn and trade in emission credits Kyoto also introduced three mechanisms; the emissions trading, joint implementation and the Clean Development Mechanism (CDM). The aims of these are to allow flexibility for the parties in meeting their emissions reduction targets and in helping them to identify lowest-cost opportunities. Developing nations in turn benefit in terms of technology transfer and investment.

In December 2007, 187 countries in Bali agreed on a road map aiming to secure an international deal beyond 2012 following the expiry of the Kyoto agreements. Negotiations to finalise a future climate agreement are set to be conducted in Copenhagen in 2009.

European

In response to international obligations, the EU launched the Emission Trading Scheme (ETS). Now the largest asset market ever created, it requires member states to impose carbon dioxide emission caps on their energy intensive industries and power stations. In January 2008 the scheme broadened from only covering CO₂ to including nitrous oxide and perfluorocarbons.

The European Council is targeting a GHG reduction of 20 per cent by 2020. Provision is given to raise the level to 30 per cent with international agreement committing developed countries to 'comparable emission reductions' and economically more advanced developing countries to 'contributing adequately according to their responsibilities and respective capabilities'. The EU is also committed to providing 20 per cent of energy consumption from renewable energy by 2020.

The ETS is set to capture aviation and already affects the car industry. The new 2020 targets include a 10 per cent binding mechanism on biofuels in transport fuels, and the commission plans more legislation to improve fuel quality. Finally the commission also plans to require manufacturers to make an 18 per cent cut in CO₂ emissions from new cars by 2012.

United Kingdom

The Climate Change Programme set out in 2006 delivers the UK Governments plans for meeting its international and European climate change obligations. The government has developed a framework for achieving its long-term aims in mitigating and adapting to climate change through the Climate Change Bill. This goes beyond international and European emission reduction targets. These targets exclude international aviation and shipping. If approved, the UK will become the first country to set such a long-range, significant and binding carbon reduction target into law.

More recently the Energy White Paper (2007) set out a plethora of measures including the Climate Change Levy and Renewables Obligation, both of which are explained later.

The Climate Change Bill

The Draft Bill was published in March 2007 and is aiming for Royal Assent in early summer, 2008. The Bill's primary objective is for a 60 per cent emissions reduction by 2050 and an interim goal of 26-32 per cent by 2020. Accordingly, the government has proposed several initiatives within the Bill's framework:

- ⇒ A committee on climate change to advise the Government on the level of the five yearly carbon budgets and the degree to which these are achieved by non-domestic action. The committee will have responsibility for reporting on the Government's progress against the Bill's emissions targets;
- ⇒ Enabling powers to introduce trading schemes, specifically the 'Carbon Reduction Commitment' (described below);
- ⇒ An enhancement of the operation of the Renewable Transport Fuels Obligation (described below); and
- ⇒ Powers to pilot local authority incentive schemes for household waste minimisation and recycling.

The first budget phase of the Bill is 2008 to 2012 inclusive. The levels of the first three budget periods to 2022 will be set together in legislation in February 2009; this will give businesses a medium-term planning horizon. The Government will then set out its plan for meeting the targets with the first committee report on progress coming in June 2010.

Emissions trading: the EU ETS & the UK Carbon Reduction Commitment

The Emissions Trading Scheme (ETS) is a Europe wide cap-and-trade scheme introduced in 2005 to reduce emissions of greenhouse gases from EU member states. It requires member states to cap emissions from installations covered by the scheme and to allocate European Union Allowances (Allowances), which are the right to emit one tonne of carbon dioxide, between the sectors on the basis of projected emissions. The cap on emissions and the allocation methodology is set out in each member state's National Allocation Plan (NAP). NAPs take into account progress towards meeting EU (Kyoto) and domestic greenhouse gas reduction targets.

Allowances allocated:

The UK will allocate 246,175,998 allowances per annum in the second phase of the ETS (2008-2012), including those to be auctioned or sold. The total number of allowances allocated will be reduced to take account of installations that come out of the scheme as a result of the implementation of a 'de minimis' threshold and change to the definition of ceramics. The reduction in allowances against business-as-usual will be borne entirely by the Large Electricity Producers (LEP) – although transmitted through the supply-chain.

Kyoto Credit Mechanisms:

Kyoto introduced three mechanisms; the emissions trading, joint implementation and the Clean Development Mechanism (CDM). The aims of these are to allow flexibility for the parties in meeting their emissions reduction targets and in helping them to identify lowest-cost opportunities. The CDM arrangement enables industrialised countries with a greenhouse gas reduction commitment (so-called Annex 1 countries) to invest in emission reducing projects in developing countries (without Kyoto commitments and therefore without allowances to transfer) as an alternative to what is generally considered more costly emission reductions in their own countries.

The CDM is supervised by the CDM Executive Board (CDM EB) and is under the guidance of the Conference of the Parties (COP/MOP) within the UNFCCC. CDM projects generate Certified Emission Reduction (CER) credits which qualify as greenhouse gas reduction projects. They also provide development benefits to their non-Annex 1 host country. The CERs are transferable to industrial countries where they can be applied to emissions reduction targets. Once a CER has been issued it carries the same compliance value as an allowance under the Linking Directive of the EU.

ETS market participants are able to import CER credits for domestic compliance to cover shortfalls. Other parties interested in trading and investment strategies can benefit from the standardised exchange-traded CER futures contracts. CDM project transactions for 2006 were valued at €3.9 billion (World Bank) and the market continues to see growth in volumes.

'Joint Implementation' is similar to CDM in that it is a project-based mechanism carried out between two countries. The host country (the country aiming to reduce emissions) has a Kyoto commitment and hence tradable EAU's, called Assigned Amount Units (AAUs).

NB – the EU ETS currently specifically excludes the transport sector. The Airline industry will be included from 2011/12, but only in terms of selling surplus credits to non-aviation industries.

Auctioning

Allowances are allocated on an annual basis. In Phase I, up to 5 per cent of allowances could be auctioned or otherwise sold, in Phase II this changes to 10 per cent. The remaining allowance must be allocated free of charge. The UK Government intends to auction or otherwise sell 7 per cent of allowances in Phase II.

Following the European Council's announcement on January 23rd, the power sector – representing a large part of emissions – will be subject to full auctioning from the start of the new regime in 2013. Most other industrial sectors, as well as aviation, would progress to step up to full auctioning gradually, with completion by 2020.

The UK Carbon Reduction Commitment (CRC)

This was announced in the 2007 Energy White Paper and is a proposed mandatory cap and trade scheme aimed at large non energy-intensive organizations in the public and private sectors. It is anticipated that the scheme could become mandatory and will cut carbon emissions by 1.2 million tonnes of carbon per year by 2020. The commitment, which involves the self-certification of emissions, backed up by auditing, is to be introduced under enabling powers planned for inclusion in the Climate Change Bill.

The scheme applies to organisations that have an annual 'half hourly meter' electricity use of over 6000 MWhr per year, approximately equivalent to an electricity bill over £500,000, irrespective of whether the energy is purchased or from direct use. Hotel chains, supermarkets, banks, central government and large Local Authorities for the most part fall below the threshold for the EU ETS. However, they account for around 10 per cent of the UK's carbon emissions. Emissions covered by the EU Energy Trading Scheme and by a Climate Change Agreement would be exempt from the CRC, as would organizations with more than 25 per cent of their emissions covered by Climate Change Agreements.

One of the key differences between this scheme and the ETS is that auction revenues are recycled to the participants and is as such revenue neutral to the Exchequer. The revenue proportion recycled to an organisation is dependent on its position on the published CRC 'league table'. The highest positioned organisation will receive a 10 per cent bonus followed by a sliding scale to the lowest positioned organisation who will receive a 10 per cent penalty. Positions are determined by a weighted combined score from three metrics: 60 per cent absolute emissions, 20 per cent early action and 20 per cent linked to additional growth.

Participants in the Carbon Reduction Commitment will also be able to purchase (but not sell) emission allowances from the EU Energy Trading Scheme at a price that is the higher of the ETS price or the minimum CRC floor price.

Tax policies: The Climate Change Levy & other mechanisms

The Climate Change Levy (CCL) forms part of the UK's Carbon Change Programme and is a tax on the use of energy in industry, commerce and the public sector which aims to encourage users to improve energy efficiency and reduce carbon emissions. The Climate Change Levy effectively replaced the Fossil Fuel Levy in 2001 under the Finance Act 2000 and is itself under pressure to become a formal Carbon Tax.

Anyone who makes taxable supplies must register for the CCL. Unlike VAT there is no registration threshold. The levy applies to most energy users, with the notable exceptions of those in the domestic and transport sectors. Electricity generated from new renewable energy and approved cogeneration schemes is not taxed. Electricity from nuclear is taxed even though it causes no direct carbon emissions. It also does not apply to energy used by registered charities for non-business uses, and energy used firms using lower than a de minimis (domestic) amount of energy.

From when CCL was introduced, the levy was frozen at 0.43p/kWh on electricity, 0.15p/kWh on coal and gas. In the 2006 budget it was announced that the levy would in future rise annually in line with inflation, starting from April 1, 2007. A reduced levy applies to energy-intensive users provided they sign a Climate Change Agreement.

Revenue from the levy was offset by a 0.3 per cent employers' rate reduction in National Insurance. However, the 2002 Finance Act subsequently increased that rate by 1 per cent, reversing the reduction.

