businessGreen

BUSINESSGREEN INSIGHT REPORT

Is UK Plc climate-ready?

In association with

pwc

businessGreen

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Foreword: UK – open and ready for business?

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PwC UK

TIME and again, the conversations we have with the leaders of UK businesses of all sizes are driven by an outlook on the economy and shaped by recurring themes: new markets, skills, innovation, investment, regulation, competitiveness, risk and resilience.

In a world craving economic growth and stability, we cannot ignore the findings of the Intergovernmental Panel on Climate Change (IPCC). This year's IPCC report gave us the most authoritative review of the scale of the threat and the risk to us all of climate change, and reinforces the case for action.

So while reading this insight into whether business is ready for climate change, let three points frame your thinking, and the case for action.

The first is that climate doesn't respect borders. It will not just be impacts locally in the UK that will matter to UK business. Global supply chains link us directly to hazard prone and potentially less prepared countries in developing and emerging economies, and 80 per cent of the FTSE350 assets are now overseas.

Secondly, weather pays no attention to scale and stature. Dealing with climate change risk is not just about the action large companies take. Smaller businesses also have international supply chains, and smaller businesses may not have the luxury of a full time climate risk manager to keep an eye out for these issues.

Thirdly, climate change is not just an environmental issue. The UK is facing fundamental challenges that underpin economic stability. This includes energy capacity, pricing and security; infrastructure resilience and access; international risks and competitiveness; security of food supply; development of skills and R&D capability. All these are interlinked to the climate and weather.

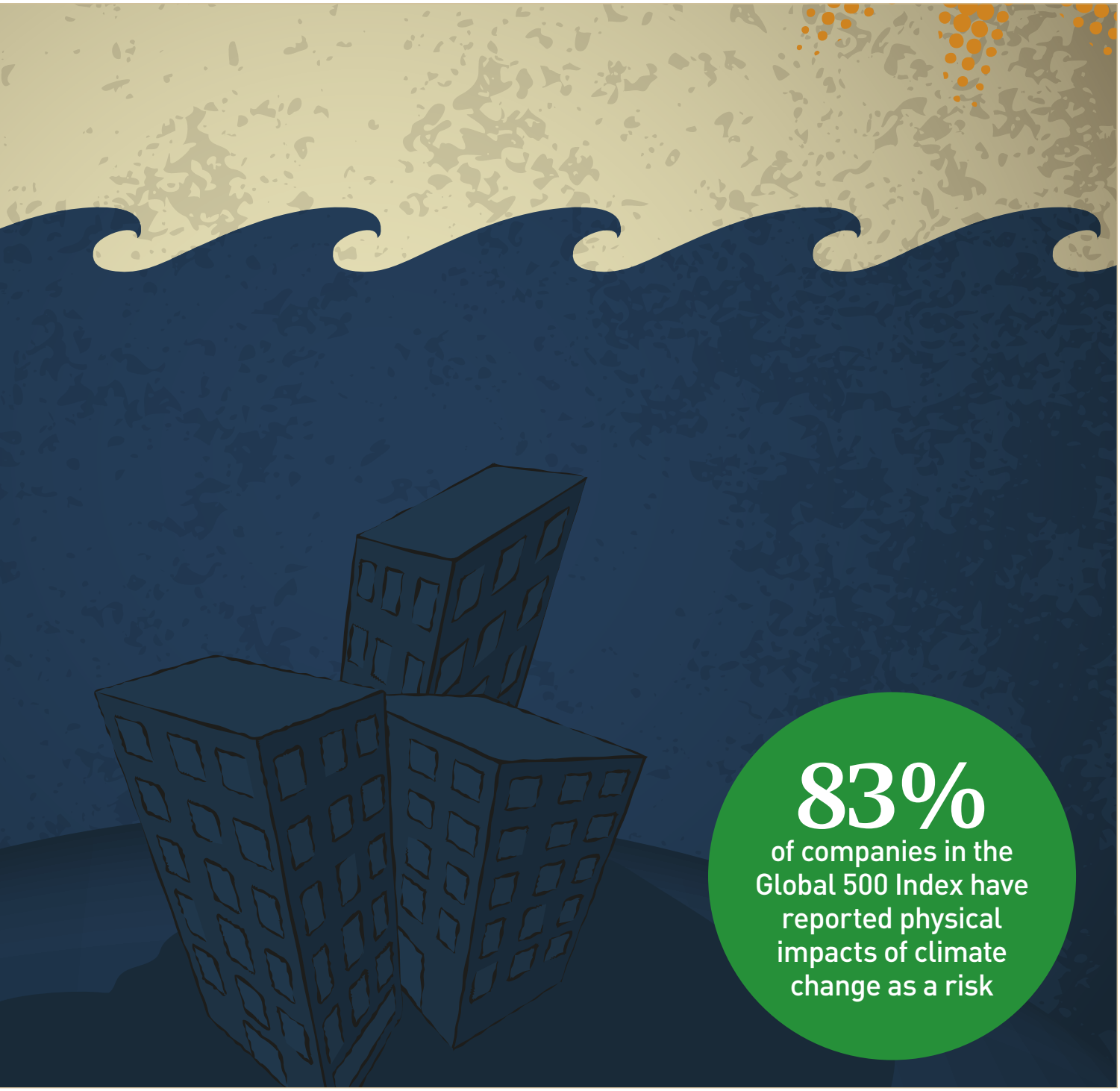
This is no longer just a debate about climate change. It's one of securing recovery and sustaining growth for UK plc.

In our role as report writer to the CDP's Global 500 report in 2013 we found four out of five (83 per cent) companies in the Global 500 Index have reported physical impacts of climate change as a risk. This report by BusinessGreen echoes that message for UK business.

Let's not lose sight too of the opportunity, not just in terms of risk prevention, but in terms of innovation, skills and business opportunities. A resilient economy is an attractive one for investments and talent. Many sectors that the UK is strong in, from insurance to water management, will have an important role to play in a changing climate. But we need to be ready in a competitive global economy.

This report provides not just a useful insight into the day to day thinking in

"Climate doesn't respect borders. It will not just be impacts locally in the UK that will matter to UK business"



UK business about the reality of action and inaction on, managing climate risks, but also reflects the scale of the economic opportunity we will miss if we don't act. We hope it will help move climate change up the risk radar for UK businesses, because it is time to act.

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Read on for in-depth analysis of the results

Executive Summary

CLIMATE change represents one of the most serious long-term risks faced by any business. Climate scientists' projections suggest businesses will experience huge levels of disruption during the coming decades as rising average temperatures, the increased incidence of extreme weather, rising sea levels, and changing weather patterns unite to impact infrastructure, buildings, agricultural production, supply chains, and geopolitical relationships.

There is growing evidence that climate change impacts are already leading to higher risks and costs for many businesses, while projections suggest that infrastructure that is built now will face a significantly more hostile climate over the next 40 years.

Businesses are aware of these risks, but how are executives responding to them? How climate resilient are their assets and operations and what can they do to improve their resilience?

This Insight Report attempts to address these questions through an analysis of the latest literature on climate resilience, interviews with leading experts, and a survey of BusinessGreen readers. The survey finds that:

- A majority of respondents have experienced climate change impacts or extreme weather in the past five years.
- Only a third of respondents work for an organisation that has undertaken a climate risk assessment and only 24 per cent have a climate resilience strategy in place.
- Common barriers to the development of climate risk strategies include uncertainty over future climate impacts, budget constraints, and uncertainty over government policy.
- Over half of respondents regard the climate risks their organisation will face over the next 30 years as "moderate" and requiring action to enhance resilience or "severe" and requiring fundamental changes to the organisation.
- 56 per cent of respondents described themselves as unsatisfied with their organisation's level of climate resilience.

The report also finds that there are established best practices in place for businesses to follow in order to enhance their climate resilience, starting with an assessment of current and future climate risks and followed by a commitment to incorporate climate risk considerations in an organisation's strategic decision-making processes.

In addition, the report confirms a growing consensus across government, the insurance industry, and the risk management sector that enhancements to climate resilience can serve to reduce an organisation's risk profile, boost its competitiveness, and make it more attractive to investors.

Introduction

THE story of climate risk is a story of big numbers. The $60tr of global economic losses that according to one recent report could be caused by the methane emissions that would be released by thawing Arctic permafrost; the $5tr agricultural asset bubble that the University of Oxford's Smith School of Enterprise and the Environment fears is being pumped up by investors who fail to account for climate risks; or the $1tr of flood damage the World Bank predicts the largest coastal cities are likely to face by 2050 unless steps are taken to improve climate resilience.

But it is also a story of relatively small numbers with potentially huge implications. The 10 per cent of the world's land mass that recent research predicted would experience summer heat waves by 2020; the 30cm to 69cm average sea level rise that researchers from the Ice2Sea project predict will occur by 2100; and, most importantly, the 2-5°C average global temperature increases that scientists are continuing to predict for this century.

All of these projections and reports are necessarily couched in the terms of risks and probability, but while short-term fluctuations in climate continue, every scientific academy in the world is in agreement over the manner in which climate change is almost certainly manmade and will result in a series of severe impacts over the coming decades even if efforts to reduce greenhouse gas emissions prove successful. Warnings of wide-ranging and hugely costly climate impacts have become more prevalent this autumn with the release of the fifth update of the Intergovernmental Panel on Climate Change's (IPCC) landmark climate science update and its confirmation of the ever higher degree of confidence with which scientists are predicting serious climate impacts that are likely to be experienced this century.

> "Rising temperatures, rising sea levels, and increasing frequency of extreme events have direct effects on people's lives, as well as disrupting commodity prices, supply chains, markets, and economies"

Moreover, a series of in-depth reports have in recent years combined climate and economic modelling to demonstrate the risks national economies and individual businesses face. Most notably in the UK, Defra's 2012 UK Climate Change Risk Assessment detailed how virtually every sector of the economy faces increased risks from flooding, water scarcity, heat waves, extreme weather and supply chain disruption.

