CBI
THE VOICE OF BUSINESS

Whatever the weather

Managing the risks from a changing climate

CBI on
climate change

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Foreword by Richard Lambert, CBI

Adapting to climate change is no longer a matter of conjecture, or a challenge we can put off to another day. We are already seeing changes to our climate, and the best scientific evidence we have indicates that the pace of these changes is set to accelerate.

For the UK, this means hotter, drier summers, warmer and wetter winters, and more frequent extreme weather events. This will have a profound impact on the way businesses operate, affecting their assets, their markets and the infrastructure on which they rely.

Preparing for the consequences of these changes is no distraction from the essential task of reducing our emissions and developing a low-carbon economy.

However, to ensure the resilience of our economy, businesses should start to incorporate changes in the climate into their long-term planning. A clear understanding of these risks will enable them to take sensible, proportionate steps to ensure they prosper as climate conditions change around them.

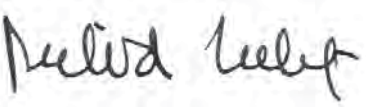
But meeting the challenges of climate change is not simply a question of addressing risk. It is also about cultivating opportunity. Robust, early planning for climatic changes will ensure more resilient business sectors, better positioned to take advantage of new opportunities. Establishing leadership in the development of new adaptation technologies and expertise will also carve out new opportunities for UK business in a growing international market.

There is a wealth of good practice across the economy. This report highlights the lessons learnt from companies that have taken a lead in this area and provides a point of reference for firms looking to assess climate impacts in their planning for the first time.

In an area where government policy is still developing, the report also identifies how public policy levers can best be used to support private sector action on climate adaptation, to ensure that across the economy, businesses and public sector organisations are moving forward in sync.

The case for climate adaptation is clear. It is up to all of us, businesses and government together, to act now to ensure our economy is best positioned to prosper in the future – whatever the weather.

Richard Lambert



Director-general, CBI

Executive Summary

Across the economy, businesses are facing up to the challenge of climate change. Even in difficult economic conditions, companies are not sitting back and waiting for others to take action. They are innovating and developing new green products and services, working to engage employees and consumers, improving energy efficiency and bringing down their carbon emissions. This is helping them embed a model of sustainable growth across UK business, and laying the foundations for a low-carbon economy.

We now need to raise our game to an equally urgent task – adapting to the inevitable consequences of climate change. This is not a question for tomorrow. We need to look seriously today at adapting our economy to incremental changes to the climate we can no longer avoid, and preparing for an increase in disruptive weather events.

The latest projections show the UK can expect longer, hotter and drier summers, warmer and wetter winters, and increasingly frequent extreme weather events (such as droughts, flooding and heatwaves). These changes could have a dramatic impact on business operations, consumer behaviour and the construction and maintenance of the infrastructure on which we all rely.

Across the private and public sector, organisations are already rising to the challenge. The UK is a world leader in climate science and risk assessment. The UK Climate Impacts Programme, the Met Office, our universities and businesses like Barclays, HSBC, RSA Group and Aviva have developed cutting edge adaptation modelling and are shaping new products and guidance to address and manage climate adaptation. At the same time, companies like National Grid, Network Rail, Transport for London and Anglian Water – firms on whose infrastructure the UK depends – are right now making huge investments to secure the long-term viability of their critical assets and guarantee security of supply to their customers.

For businesses outside of certain sectors, the diffuse scope of climate adaptation has not been an easy issue to grasp. Much of what will happen cannot be known with precision and it is often difficult to identify pre-packaged solutions that work across different geographies and sectors. But while the precise impacts of changes to the climate are uncertain, much can still be done to implement robust risk evaluation and planning processes.

In 2009, the CBI published *Future proof: preparing your business for a changing climate*, setting out first steps for companies looking to start planning for climate risk. This report develops that work with a more detailed view of how climate risk affects firms across the economy.

Government has an essential role to play in supporting businesses to take action to secure the long-term health of the economy in the face of changes to the climate. Central government departments and local authorities and agencies need to speak with a consistent voice, driving good adaptation practice through clear regulatory signals, coherent planning criteria and far-sighted public infrastructure procurement.

Businesses also need expert and transparent guidance. The wealth of data in current climate projections needs to be complemented by more 'off-the-shelf' guidance for (the majority of) businesses that are not experts on the climate.

This report looks across the economy at different ways businesses are beginning to address the impacts of changes in climate. It assesses the case for action, sets out guidance for companies looking to address climate risk in their business planning for the first time, and outlines the policy mechanisms we need from government to ensure we tackle the challenges of adaptation in a coherent fashion. It argues that:

- Business planning needs to address climate risk
- Government needs to support businesses to adapt

Key recommendations

For business

- Companies should include an evaluation of climate risk in their overall assessment of business risks.
- Climate adaptation strategies should focus on actions that fit within broader sustainability strategies and which deliver savings (in resource use and running costs) in their own right.
- Climate risk evaluations should cover six key areas – supply chains, assets, operations, markets, regulatory compliance and business reputation.
- Climate exposure should be clearly identified and included in corporate reporting.
- Non-commercially sensitive climate adaptation information should be shared by companies to avoid an inconsistent approach between different sectors.

For government

- The UK Climate Projections should be packaged as a range of more tailored offerings with clearer 'best available prediction' models for non-climate-specialists.
- A publicly-accessible information bank detailing the climate risk to critical public infrastructure should be developed, to support businesses in their own climate adaptation planning.
- The government's forthcoming national Climate Change Risk Assessment must shape a coherent approach to climate adaptation across regulated sectors, the planning process, and in public infrastructure procurement.
- A consistent approach should be taken across regulatory authorities to support firms to adapt public infrastructure to long-term climate risk.

1

The UK's climate is set to change

At a national level, we have a relatively strong understanding of what changes to the UK climate will mean over the next 100 years. The 2009 UK Climate Projections produced by the Met Office's Hadley Centre and the UK Climate Impacts Programme (UKCIP) provide the most detailed climate forecasting in the world and set out probabilistic projections of climate change impacts at a regional level for the whole of the UK.

This is the picture presented by the projections opposite (**Exhibit 1**):

- Longer, hotter and drier summers – the 2009 projections suggest the summer average temperature in the south of England is likely to rise by well over 2°C
- Warmer and wetter winters – with precipitation likely to be increasingly focused on the winter months over coming decades (the north west, for example, could see a 16% increase in average winter rainfall)
- Increased frequency of extreme weather events such as storms, coastal flooding, heatwaves and droughts.