Climate Change Agreements

The CCL paves the way for Climate Change Agreements (CCAs), which are agreements between energy intensive business users such as aluminium, cement, ceramics, food etc and the government where users receive an 80 per cent discount from the CCL in return for meeting energy efficiency or carbon saving targets.

Energy intensive industries had an 80 per cent discount from the levy if they agreed to challenging targets for improving their energy efficiency or reducing carbon emissions until 31 March 2003. Eligibility for the discount from this point onwards depends on whether the first targets set in the agreements have been met.

A Levy Exemption Certificate (LEC) is issued as evidence that Qualifying Power Output (QPO) electricity was produced in a fully exempt CHP station or a partly exempt CHP station. One LEC is issued for each MWh of certified QPO electricity. The LEC is part of the evidence that suppliers use to prove that they have supplied non-domestic customers with renewable source electricity, entitling the end user to an exemption from the Climate Change Levy tax. Ofgem will issue CHP LECs to an eligible CHP station.

Energy Sourcing: Renewables Obligation, Supplier Obligation & other measures

The Renewables Obligation

The Renewables Obligation Order (RO) was introduced in April 2002 and requires all licensed electricity suppliers in England to source a specific increasing percentage of the electricity they supply from renewable sources. In 2006-07 the obligation was set at 6.7 per cent and the current level is 7.9 per cent for 2007/08 rising to 10.4 per cent by the period 2011-12, then by 1 per cent annually for the five years following 15.4 per cent by 2015/16.

A Renewables Obligation Certificate (ROC) is a tradable certificate issued to an accredited generator for eligible renewable electricity generated within the United Kingdom and supplied to customers within the United Kingdom by a licensed electricity supplier. One ROC is issued for each megawatt hour (MWh) of eligible renewable output generated. Where suppliers do not have sufficient ROCs to cover their obligation, they must make a payment into the buy-out fund. The buy-out price is a fixed price per MWh shortfall and is adjusted in line with the Retail Price Index each year. The proceeds of the buy-out fund are paid back to suppliers in proportion to how many ROCs they have presented. For example, if they were to submit 5 per cent of the total number of ROCs submitted they would receive 5 per cent of the total funds that defaulting supply companies pay into the buy-out fund.

Compliance periods run from the 1st April each year to the 31st March. Generating stations located outside the United Kingdom are excluded from benefiting from the RO. It is expected that the RO, together with exemption from the CCL for electricity from renewables, will provide support to industry of up to £1bn per year by 2010.

Additionally, operators of large generating stations must provide the Office of Gas and Electricity Markets (Ofgem) with an annual declaration, confirming that they are not a connected or linked person to an owner or operator of a generating station that is a party to a Non-Fossil Fuel Obligation (NFFO) contract that provided for the building of a generating station at a particular location. The schemes are no longer open to new generators, but existing contracts will continue until the last of them expires in 2019.

The Renewable Transport Fuels Obligation

The Renewable Transport Fuel Obligation (RTFO) due to come into effect from April 2008, places an obligation on fuel suppliers to ensure that a certain percentage of their aggregate sales is made up of biofuels. The aim of the obligation is that 5 per cent of all UK fuel sold on UK forecourts will come from a renewable source by 2010 – an absolute reduction of 0.7-0.8 million tonnes of carbon. The RTFO is modelled on the existing Renewables Obligation

The obligation is based upon a mechanism for trading RTF certificates. If a company cannot produce enough certificates at the end of each compliance period it will have to pay a buy-out price which will go into the RTF buy-out fund.

Planning policy framework & building regulations

The building sector accounts for a significant proportion of the EU's energy requirement (around 40 per cent using the widest of definitions), and offers the single largest opportunity for energy efficiency. Driven by the EU, developments include a new code for Sustainable Homes, Energy Performance Certificates and ever tightening Building Regulations. The UK

government has set out plans in its Building for a Greener Future policy statement in July, 2007 for all new homes to be zero carbon by 2016. To achieve this interim milestones have been set of 25 per cent in 2010 and 44 per cent by 2013.

English Building regulations are set out in the Building Act 1984. The Climate Change and Sustainable Energy Act 2006 makes provision for microgeneration be brought within the Building Regulations, and increases the time limit for prosecuting contraventions of the regulations relating to energy use, energy conservation or carbon emissions to two years. It also requires the Secretary of State to report on compliance with these aspects of the Building Regulations and steps proposed to increase compliance.

From 6 April 2006, the 14 sections of the Building Regulations were extended to incorporate Energy in Existing and New Buildings to be measured. The term 'Building Work' was once again amended its scope extended to include "renovation of thermal elements", and energy used by 'space cooling' systems as well as energy used by 'space heating' systems. These are now subject to efficiency limits and energy use controls. New Regulations also require the calculation of building Carbon / Energy Targets and Carbon / Energy Emissions. A building's 'Air-tightness' must now be tested. New building ventilation provisions were introduced.

Climate-driven factors in other policy, Acts and regulation

There are a number of policies with strong climate driven agenda's including the Climate Change Programme (2006), new Energy Review which lays the foundation for the nuclear build programme as well as the Energy White Paper (discussed in the next section).

Climate Change & Sustainable Energy Act 2006

This includes:

- ⇒ Publication of annual microgeneration targets
- ⇒ Review of permitted development rights
- ⇒ Changes to the building regulations.
- ⇒ Facilitating the involvement of local authorities in microgeneration technologies
- ⇒ Reporting of emission reductions achieved by government departments.

There are three legislative pillars to the Government's response to climate change:

- ⇒ Climate Change Bill – first country to set itself legally binding carbon reduction targets
- ⇒ Planning Reform Bill – aiming to streamline the planning regime by including a single consent for major infrastructure projects and the creation of an Independent Infrastructure Planning Commission.
- ⇒ Energy Bill – to create greater incentives for and 2nd tier of renewables.

Sub-national Review

July 2007's Sub-national Review (SNR) of Economic Development and Regeneration recognises that economic growth must be sought within the context of the challenges of environmental constraints, including the issue of climate change.

Whilst not including any specific legislation, the SNR advocates strong regional and local planning to ensure that regions and City-regions are resilient to climate change and also recognises that to tackle climate change incentives for Government, business and individuals need to change.

Some future mechanisms discouraging emissions and pollution

- ⇒ The EU **Waste Electrical and Electronic Equipment (WEEE)** Directive is one of a series of 'producer responsibility' directives that forces EU producers of new

equipment pay for the recycling and / or safe treatment and disposal of the products they put on the market at the end of their 'life'.

Any business that manufactures brands or imports electrical or electronic products is known as a 'producer' and is affected by this directive. Businesses selling electrical items or storing, treating or dismantling WEEE are affected. The legislation applies to household and non-household products.

- ⇒ **REACH** is a single EU regulatory system for chemical substances aimed at improving the protection of citizens' health and the environment. The marine framework directive aims to ensure that all EU marine waters are environmentally healthy by 2021 and it is the main component of the Thematic Strategy on the protection and conservation of the marine environment, which the Commission adopted in October 2005.

REACH will require the registration over a period of 11 years of around 30,000 chemical substances currently in use. It is expected that the most dangerous among them will be progressively phased out and replaced by safer substances. The day-to-day management of the new requirements will be the responsibility of the new European Chemicals Agency (ECHA) to be set up in Helsinki. There is limited information on this at present but it is likely to have a significant impact on many businesses.

Mechanisms encouraging green business practices

There are also a number of mechanisms in place to encourage green business practices. A selection of which are highlighted below:

- ⇒ Corporate tax: enhanced capital allowances for energy-saving plant and equipment;
- ⇒ Renewables Obligation Certificates (ROCs) for use of renewable energy;
- ⇒ R & D tax credits;
- ⇒ Exemptions from Climate Change Levy, including:
 - Renewable energy sources;
 - Supplies to and from Combined Heat and Power (CHP) plants;
 - Climate Change Agreements (CCAs) negotiated with Government;
- ⇒ Government funding; and
- ⇒ Environmental Transformation Fund to spend at least £370m on development of low carbon energy technologies in the UK.

2008 Budget

The box below summarises the main legislative changes related to climate change announced in the 2008 budget. It should be noted that some legislation may be for tax raising purposes rather than an attempt to influence behaviour per se.

The Government has committed to taking advice on whether the carbon emissions reduction target should be raised to 80 per cent by 2050. This is a requirement on the Government as part of the Climate Change Bill.

Other climate change / environmental issues include:

- ⇒ A reform of car taxation to encourage the use of cleaner and more efficient vehicles. For consumers, reform of vehicle excise duty from 2009 based on carbon dioxide emissions. A notable highlight is a first year 'show-room' tax, with vehicle excise duty of £950 from 2010-11 for the most polluting vehicles. By contrast, there will be a first year zero rate for new cars that emit 130g CO₂ per km or less. These changes can be expected to have real impact on behaviour. For business, car capital allowances are to be based on emissions with low emitting cars continuing to receive a 100 per cent first-year allowance until 31 March 2013 (this was due to expire in this year). In addition, company car benefit tax rates, which are already based on emissions, will generally increase from 6 April 2010.
- ⇒ Capital allowances for expenditure on thermal insulation on all qualifying business buildings, extension of Enhanced Capital Allowances to 'good CHP' (Combined Heat & Power) and an extension of 100 per cent First Year Allowance for expenditure incurred on natural gas, hydrogen fuel and biogas to 31 March 2013.
- ⇒ Retrospective exemption from Stamp Duty Land Tax on new zero carbon flats from 1 October 2007.
- ⇒ Climate Change Levy rates are to rise in line with inflation.
- ⇒ Aggregates Levy will increase from £1.95 to £2 per tonne from 1 April 2009.
- ⇒ Landfill Tax lower rate applying to inactive waste, will be frozen at £2.50 per tonne from 2009-10. Contaminated land relief for landfill tax is being phased out by April 2012 with the revenues being earmarked for land remediation relief. These changes could bring significant costs to developers of brown field sites.
- ⇒ The removal of the existing biofuel duty rate differentials for specific biofuels in view of the commencement of the Road Transport Fuel Obligation from April this year, which is expected to offer better support for different types of biofuels.