As then Environment Secretary Caroline Spelman observed: "Climate risks affect all aspects of society. Rising temperatures, rising sea levels, and increasing frequency of extreme events have direct effects on people's lives, as well as disrupting commodity prices, supply chains, markets, and economies." A follow up Defra-commissioned report from PwC similarly concluded UK interests overseas could face even greater climate risks than domestic assets with increased supply chain disruption, calls for humanitarian intervention, and food price volatility all likely to have a major impact on British businesses.

The net result is that many key industries and large businesses are now incorporating climate risk assessments and climate resilience strategies into their long term planning. The UK government has mandated key infrastructure providers to report every five years on their climate resilience plans, while a combination of corporate reporting rules and investor activism is prompting more businesses to publicly disclose the climate risks they face. For example, a Carbon Disclosure Project (CDP) survey of FTSE 350 companies published this month found that 86 per cent of responding companies report on climate change risks, while 82 per cent report on related opportunities.

Meanwhile, many other firms are being forced to take climate risk seriously as they face direct climate impacts. A 2012 survey of its members undertaken by manufacturers' association EEF found that 61 per cent had been adversely affected by

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http://www.businessgreen.com/bg/news/2289658/coastal-cities-risk-gbp640bn-flood-bill
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https://www.cdproject.net/CDPResults/insights-into-climate-change-adaptation-by-uk-companies.pdf

weather issues, while the £3.2bn economic cost attached to the UK's 2007 flooding or the well-documented global supply chain disruption caused by the 2011 Bangkok floods have similarly served to raise the profile of corporate climate risk.

However, as our exclusive new research shows, while climate risk and resilience is slowly climbing up the corporate agenda it remains a rare company that has put in place a comprehensive and effective climate resilience strategy. Through a survey of our readers and interviews with leading climate risk experts, this BusinessGreen Insight Report aims to explore the extent to which sustainability executives are engaging with climate resilience issues and developing the kind of business models, infrastructure and investments that will be less vulnerable to climate impacts.

"Rising temperatures, rising sea levels, and increasing frequency of extreme events have direct effects on people's lives, as well as disrupting commodity prices, supply chains, markets, and economies"

It will also provide a series of case studies on how leading firms are enhancing their climate resilience, explore the best practices that define the most effective climate risk assessments, and help businesses overcome the barriers that can block the development of successful climate resilience strategies.

Footnotes

http://news.bbc.co.uk/1/hi/uk/8464717.stm

Climate impacts and risks

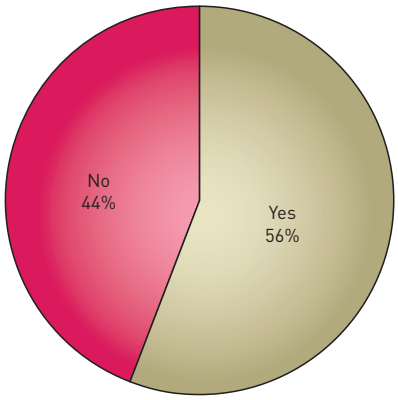
THE question as to whether UK Plc is climate ready begs the further question, ready for what? The answer is two-fold: ready for the climate impacts businesses are already experiencing and ready for the projected impacts that are likely to occur as climate change continues.

Current impacts

Climate risk experts agree that one of the most effective ways to get executives to engage with climate change is to ask them how often their operations or supply chains have been impacted by extreme weather in the past five years — the answers are often pretty compelling with significant numbers facing at least some disruption.

Our survey of BusinessGreen readers found that 56 per cent had been affected by climate change or extreme weather impacts in the past five years, of which 61 per cent experienced flooding, 34 per cent endured storm damage, and 25 per cent faced drought conditions and 23 per cent reported drought conditions. Moreover, a significant minority of respondents reported indirect impacts on their operations, with 26 per cent experiencing higher commodity prices or resource scarcity that they attributed to climate change, 11 per cent identifying increased climate-related security risks related to geopolitical issues, and 16 per cent reporting increased insurance premiums.

Have your operations or supply chain been affected by climate change/extreme weather impacts in the past five years?



There is also evidence that awareness of these risks is increasing. Paul Simpson of the Carbon Disclosure Project (CDP) reports that the organisation's recent survey of Global 500 companies found that while in 2010 only 10 per cent of

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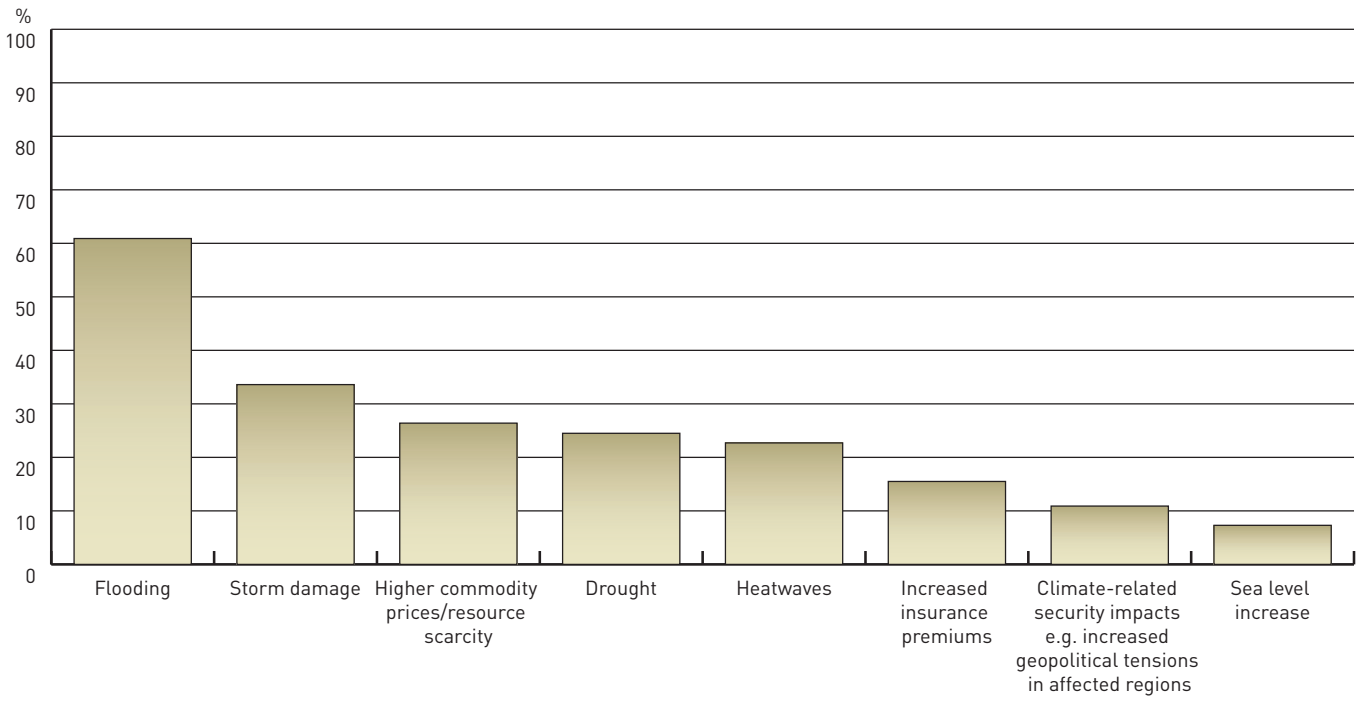
https://www.cdproject.net/en-US/Pages/global500.aspx

Climate change/extreme weather impact on operations or supply chain



respondents regarded climate change as a "current risk", by late 2012 the proportion seeing it as a current risk had risen to 37 per cent. And as Simpson observes, the latest survey was taken before Hurricane Sandy impacted the US north eastern coast.

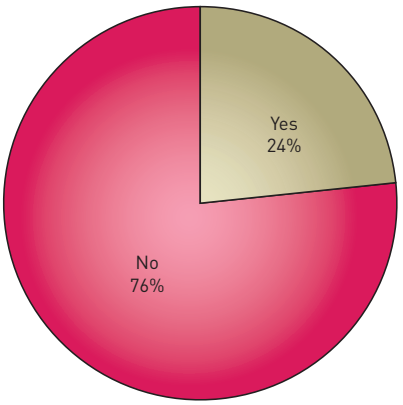
And yet numerous studies have consistently shown that businesses struggle to develop an adequate response to these existing risks. Our survey paints a similar picture with 67 per cent of respondents confirming their company had not undertaken a formal climate risk assessment. In contrast, 31 per cent had assessed the climate risks faced by their operations and just 11 per cent had looked at the risks faced by their supply chains. "Corporate memories can be quite short," observes the Met Office's Michelle Spillar. "Not many companies have a good understanding of the impact of weather today. That has to be the first step of a climate risk assessment - what is happening today?"

Current flood and drought risks are now well documented and, thanks to improved weather forecasting, increasingly easy to predict. Warning services from the Environment Agency and modelling tools from the Met Office allow businesses to quickly assess whether their assets or suppliers are vulnerable to extreme weather impacts and all firms are advised to draw up business continuity plans to cope with extreme weather events. Meanwhile, periodic disasters, such as the Bangkok floods of 2011, Hurricane Sandy's impact on the north eastern seaboard of the US, or the European heat wave of 2003, all serve to highlight the large scale financial and economic risks presented by extreme weather.