This presents two sets of impacts for business – the cumulative, gradual consequences of incremental climate changes (such as higher average temperatures) and the effects of more frequent disruptive weather events (with consequences for fixed assets, supply chains and market behaviour).

The principal challenges for the UK lie in the increased risk of flooding (from rising sea levels and changes to inland rainfall patterns) and the impact of higher temperatures during summer months.

The UK has a relatively high demographic density (the highest in Europe after Belgium and the Netherlands), along with a concentration of population in low-lying coastal areas and river valleys, particularly in the south and east of England. It is estimated that 12% of the population lives in areas at risk of coastal or fluvial flooding.[1] This is a concern when we look at the impact of increasingly frequent extreme weather and changes to rainfall patterns (involving increasingly irregular, heavy downpours during the winter months).

The density of the UK's settlement and infrastructure distribution also presents a problem in terms of planning for increased coastal and inland flooding. By 2035, over 840,000 houses could be at significant risk of flooding across the UK.[2] With a large proportion of major rail and road routes, and key infrastructure such as water treatment plants, also laid out in river valleys and low-lying coastal areas, this presents an acute challenge.[3]

The flooding of the summer of 2007 highlighted the heavy cost associated with severe weather events, with 180,000 insurance claims totalling over £3bn. It is estimated that annual flood damages could total as much as £22bn by 2020.

Rising ambient temperatures could also affect the operability of industrial equipment and key infrastructure assets. For example, a recent study found that increased night-time temperatures during summer months could result in electricity substations in urban areas being unable to cool properly overnight.[4] Sustained exposure to increased night-time temperatures could therefore impact on the security of supply of electricity in the short term, and the conditions and costs of maintaining key assets in the long term.

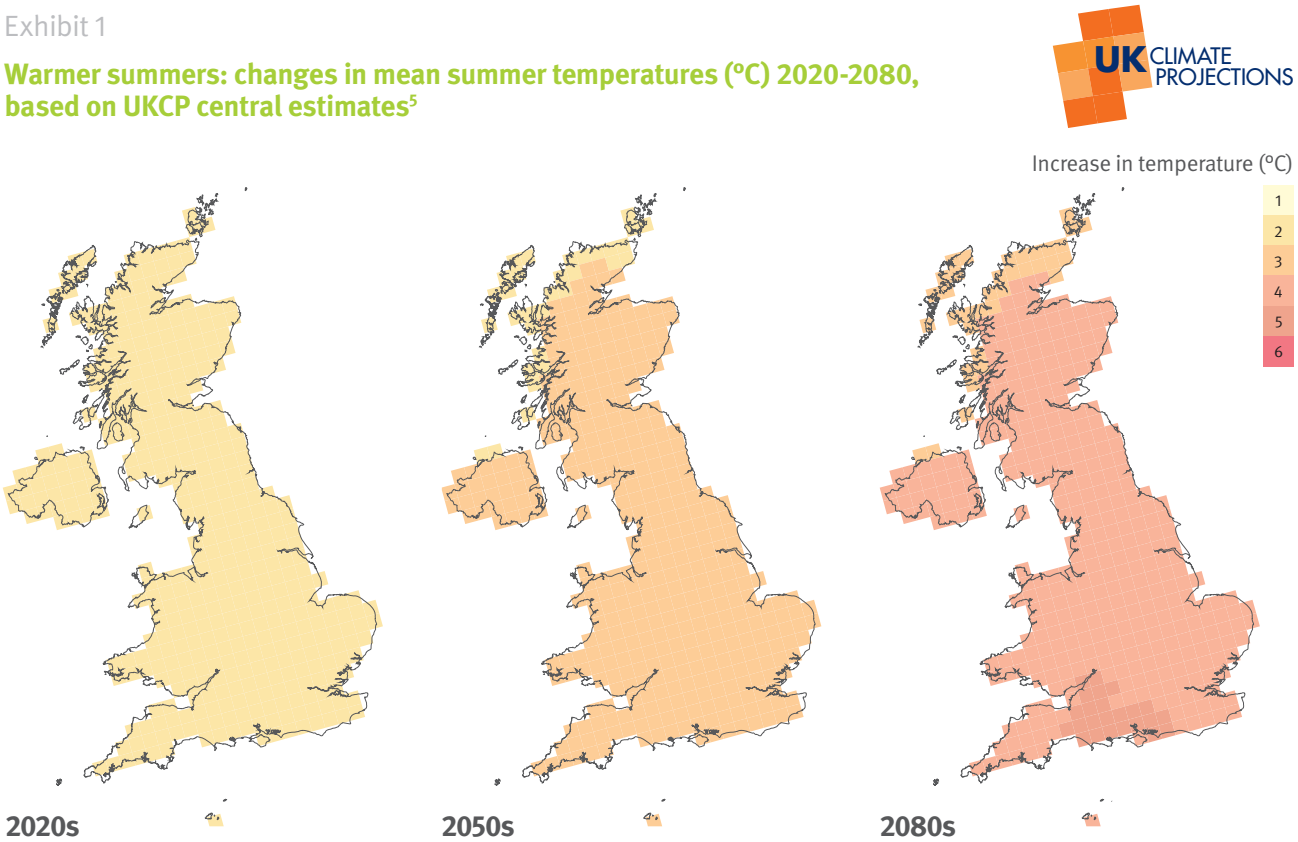
Changes in climate across Europe and internationally, and more frequent extreme weather events globally, will also have a direct impact on UK companies and consumers. Increased crop failures and water scarcity caused by climate change are likely to place strain on the global supply chains on which many UK businesses depend. For example, food manufacturers who source much of their grain supplies from Canada are re-thinking their global supply strategies following the drought across the Canadian plains last summer which significantly reduced grain output, driving up the price of staple foods in retailers across the UK.

Changes to climate will therefore present a range of challenges to UK businesses, but they will also open up new opportunities. A more resilient business sector, able to respond flexibly and swiftly to any weather-related disruptions to supply chains, operations and markets, is likely to have a sharper competitive edge as unstable and extreme weather conditions become increasingly common.