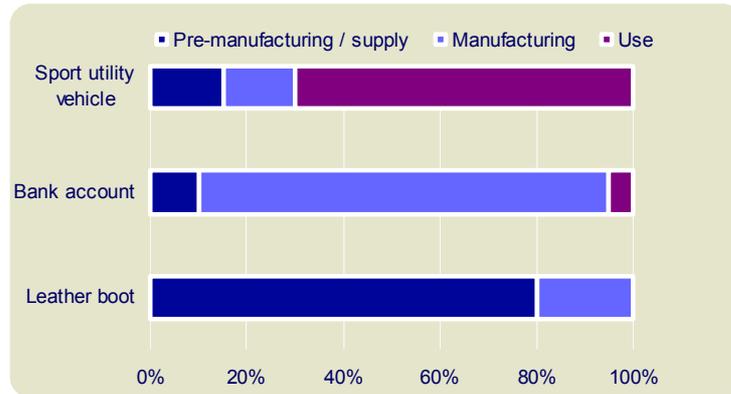
A number of other policy measures including:

- ⇒ consultation in summer 2008 on what the UK should do to increase renewable energy use and meet its share of the EU target and how to overcome planning and grid access issues;
- ⇒ proposed auctioning of 100 per cent of allowances for large electricity producers in Phase III EU Emissions Trading Scheme; and
- ⇒ a 'plastic bag tax' on retailers if they do not take action on single-use carrier bags.

Carbon footprints – product example

For instance, 90 per cent of the carbon from the shampoo life-cycle is from its use whilst running water at the end. On the other hand, reading a newspaper has no impact on the carbon emissions – all come from cutting down trees in the manufacturing stage. The figure below highlights the carbon emissions at three broad stages of the life-cycle for three other products.

Life-cycle analysis – examples of carbon emissions for different products



Source: Sustainability Forum and Deloitte Analysis

To target emissions reduction each of the products above would need a different approach including:

- ⇒ Strategic sourcing through procurement policies and supplier audits.
- ⇒ At the manufacturing and operations stage it is vital to ensure the appropriate energy management, waste and water management and logistics / transportation. and
- ⇒ At the point of product design the product life cycle evaluation and product innovation methods should be considered.

Annex B – Impacts of carbon price on energy sources

This section contains further information in relation to the Impacts of carbon price on energy sources including:

- ⇒ Coal
- ⇒ Gas
- ⇒ Nuclear
- ⇒ Renewables
- ⇒ Electricity

Coal

General trends and considerations

Given the abundance of global reserves of coal, future use of coal is unlikely to be limited by the availability of resources. However, there are a number of international issues and risks that could affect prices. These include the economic growth of rapidly developing economies and increasing levels of consumption by countries which are currently coal exporters. The global market is currently flexible and robust enough to respond, but there is risk of higher prices and short term price spikes.

On the other hand, there are risk factors which could affect supply or cause upward pressure on prices. For example, the Russian coalfields are a long way from port and supply interruptions have been caused over the past year as a result of congestion and shortage of rail cars.

Climate change impacts on price

Climate change policies will make coal less attractive, thus lowering coal demand and prices. Unless carbon capture and storage becomes more cost effective, a switch to gas or other alternative forms of electricity generation would be likely to push down international prices.

Gas

General trends and considerations

The forecast decline in indigenous gas supplies means that the UK will be increasingly reliant on gas imports, the price of which will be linked to prices in European and global gas markets.

While the UK gas market is one of the most liquid markets in the world and the most liquid in Europe, there is a relative lack of liquidity and competitiveness in some of the markets from which we import gas supplies. This is important when considering the likely responsiveness of the international marketplace to price signals from the UK.

Climate change impacts on price

Higher temperatures that are associated with global climate change could lead to a reduction in annual gas demand in the UK.

Research suggests that fixing the quantity rather than the price of carbon reduces the price elasticity of demand for gas appreciably. This amplifies the market power of gas suppliers, and the impact of gas price increases on the electricity price through the supply chain.

Nuclear

General trends and considerations

Energy from nuclear sources will help the government to meet its energy policy goals and will be a significant move towards a low carbon environment. Furthermore, the projected dependency on imports will fall with having our own energy source. However, the decision has not yet been made due to location and safety considerations.

Climate change impacts on price

A high carbon price would encourage a higher level of new renewables and also encourages nuclear power station owners to apply for life extension for all of the nuclear AGR plants by five years beyond the scheduled closure date, providing this would be allowed by the Nuclear Installations Inspectorate.

If a high carbon price leads to nuclear-generated electricity demand it may also encourage the Large Combustion Plants Directive (LCPD) opt-out power stations to run harder and consequently close earlier, either because they run out of useful life hours or because they wear out.

Renewables

Renewable energy includes all energy derived from natural sources that may be regenerated within a short period of time, from sun, natural movements and mechanisms of the environment. This includes biomass / biofuel, hydro power, solar, wave and marine, geothermal and wind sources. In practice it also includes technologies which increase energy efficiency and waste and carbon reduction.

Fuel inputs can be sourced from finite geological resources or generated from renewable forms of energy. In the very long term, as there is no supply limit to how much renewable energy can be used, fuel inputs to renewable energy may be more accessible than those forms of energy production which depend on the irreversible use of finite geological resources, i.e. fossil fuels and uranium. As these geological resources become scarcer and easily accessible reserves are depleted, the commodity price can be expected to rise, encouraging both demand reduction and the development of previously unexploited supply sources as well as increasing the competitiveness of alternative energy sources. Investment and experience should ensure cost reductions through economies of scale and technological improvement.

Key drivers of the use of (and prices of) renewables include:

- ⇒ Policy mechanisms influencing the relative price of fossil fuel;
- ⇒ Security of supply; and
- ⇒ Consumer / voter pressure.

If the carbon price is 'set' too low it will not encourage either a high level of renewables build or nuclear life extensions but is likely to increase the growth rate of gas demand.

Electricity

General trends and considerations

Britain's electricity comes from a variety of generating sources including renewables, coal, oil, gas and nuclear. Thus in the electricity generation industry, the price of carbon could be affected by both in the emissions generated directly by electricity producers but also indirectly through the supply chain depending on which inputs are used to generate electricity.

Climate change impacts on price

A low carbon price and a limited impact of carbon reduction policies would boost electricity demand. However, a strong regulatory approach would increase the price of carbon and, in turn, raise the wholesale price of electricity.

Evidence suggests that the price of electricity has risen dramatically in EU countries since the start of emissions trading.

The price of EUAs can feed through to the wholesale price of electricity in a competitive market. However, if final prices are regulated, the price could be capped to offset profits gained from allocated EUAs.

The Renewable Obligation targets an increase in the share of electricity provided by renewable sources to 10 per cent of electricity supply by 2010. This will rise to 15.4 per cent by 2015-6.

Annex C – Economic and social assets

This section contains further information in relation to economic and social assets within the North West region and City Region within the North West.

Regional assets

The North West region is home to the largest media hub outside of London (Manchester), one of the world's most famous waterfronts and current European City of Culture (Liverpool), the largest concentration of advanced manufacturing and chemicals production in the UK (Lancashire and Cheshire) and one of Europe's leading national parks (The Lake District). This section explores some of the key assets in the North West economy in more detail.

The North West of England is a £98 billion economy with 6.6 million inhabitants and over 230,000 firms

NWDA's Regional Economic Strategy (RES) highlights some of the important assets in the North West of England. It has been developed in the context of a rapidly changing global environment where international competition, energy supply and climate change are all of significant concern and very much interlinked. It has also been developed in the context of a range of European, national and regional policies. These include the government's Regional Economic Performance Public Service Agreement (PSA) target, aimed at reducing disparities in growth rates between regions, as well as the Northern Way Growth Strategy.

Broadly it is aimed at enhancing key business sectors, skills, infrastructure, research and development and innovation in the region. This will help to support and drive its economy in and ensure prosperity for the region in the future. As this report highlights in later sections, climate change legislation will have a significant bearing on what is required in terms of the aforementioned enhancements.

Key business sectors¹¹

The priority sectors have been identified to develop higher value activity, improve productivity and identify future growth opportunities from converging markets / technologies. The aim of this research is not to replicate that analysis beyond identifying those sectors but to provide summary information and, where necessary, in-depth analysis of climate change impacts.

There has been a marked decline in employment in manufacturing and primary sectors whilst employment in service sectors has grown. impacted in quite different ways than manufacturing and primary based industries

The North West economy is currently dominated by service sector industries. Since 1991, there has been a marked decline in employment in manufacturing and primary sectors whilst employment in service sectors has grown.