As Matt Cullen, policy advisor for flooding and climate change at the Association of British Insurers (ABI), observes many firms are leaving themselves exposed to risks that are relatively easy to avoid by failing to respond to climate factors that are already having an impact on operations. "There's a lot of evidence on changing patterns in climate-related incidents both in the past and in projections for the future," he explains. "In the UK if you look at flooding in the 1990s there were two events that cost more than £150m, but since 2000 we've had seven, and some of them have cost a lot more than £150m. That particular snapshot may not be statistically relevant on its own, but it is part of a trend, and it is a trend that we can all see if we think about it. But flooding is still not something that people think will happen to them."

It is a mental block that Paul Leinster, chief executive of the Environment Agency, has seen in action, with some firms failing to take even the basic steps that can help to tackle climate vulnerability. "Knowing your business continuity plan is crucial," he advises. "There's a big difference with flooding between the response of those who have a plan in place and those who have not thought about it. I visited a company that had put a lot of very valuable stock in a below-ground floor that was all ruined when it flooded — and then when the flood was cleared they continued to use that space for stock and it happened again. In contrast, another nearby business responded to an Environment Agency flood warning, moved stock to a higher floor, and was able to get back to normal operation much quicker when the flood receded."

Does your company have a formal climate resilience strategy in place?



Astute businesses can take steps to mitigate current climate risks by developing business continuity plans, investing in flood protection measures and climate resilient buildings where appropriate, and locating assets in areas that are less exposed to weather-related risks. But again it is a minority of companies that have taken such steps, despite the clear risk management and commercial benefits that are available. Our survey reveals just 24 per cent of respondents work for a company with a formal climate resilience strategy in place, with the remainder having no such strategy. Separate studies paint a very similar picture. A recent EEF survey of manufacturers found that 61 per cent had been affected by local weather factors, but only a quarter had started to think about climate risk.

"Not many companies have a good understanding of the impact of weather today. That has to be the first step of a climate risk assessment - what is happening today?"

Case study

Saint Gobain reveals plan to tackle rising drought risk

For most people in the UK the biggest inconvenience associated with summer drought conditions is a hosepipe ban, but for many industries drought risks could result in millions of pounds worth of disruption as water shortages raise the prospect of higher costs and even production restrictions.

It is certainly a risk that building materials giant Saint Gobain has recognised, not least in some of the water-stressed regions in which it operates. "To be sustainable we need to water efficient, use less water where possible and ensure water we return to the environment is clean," explains head of environment at the company, Allen Gorringe. "You have to look at the reputational risk you face if you end up as a big water user in a water-stressed area."

Gorringe admits the organisation has not yet undertaken a full company-wide climate risk assessment, but it has recognised that water-related issues, including both drought and flooding, pose a risk to its operations that is likely to intensify as climate impacts take effect. As such, a water strategy has been devised, including a water management standard that is now being adopted across all the company's sites.

The strategy has a target to reduce water use at manufacturing sites by six per cent over three years, but Gorringe is confident the company will comfortably exceed the target. "Six per cent is a significant saving for a manufacturing based business, but each site is trying to do even better than that and in some cases we're seeing 25 per cent reductions in three years," he says, adding that a programme of leak reduction and water use monitoring has allowed sites to deliver big savings.

"New systems now allow you to test for leaks without digging up pipes, which makes a big difference," he says. "Simply monitoring water use also allows you to optimise it and deliver savings, plus a lot of sites have developed bespoke capture and reuse processes."

One such site is Saint Gobain's British Gypsum plant in Robertsbridge, East Sussex, which manufactures plasterboard using gypsum from a nearby mine.

Gorringe confirms that its location in a commonly water-stressed area ensured the site was one of the first plants to pilot new water-saving technology. "Parts of the South East have water stress levels that are higher than some Mediterranean countries," he says, adding that the company was keen to reduce the plant's reliance on a surface water reservoir that is serving a local community. The site has not seen production disrupted because of water shortages, but with climate change likely to result in a higher risk of drought, Gorringe confirms the company has in the past highlighted water shortages as a potential compliance risk. "Reducing the amount of water we use reduces that risk," he says.

A number of measures have been put in place to reduce water use at the site, including technology that can collect condensate from the plant's steam plumes so that the water can be reused in the production process.

However, the biggest water savings have resulted from the installation of a new system capable of processing the "leachate", which the company previously had to collect from its onsite landfill site and ship off for processing.

> "You have to look at the reputational risk you face if you end up as a big water user in a water-stressed area"

Historically, residues from the production process have been land filled on site, leaving the company with a responsibility for collecting water that passed through the landfill collecting sulphides and other contaminants. That meant the company had to transport tonnes of water for cleaning each year, with around 190 road tankers worth of leachate removed from site in 2008 alone.

However, the company realised that it could process the water onsite for reuse in the manufacturing process, also making use of the recovered sulphides at the same time. Existing pipe work was used to divert the leachate water from the landfill sites back to the manufacturing site and into some refurbished process water tanks. "We've reduced water use by 15 to 20 per cent," says Gorringe. "It might not sound much, but this is quite a water intensive process. It is a significant saving."

In fact, the saving amounts to a reduction in the amount of water abstracted from the nearby reservoir of 2,000 tonnes a year, as well as waste management cost savings totalling £118,000. And perhaps most importantly, the company has significantly reduced its risk exposure the next time the South East experiences drought conditions.

Future impacts

Assessing future climate impacts is, by definition, significantly harder than assessing current risks. A combination of historic data and advanced computer models are required to deliver probabilistic projections on how climate impacts will evolve, each of which have a degree of uncertainty attached that makes assessing climate risks and preparing for impacts more difficult.

Projections undertaken at a global or continental level have relatively low levels of uncertainty - scientists have a high degree of confidence that rising levels of greenhouse gas emissions will lead to higher average temperatures, which in turn contribute to more extreme and volatile weather patterns. However, regional climate projections invariably face higher degrees of uncertainty, a fact which has been seized upon by so-called "climate sceptics" to lobby for corporate inaction in response to climate risks.

As a general rule, business leaders are ignoring these "climate sceptic" calls, as they understand that it is in their long term interests to develop a response to future climate risks that could have a severe impact on their operations and they generally accept that even regional climate projections have an acceptable degree of certainty. "The response to climate risk varies a lot by country and the UK response is actually quite advanced," argues the Met Office's Spillar. "We are a long way ahead of the likes of the US and Australia, which have only just started to see climate change as something to respond to. The UK business community has very much moved from 'is this happening' to 'what can we do about it?'"

British businesses have access to several major reports that provide an in-depth assessment of future climate risks: Defra's UK Climate Change Risk Assessment, PwC's International Threats and Opportunities of Climate Change for the UK, the government's National Adaptation Programme and the UKCP09 toolkit, which provides detailed climate information and probabilistic projections for 25km square grids across the whole of the UK.

The reports' conclusions broadly echo one another: the biggest climate risk faced by the UK is flooding, particularly in the form of winter floods; the incidence of extreme storms is likely to increase; rising sea level will present challenges to coastal communities during the second half of the century; heat waves and droughts will increase in frequency, particularly in the south of the country; and the greatest climate impacts will be faced by UK supply chains and interests overseas, potentially leading to a knock on effect on prices for food and other key commodities.

The reports also provide in-depth risk assessments for those sectors that display the highest levels of vulnerability. For example, Defra's

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http://www.pwc.co.uk/sustainability-climate-change/publications/international-threats-and-opportunities-of-climate-change-to-the-uk.jhtml
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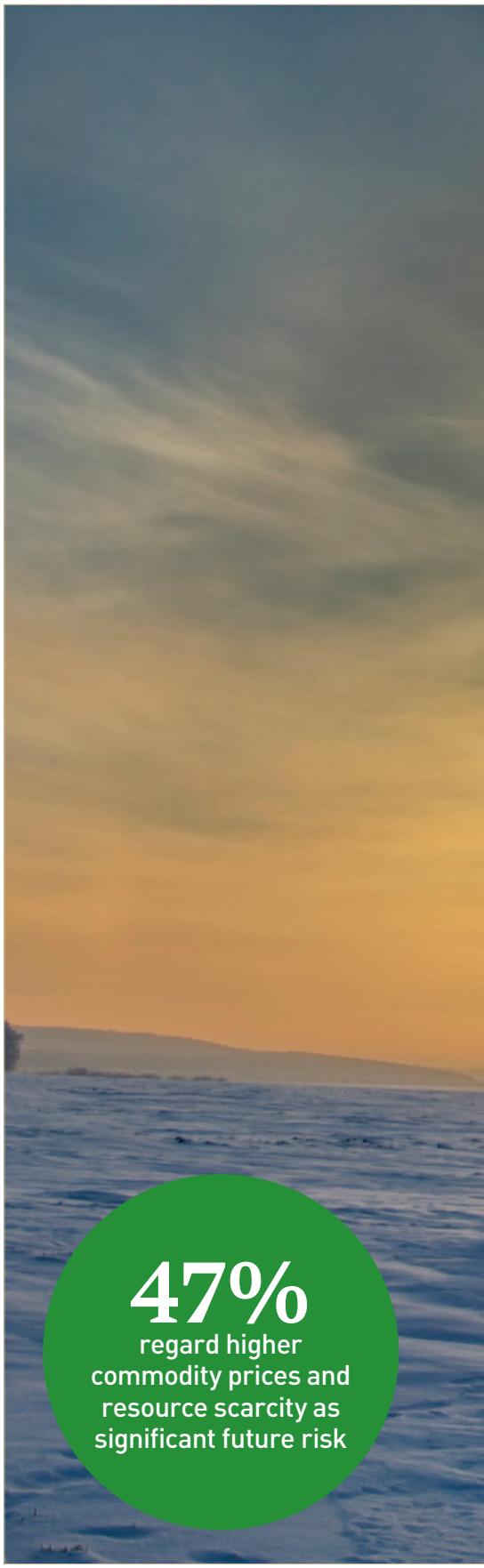


Climate Change Risk Assessment details a series of predictions for different parts of the economy:

Agriculture and Forestry — Face increased risks from competition for water resources, flooding and erosion, higher incidence of plant and tree diseases, and wild fires, offset only in part by longer growing seasons and the prospect of harvesting different crops.