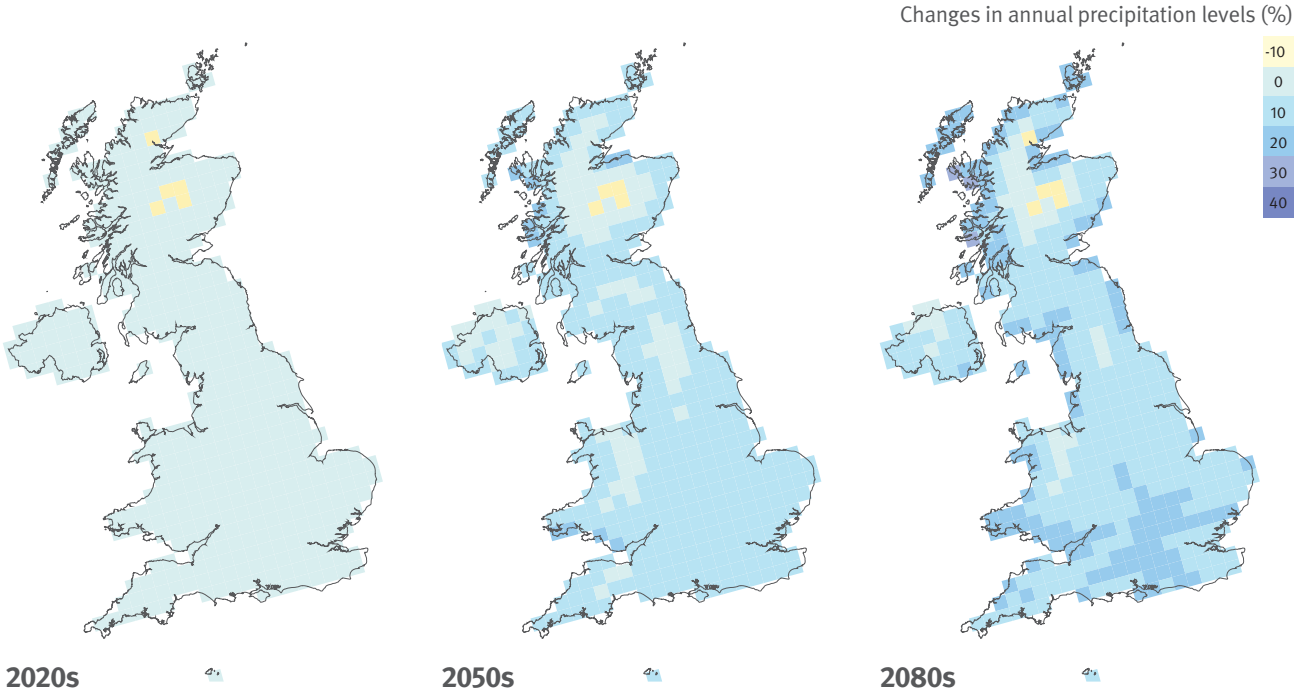
Taking a lead in the development of new climate adaptation technologies and expertise could also open up new markets for UK firms internationally. Financial institutions, for example, are at the centre of efforts to evaluate climate vulnerability and act on the risk to investments it poses. HSBC and Barclays have both undertaken research, with Acclimatise and the Met Office respectively, to support investment managers incorporate climate-related risks in assessments of investment portfolios.

Exhibit 1

Warmer summers: changes in mean summer temperatures (°C) 2020-2080, based on UKCP central estimates[5]



And wetter winters: changes in winter mean precipitation (%) 2020-2080[6]



Higher winter rainfall levels, coupled with longer, drier summers, also increase the probability of extreme weather events such as heatwaves and flooding (inland and coastal).

2

Business planning needs to address climate risk

Firms are already thinking about their business models in terms of CO_2 reductions – increasingly they will need to start thinking in terms of climate adaptation, too. This challenge is multifaceted. It will include ensuring business resilience to new regulatory burdens, supply chain disruption and increased insurance costs, and looking carefully at the procurement of new assets.

As the case studies in this report demonstrate, businesses with an interest in long-term asset procurement and risk-management have already begun to integrate climate risk planning into their future strategic assessments. There is also a wealth of experience among specialist UK risk-management consultancies such as Aon (featured in the CBI publication *Future proof*) and Acclimatise that have carved out a lead in this field internationally, and with the work being carried out in the insurance sector in firms such as RSA (**case study 1**).

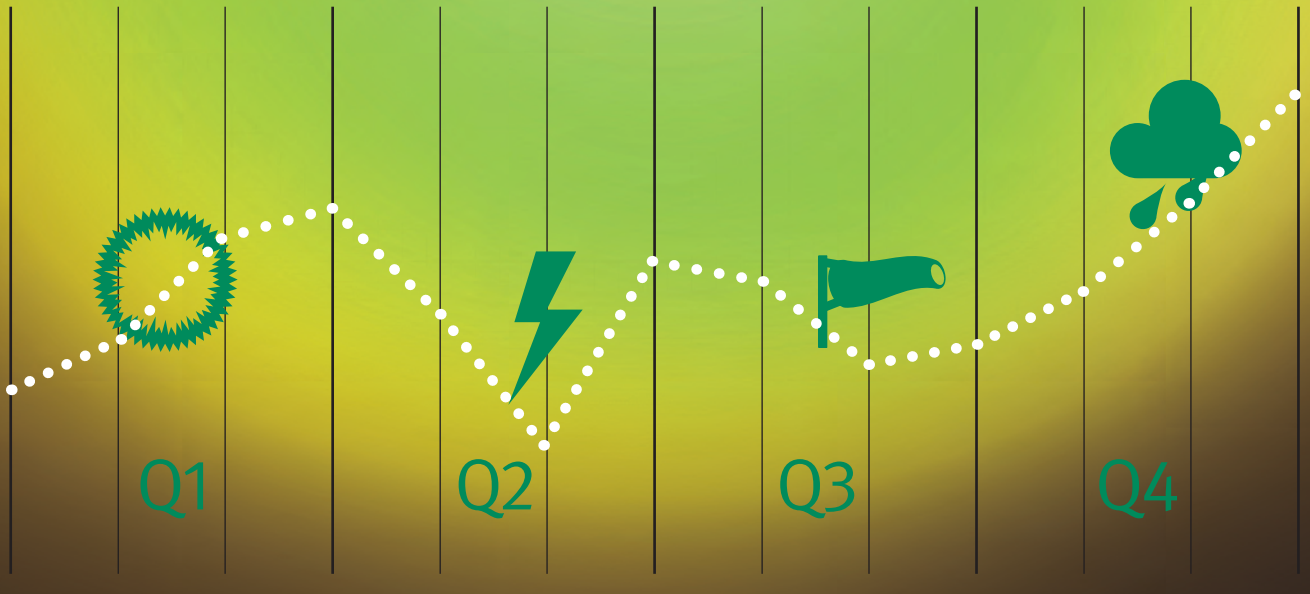
But the challenge remains for a wider range of businesses to engage with the issue and incorporate climate adaptation into more mainstream corporate continuity planning. Working with the Carbon Disclosure Project, the climate risk consultancy Acclimatise has developed an 'acclimatisation index', analysing the resilience of FTSE-350 companies. This highlights the work that remains to be done (**Exhibit 2**), with respondents averaging a low 'acclimatisation' score of 38%, indicating a lack of knowledge of the risks and opportunities to their companies of a changing climate.