In broad sectoral terms, the North West features a number of sectors with a particularly high concentration of activity relative to that of the UK average. Based on location quotient analysis the following service sector industries are currently more concentrated in the North West region relative the UK¹² Distribution & retail; Hotels & restaurants; Transport & communications; Public administration & defence; Education; and Health.

Forecasts to 2026 highlight that these sectors will also become more concentrated relative to the UK in the future so are important assets for the North West economy. This growth is, in

¹¹ Key sectors in the region can be defined on a number of different criteria. These may include: Size (measured through gross value added – GVA – or employment); Concentration relative to the national equivalent (measured through location quotients); Productivity (measured through GVA per employee); Past and anticipated future growth; Links with the knowledge economy; and Influence in developing the brand of the region.

¹² Location quotients are based upon a calculated ratio, of employment in this instance, between the local economy and the economy of some reference unit. This technique compares the North West economy to the UK economy and highlights specializations or concentrations in the local economy.

itself, an 'asset' and is important with reference to climate change legislation as service sector industries are likely to be impacted in quite different ways to manufacturing and primary-based sectors.

Skills

There is evidence that employers in the North West are investing in skills for the future. For example, data on the proportion of employers that provided training during the previous twelve months shows that 64 per cent of employers in the North West provide training – which is not far behind the England average. In addition, employers in Greater Merseyside are most likely to provide training to their staff – with 67 per cent doing so.

Data from the National Employer Skills Survey¹³ 2005 helps to describe the training behaviour of employers in the North West, making comparisons across sub-regions and with England. It gives a high level indication of how pro-active North West employers are in workforce development. The survey highlighted that the skills issues in Greater Manchester is becoming more important in the workplace, with employers increasingly demanding higher-level vocational skills at Level 3 and above. This is a particularly important asset for the region given forecasts to 2017 in the latest Manchester Independent Economic Review which suggest half of all job opportunities will have a requirement of NVQ level 3 or above.

Infrastructure

The region benefits from excellent infrastructure and connectivity, particularly through multi-modal transport links building networks from Global Gateways to within the heart of local communities as well as centres of employment, and seats of learning and innovation. The North West's Regional Spatial Strategy (RSS) highlights that a high-quality transport system is essential to support the future competitiveness of the North West's industry and commerce, and to facilitate the Region's social and recreational needs.

The region benefits from the existence of a number of airports including those in Manchester (Stockport), Liverpool, Carlisle and Blackpool. Manchester Airport is the largest airport outside the Greater South East and the only international / intercontinental gateway to the northern regions that could have the capacity for the growth in business-based and tourist traffic anticipated in the Northern Way Growth Strategy.

The airport serves over 200 destinations across the world and continues to work towards further growth of its network of international scheduled destinations. It has an undoubted and significant economic contribution to City Region within the North West and the rest of the North West, but also well beyond the region as it provides a major international gateway for the North of England. However, Liverpool Airport has the potential to sustain further growth and become an important gateway for Merseyside and the second airport for the North West.

In addition to international connectivity the region also lies at the cross roads of two key development and transport axes within the country – the M62/M60 and trans-Pennine rail links as well as the M6 and West Coast Main Line. With a quarter of the nation's motorway miles, the region has one of the best road networks in the UK. The M66, M61, M56 and M62 (west) connect the region to other major cities. The M62 (east) links Manchester with Leeds, the Humber ports, the M1 and the A1. The M6 runs south to Birmingham and London, and north to Scotland.

The regional rail network provides helps to create and maintain links with organisations associated in rail service and infrastructure provision. The West Coast Main Line provides access into the region for national and international freight and passenger rail connections into London and Scotland. There are also links through the trans-Pennine motorway and railway linkages underpinning the North European Trade Axis running from the Mersey to the Humber ports.

¹³ The National Employers Skills Survey 2005 (NESS 2005) was commissioned by the Learning and Skills Council together with the Department for Education and Skills and the Sector Skills Development Agency.

The North West has major trading links into Europe through a number of small-scale ports as well as bulk tonnage through the Channel Tunnel and the Dover/Haven ports, and also through the Humber ports. This creates two major transport corridors of strategic importance for the region, from north to south and from east to west.

With respect to climate change and associated legislation, whilst the existence of excellent road and air links confers a competitive advantage in an era of Globalisation, it presents a challenge in terms of managing emissions. This is considered more fully in Chapter 5.

R&D and Innovative Capability

The region performs well on several measures of innovation¹⁴ and research and development, with a relatively high level of business R&D and a strong university research capability. The total levels of business R&D (£1.5bn in 2001) per head of population as a share of GVA are above average driven by a few peaks of performance and important chemicals, pharmaceuticals, aerospace and nuclear sectors. However, a recent Department of Trade and Industry report suggests that the region lags behind the all-England average in terms of leading edge innovation.

Within the 'Arc of Opportunity', The University of Salford has invested in a £10 million Innovation Forum which will house over 50 knowledge-based businesses, and will be the focus for community initiatives, education and training. The aim is to strengthen the enterprise culture in the area, promote business innovation and to help the business community grow and develop better working practices, as well as creating employment opportunities for local people. A similar objective is evident with the One Central Park development.

Companies are increasingly seeking to work in collaboration with world-class research facilities. Therefore the necessity for the Manchester City Region universities located within the Arc of Opportunity to be performing well is highly important. The University of Manchester is ranked 40th in the 2006 QS World University Rankings, and in the last Research Assessment Exercise (conducted before the merger of UMIST and Victoria), together they had as many 5 and 5* units as either Oxford or Cambridge. The ORC Universities (most significantly The University of Manchester) are expected to add £1.24 billion annually to the North West by 2015, and £2 billion to the UK as a whole.

As one of HM Treasury's Five Drivers of Growth, innovative capacity is likely to be a key determinant of long-term economic growth in the North West and Manchester City Region. The speed with which innovative minds can be leveraged is important. There is a need to provide businesses and individuals with practical and cost-effective solutions to the new climate change reality the greater the scope for sustainable economic growth in the region.

¹⁴ Innovation refers to the ability to recognise and exploit opportunity and create new business activity. Innovation can relate to new products, new processes, or new organisational structures. Much of the recent focus of Innovation Policy has been on encouraging better links between research organisations (the knowledge base) and industry.

Manchester City Region assets

City Regions are based on the economic footprint of a core city or cities. They represent the interconnection of markets for jobs, housing and the supply of goods or services, rather than the limitations of administrative boundaries.

The Regional Economic Strategies and the Regional Spatial Strategies of the North East, the North West and the Yorkshire & the Humber regions now recognise the role of the City Regions as key drivers of economic growth in the North. Unarguably, Manchester is the dominant city in this expanded region.

Key business sectors

The Manchester Independent Economic Review (MIER) has identified key industry sectors that are of importance to the Manchester City Region. The review highlights that certain sectors are significant in terms of total GVA output and are therefore critical to growth and the prosperity of the City Region's residents. These include Financial and Professional Services, Manufacturing, and the Life Science Industries.

Other sectors are also important due to the high levels of per worker productivity (GVA per employee) they support; these include Logistics, Manufacturing, Financial and Professional Services, ICT Digital / Communications, Aviation, Creative / Digital / New Media and Life Science Industries.

Many of these sectors are also critical for the future in terms of growing the knowledge economy. Other sectors are not as large but are, nevertheless, significant because they reinforce the area's global image and branding, for example, Sport and Hospitality, and Tourism.

Growth over the last decade has been based around an expansion in private sector services and not just on growth in the public sector. Although the single largest contributor is Other Public Sector Services – the combined contribution of Financial and Business Services, Communications and Transport easily outstrips that of the public sector.

Moreover, Manchester is the only UK city outside of London in the top 20 European business destinations and is currently the largest commercial centre outside of London with financial and professional services, media production, digital communications, high value manufacturing and a regional retail, cultural and sporting offer underpinning its destination role. Manchester is now ranked as the UK's best City for business.

The Manchester City Region also has some sectors with a particularly high concentration relative to the North West. Based on a location quotient measure the following sectors are currently more concentrated in the Manchester City Region relative to the North West¹⁵ Construction; Distribution and hotels; Transport and communications; and Financial and business services.

Forecasts suggest that these sectors – except for distribution and hotels – are expected to remain concentrated in Manchester, albeit at lower levels relative to the region in future.

Skills

The Manchester Independent Economic Review highlighted that sufficient skills, which match the changing needs of employers, are crucial to the successful development of the City Region's economy. With climate change legislation comes the need to source staff that are capable of meeting the induced demand for specific skills.

The Manchester City Region's current skills base has many positive features. This includes a relatively highly skilled economically active workforce with over three quarters (77.8 per cent)

¹⁵ As outlined earlier, location quotients are based upon a calculated ratio, of employment in this instance, between the local economy and the economy of some reference unit. This technique compares economy to economy and highlights specializations or concentrations in the more local economy.

of the City Region's population are economically active, marginally lower than the UK rate (78.3 per cent).

Within Manchester City Region, there are four universities (University of Bolton, University of Salford, University of Manchester and Manchester Metropolitan University) and one other higher education institution (Royal Northern College of Music, or RNCM). The Higher Education Statistics Agency provides data on the total numbers of students within these institutions in comparison with the rest of the UK. These show that the share of postgraduate, undergraduate and higher education students are broadly inline – and in some instances higher – compared to the national average. In particular, the higher Education institutions Joule Centre, Manchester University, MMU, Salford are the key assets that make Manchester City Region unique. Other universities in the region include: University of Bolton; and the Regional Centre of the Open University.