Businesses — Face a possible decrease in output due to an increase in supply chain disruption as a result of extreme events, as well as a greater risk of monetary losses as a result of flooding, greater variability in water supplies, and a "potential loss of staff hours due to high internal building temperatures". These risks are again partially offset by a possible increase in revenue for the tourism and leisure industries and the creation of a new market delivering climate adaptation measures.

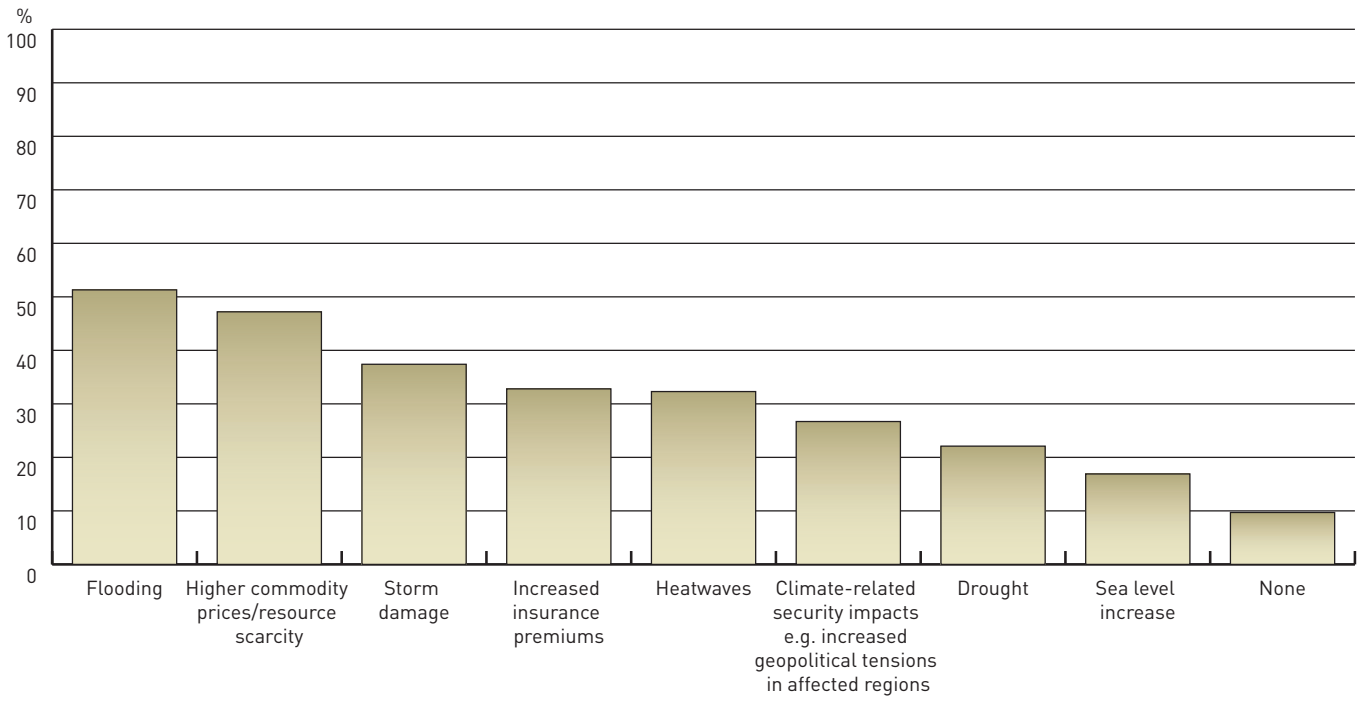
"The UK is a long way ahead of the likes of the US and Australia, which have only just started to see climate change as something to respond to"

Health and well-being — Increased temperatures and flood risks pose a series of public health risks, including higher mortality rates related to heat stress, increased ozone levels, a higher incidence of algal blooms and marine pathogens, and changes to disease vectors. Some of these risks will be offset by lower mortality rates related to winter temperatures and a potential increase in vitamin D levels due to higher summer temperatures.

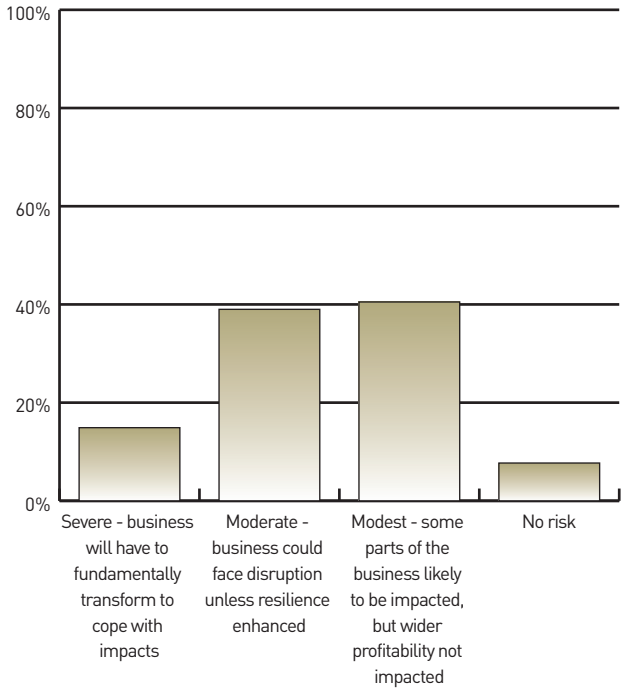
Buildings and infrastructure — Key energy and transport infrastructure are deemed to be at "significant risk of flooding", while higher energy demand for cooling, heat damage to energy and rail infrastructure, increased pressure on water supplies, damage to property from flooding and coastal erosion, potential overheating in schools and hospitals, and greater likelihood of building subsidence all present risks. Relatively few opportunities are identified, although winter demand for heating is likely to fall and the government predicts shipping routes could become shorter as Arctic ice recedes.

Natural Environment — Faces a wide array of risks, including increased concentrations of pollutants from agriculture, sewage and air pollution due to lower water levels, soil moisture deficits and erosion impacting biodiversity and increasing risk of wildfires, increased

Which climate-related impacts do you regard as posing the greatest threat to your organisation's operations over the next 30 years?



How would you describe the level of climate change risk faced by your organisation over the next 30 years?



How would you describe the level of climate change risk faced by your organisation over the next 30 years?	%	No.
Severe - business will have to fundamentally transform to cope with impacts	14.9%	29
Moderate - business could face disruption unless resilience enhanced	39.0%	76
Modest - some parts of the business likely to be impacted, but wider profitability not impacted	40.5%	79
No risk	7.7%	15

prevalence of invasive species, potential biodiversity loss on a range of fronts, and the increased possibility of algal blooms, ocean acidification and species range shifts impacting on marine habitats, species and ecosystem services.

Similarly, PwC's report on International Threats and Opportunities of Climate Change for the UK concludes that even under a 2°C of warming scenario the international implications for the UK would include:

- Extreme weather leading to increased damage to physical and financial assets.
- Increased demands for humanitarian assistance.
- Greater levels of food price volatility and potentially damaging political or policy reactions resulting from food supply constraints.
- Increased demand for UK Government services by overseas territories and citizens abroad.

In contrast, potential opportunities are restricted to:

- The potential for the UK to export adaptation goods and services to new markets.
- Reduced shipping costs as Arctic sea ice retreats.
- Potential for greater international diplomatic cooperation as governments are forced to respond to global climate risks.

A clear majority of businesses are concerned about these future risks. Asked about the scale of climate risk faced by their organisation over the next 30 years just over half of respondents to our survey said they regarded them as "moderate" (39 per cent) and requiring enhanced resilience or "severe" (15 per cent) and requiring a fundamental transformation of the business. Meanwhile, 41 per cent identified "modest" climate risks that would impact some parts of the business. Only eight per cent predicted that they would face no climate risk over the 30-year period.

The risks that respondents regard as the greatest threats largely echo the conclusions of the government's various climate risk reports. For example, flooding is regarded as a risk by 51 per cent of respondents, followed by higher commodity prices and resource scarcity by 47 per cent, storm damage by 37 per cent, increased insurance premiums by 33 per cent, and heat waves by 32 per cent.

Case study

IKEA cottons on to supply chain climate risks

What do you do if your company purchases one per cent of the entire global supply of a product that experts agree will become increasingly vulnerable to climate impacts over the coming decades? That is the question faced by retail giant IKEA when it looks at a global cotton market for which it is one of the world's largest customers.

The answer lies in the Better Cotton Initiative, a global programme of which IKEA is a founder member that is designed to help cotton farmers embrace the kind of best practices that not only reduce their environmental impacts, but also serve to make them more resilient to climate impacts.

"We sell a collection with a significant proportion of cotton and that's not going to change, so we need to address the climate risks that could impact on cotton supplies," explains Joanna Yarrow, country sustainability manager for the UK and Ireland at IKEA. "We need to look at the right locations and ensure there are good farming practices in place."

> "We sell a collection with a significant proportion of cotton and that's not going to change, so we need to address the climate risks that could impact on cotton supplies"

In order to help achieve this goal, IKEA already sources 59 per cent of its cotton from farms and plantations that are certified under the Better Cotton Initiative and plans to ensure 100 per cent of its cotton is certified by 2015. In addition, alongside the likes of H&M, Marks & Spencer, Nike and Tesco, the company is supporting the Better Cotton Fast Track Program, which channels funds to farmer training and improvement projects that help farms meet the scheme's various sustainability criteria.