The UK is unique in the quantity and precision of the climate modelling data available through the UK Climate Projections 2009 (**Exhibit 1**) so this gives British businesses an advantage in building climate adaptation into their core risk management practices.

A lack of clarity surrounding climate adaptation can lead to a lack of action

The broad range of what climate adaptation can mean, and the amount of data available to inform decisions based on climate risk, can appear daunting for companies looking to take action. With the amount of data available, it can be difficult for non-specialists to evaluate risks effectively and understand where to start taking action within their business operations. Although the UKCP provide a wealth of data, for many businesses it is not clear what data to use and how to apply it to their corporate risk management planning.

This lack of clear understanding can lead to a lack of action. In a survey of FTSE 350 corporate leaders, 87% acknowledged that their companies were exposed to the risks of a changing climate,[7] but a separate CBI low-carbon business survey revealed only 35% of businesses are taking action on climate adaptation.[8] The challenge is particularly acute for smaller companies – a recent survey by AXA Insurance found that while 85% of UK SMEs identified climate change as a serious problem, only one in four could identify specific threats to their businesses.[9] These indicate that while awareness of climate risks is relatively high, the proportion of companies pro-actively taking action is not. This is backed up by the recent survey work conducted by Ipsos Mori for Defra, which revealed that while three quarters of businesses are concerned about the effects of climate change, less than a quarter have started to take action.[10]



Proportionate climate adaptation makes sound business sense and should build on existing corporate assessment and environmental management

So the challenge is to get more businesses developing climate adaptation strategies and, given the uncertainties about exactly how the climate could change, to ensure these strategies are flexible enough to accommodate a range of future climate scenarios.

Indeed, experience from businesses already adapting to climate change indicates that much can be done to implement robust risk evaluation and planning processes in the face of these uncertainties – and at relatively low cost. In the CBI's *Future proof* publication we set out a step-by-step guide for businesses looking to get started (see **Exhibit 3** for the eight simple steps).

Proportionate climate adaptation builds on the experiences of internal sustainability policies but is not in itself an exclusively environmental issue. It needs to be dealt with as a mainstream corporate risk, as evidenced in the work of the insurance sector highlighted in the ABI case study (**case study 2**). This means companies should utilise existing expertise in their organisation – among sustainability, procurement, business continuity and environment managers.

It also means effective climate adaptation action is likely to bring substantial co-benefits. In particular the focus on existing sustainability practices will deliver short-term returns in its own right. In the longer term, smarter risk management will also lead to clear cost savings for business.

Improving resource management, in particular, is a central strand of developing adaptive capacity, making businesses less vulnerable to shortfalls in water and energy supplies. Anglian Water's action to maximise water efficiency and minimise environmental impact underlines the synergy between sustainable resource management and action to reduce climate risk (**case study 3**).

Likewise, Network Rail's experience of tackling climate risk demonstrates how an organisation-wide approach can focus action on select actions that deliver clear benefits (**case study 4**).

In the longer term, developing this capacity also involves increasing preparedness for extreme, unexpected weather events, bringing further co-benefits. For example, increasing the flood resilience of buildings, infrastructure and homes reduces the immediate costs of insuring vulnerable assets at a premium.

Key recommendation 1

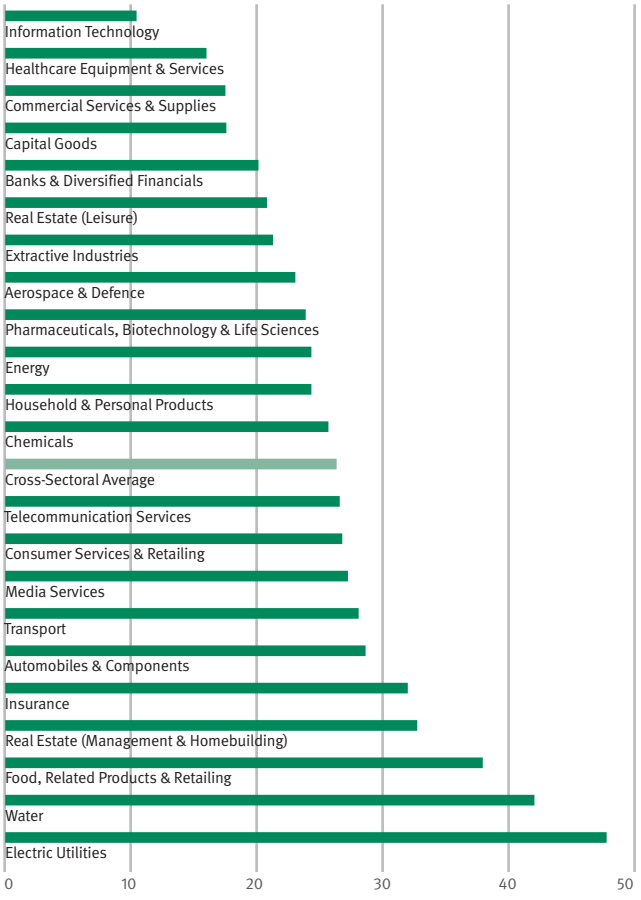
Companies should include an evaluation of climate risk in their overall assessment of business risks

Key recommendation 2

Climate adaptation strategies should focus on actions that fit within broader sustainability strategies and which deliver savings (in resource use and running costs) in their own right

Exhibit 2

Acclimatisation Index – Awareness of climate risk (average score by sector)



Overall scores (%). Reproduced from Acclimatise work with Carbon Disclosure Project (2008) [11]

Case study 1
RSA Group – preparing for tomorrow's climate

Like many other sectors, the insurance industry can't afford to ignore the impacts of climate and environmental change. Thus, the changing intensity and frequency of extreme weather is a cause for concern for insurers.