Infrastructure

As discussed in the equivalent section for the North West of England, Manchester is already the primary airport for the North of England and as passenger capacity continues to expand, the number of passengers using the airport is expected to grow to around 42 million per year by 2015. This is an important asset to the Manchester City Region, wider North West region and North of England.

The city region also lies at the cross roads of two key development and transport axes within the country – the M62 / M60 and trans-Pennine rail links as well as the M6 and West Cost Main Line. The completion of the M60 ring road in 2001 has led to less congestion and better access to the city for Greater Manchester residents. As a result around 20 million of the UK's residential population and over 60 per cent of all UK businesses are within two hours drive time of Manchester.¹⁶

There are also a number of rail links with the largest heavy rail network outside of London and the UK's most successful light rail system in the Metrolink network.

Virtual connectivity is equally important for a knowledge economy and the Manchester city region is the second most important hub for broadband infrastructure in the UK, having the only international internet exchange outside London.

R&D and Innovative Capability

Science Parks are important drivers of the Manchester City Region economy. Around 200 University alumni work in the 1,000 workplaces of the MSP tenants, increasing the knowledge flow within the Science Parks. In addition to this, 11 per cent of tenants come from outside the North West, therefore adding significant value to the MCR economy, whilst around 15 per cent of people employed by tenants live within 3 miles.

The Universities undertake research linked to major companies, such as Astra Zeneca for example. The recently created new University of Manchester has the 5th largest research budget provided by HEFCE2 of any English University and the scale of HEI research activity in Manchester is larger than in any city in the Midlands or North of England.

The Oxford Road Corridor (ORC) Implementation Plan aims to establish the ORC as an 'international location for study, research, innovation and public service'. With this comes the expected additional increase of 8,000 jobs and £3 billion in investment over the next ten years. This level of investment, particularly along the ORC, is likely to create a climate for innovation and the embedding of innovative capital and mainstream projects.

¹⁶ Source: CACI, 2002

Annex D – Supply chain impacts

This section contains further information in relation to supply chain impacts of climate change legislation.

Raw material extraction:

- ⇒ A major method for a business to achieve its Climate Change Agreement (CCA) target and the 80 per cent Climate Change Levy discount is through the use of recycled materials. Materials purchasers will therefore favour recycled products over extracted products, though other factors exist.
- ⇒ Raw materials are also subject to the Aggregates Levy, a tax on primary sand, gravel and rock extraction. Using recycled materials means the Aggregates Levy is avoided.

Manufacturing:

- ⇒ Iron and steel, cement and lime, paper, food and drink, glass and ceramics manufacturing are all covered by the EU Emissions Trading Scheme. A proportion of the costs incurred by the manufacturer in complying with the scheme will be passed on to their customers depending on price elasticities.

Distribution:

- ⇒ Increased cost of air transport – as a result of the possible inclusion of aviation in emissions trading schemes and increased fuel taxes.
- ⇒ The Government incentivises companies to shift their car fleets to low-carbon portfolios via favourable company car tax and duty rates. VAT fuel scale charges are also now based on vehicles' carbon emissions. There is also a flow on effect to National Insurance contributions for employees with company cars
- ⇒ Congestion Charging and Low-Emission Zones are other mechanisms for incentivising the use of low-emission vehicles as the charges they incur are either reduced or waived. Although such mechanisms only currently exist in London, there is potential for them to be replicated in other large UK cities and notably for this study in Central Manchester.

Disposal:

- ⇒ The Landfill Tax incentivises business to divert its commercial and industrial waste from landfills to alternative waste management processes, particularly recycling.
- ⇒ A key regulation impacting on the manufacturing industry is the Waste Electrical and Electronic Equipment (WEEE) Directive. As discussed earlier, the objective of the directive is to reduce the amount of electrical goods waste going to landfill and improve recovery and recycling rates. Businesses which are manufacturers of electrical or electronic equipment must comply with the regulation or face prosecution. The implication of the regulation is that manufacturers have become responsible for what happens to their product after its use and must ensure compliant processes are in place to dispose, recycle or re-use it. It is anticipated that similar regulations will be initiated for packaging, tyres, end-of-life vehicles and batteries.

Strategic supply-chain thinking

A recent initiative by businesses committing to reduce the carbon footprint of their supply chains is that of carbon labelling. A carbon label is a measure of the carbon footprint of a product across its lifecycle.

Case study

As part of Atlanta's Energy Conservation Program, the city's Department of Procurement has instituted an ENERGY STAR energy-efficient purchasing policy. By purchasing office equipment and other products that have the federal ENERGY STAR label, the city will save energy, which translates into financial savings and reductions in greenhouse gas emissions. The city estimates that it could save nearly \$400,000 over ten years if it replaced 1,000 exit signs with ENERGY STAR-qualified models alone.

To accurately carbon label a product the carbon emissions from each stage of the supply chain must be calculated. Because the label is shown on the product and hence visible to consumers, there is incentive for businesses to make the product low carbon. Carbon labels on products will only be useful to consumers if there is a common standard.

The monitoring of the supply chain to calculate the label on its own makes suppliers more aware of their emissions. To make the product low-carbon the sellers, i.e. the business with their name on the product, will put pressure on their suppliers to reduce emissions. One way businesses are doing this is by setting our environmental standards and targets when commissioning suppliers.

Other examples of strategies businesses have implemented for reducing their supply chain footprint include:

- ⇒ Switching from air transport to shipping, rail, waterway or 'combined transport' (a combination of a road & non-road method);
- ⇒ Redesign of distribution networks to reduce total product mileage;
- ⇒ Sourcing of locally produced goods;
- ⇒ Commissioning of suppliers who offset their emissions;
- ⇒ Redesign of products and 'lean manufacturing' to reduce the use of materials;
- ⇒ Internal carbon trading schemes to promote innovation within parts of the business;

Case study - working with suppliers for environmental standards

B&Q currently works with its suppliers to identify the environmental issues associated with each product's life-cycle. The company defines environmental performance standards for suppliers and then assess performance against them. To help them in this, B&Q provides training for commercial teams and suppliers on environmental issues. It also ensures that product labelling is verifiable and that the development or refurbishment of suppliers' premises is consistent with B&Q's standards.

Annex E – Scenario analysis assumptions

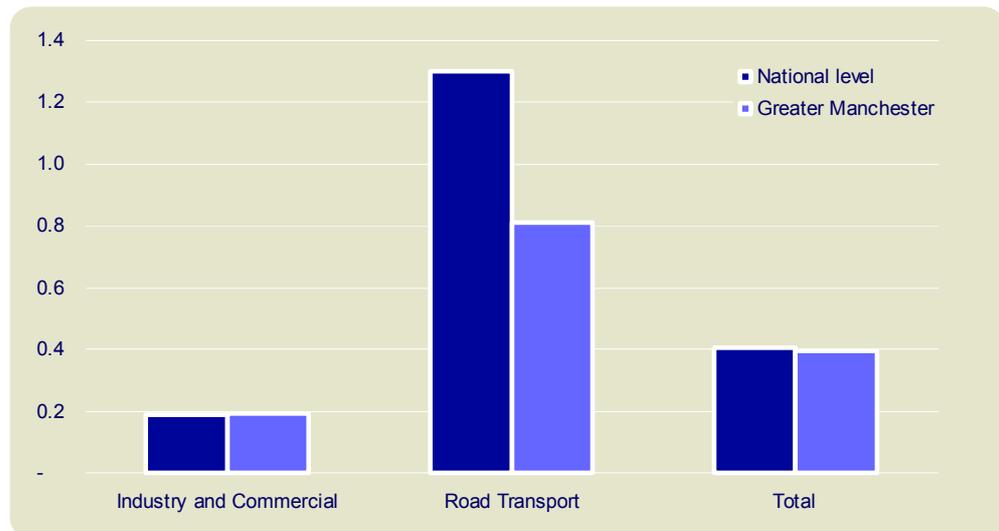
This section contains further information in relation to the assumptions used in the scenario analysis.

The following comparisons in the figure below have been made for emissions per unit GVA in Manchester City Region and at the national level. This comparison is also limited in its usefulness as it is based on just three broad sectors for which emissions data is available for Manchester City Region. These sectors include:

- ⇒ Industry and commercial;
- ⇒ Domestic; and
- ⇒ Road transport

Although emissions data is available for the domestic sector as well, there is no readily available GVA data to make the appropriate comparisons. This will however, be incorporated in the 'total' segment. The analysis highlights that although there may be differences – as expected – between the relationship between emissions and economic output for the local economics of Manchester City Region and the UK or England, it is a reasonable assumption that on the whole there will be similar trends for each sector.¹⁷

Thousands of tonnes of Emissions per £million of GVA, 2005.



Source: ONS, DEFRA, Deloitte Analysis

¹⁷ As an example, it is not entirely clear how the definition of road transport is calculated in DEFRA's experimental local statistics of 2005 relative to official ONS and SIC definitions. Accordingly, whilst road transport emissions are higher at UK level in the above chart, this could be as a result of non-consistent definitions.