The Better Cotton Initiative certification requires farms to embrace a series of best practices, including responsible use of pesticides and fertilisers, adherence to labour rights, reporting on yields, and the introduction of water-efficiency measures. According to Yarrow, the scheme could see farmers use significantly lower levels of chemicals during the production process, as well as up to 50 per cent less water – a potentially significant saving given that traditional cotton production uses around 10,000 litres of water to produce one kilogramme of cotton fabric.

It is this improvement in water efficiency that is arguably of the greatest importance given the significant climate risks cotton producers face. A 2011 report from the International Trade Centre suggested that while higher average temperatures could increase cotton production in some regions many of the world's largest cotton producers faced significant climate risks in the form of water shortages and excessive daytime temperatures. "Overall, the negative impacts of climate change on cotton production relate to the reduced availability of water for irrigation, in particular in Xinjiang (China), Pakistan, Australia and the western United States," the report states. "Heat stress risks creating depressed yields in Pakistan in particular... Cotton supplies may benefit from higher temperatures as new production areas are established where cotton was not grown before. [But] the overall impacts of climate change on cotton production and trade are very hard to predict."

However, the report notes that farmers can improve their resilience to climate impacts by embracing a series of best practices, such as minimising soil tillage, encouraging local plant diversity, and maximising water efficiency.

Timber

IKEA's support for the Better Cotton Initiative is just one of the approaches it is using to enhance its climate resilience. Similar work is underway with its timber supply chain to ensure the company can retain access to sustainable timber supplies, while the rest of the supply chain is constantly monitored for potential climate-related risks even if the company does not have a specific over-arching climate resilience strategy.

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http://www.intracen.org/workarea/downloadasset.aspx?id=52570

"We do a lot that would come under the heading of climate resilience, but we don't think about it that way," explains Yarrow. "We ran a session recently for all our risk managers globally on climate risk. They might not have "climate" as such at the top of their lists of issues, but they are looking at all the specific issues that relate to climate change, like extreme weather, water risks, resource availability and energy pricing."

Eye-catching

The most eye-catching green commitment from the company is its pledge to become fully energy independent by the end of the decade through a huge investment in renewable energy assets, an approach that is designed to both reduce greenhouse gas emissions and enhance energy security at a time of fluctuating prices. But Yarrow reveals less high profile work is underway to ensure IKEA stores are both low carbon and climate resilient.

"We've just launched a global programme on store design and we have committed that every new store will be greener than the last," she says. "We have a global research project in place to bring together all our knowledge to build new stores and ensure they are the greenest ever, and local climate adaptation measures will be one of the factors in that brief." Specifically, the company is looking at rainwater harvesting systems, incorporating more capacity for storm water in drainage systems, and even developing green roofs and walls that can boost biodiversity while minimising the need for heating and cooling within a building.

"We've just launched a global programme on store design and we have committed that every new store will be greener than the last"

"The main aim is to make sure that we can continue to operate these stores as the climate becomes more hostile," says Yarrow. "Forty years ago the assumption was that operating conditions would remain basically the same for the lifetime of a store, but we just can't presume that anymore."

Corporate climate resilience: leaders and laggards

WHERE businesses are developing climate resilience strategies best practices are fast emerging. Experts agree that any climate resilience strategy needs to start with a risk assessment, and preferably a comprehensive risk assessment that takes account of current and potential future climate impacts on operations, assets, staff, suppliers, customers, and legislative and investment trends.

Once risks are established businesses can then model which risks require action, which risks require insurance, which risks require a watching brief, and which risks are acceptable and require no action. Initial steps are likely to include the development of a comprehensive business continuity plan to help businesses cope with climate-related disruption, investment in measures that can reduce climate impacts, such as improved flood protection, and the development of longer term strategies, such as the incorporation of climate factors into investment decisions to ensure assets are resilient or the diversification of supply networks to ensure reliance on a vulnerable region is minimised.

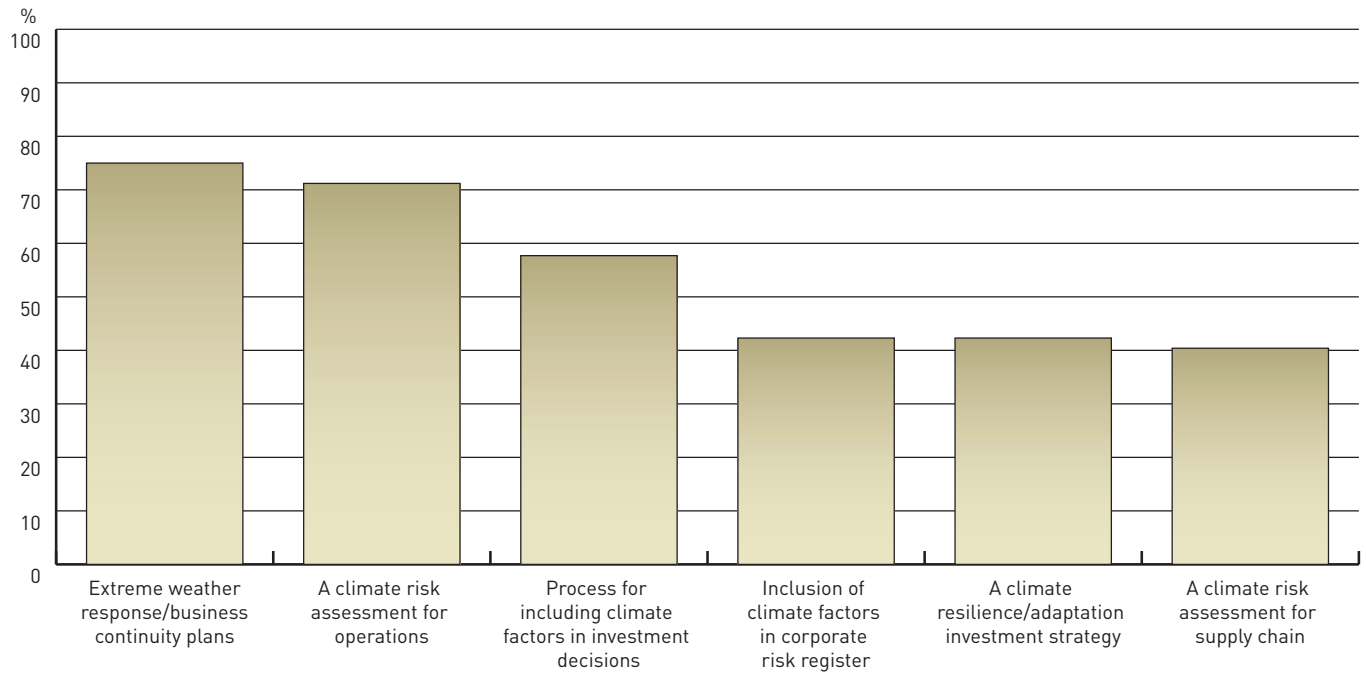
71%
of firms have assessed climate risks for their operations

"The first thing any business should do is assess the risk they face," summarises the ABI's Cullen. "You can then do simple stuff like making modifications to the property to make it more resilient, as well as long-term stuff like thinking about avoiding areas that are at high risk. Once you understand the risk you can start planning an approach. You need 'before the event' strategies to minimise risk, but you also need contingency plans for what happens if an event occurs. That *ex post* response is an important part of the plan that is often forgotten. It is not just about managing risk, but also knowing what to do if an event happens."

Leaders

Where businesses have developed climate resilience strategies they tend to be adhering to many of these best practices. Of those respondents to our survey that have a climate resilience strategy in place 71 per cent have assessed climate risks for their operations, 75 per cent have business continuity plans in place for extreme

If your company has a formal climate resilience strategy in place, what does it include?



weather, 42 per cent include climate change in their corporate risk register, and 58 per cent have a process for including climate resilience issues in investment decisions.

However, blind spots remain, most notably in terms of supply chain management. Only 40 per cent of those companies that have a climate resilience strategy have assessed risks faced by their supply chain, while over two thirds of all respondents to our survey place no requirement on suppliers to demonstrate their climate resilience. Of those that do ask suppliers about their climate resilience just nine per cent require all suppliers to demonstrate their resilience while 18 per cent ask questions of a few key suppliers. These findings again mirror the results of CDP's recent survey on climate risk with large corporates typically having climate resilience and emission reduction strategies, while a significantly lower proportion of suppliers embrace such strategies.

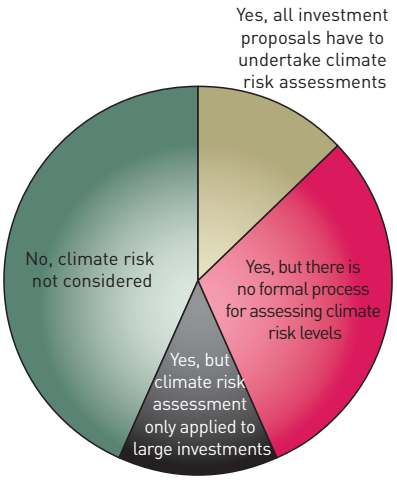
> "It is not just about managing risk, but also knowing what to do if an event happens"

Laggards

Overall, the 24 per cent of respondents with formal climate resilience strategies in place represent a group of leading firms whose actions are not yet being replicated by their peers.

Asked if climate risk informs long term investment decisions at their organisation 13 per cent said "all investment proposals have to undertake climate risk assessments", while 31 per cent said climate risks were considered but "there is no formal process for assessing climate risk levels".

Does climate change risk inform long-term investment decisions?