In recent years, the spotlight in the UK has very much focused on flooding and the role insurers play in dealing, not only with the aftermath, but also in working with government on flood prevention. Flooding is a serious risk for people in many parts of the UK. Currently, over 2.5 million properties in the UK are at risk of flooding from seas and rivers,[12] and projections now show that we can expect to see the rate of extreme floods increase.

In reaction to this, RSA has developed systems which monitor the weather and anticipate potential incidents. This allows the firm to stay on top of weather events and provide the best service to customers. Expected rainfall, wind speeds and gust levels are tracked daily and RSA uses sophisticated Geographical information Systems (GiS) that can calculate flood risk on a street-by-street basis. These allow RSA to respond quickly when an extreme weather event occurs.

Looking ahead, along with industry partners, the RSA is working with government and communities to ensure customers continue to benefit from the security of flood defences and insurance, by understanding how we can adapt to the worst impacts of extreme weather events.

To embed sustainable environmental policy in flood defence design, RSA has partnered with WWF to look at ecologically sensitive ways of managing water and tackling flooding. RSA is promoting practical solutions to address this issue, such as Sustainable Urban Drainage Systems (SUDS), to tackle the flooding incidents caused by insufficient drainage[13] (5,000-7,000 – around 50% of the total).

SUDS reduce pressure on water resources and increase water quality by mimicking natural processes, slowing down the movement of water and enhancing groundwater recharge. The WWF-RSA programme aims to encourage widespread adoption of SUDS across England and Wales.

By taking action through innovative partnerships such as that with the WWF, RSA is intending to demonstrate how low-cost, environmentally sensitive solutions can make a difference in the way we deal with climate change.

Case study 2
ABI – insuring for change

Association of British Insurers

As the voice of the insurance and investment industry the Association of British Insurers (ABI) has promoted adaptation for some time. In January 2009 the ABI launched a new adaptation strategy for reducing the threat of climate risks, built on two pillars:

- Improving the understanding of current and future risks
- Protecting people and businesses by managing the risks and shaping effective government policy

A range of activities, initiatives and events were conducted under these two objectives, including:

Tackling risk

With Hyder Consulting, the ABI conducted a major research project looking at surface water flood risk in England, to highlight the challenges likely to be faced by local authorities in preparing surface water flooding strategies and to give an indication of the measures and costs involved in tackling surface water flooding in a typical local area.

Providing guidance

In January 2009 the ABI published new guidance for property developers on climate resilience, to ensure that they design, plan, build and buy new developments that meet the challenges of climate change. The guidance is focused around buildings that are sustainable, energy efficient and low impact, while also being attractive to occupy, and provides the information necessary for owners to access affordable insurance.

Sharing intelligence

In November 2009 the ABI published the results of a major research project examining the financial implications of climate change using climate models and insurance catastrophe risk models.[14]

Exhibit 3

Eight steps to prepare your business for a changing climate (CBI):

1. Appoint someone internally to evaluate and manage climate related risks
2. Assemble evidence of the impacts on your business from recent and historic weather events
3. Access sources of external support and climate and weather information
4. Assess vulnerable areas of your business
5. Engage colleagues to raise awareness of climate risks and to gain their input
6. Establish a climate resilience plan
7. Implement solutions and ongoing risk-assessment plans and gain company-wide support
8. Explore how you can work with external partners to contribute to increased climate resilience

Case study 3

Anglian Water – guaranteeing security of supplies

Serving four million customers across the east of England, climate change presents Anglian Water with an urgent challenge. Working in the driest area of the UK, and with £6.7bn of fixed assets in a region with significant flooding risk, the effects of climate change and a projected 7% population growth over the next decade drive its strategic thinking. In terms of water resource management this includes flood protection for vulnerable assets, source duplication, network enhancement and a water efficiency programme.

The longer, warmer and drier summers predicted in the east of England and increasing population pressure pose long-term challenges for water resources. A twin-track approach is being taken, addressing process loss and leakage as well as maximising the efficient use of water by customers.

Anglian Water has been working hard to reduce leakage, down to 5.5m^3/km main/day – one of the lowest levels in the industry.

During the next five years the company will carry out a large water efficiency programme, providing a free water efficiency audit and retrofit of water-efficient devices to around 87,000 household customers. In addition, it will increase the proportion of household customers using a water meter from 68% to 80% by 2015.

Anglian Water provides free water efficiency audits to around 220 business customers a year, and offers technical advice, water meter logging, and leak detection and repair through its 'Optimiser' service which helps business customers lower their water footprint.

These actions provide multiple benefits – reducing costs and guaranteeing security of supply, as well as mitigating the risks of future changes to climate.

These efficiency savings reduce the exposure of the company, customers, other water users and the environment to the possible effects of increasing water scarcity. They also lead to lower operating costs, lower customer bills and a reduced carbon footprint. Less energy and carbon is used in extracting, treating, pumping, using and heating water – providing a significant saving which can be passed on to customers.

Assessing risk is the first step and includes looking at climate risks across six key areas

There will be wide variation between different firms' exposure to climate risks, and a similar disparity in the nature of responses that will be appropriate for them, depending on the time horizon of their forward planning, the sectors in which they operate and the geographical location of their operations. But the template for such a response can look broadly uniform. Any clear assessment of climate risk should begin by evaluating an organisation's exposure to climate risk across six key areas:

- **Supply chains** – supply routes and sources for raw materials
- **Assets** – potential impact to the organisation's key infrastructure
- **Operations** – possible impact on the organisation's core functions (internal communications, output delivery from plants, employee working conditions, insurance cover)
- **Markets** – resilience of distribution networks and potential shifts in market (consumer) behaviour
- **Compliance** – regulatory framework governing firms' operations, including long-term (eg climate risk reporting standards) and short-term impacts (eg workplace health and safety restrictions during heatwaves)
- **Reputation** – impact of climate risk on public perception of organisation – social 'licence to operate' – and investor confidence (company's long-term credit risk).

These risks will then need to be assessed against the two components of climate risk:

- **Incremental climatic changes** – increasing water scarcity, average temperature increases (with consequences for resource cost and workplace management)
- **Increasing frequency of disruptive weather events** – such as flooding and storms – with immediate impacts (eg disruption to supply chains) and longer-term consequences (eg increased insurance costs).

Generic templates have been developed which provide an example of how to begin this assessment process (**Exhibit 4** shows an example).