Annex F – Funding sources

There are a number of national funding opportunities and initiatives that can help support business in the region in addition to that offered through the North West Regional Development Agency:

- ⇒ Technology Strategy Board (TSB) – focuses on a selected number of areas in which technology innovation has a significant role to play, these include environmental sustainability and energy generation and supply;
- ⇒ Energy Technology Institute (ETI) – a Public: Private partnership principally between BERR and four of the world's leading international energy companies and hosted by the Universities of Birmingham , Loughborough and Nottingham;
- ⇒ Energy Research Partnership (ERP) – aims to improve the impact of funding for energy research and innovation;
- ⇒ Environmental Transformation Fund (ETF) – will begin operation in April 2008 and offer £400m in funding over three years. The objective of the Fund is to accelerate commercialisation of low carbon energy and energy efficiency technologies in the UK;
- ⇒ Low Carbon Innovation Programme (CT) – the venture capital invests, leveraged from private funding sources, in the UK's clean energy technology industry, provides grants for projects that demonstrate a potential to reduce greenhouse gas emissions, and supports companies with promising low carbon technology potential who are successful in the application process;
- ⇒ Sustainable Procurement Task Force – established in May 2005 with an aim to develop an action plan to raise the level of UK sustainable public procurement to become a European leader;
- ⇒ Environmental Action Fund (EAF) – set up with an aim to assist voluntary and community sector groups in furthering the Government's sustainable development objectives within England but is currently closed due to budget pressures; and

Low Carbon Building Programme (LCBP) – launched in April 2006 aimed at businesses, householders, communities and voluntary organisations. It is also currently closed for applications.

Annex G – Case Studies

This section contains further information in relation to sector specific impacts – focusing on some key case studies.

Country / region case studies

Local governments are responsible for issuing building and development permits and for making land-use decisions about residential and commercial neighbourhoods. They also have the authority to determine the availability of public transport, and to set building codes that influence the energy efficiency of houses and commercial buildings.

However, there are lessons that can be learned from other regions across the globe in how to control local energy used. This section outlines some actions other regions are developing to tackle climate change.

Toledo, Ohio

Some estimates have suggested that the drive toward solar power could create two million jobs in the United States by 2020. Toledo, Ohio, is leading the way with a dedicated cluster geared toward the design and manufacture of such panels. 6,000 people were employed in the cluster in 2007 and Toledo has launched a \$22 million venture capital fund to back new start-ups in the industry.¹⁸

California

To date climate change revolution in the United States has been led at a state rather than federal level. In California (traditionally the greenest of the US states), the Government have looked into opportunities and constraints for managing the impacts of climate change and in doing so aim to be the first 'green economy' Much in the same way Silicon Valley has come to represent a model for regional economic growth, California aims to use climate change as a positive driver for innovation, job creation and economic growth.

Governor Arnold Schwarzenegger recently called for specific emission reductions, a periodic update on the state of climate change science and the emerging understanding of potential impacts on climate-sensitive sectors such as the state's water supply, public health, agriculture, coastal areas, and forestry.

Whilst California has much more autonomy than Manchester and the North West of England, there are key learning points that are brought out in subsequent sections of this report.

In California, efforts to raise awareness efforts surrounding the environmental impacts of human activities has affected values, beliefs, and in some cases public policies and individual behaviours. Littering is now generally viewed as "bad," recycling as "good." Similar social norms are also beginning to emerge around climate-relevant behaviour.

Since 2002, there has been \$2 billion in clean-tech venture capital, 124 start-ups incorporated and an estimated 52,000 - 114,000 jobs will be created by 2010. Meanwhile, over 100,000 Americans are directly employed by companies producing biomass, solar, wind, and geothermal energy.¹⁹

London

In 2004 the Mayor launched the London Energy Strategy. The Mayor had no statutory powers in respect of energy but was required to deliver his other strategies with due consideration of sustainable development. He decided that this could not be achieved without an Energy Strategy and so developed and adopted one. The Strategy identified the London Energy Partnership (also established in 2004) as the vehicle through which it would be delivered. The LEP consists of key stakeholders and delivery agencies with a remit to providing sustainable energy supplies to the capital. Following the appointment of Nicky Gavron as

¹⁸ Deloitte, 2008, Climate Changes Everything: The Dawn of the Green Economy.

¹⁹ The National Resources Defense Council estimates

Deputy Mayor a new agency was established to take forward climate change work across London; the London Climate Change Agency is a limited company wholly owned by the London Development Agency. Its principal activity was the establishment of the London ESCo and the procurement of a private sector partner. EDF was appointed and owns 80.1% of the company whilst LCCA owns the remaining 19.9%. At this time the Mayor released his Climate Change Action Plan setting out a path for London to tackle climate change and deliver London's CO² targets. In 2007 concern over the effectiveness of the LCCA (to date the London ESCo has not secured a single contract) led to a restructuring of climate change and energy related activities within the London Development Agency.

Under new powers granted to the Mayor under the Greater London Authority Act 2006 in respect of energy he is producing a new Climate Change and Energy Strategy, with a view to publishing in 2008. GLA retains the lead on energy policy whilst the LDA has the lead on delivering key elements within the mayor's Energy Strategy and Climate Change Action Plan. In doing this it has established two new units alongside the LCCA, one dealing with non-infrastructure elements of climate change and another dealing with infrastructure related work. This latter team, the Decentralised Energy Delivery Unit, currently consists of secondees from Arup with a view to establishing a permanent team (Head of Delivery has been appointed) shortly to take forward work on Energy Service Companies, Combined Heat and Power Plants and other related work. The LCCA is now responsible for new technology and the residual ownership of the London ESCo. This arrangement is about to be reviewed yet again.

Meanwhile the London Energy Partnership's role is now to facilitate the development of sustainable energy within the city and identify gaps in provision. It undertakes research and pilots initiatives which are then passed to the LDA for full scale commercial development.

UK

The Carbon Trust receives funding from the Climate Change Levy. The trust provides a variety of products and services to businesses that would like to reduce their carbon emissions. As well as various publications and guides offering information and advice to companies, the Carbon Trust also offers interest-free energy-efficiency loans to help businesses fund their energy-saving projects, Enhanced Capital Allowances for energy-efficient equipment, energy surveys, and a Design Advice Service which advises businesses on the construction of more energy efficient commercial buildings. The offer of ECAs is one of a few concrete financial incentives to be greener. It means that in the first year of investment, businesses can claim back 100 per cent of the capital cost against their taxable profits.

Clinton Foundation's Climate Initiative

Clinton Foundation's Climate Initiative (CCI) works with the C40 Large Cities Climate Leadership Group, an association of large cities dedicated to tackling climate change – to develop and implement a range of actions that will accelerate greenhouse gas emissions reductions.

These examples highlight the importance of strong governance and the role they can play in giving Manchester City Region a competitive advantage.

Sector case studies

The financial services sector

Background

In the UK, air emissions from financial services account for just 0.1 per cent of all greenhouse gas emissions. However, although businesses in the financial services sector may not have significant levels of relative energy use or emissions, they use products that are energy intensive and will still have an important role in climate change policies in the North West.

Impact of climate change policies

There is currently no legislation that directly affects goods or services sold in the financial services sector. However, that does not rule out the possibility in the future. And climate

change policy is still likely to have an impact indirectly through links with other sectors, although any impact is likely to be lower than in other industries.

Commercial banks could, in future, reduce risk by pricing climate change risks into loan terms and conditions. This would also encourage borrowers to adopt adequate climate mitigation strategies.

Insurance companies could influence investors to account for climate change risks in the structure of the insurance coverage. By specialist underwriting procedures and developing new risk transfer products, insurers can ensure that economic adverse effects of climate change can be internalised in investment decisions. For example, at present insurance policies automatically cover property in the event of floods. In future, insurance companies in England may adopt higher premia to account for those in flood risk areas. However, effective cross-subsidisation from lower-risk consumers may not prove sustainable if there are further cases of extreme weather. Likewise, higher premia for higher-risk customers may result in people choosing to not take out insurance – creating a market failure.

As a result there is a possibility that the insurance industry will require Government support to create a reserve pool in order to cover high risk areas. This is already in place in other markets such as the Terrorism Risk Insurance Act and its extension (TRIEA) in the US which authorised the creation of a federal reinsurance plan. This is enforced when insured terrorism losses exceed a predetermined amount and the reinsurance program has enabled the commercial insurance market to function, despite the remaining threat of terrorism.

There are opportunities in adaptation to climate change in the insurance industry to ease the financial impact of more extreme weather. This is already taking its toll, with claims related to natural disasters rising twice as fast as general insurance claims. But growing awareness of climate change is also likely to encourage an increase in insurance cover not only by individuals and companies, but perhaps even by governments and international organisations.

Financial industry regulators may look at methods for listed companies and their financial advisers to provide investors with information on climate risks. They might demand that investment related documents, company profiles and stock market prospectuses should contain climate change risks.

Asset managers could have an important role to play in directing capital towards new environmental technology by designing products that encourage institutional investment in these technologies. They should be encouraged to develop more robust, quantitative tools that account for the implications of GHG regulations and climate risks on equity prices, corporate earnings and relative sector risk.

A number of financial services companies have announced their intention to go 'carbon-neutral' by 'offsetting' carbon emissions that they themselves cannot reduce. For instance, HSBC are planning to plant trees, reduce energy use, and buy 'green' power to become carbon neutral at an extra cost to the bank. In addition, major investment banks are lining up sizeable funds to invest in this area.

Businesses in this sector are not significant emitters of CO₂ therefore direct impacts of climate change and its associated legislation will be relatively small. However, some legislation can apply to operations within these firms.