Does climate change risk inform long-term investment decisions?	%	No.
Yes, all investment proposals have to undertake climate risk assessments	12.8%	25
Yes, but there is no formal process for assessing climate risk levels	30.8%	60
Yes, but climate risk assessment only applied to large investments	13.3%	26
No, climate risk not considered	43.1%	84

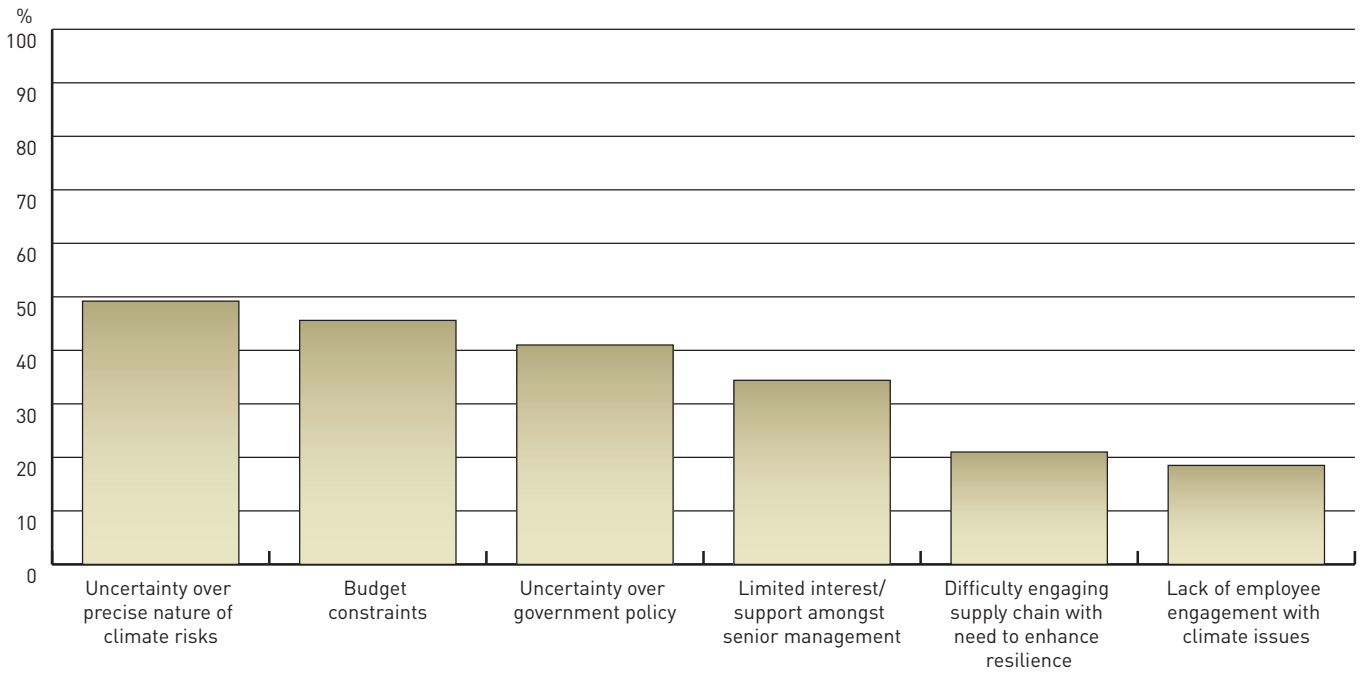
Meanwhile, 13 per cent only consider climate risks for the largest investments and a full 43 per cent admit to climate risk not being considered at all in long term investment decisions.

As such, it is hardly surprising that a clear majority of respondents, 56 per cent, describe themselves as being unsatisfied with their organisation's level of climate resilience. Like much of the research on this topic some caveats are required: our survey was a self-selecting sample of BusinessGreen readers and as such the respondents primarily work in environmental roles and are likely to want to see their organisations embrace green best practices.

But the findings are in line with the conclusions of much of the recent research on corporate climate resilience, which finds that many businesses are failing to adequately assess and develop a response to climate risks.

Speaking to BusinessGreen for this report, Lord de Mauley, environment minister with responsibility for climate adaptation, admitted the government is concerned with the ability of smaller businesses in particular to build climate resilience. "Many large businesses are taking climate risk very seriously

What do you regard as the main barriers to enhancing your organisation's climate resilience?



"I am confident that big businesses understand risk and will get across this issue. Where I worry is smaller businesses, as they often find it hard to get the time to work on issues such as this"

and making plans, while others are thinking about taking action," he says. "I am confident that big businesses understand risk and will get across this issue. Where I worry is smaller businesses, as they often find it hard to get the time to work on issues such as this."

However, there is evidence that companies of all sizes are failing to develop comprehensive climate resilience policies. Asked how climate resilience efforts could be improved, respondents from all industries typically pointed to the need for climate risk assessments, the need for greater management buy-in, increased budgets for resilience-related investments, and greater government support to enable such investments.

Asked specifically about the main barriers to developing a climate resilience strategy, inherent uncertainty over the nature of future climate impacts is the most common barrier with 49 per cent of respondents highlighting it. However, 46 per cent acknowledge budget constraints are also a barrier to action, while 41 per cent point to uncertainty over government policy and 34 per cent bemoan limited interest from senior management.

Case study

National Grid highlights link between climate security and energy security

Few companies play a more vital role in ensuring the resilience and security of the UK than National Grid, and as such the grid operator has more to worry about than most when it comes to developing an adequate response to climate change. Increasingly frequent floods pose a threat to substations, the effect of heat waves on the ground can damage gas pipelines, and storms present growing risks for pylons. Add in the negative effect higher temperatures can have on the efficiency of gas and electricity transmission infrastructure and there are plenty of reasons for the company to be concerned about projected climate impacts.

Thankfully, National Grid has one of the most advanced climate resilience strategies in the UK, following several years of work on how to ensure its infrastructure is able to cope with mounting climate-related risks.

> "We're now investing in better flood protection for some substations and also looking at new specs for future sites that might face flooding risk to ensure they are resilient"

The company recently faced a government mandate, along with other utilities, requiring it to assess its climate risks and draw up a resilience strategy. But Stuart Bailey, head of sustainability and climate change at National Grid, insists work was already underway to enhance climate resilience before the government ordered its report.

The company had been given a major wake-up call in 2007 when its substation at Walham in Gloucestershire famously flooded, while senior executives were also aware they needed to have a good handle on how much climate resilience investment would be required in the coming years ahead of the review with regulator Ofgem that agreed pricing and spending plans for the period from 2013 to 2021.

"It was prudent to do that work before going into the recent price review rather than after it," explains Bailey, adding that the Walham floods were an "almost perfect photo opportunity for climate risk" that had served to "focus minds" at the company. "We had started working on the report before the government put in place legislation requiring key infrastructure to report on climate resilience," he says. "We were starting to prepare the investment plan for the price control review at that time and it was prudent to take account of what we needed to do to make the network more resilient."

As such, the company undertook two reviews to assess the climate risk and resilience issues faced by its gas and electricity networks and assigned funding to support climate resilience projects, most notably with around £105m (in 2009/10 prices) being earmarked to help make networks more resilient to flood risks.

The review of the electricity network confirmed that flooding represents the main risk to the grid with a number of substations deemed to be particularly at risk. "We did work looking at sea level rise and projected rainfall and mapped that onto where our infrastructure is located, looking at substations that needed more protection," recalls Bailey. "We're now investing in better flood protection for some substations and also looking at new specs for future sites that might face flooding risk to ensure they are resilient."

The resilience programme has seen big concrete flood barriers installed at a number of vulnerable base stations, while new specifications are also being developed for new stations to ensure they are less exposed to flood and other climate risks. "Most of our equipment is in the air anyway to ensure that it has electrical clearance, but by moving the control panels and other supporting technology to a higher point in the station you can really improve the resilience to flooding," explains Bailey. "That is the kind of design change we are looking at."

Bailey also reveals that design decisions are similarly helping to reduce the vulnerability of pylons to extreme weather. "We have changed the way overhead cables are configured so that they are more spaced apart in order to stop them clashing," he explains. "Otherwise, you can get a phenomenon known as 'galloping' in high winds where the wires are shaken and then touch, which can lead to a trip."

Future risks

Longer-term climate risks are also being tracked with the

company aware that further investment may be required down the line to cope with the increased incidence of heat waves. "Ambient air temperature could be an issue," Bailey admits. "The higher the ambient air temperature, the lower the ability of the infrastructure to carry current - in the long term, that could become an issue. The equipment would still be usable, but you could lose current. For example, if you are getting 2,000 amps, a rise of four degrees could reduce that to 1,950 amps. You can invest your way out of the problem, but there could be a need for more equipment. We have time to respond to it, but we need to be aware that future investment may be needed."

Similar challenges are faced by the gas network, with flooding and heat waves again posing a risk to gas distribution centres and older parts of the infrastructure, such as gas compressors, that can overheat in hot weather. Bailey reveals work is already underway to enhance flood protection measures at a number of key points on the grid, including work to reinforce a number of gas pipes where they cross rivers prone to flooding, while improvements to gas compressors are also being worked on. "We have changed the spec for newer compressors to cope with higher ambient temperatures and we're trialling technology this summer that is looking at new ways of cooling down compressors," he reveals.

Significantly, the management and reporting structure at the company is set up to ensure that these various climate resilience projects remain a priority for the company. A sub-committee on health, safety and environment reports directly into the senior management board and twice a year that committee assesses a report on climate change and associated risks. Meanwhile, the government has mandate five yearly updates from key infrastructure on climate risks and responses, requiring the company to undertake an in-depth risk assessment on a regular basis. "National Grid is critical to the infrastructure of the UK, so anything that could impact our reliability is very concerning to our board," concludes Bailey. "It is a key risk and the board regularly wants updating on levels of climate risks and our response."