Having done this, businesses should then be able to start prioritising the responses needed and the cost implications. This will allow them to understand the opportunities in terms of markets for new goods and services, as well as the risks for their organisation.

Building on this initial assessment procedure, the challenge is to develop a corporate understanding of climate risks and adopt a consistent approach. Experience from the case studies indicates this should involve establishing (with staff across the organisation) a clear decision-making process which remains flexible – as Network Rail have done (**case study 4**). Because climatic changes are incremental and disruptive weather-related events difficult to predict, it is important that firms have the processes to deal with both types of climate change – even if they don't need to put these into practice immediately.

A climate adaptation strategy should also monitor the climate positions of external stakeholders – including suppliers, customers, insurers, government policymakers and regulators – and the organisation's dependence on public infrastructure networks (road, rail, IT).

Key recommendation 3

Climate risk evaluations should cover six key areas – supply chains, assets, operations, markets, regulatory compliance and business reputation

Exhibit 4

Q&A route map to assessing the impact of climate risk

Supply chains

- How are your supply networks (including suppliers' operations and infrastructure) affected by possible changes to climate conditions?
- Do changing climate conditions affect the availability and/or cost of raw materials for your business (including utility services such as gas, water and electricity)?

Markets

- How sensitive to climate/weather pattern changes is the market for the goods and services your company produces?
- How vulnerable is the distribution network to get these goods and services to market? How quickly/effectively can it be modified to accommodate sudden disruptions?
- What new market opportunities presented by changes to climate conditions are there which your organisation could exploit?

Assets

- Which of your organisation's key assets are located in areas vulnerable to climate change? How seriously could these be affected, over what timescale, and how would it affect your firm's operations?
- What would be the cost implications of altering/relocating assets to mitigate/respond to this risk?

Compliance

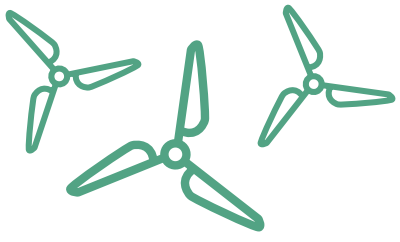
- How could current and proposed future regulation affect your business operations and running costs?
- How effective is your internal auditing system for climate risk?

Operations

- How would your company's operational functions be impacted by changes to climate conditions (eg productivity at manufacturing plants, internal communication)? How would this affect your output and running costs (eg insurance cost)?

Reputation

- What are the potential impacts for business reputation/attractiveness to investors presented by climate risk? Has your firm taken steps to respond to these?



Clear disclosure of climate risks is also critical, building on the experience of carbon reporting

Having understood the risks and opportunities of climate change and developed a climate adaptation strategy, this should then be communicated to all stakeholders. In fact, an appraisal of climate risk, along with an assessment of environmental impact, is becoming an increasingly important factor for business reputation and investor confidence. This is demonstrated by the expansion of investor-led projects like the Carbon Disclosure Project, founded in 2000 and which now acts on behalf of 534 institutional investors, holding $64tn in assets. The project now works with 2,500 companies to measure and disclose their emissions and climate change strategies (up from just 355 companies in 2006).[15]

Many companies are building on internal risk analysis, and the experience of new regulatory schemes (particularly, reporting obligations under the CRC Energy Efficiency Scheme and the EU Emissions Trading Scheme), to develop clearer public carbon disclosure narratives. This is not simply a question of numbers – a full material disclosure should include a clear appreciation of climate risk and opportunities for the firm and a demonstration of the ability to manage these, in particular the risks.

Such disclosure will support a company's relationship with investors, demonstrating a clear understanding and management of climate adaptation.

Collaboration across non-competitor organisations can bring benefits in sharing expertise and preventing 'siloed' industry approaches to climate adaptation

Examples from the insurance and financial services sector highlight how non-commercially sensitive information can usefully be shared across sectors, providing a ready pool of information for companies looking at climate risk in their operations for the first time.

For example, through the London Accord, financial institutions have shared their expertise on climate risk management (linked to their assessment of credit risk for investors in climate sensitive industries) with other sectors and public policymakers, making non-sensitive reports available. This could serve as a model for an information bank for key infrastructure and public utilities (**see recommendation 9**).

With the establishment of the industry group Climate Wise, the insurance sector has also taken a proactive step by attempting to put a financial value on climate risks and opening up channels of communication with scientists and government policymakers. It has also set out a series of principles for industry action, including taking a lead in risk analysis and supporting climate awareness amongst consumers.

Key recommendation 4

Climate exposure should be clearly identified and included in corporate reporting

Key recommendation 5

Non-commercially sensitive climate adaptation information should be shared across companies to avoid an inconsistent approach between different sectors

Case study 4

Network Rail – driving an organisation-wide response to climate change

Network Rail manages the infrastructure underpinning the UK railway network – responsible for the safety and operation of 32,000km of railway track across the country.

Its experience demonstrates how an organisation can effectively identify, evaluate and prioritise the climate risks it faces – and develop a consistent organisation-wide response. This is what it did:

- Appointed a principal engineer with responsibility to assess climate risk on the network's infrastructure
- Convened seven workshops with Met Office experts and senior railway industry engineers from Network Rail and the Association of Train Operating Companies (ATOC). These looked at different areas of railway operations – including track, signalling and power, and system issues
- In each workshop, engineers drew up an 'assets and hazards' grid for their area based on Met Office guidance on future weather conditions, following the framework below:
- Based on this exercise, the workshops prioritised the key railway assets and systems to address, based on the likelihood of climate impact balanced by the severity of this impact's safety and performance implications. This workshop process produced a list of 60 areas for further analysis. This process provided a consistent, transparent risk assessment, with buy-in across the rail industry.
- These workshops also prompted discussion on which priority areas would require detailed weather modelling for a focused climate change risk assessment. Following this, in April 2010 the rail industry worked with the Met Office to decide on a methodology for the weather modelling.
- Taken together, this tailored weather modelling and the risk assessment process will inform Network Rail's climate risk assessment submission to Defra under the Adaptation Reporting Power.
- The company will then use this submission (tying regulatory compliance with internal risk management) to provide options for internal policy development in 2011 – as the organisation prepares for its next planning period (2014-2019).