Case study

EU targets on car emissions indirectly applies to Barclays fleet of cars but the company proactively encourages eligible staff to participate in the company car scheme as it allows greater flexibility in creating a greener fleet, as well as ensuring the safety of staff while travelling by car for business.

Key Issues

The direct legislative burden is comparatively low compared to other sectors, but future legislation could change this and the sector is still affected significantly through supply-chain.

Travel and transport

Background

Transport accounts for 14 per cent of global greenhouse gas (GHG) emissions, behind the power and land use sectors and the same as the agriculture sector. The majority of these emissions are from road transport (76 per cent) and aviation (12 per cent).²⁰

The Stern Review highlights that the demand for transport is a derived demand. As such, a key driver behind growth in transport emissions is income. Associated transport emissions increase with income both because more travel is being undertaken, and because as earnings rise there is often a switch to more carbon-intensive modes (for example from bus to train, from train to car or from small car to large car).

Transport emissions are influenced by cost and demand is more inelastic in the transport sector than in the buildings and general industry sectors. Other important factors affecting emissions include availability of less carbon intensive modes of transport (the balance between public and private transport for example), social choices (such as willingness to walk or use bicycles), the carbon content of fuel and a large number of technical developments affecting fuel efficiency (for example, factors related to vehicle weight and design).

In the North West, Air travel is forecast to double to around 38 million passengers per annum by 2015. The growth of air passengers could create demand for significant growth in jobs and increased opportunities for local suppliers.

In addition to direct CO₂ emissions from road vehicles, aircraft, trains and ships, transport also contributes to climate change through the supply chain in the form of upstream CO₂ emissions, including manufacturing of aircraft, trains and vehicles. The refineries that produce transport fuel release CO₂ emissions. Also, electricity consumed by electric trains and road vehicles is indirectly associated with CO₂ emissions from the power sector.

Impact of climate change policies

The effects of climate change legislation in this sector are particularly important for the North West economy. The 'traffic-light' analysis in Chapter 4 highlighted that the 'Air transport' and 'Other land transport' industries have the highest risk from climate change policies in the Manchester City Region based on their direct energy use and emissions relative to other sectors.

The transport sector is already affected by the climate change / environmental policies. In the 2008 Budget the announcement of further plans to increase taxation for the most polluting cars highlight that regulation is already affecting the industry and may have an impact on behaviour.

In future, further regulatory measures are likely to affect input costs in the sector. For instance, the Renewable Transport Fuel Obligation requires that 5 per cent of all UK fuel sales come from renewable sources by 2010-11.

In addition, other consumer campaigns may lead to legislation. An example is the 'food miles initiative' which calls for a ban on food imported from long distance, because of the fuel burned in its transport.

The transport sector is currently excluded from the EU Emissions Trading Scheme, and there are currently no plans to include road and rail transport in the future. However, from 2011-12 airlines will be able to trade surplus credits on the European Emissions Trading Scheme (EU ETS). As discussed in Chapter 4, the road and rail network are an important asset to the local and region's economy. Consequently this could create costs or opportunities for related businesses in the future.

²⁰ Stern Report

The European Parliament also supports the introduction of taxation on aviation fuel. This could have a significant impact on smaller airports and related businesses in the North West region that may not be in as strong a position as the larger airport at Manchester and airports located in the South of England. It would also work to place pressures on Manchester Airport. Depending on whether or not airlines pass on any additional costs to customers the price of trips could rise in the future – although air travel may be relatively inelastic. This will have a greater impact on goods and services where the demand is more elastic – such as flights taken for holidays.

Key Issues

The transport sector is already affected by the climate change agenda and environmental policies and stands to be targeted with further anticipated and unanticipated legislation.

Elements of the North West economy are likely to be vulnerable through the supply chain with many sectors dependent on effective transport links.

Information and Communications Technology

Background

Estimates for the contribution of the Information and Communications Technology (ICT) industry to emissions can vary depending on the definition. For example, Computer services alone accounts for 0.05 per cent of all CO₂ emissions whilst, on a wider definition, IT has a more significant environmental impact for all organisations which are large users of IT. On this wider definition the industry is estimated to produce 2 per cent of global CO₂ emissions.

The sector is particularly important to the North West region with ICT having been identified as a key industry sector that is of importance to the Manchester City Region, as discussed in Chapter 4.

Impact of climate change policies

The ICT industry will also have to deal with the impacts of climate change. Impacts could include higher demand for 'Green Computing' – which involves using computing resources efficiently. Typically, green computing systems or products incorporate more than economic viability of a computing solution by accounting for environmental impacts. It uses good business principles to reduce costs and improve service, whilst also reducing an organisations impact on the environment. Examples of strategies which involve green computing include:

- ⇒ Green Strategy
- ⇒ Infrastructure Optimisation
- ⇒ Data Centre transformation
- ⇒ Cost Reduction
- ⇒ Green Sourcing & Procurement
- ⇒ Capacity Management & Provisioning
- ⇒ Green Audit & Due Diligence
- ⇒ Asset Management
- ⇒ WEEE Handling & Recycling

Efficiency gains will combat rising energy costs and environmental taxes. Increasing the utilisation of IT hardware maximises value from IT investments. Changes in regulation are creating new risks and new opportunities for the sector. In the medium term some of the cost reduction improvements that the sector may benefit from include:

- ⇒ Economies of scale through Centralised 'green' procurement policies;

- ⇒ Improved assessment of total cost of ownership;
- ⇒ Reduced power expenditure for data centre and distributed computing;
- ⇒ Reduced tax liabilities & leverage tax and R&D credits;
- ⇒ Reduced infrastructure spend via improved capacity planning and demand aggregation;
- ⇒ Reduced print and copy costs through use of managed print services (MPS); and
- ⇒ Reduced employee travel costs through improved use of technology (e.g. voice and video conferencing).

General Manufacturing and Extraction

Background

Process and end-use efficiency improvements have delivered major energy savings in manufacturing in recent decades, particularly in key energy intensive sub-sectors. For example, between 1990 and 2004 emissions in the manufacturing sector fell by 27 per cent despite a 32 per cent increase in the sector's output.²¹ Greater use of more integrated processes, for example to utilise waste heat, together with the introduction of new technologies particularly in key energy intensive sectors are critical to reducing global growth in emissions.

In addition, progressive substitution of gas or renewable sources for coal and oil inputs has contributed to the slight reduction in direct CO₂ emissions from manufacturing and construction. Higher energy prices are likely to be a key incentive to achieve the necessary future reductions in industrial carbon intensity.

The industry sector can contribute to emission savings through measures to switch towards lower carbon fuels and technologies, improve efficiency, and reduce upstream emissions via reduced demand for energy. For example, the IEA found that industry could contribute 5 GtCO₂ saving at \$25/tCO₂ by 2059. Almost half of this is upstream emission savings arising from reduced demand for electricity.

Impact of climate change policies

As discussed earlier, tighter environmental regulations will push up energy prices in an attempt to change behaviour. Given the energy intensive nature of mining and metals production, the industry is likely to see higher input costs as a result in the production of commodities. Much of the recent increase in crude oil prices have been absorbed by manufacturers, however the impact of regulation on input costs may be passed onto the consumer depending on price elasticities.

The manufacturing sector has the burden of the following compliance costs and financial liabilities:

- ⇒ Integrated Pollution Prevention and Control (IPPC) Regulations;
- ⇒ Large Combustion Plant Directive;
- ⇒ Contaminated land regime;
- ⇒ Control of Asbestos at Work Regulations; and
- ⇒ Producer responsibilities;

²¹ Based on the latest data from the Office for National Statistics' Environmental Accounts

It also has tax liabilities to contend with such as:

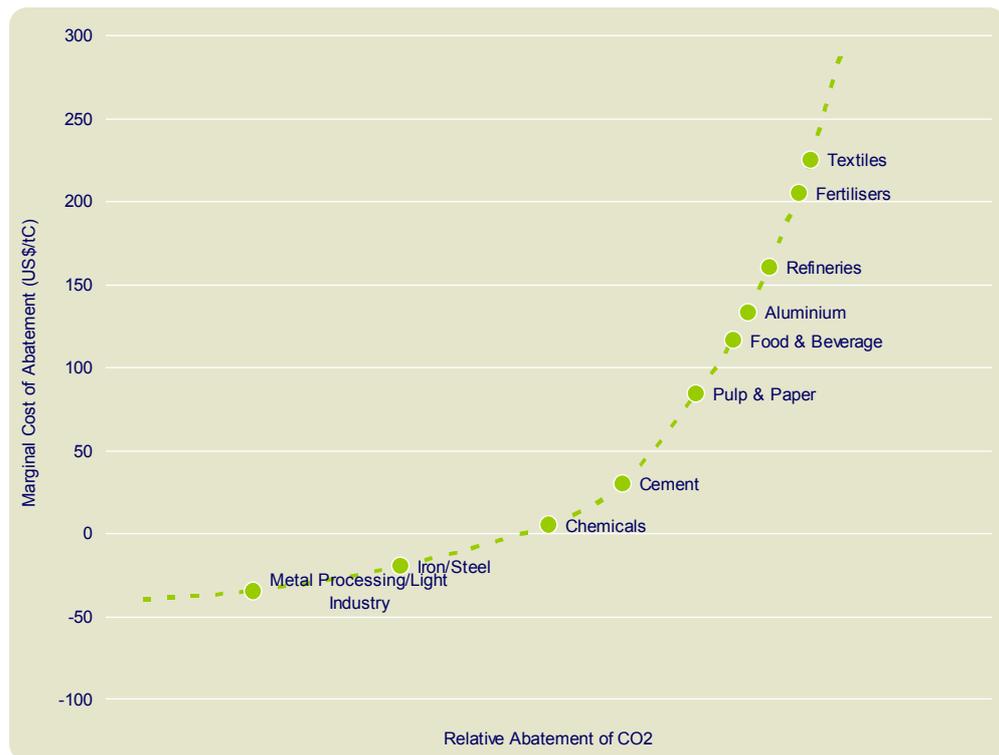
- ⇒ Landfill Tax;
- ⇒ Climate Change Levy; and
- ⇒ Land remediation tax relief.