How to build climate resilience

THE gap between the recognition of corporate climate risks and the adoption of climate resilience policies begs two questions: Does it matter? And if so how can the gap be closed?

The answer to the first question from government, science academies, the insurance industry and growing numbers of business leaders and economists is a categorical "yes". Study after study warns of the potential for multi-billion, and in some cases multi-trillion, dollar economic costs associated with climate impacts throughout this century. There are already examples of small businesses that have been bankrupted by flooding, while multinationals reported multi-million dollar costs associated with extreme weather such as Hurricane Sandy and the Thailand floods. A recent report from the US Natural Resources Defense Council put the cost to the US taxpayer of the clean up operations necessitated by extreme weather at $100bn in 2012. Failure to account for these climate risks and bolster resilience where necessary leaves businesses exposed to avoidable risks.

As the Environment Agency's Paul Leinster observes, investors are likely to look favourably on those organisations that take climate resilience seriously. "Bankers and pension funds are going to start asking questions around climate resilience," he predicts. "It becomes a fundamental question about whether or not you will get a return on your money. There is a risk your investment will just be sunk into a response to climate impacts when those impacts could have been mitigated."

The challenge then for many sustainability executives and risk managers is in forcing climate resilience up the corporate agenda and ensuring that appropriate climate resilience measures are enacted. This is easier said than done, according to the ABI's Cullen. "Delivering something like climate resilience tends to be a slow process," he says. "They are not particularly tangible risks at any one time, so it can be difficult to get the focus you need. It is not something that affects people every day and it's not something businesses think about every day. That is the biggest barrier to getting higher levels of resilience."

It is a concern echoed by the Met Office's Spillar, who argues that even when businesses respond to climate risk they will do so in a "knee jerk fashion". "Some companies will see a cold winter or a wet year and try to respond to it, but that is not a very strategic way of doing things," she says. "For example, land slip risk is now being looked at quite closely, because we have had wet years that have led to an increased incidence of landslips. The variability of weather means that some risks climb up the agenda based on what the weather is doing."

The CDP's Simpson similarly warns that many boards are failing to develop a coherent response to climate risks. "Climate risk has to be seen as conventional risk management," he says. "The business case is the same as the business case for any form of risk management - you want your business to be resilient to risks that we know are going to worsen. But the problem is that the perception is that climate risk is in the future. Business leaders are still incentivised to think about this year, or at best the next five years. Even if they are investing in assets with a 40 year life span they are often not looking that far ahead."

"Bankers and pension funds are going to start asking questions around climate resilience... It becomes a fundamental question about whether or not you will get a return on your money"

How can executives raise climate risks up the agenda and convince senior management of the need to develop a coherent resilience strategy?

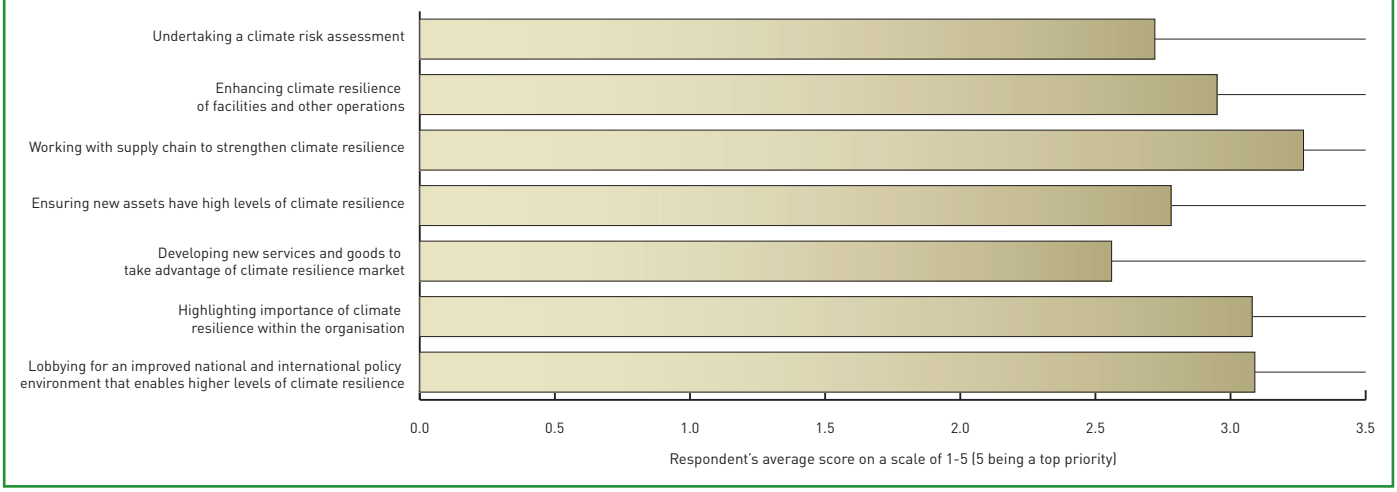
Experts are united in recommending a broad five point plan for highlighting the business case for action on climate resilience:

Know the current risks — Highlighting recent weather and climate impacts represents the most effective way of kicking off a conversation on climate risks as it typically serves to highlight the fact that risks already exist and can have significant impacts.

Have numbers available — Senior management tend to respond to issues that impact the bottom line and as such an effective business case for action on climate resilience will incorporate a clear commercial case. It is inherently difficult to put a financial value on risk and risk mitigation given you are dealing with uncertain future events, but evidence of the economic impact associated with climate impacts and modelling on the scale of exposure an organisation faces serves to focus minds.

Highlight associated benefits — There are reasons to invest in resilience even if you are lucky enough never to get hit by an extreme climate event. Most notably, growing numbers of investors on both sides of Atlantic are calling on firms to demonstrate their climate resilience and are more likely to look favourably on those with effective risk management strategies in place. More specifically, insurance companies are starting to explore offering lower premiums to companies with resilience strategies in place.

What are your climate resilience priorities for the next five years?



"There is already evidence that companies that think about climate risks don't make as many claims, and when they do those claims are lower," says Cullen. "You need to get information on premiums, you need to think about costing the value of certain events. Ask yourself, what happens if there is a shut down because of weather? Then you can work out whether it is worth mitigating that risk."

Draw on case studies — The case for an increased focus on climate resilience is strengthened by real world examples of organisations that have suffered as a result of climate impacts and those that have effectively enhanced their climate resilience. In every industry there are leading organisations that can put pressure on their peers to embrace similar climate resilience strategies.

Raise the profile of wider climate issues — It is a lot easier to make the case for a climate risk assessment and climate resilience measures if executives are aware of the basic tenets of climate change and the trend towards more demanding climate policies. Internal advocacy of the need to respond to climate risks, both in terms of resilience and emission reduction, often plays a key role in driving corporate climate action.

> "Some companies will see a cold winter or a wet year and try to respond to it, but that is not a very strategic way of doing things"

Encouragingly, respondents to our survey confirm that aspects of this five-point plan are being adopted, while also revealing that senior management is increasingly willing to authorise some form of action on climate resilience.

Asked to rate their climate resilience priorities for the next five years on a scale of one to five, the top rated priority was working with the supply chain to enhance climate resilience, closely followed by lobbying for an improved policy environment for climate resilience action and highlighting the importance of climate resilience within the organisation. Furthermore, 28 per cent said they were pursuing a specific strategy to try and raise the profile of climate risk and resilience issues within their organisation.

Similarly, there is evidence executives are in agreement with experts on the most effective ways of driving action on climate resilience. Asked to rate the most compelling reasons for developing a climate resilience strategy, the top rated reason was that "high levels of climate resilience [are] likely to impress investors", followed closely by the fact "climate resilience represents an important component of an organisation's license to operate" and the way in which "climate science projections indicate risks will become increasingly severe".

There are also signs that senior management could be amenable to these arguments. Thirty five per cent of respondents claim that an acceptable pay-back period for a climate resilience investment could reach from seven to 10 years, while 15 per cent would accept a payback period of 11-15 years, and over 10 per cent would accept a return in investment that takes over 16 years to manifest itself, all of which suggests widespread awareness of the fact investments in climate resilience

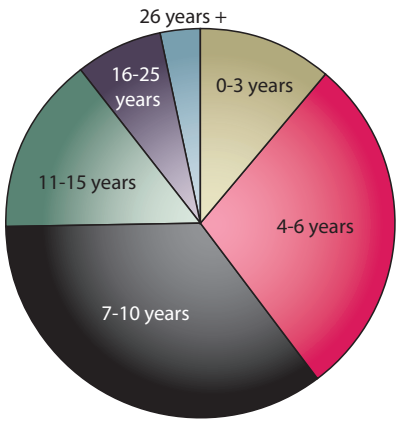
measures are likely to require longer payback periods than standard investments.

Moreover, when asked to rate the importance a company's board places on environmental and social issues relative to financial performance the average score suggests environmental and social considerations are ranked only just behind financial performance as a top priority in many organisations. Respondents rated their organisation on a 1-10 scale with one representing environmental and social issues as being a primary consideration and 10 representing financial performance as the primary consideration. The average score was 5.55, while just over a quarter of respondents said that environmental and social issues and financial performance were equally important.