		Safety (severity of impact)			Performance (severity of impact)		
Asset	Are changes to climate conditions going to impact it?	High	Medium	Low	High	Medium	Low

Case study 5

Transport for London – embedding resilience to extreme weather events

Transport for London (TfL) manages transport services across London for which the mayor has responsibility – including London Underground, London Buses, London Overground, Docklands Light Railway and Tramlink. It also runs the 580km network of main 'red route' roads and all the traffic lights.

TfL's experience dealing with extreme weather disruption over the last two winters has highlighted the value of focused planning, collaboration between different organisations and public agencies, and clear communication with business partners and customers. January 2010 saw the longest spell of freezing conditions experienced by the UK for 30 years. London had heavy snowfalls and prolonged sub-zero temperatures with potential for icy roads and disruption to travel. Despite these exceptional weather conditions, London largely continued business as usual due to the implementation of the lessons learned from the snow in February 2009.

Partnership working and multi-agency cooperation

Following snow in February 2009, TfL worked closely with London boroughs to develop and implement cold weather plans. They identified gaps in planning which could affect bus and Tube services. Surface services are most affected by adverse weather so key routes for buses were identified and access roads to bus garages gritted to keep them clear of snow. A relatively small amount of additional investment (fewer than 20 miles of extra roads gritted) enabled the large majority of buses to run. Plans were agreed setting out how partners should co-ordinate priorities for clearing ice and snow. TfL and other London highway authorities developed a pan-London 'Resilience Network', which established priority routes that are maintained, enabling access to ambulance stations, fire stations and national health premises.

The majority of the Underground is actually above ground and also susceptible to extreme winter weather. TfL therefore took steps such as running trains throughout the night to keep the tracks open and ensure the rail network continued to operate.

Clear communication strategy

It was important to have early, multi-agency meetings as soon as the first severe weather alert was received. TfL participated in the London Resilience media cell which was activated as agreed after the 2009 snowfall. This ensured there were mechanisms to deliver clear and consistent messages to media and business partners as well as to TfL's customers.

3

Government needs to support businesses to adapt

Defra, the department with responsibility for climate adaptation, is developing a new, national Climate Change Risk Assessment, drawing data from companies across the economy (**Exhibit 5**). It is also undertaking a programme of work to highlight the business opportunities associated with climate change adaptation. New secretary of state Caroline Spelman set the scope of the department's ambition, saying "I want to ensure that UK businesses are well placed to take advantage of the new opportunities that arise as well as ensuring they are ready for the difficulties that higher temperatures and more adverse weather could mean".[16]

One of the difficulties with increasing business sector engagement in this work has been communicating the UK climate projection data to a wider audience. In their current form, the UK Climate Projections (UKCP) provide a wealth of extremely valuable detail for climate experts, but are not yet usable in an 'off-the-shelf' fashion for non-specialists. To quote one corporate user, they can be 'conceptually challenging and difficult to use simply'.

There is of course a tension between over-simplifying projections and making them more accessible. The current projections provide detailed 'probabilistic' projections – setting out a range of climate outcomes based on a 10%, 50% and 90% probability spectrum – without bias of prediction towards any scenario. This provides a comprehensive and detailed picture, but can be difficult to use for non-specialist users.

Making more use of a scenario-based approach (alongside the existing probabilistic projections) is one way forward – to fit into standard risk management approaches and enhance the projections' usability for a wider audience. A scenario-based approach could set out the most likely climate consequences according to a clear assessment of current conditions, while maintaining the depth and rigour of the probabilistic projections for more specialist users. Mixing existing probabilistic projections with simpler 'best available prediction' climate scenarios, a more varied offering could transmit the same data to a much broader range of companies.

As Defra looks to reduce costs and streamline its support to business, a more focused headline offering could enable the Defra-funded UK Climate Impacts Programme (UKCIP – established to raise awareness and support action on climate adaptation) to enhance the visibility of their projections among companies, while still allowing more expert users to access the full range of detailed projection data available under the current UKCP.

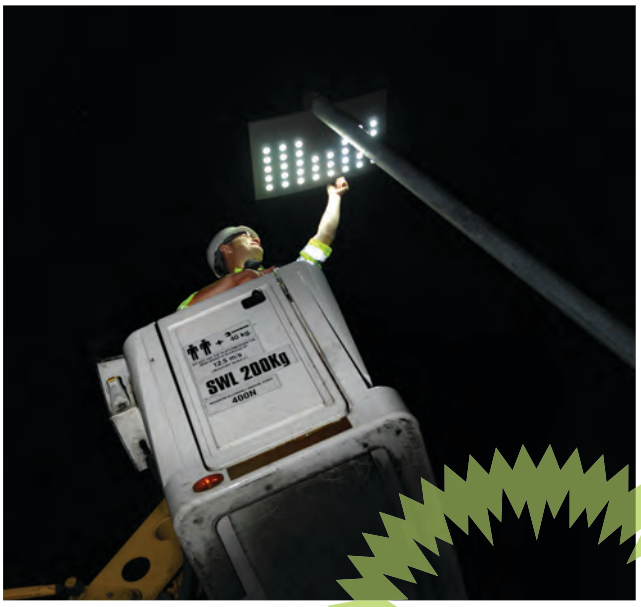
The UKCIP's targeted engagement of businesses has so far had some success in working with large companies in regulated sectors, and in producing guidance material for businesses looking to proactively address climate risk in their operations. But it has been less effective in promoting an accessible message on climate action to a broader audience. This contributes to a lack of awareness of the programme, and the projections across much of the private sector. More easy-to-handle projection data should support a more broad-based business engagement strategy, ensuring the unique resource of the UK Climate Projections reaches the widest audience, in the most effective manner.

Key recommendation 6

The UK Climate Projections should be packaged as a range of more tailored offerings with 'best available prediction' models for non-climate-specialists

Case study 6 Amey – building climate resilience into public infrastructure contracts

Delivering nearly £1.5bn of public service contracts in 2009, Amey provides services to public sector clients using risk transfer mechanisms which enable it to balance higher initial capital expenditure against reduced cost risk over the lifetime of an asset.



This means the firm can invest in more climate resilient and resource-efficient technologies, which are higher cost initially but save money over the lifetime of the asset through lower running costs and reduced vulnerability to extreme weather events.

This has been applied to Amey's delivery of highway maintenance contracts. The flexibility to set savings in whole-life costs against additional capital investment has allowed Amey to invest significantly in drainage pumping stations, mitigating risks associated with a possible increase in flooding incidents brought about by changing weather patterns.