However, there are trading opportunities for the industry, including:

- ⇒ UK & EU Emissions Trading Schemes;
- ⇒ Packaging Recycling Notes; and
- ⇒ Waste Electrical and Electronic Equipment (WEEE).

The illustration below shows the calculated costs of energy efficiency to a variety of manufacturing industries in the United States, this is equally applicable to UK firms. The vertical axis shows the marginal costs of energy abatement for each industry, with the horizontal axis showing the level of abatement required in each industry. This traces out a non-linear relationship between abatement and marginal cost, meaning that for higher abatement industries the marginal cost of abatement is significantly higher than low abatement industries and also that a slight increase in abatement increases marginal cost more than proportionately at higher levels of abatement. Thus the manufacturing sectors toward the top right of the chart are at higher risk from legislation seeking to reduce carbon emissions.

Industrial energy efficiency costs, 2001 Prices.



Source: US Intergovernmental Panel on Climate Change

The Textile industry faces a unique challenge with high levels of abatement required and a high marginal cost of doing so. This is in tune with our earlier analysis which highlighted the sector as at risk. The next section is specifically devoted to textiles for this reason.

Key Issues

Like the transport sector, the manufacturing sector is already being affected by climate change / environmental policies and will increasingly have to adapt to the legislation outlined in this study.

Although the industry is in decline in the North West region, it is still relatively significant for the regional and national economy providing relatively high value added products.

Textiles

Background

Across Europe the textile supply chain uses about 1,500 basic chemical substances and equal amounts of specialty chemical substances, which mix into 15,000 combinations. Most suppliers of these chemicals are based in Europe but the greatest environmental impact of textile finishing processes comes from chemical substances contained in “grey textile,” most of which is imported from outside the EU.

Manchester took the lead in the world's textile manufacture and production in the late 18th century, a position it held until its decline in the 1960s. Although the industry has declined significantly already, it is nonetheless a key part of regional and local heritage and faces challenges due to climate change legislation due to its relatively high energy usage and emissions, as highlighted in the traffic light analysis in Chapter 4 and the abatement costs analysis conducted by the US Intergovernmental Panel on Climate Change.

Impact of climate change policies

Most textile finishers are concerned about the availability of substances and preparations because their competitiveness depends on innovative uses of many of these specialty chemicals. Textile finishers will face significant costs for reformulation and process adaptation. These will be costs that they cannot absorb or pass on their customers because of strong competition – particularly with non-EU business.

Reformulation and adaptation efforts can take textile finishers from up to 18 months. These delays will hurt this industry, which is tied to fashion cycles (consumer textiles) and product cycles (industrial textiles).

The identification of usage will involve substantial costs and effort as finishers use a large number of chemicals in an even larger number of applications. Further to this, firms may not be aware of all unintended impurities and by-products. As users will need to give suppliers sensitive information on usage there are risks that could damage their market position. Also, they could likely have a competitive disadvantage with non-EU competitors.

Considering the wider production and retail market, business could adapt to take into account more sustainable raw materials sourcing, crops, yield and land usage, water supplies, consumer habits – such as food labelling – and regional socio economic shifts.

Key Issues

The textiles industry is a key part of regional and local heritage and faces heightened challenges due to climate change legislation.

Cross cutting themes

Market participants respond to price signals and the supply / demand outlook at different rates. On the supply side, companies can invest in new infrastructure to deliver more or alternative energy supplies. On the demand side, customers can invest in energy saving technologies or seek to reduce their energy use during periods of peak energy demand. The lead times associated with the different types of response and different technologies will vary.

The impacts of climate change policy will result in changing processes to limit potential damage or to benefit from opportunities that may be associated. There is a distinction between

whether consumers and businesses adapt through choice or through government intervention, although the two are linked. Where it is difficult and costly for individuals and business to adapt quickly there will be a case for Government intervention to correct market failure.

As discussed, the insurance industry may need to adjust its premium pricing to avoid financial risk of further cases of extreme weather. This could consequently affect the costs of insurance across all sectors of the economy. However, increasing awareness of climate change and its impacts may also increase in insurance cover by individuals, companies and also governments. If the effects of climate change result in insurance payments that are or are expected to be too high in future, they may be eventually excluded from insurance policies. This would require some form of Government intervention that could correct this market failure and provide support for businesses and consumers.

In addition, as part of the European Energy Performance of Buildings Directive, the European Commission established a framework to achieve cost-effective savings potential of around 22 per cent of present energy consumption in buildings across the European Union by 2010. In the United Kingdom, recent regulation requires that new and refurbished buildings reduce carbon emissions by 27 per cent from present levels.

These performance standards are designed to limit energy demand, encourage the removal of energy inefficient products from the market, and create more efficient solutions. These standards are particularly prevalent in the construction sector. Although the construction sector will face these direct costs it may also affect businesses and consumers indirectly through subsequent increases in property prices and other goods from the sector.

This could have a consequent impact on building for all sectors as well as spatial planning as it may affect location decisions. Further on spatial planning from impacts of climate change and associated policies might arise from taxation on fuel or transport which could affect decisions of where to search for employment and homes.

Some industries will face multiple impacts as a result of climate change policy. These may result:

- ⇒ **Directly** through their production / activities. Consequently businesses may face higher costs (for example by the cost of permits to cover emissions)
- ⇒ **Indirectly through the supply chain** (discussed further in the next section) if higher costs of emitting and new costly processes are passed upstream to manufacturers
- ⇒ **Indirectly through the need to change processes** – such as those subject to new building regulations.

Supply chain impacts

Total carbon emissions are a result of all the steps in the supply chain to produce, use and dispose of or recycle products.

All emissions sources can be tied back to the provision of different products and services to meet the needs of the end consumer. This section considers all stages in the supply chain to assess how the impact of policy may be transmitted through the supply chain.

Factors influencing the supply chain impacts include:

- ⇒ Increases in direct energy costs and the energy costs of suppliers;
- ⇒ Existing and planned legislation which penalises high energy consumption and rewards emissions reductions; and
- ⇒ Changing consumer attitudes to climate change, presenting forward-thinking companies with an opportunity to develop and market low-carbon products, which other companies will then use as part of their supply chain.

Case study – Stuart Rose, Chief Executive of Marks and Spencer

“Over the last 12 months, we have seen a real shift in customers’ priorities and expectations. We know that ethical and environmental considerations increasingly influence their purchasing decisions”

The UK acts as both buyer and seller in a global market where prices and availability are determined by global supply and demand conditions.

Another key determinant of developments in the global oil market is the level of investment across the sector, both upstream and downstream. While forecasts are for an increase in global spare oil production capacity over the next few years, there are still concerns that limited investment may cause a tighter market early next decade.

The evolution of governments' energy and climate policies will be important in determining the rate of global oil demand growth, particularly in the longer term. In a number of developing countries, domestic price subsidies on petroleum products have helped insulate consumers from price rises and therefore prevented demand from responding effectively to market price signals. Whether these policies prevail or not is even more important given the growing share of transport demand, which has been relatively price-inelastic.

Business drivers

There are a number of key drivers for businesses that will force them to review their supply chain in the context of climate change & carbon emissions as well as subsequent legislation. Broadly these are:

- ⇒ Brand image & 'influence' on a market: To comply with customer requirements and gain competitive advantage through offering a low-carbon product. Also, to manage risk to reputation by ethically managing suppliers and monitoring their environmental impact
- ⇒ Cost reduction: To reduce costs by redesigning the supply process to improve efficiency;
- ⇒ Innovation: New supply chain approaches can stimulate innovation;
- ⇒ Stakeholder satisfaction: To respond to pressures from investors and shareholders; and
- ⇒ Compliance: To comply with related legislation and anticipated future requirements.

Case study – Vivienne Cox, BP Executive Vice President and CEO of Gas, Power and Renewables and Shipping

“Someone asked me recently if the BP Alternative Energy business was a real commercial venture or simply a public relations exercise. My answer was to point out that we plan to invest more than \$8 billion in Alternative Energy over the next decade - so it would be an extremely expensive publicity stunt! The truth is that this is not public relations. It is a significant business. And it exists because there is a strong business case for low carbon power - one that gets stronger every day. That business case is about responding to the need for energy.”

Some examples of supply chain impacts

To understand the impact of climate change legislation on a product's lifecycle it is useful to break it down into its constituent parts. This not only includes each stage of the supply chain: from the extraction of the raw material through manufacture and distribution but also the use and final disposal or recycling of the product.

Whilst some of this is more easily achievable for big business, our policy recommendations in chapter 7 contain interventions for SME support which would require that these types of implementable actions be shared.