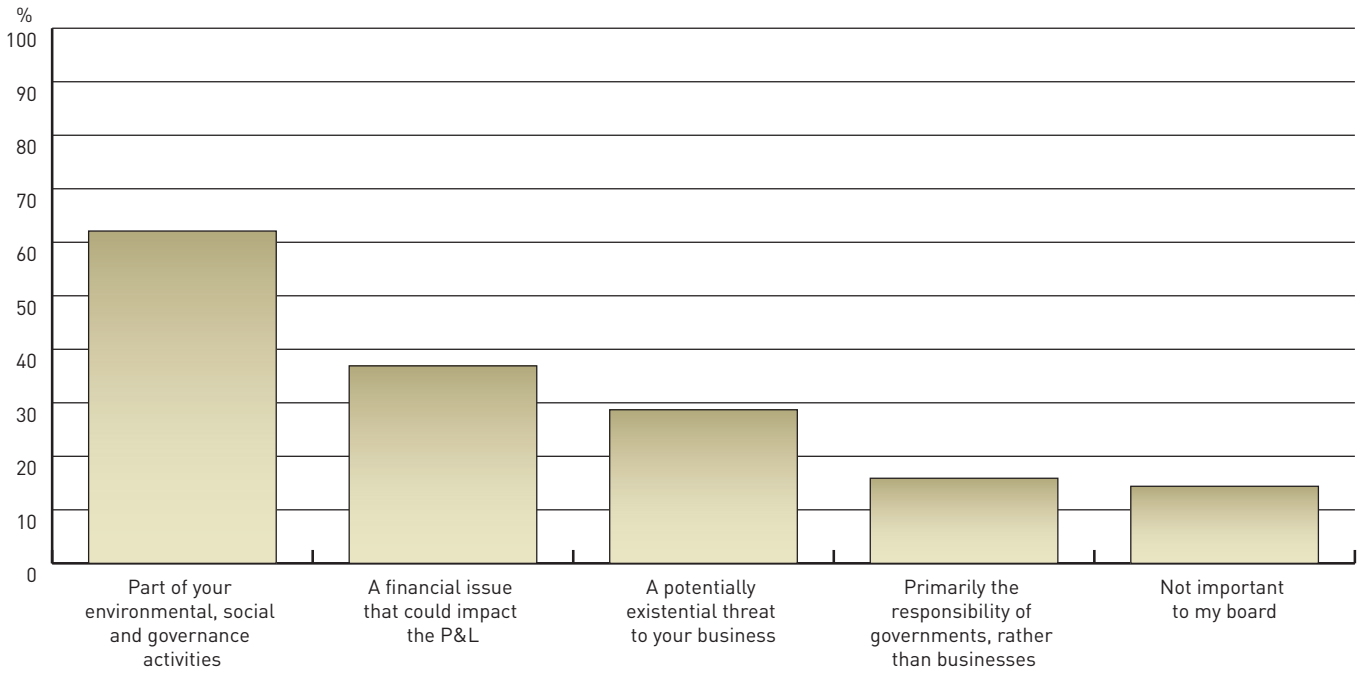
In addition, there is evidence that a significant number of boards are starting to treat climate resilience as a top priority. Asked how their organisation's board level management regarded the climate resilience of their operations and supply chain, 37 per cent said that it was seen as a financial issue that could impact the profit and loss accounts, while 29 per cent described it as a "potentially existential threat" to the business. Moreover, 62 per cent said that resilience was seen as a part of environmental, social and governance activities. In contrast, just 16 per cent said climate resilience was primarily the responsibility of governments rather than businesses and only 14 per cent said their board did not regard it as an issue.

Taken together the results suggest that while a majority of businesses are yet to properly assess the climate risks they face or engage with how they could enhance their climate resilience, there is a trend towards more ambitious and concerted action and an understanding that barriers to investment can be overcome. How businesses turn this growing interest in climate resilience into active steps to enhance their resilience depends to a large extent on their circumstances.

What do you regard as an acceptable payback period for a climate resilience investment?



How does your board regard climate resilience as a topic?



Case study

The Environment Agency, the Thames Estuary and the fear of the White Elephant

Companies seeking to enhance their climate resilience face two main risks. The first is the obvious risk presented by climate change that they are attempting to mitigate, but the second is that they over-invest in resilience, creating an unnecessary white elephant when the money could have been better spent elsewhere.

That is the dual risk that the Environment Agency attempted to overcome with its wide-ranging Thames Estuary 2100 (TE2100) strategy, which brought together the government and experts from the Met Office Hadley Centre, the Proudman Oceanographic Laboratory, and the Centre for Ecology & Hydrology to assess how the UK should tackle rising flood risks in the Thames Estuary through to the end of the century.

The report takes at its starting point projections from climate scientists detailing how sea levels are likely to rise throughout the century, increasing the risk of flooding and storm surges that could inundate large areas around the Thames Estuary, potentially reaching as far as the capital. Add in the fact that current flood defences in the region are ageing while population densities in the flood plain are increasing and it is clear that the warnings should be taken very seriously.

But at the same time the rate of sea level rise remains uncertain, with the TE100 strategy estimating that while sea level rises are likely to reach 90cm by 2100 they could be lower or could reach as high as 2.7 metres by the end of the century.

The result, explains Paul Leinster, chief executive of the Environment Agency, is that the strategy has focused on developing a flexible plan that can scale up or down as the evolving climate risks demand. "The plan looks at a range of scenarios for sea level rise and essentially says if you see sea level rise happening faster than expected then you are ready to enact certain measures faster," he says. "It is not a case of trying to second guess what will happen, but rather having an adaptive mechanism in place for if certain scenarios occur. It means you know what you are going to do based around a future pathway with agreed decision points."

Three phases

The strategy is split into three phases - one running from 2010 to 2035, the second running 2035 to 2050, and the third covering the rest of the century - and includes a series of "trigger points" at which policymakers will have to make climate resilience investment decisions.

The first 25 years represents a continuation of the strategy of maintaining current flood defences and managing flood plain development to minimise flooding risk. But it also includes a commitment to monitor sea levels and a pledge to "safeguard areas that will be required for future changes to the flood defences", meaning that future upgrades can be made relatively easily if necessary.

The second phase from 2035 to 2050 includes plans to raise and refurbish existing sea walls and flood protection, while the third phase marks the trigger point where the government of the day will have to decide on the "end of the century" strategy, making a call on whether to raise defences still further and proceed with plans for a new Thames Barrier.

"It is not a case of trying to second guess what will happen, but rather having an adaptive mechanism in place for if certain scenarios occur"

The aim of this staggered and flexible strategy is to avoid unnecessary investment, while ensuring that those investments that are made in the next few decades are compatible with the longer term infrastructure that may have to be built. Climate risk experts frequently cite flood defence upgrades as a prime example of effective risk management, noting that it is often cost effective to build foundations that are large enough to support the higher defences that may well be required in the future.

Leinster hails the TE2100 project as a "sensible approach" that businesses and policymakers would be advised to emulate with other key pieces of infrastructure. "It means you are not making decisions now that require huge investment that could become a white elephant, but you are aware of the risks and you know that at a certain target point you are going to have to make a decision about what to do to manage the risk," he argues.

Climate resilience best practices

LIKE any risk management strategy, the nature of any individual climate resilience strategy is determined entirely by the nature of the organisation involved. Some companies require urgent investments to enhance their climate resilience, others face few immediate risks and should simply maintain a watching brief.

However, there are a number of climate resilience best practices that experts are united in recommending:

Start with a climate risk assessment — It is impossible to develop a coherent strategy without assessing the risks that the organisation faces, and any assessment should ideally include the supply chain and the markets a company serves. It makes sense to focus on current weather risks first and then factor in how projected future climate change will amplify those risks.

Remember to convert climate hazards into climate risks — Climate impact information on its own is not much use without an understanding of the likely implications of the risks such impacts present. For example, you may find that a supplier is at risk from flooding, but your response is likely to be determined by how critical that supplier is to your operations. In climate risk management circles converting climate hazards into climate risks involves a relatively simple calculation based on the scale of the hazard multiplied by the vulnerability of the asset, which tells you the scale of the risk. In reality this represents complex financial and risk modelling work, but it should provide valuable information on which assets need greater levels of resilience and which are already adequately protected.

"Climate impact information on its own is not much use without an understanding of the likely implications of the risks such impacts present"

Make climate resilience someone's job — By definition a climate resilience strategy should involve every area of an organisation and as such it typically needs an individual or team to take responsibility for leading the development of the strategy. They also need to be backed by senior management to ensure that all departments engage with the risk assessment and eventual strategy.

Prioritise — Climate change is such a wide-ranging and long term

issue that a comprehensive climate risk assessment is likely to result in hundreds of recommendations that an organisation could or should follow. However, it is a rare company that will be willing to authorise a rapid transformation of their operations in response to climate risk. As such it makes sense to prioritise climate resilience actions, starting with the low cost and no regret measures, such as developing a business continuity plan and incorporating climate risk assessments into future investment decisions. It makes sense to make a new building resilient to extreme weather during the design stage, it is much harder to justify investment for upgrades at a later date.

Embrace basic risk management principles — Climate risk may be longer term than many other corporate risks, but the same principles apply. Organisations are advised to measure risk, manage risks that can be managed, insure risks where appropriate, and offload assets that face unacceptable levels of risk.

Do your research — Climate risk and resilience is an area of huge interest for academics, insurers, governments and consultants, as such there is a growing body of work on how to measure and manage risks, as well as numerous case studies detailing how organisations are enhancing their resilience. It makes sense to tap into these resources and, where necessary, draw on specialist expertise to assess and manage the more complex climate risks organisations can face.

Don't forget indirect risks — Much of the discussion of climate risk and resilience focuses on physical assets and how they can be improved to ensure they can cope with climate impacts. However, all businesses face a series of indirect climate risks that could still have a major impact on their operations. For example, food insecurity and geopolitical tensions are both widely expected to increase as climate impacts increase. Businesses need to factor these risks into their long term planning.

Methodology

BusinessGreen undertook an indicative survey of its readers through an online poll, incentivising respondents with the promise of a free copy of this report and entry into a prize draw. Two hundred respondents completed the survey and the results were then filtered to ensure only respondents from sustainability professionals were analysed. In total, responses from 195 individuals were analysed.

An incisivemedia publication