The same risk transfer mechanism has been applied to the provision of street lighting in the 25-year Birmingham Highways Maintenance and Management PFI contract between Amey and Birmingham City Council. Transferring the entire operational responsibility for the lighting to Amey has allowed the company to replace all existing street lamps with state-of-the-art LED lights. The energy consumption of LED street lights is far lower than that of traditional lights, and they do not need to be renewed at all over the contract (compared to every three or four years for normal lights).

These operational benefits mean that although the initial capital outlay for LED street lights is higher, the whole-life costs resulting from long-term operational efficiencies are lower and the price risk associated with future energy costs and emissions tariffs is mitigated.

Businesses need more information on the risk to critical public infrastructure to inform their own climate adaptation strategies

In addition to new packages of climate projections, a central 'information bank' detailing public infrastructure's exposure to climate/weather risk, and particularly contingency plans for extreme weather events (as these increase in frequency), would be useful to support businesses' assessment of their own climate vulnerability.

There is a large (and increasing) amount of non-commercially sensitive information available on the potential impact of changes to climate on infrastructure, transport and utility networks (and the planning to address this), collated by Defra through the adaptation reporting power, and available through departmental climate change risk assessments and existing sectoral initiatives such as the London Accord and Climate Wise, as well as in the case study data compiled by the UKCIP. Making this available to companies through a central, web-based information platform would provide a valuable resource for businesses looking to evaluate the climate risks to their operations across the UK.

Key recommendation 7

A publicly-accessible information bank detailing the climate risk to critical public infrastructure should be developed, to support businesses in their own climate adaptation planning

Government needs to embed the parameters for action on climate risk in public infrastructure development and in public procurement

The costs of adaptation measures in public infrastructure projects can be relatively small, but they represent an additional up-front capital expenditure, with the savings only realised over the longer term. At a time of significant downward pressure on public procurement costs, we need to measure the full cost and benefits of adaptation actions more clearly (see Amey's work establishing models for public service contracts that address climate risk – **case study 6**). We must ensure the understandable focus on value for money in the short term does not lead to greater operational costs in the future, with the future impact of climate risk not being taken into account when procurement criteria for large-scale public infrastructure projects are developed.

More consistency from local authorities is needed to drive action on climate adaptation

Climate risk has been established as one of the criteria local authorities have to consider in planning processes, but there is still fragmentation in local authorities' actions. Only 35%[17] have so far incorporated the new (voluntary) climate adaptation guidance NI 188 (planning to adapt to climate change) into their planning and public procurement assessments.

This indicator is designed to measure progress on assessing and managing climate risks and opportunities, and incorporating appropriate action into local authority and partners' strategic planning. As the localism agenda is developed, a joined-up approach from the two central government departments – Defra and the department for communities and local government (CLG) – is central to ensuring important guidance of this type is further embedded into local action.

Local authorities and agencies are best placed to understand the particular challenges of their own area, but a consistent strategy across different areas would support private contractors (many of whom operate across multiple jurisdictions) deliver the most effective and economical solutions to addressing climate risk in infrastructure construction and maintenance.

Design standards and regulation need to look at future climate projections as well as historic climate data

In the face of significant changes in climate, there is a clear lesson for design-stage planning to look at projected future temperature and weather scenarios as well as historic data. The benefits of integrating adaptation planning at design stage are highlighted in the guidance that the ABI has set out with property developers (**case study 2**).

Infrastructure and assets should now be designed to be resilient in the face of future – rather than historical climate conditions, taking into account their predicted asset life. Planning for new and redeveloped public buildings can be used to promote best practice, using revised parameters for flood risk and advanced ventilation and cooling solutions to foster novel approaches in sustainable

design. The Technology Strategy Board, for example, is working with the construction industry to look at what information companies can use to adapt construction practice and processes to adapt to future changes in climate.[18] Building regulations and master-planning models used by local authority planners should also look increasingly at lessons from design in warmer climates – including the latest generation of low-carbon urban developments (such as the proposals for a new zero-carbon city in Dongtan in China[19]).

Structural barriers to adaptation in current regulations must be addressed

Regulation in cost-controlled sectors (such as water, electricity generation and distribution, and rail transport) can also provide a disincentive for firms to take action, if it adopts too narrow a focus and doesn't take into account lifetime cost-benefit analysis. Where climate adaptation is currently outside of the regulated sphere (in electricity and transport sectors for example) companies cannot pass on costs, which generally have to be recouped within a short (eg five-year) price-controlled period. This places a premium on immediate capital expenditure savings, rather than operational expenditure savings achieved through investment in additional asset resilience. This bias against adaptation investments with longer-term returns should be addressed.

Regulation can and should work as a key catalyst for firms to take action. To ensure this occurs, it is important that attention is paid to the increased capital investment needed (in many cases) to address climate adaptation, and it is essential that the mechanisms by which companies in price-controlled sectors can pass on these costs to consumers are kept under review. It is also critical that regulators across different sectors, and those whose scope covers firms in different industries, adopt consistent approaches – to ensure a joined-up approach to addressing climate risk for companies whose operational dependencies very often overlap (with gas and electricity networks, for example).

The UK is pioneering new legislation and regulation to address climate adaptation through the Climate Change Act, which sets out powers for the government to require public authorities and statutory undertakers to report on climate adaptation (**Exhibit 5**). The government is also drafting a national Climate Change Risk Assessment. It is essential that all this work brings together the existing strands of action on climate adaptation to form a coherent approach to this important issue – across government and across regulatory agencies.

Key recommendation 8

The government's forthcoming national Climate Change Risk Assessment needs to shape a coherent approach to climate adaptation across regulated sectors, the planning process, and in public infrastructure procurement

Key recommendation 9

A consistent approach should be taken across regulatory authorities to support firms to adapt public infrastructure to long-term climate risk

Exhibit 5

Climate Change Act (2008)

The Climate Change Act 2008) gave government the power to require public authorities and 'statutory undertakers' (as defined by the Town and Country Planning Act [1990], and including a range of businesses, such as water and energy companies) to report on how they've assessed the risks of climate change to their operations, and what they're doing to address these risks. This power is known as the adaptation reporting power.

Submitted to Defra over the course of this year, the assessments will inform a **national Climate Change Risk Assessment**, which the government is producing under the guidance of the new adaptation sub-committee of the Climate Change Committee. This will lead to a National Adaptation Plan in 2011.

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INVESTORS IN PEOPLE

September 2010

ISBN: 978-0-85201-730-2

Product code: CCT_036