

# MANAGING the **UNAVOIDABLE**: investment implications of a changing climate



RAILPEN *Investments*<sup>®</sup>



This report has been prepared by Rory Sullivan, David Russell, Seb Beloe, Frank Curtiss and John Firth.

This report is intended to stimulate dialogue between institutional investors, companies, and policy-makers about how we may work together to respond to the physical impacts of climate change. We would be delighted to receive input/comment and to work with others to address this issue, which poses such significant investment and societal risks.

For further information on the project, please contact:

**Seb Beloe**

Head of SRI Research  
Henderson Global Investors  
seb.beloe@henderson.com

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**Frank Curtiss**

Head of Corporate Governance  
RAILPEN Investments  
frank.curtiss@rpm.co.uk

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**John Firth**

CEO  
Acclimatise  
j.firth@acclimatise.uk.com

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**David Russell**

Co Head of Responsible Investment  
Universities Superannuation Scheme  
drussell@uss.co.uk

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**Rory Sullivan**

Head of Responsible Investment  
Insight Investment  
rory@rorysullivan.org

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## Foreword



The Earth's climate is changing. Global temperatures are predicted to continue rising and this will alter our weather patterns, with increased frequency and intensity of extreme weather as well as gradual changes. The severity of these changes will depend largely on our efforts to reduce emissions, which is why Copenhagen is so crucial. Yet some climate change is inevitable as a result of past emissions.

A changing climate is one of the most serious long-term issues facing companies, both in the UK and globally and is likely to have an impact on company assets, operations, logistics, supply chains, and employees. There will also be shifts in markets as demand for goods and services change. Opportunities will emerge in a diverse range of industries, such as new technologies in water harvesting and conservation, consultancy and risk management, tourism and agriculture. Companies that are well prepared for the impacts of a changing climate will be well-placed to maximise opportunities, minimise costs, and protect and enhance common assets.

There are steps companies can take today to start to manage the impacts of a changing climate. The UK Climate Projections 09 will help companies analyse their exposure to climate change whilst the UK Climate Impacts Programme provides practical guidance to companies and organisations about how to adapt to those changes. Leading companies, such as those in the water industry, are already starting to take action and report on how they are managing the risks they face. Those that aren't will be catching up.

In outlining the risks that inevitable climate change poses for companies, this report encourages investors to examine adaptation-related risks in their portfolios and use their influence to encourage companies to manage these risks more effectively. I welcome 'Managing the Unavoidable' as a valuable contribution towards our efforts in adapting to the risks and opportunities from a changing climate, and look forward to further collaboration with the investment community in the future.

A handwritten signature in blue ink, appearing to read 'H. Benn'. The signature is stylized and fluid, with the first letter 'H' being particularly large and prominent.

Hilary Benn  
UK Secretary of State for Environment, Food and Rural Affairs

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# Executive summary

## Setting the scene

The world's climate is changing with immense, albeit still poorly understood, implications for investors. The changes – some of which are already observable – are expected to include alterations in prevailing weather patterns as well as shifts in the frequency and consequences of extreme weather events. These changes and associated impacts, such as the potential damage to physical assets and the implications for supply chains, employees and customers, have potentially profound implications for investors.

## The 'Managing the Unavoidable' Project

In January 2008, Henderson Global Investors, Insight Investment, RAILPEN Investments and the Universities Superannuation Scheme (USS) launched the 'Managing the Unavoidable' project, with the aim of better understanding how companies and their investors are likely to be affected by the physical impacts of climate change. Over the period January 2008 to September 2009, we researched the implications of climate change adaptation for four sectors (electric utilities, oil & gas, real estate and water utilities).

## Key findings

- 1 Climate change adaptation is starting to receive more management attention but, with the exception of the water sector, management systems and processes are much less developed than for climate change mitigation.** This comment applies across all major elements of governance and management. Specifically:
  - Climate change adaptation is not yet recognised as a strategic issue warranting board-level attention and oversight. In most companies, responsibility for climate change adaptation is spread across operational and head office functions.
  - Monitoring processes – in relation to the physical and business effects of climate change – remain relatively weak. Monitoring is usually conducted at the site or operational level; in most companies, there is limited coordinated oversight to enable the business as a whole to capture wider trends and to share knowledge and expertise across the business.
  - Reporting on adaptation is highly variable. While there is quite a lot of detailed analysis in the water and, to a lesser extent, electricity and property sectors, the issue receives limited explicit attention in reports from the oil and gas sector.

**2 There appear to be significant weaknesses in companies' risk assessment processes.** Specifically:

- **Incremental changes are being under-emphasised.** To date, extreme weather events have received the most attention in risk assessment processes. In contrast, 'creeping' average changes have received much less attention. These changes are more subtle and their impacts on business models may pass undetected until critical thresholds are breached, potentially resulting in 'step-change' impacts on a company (e.g. increasing operational costs beyond forecasts, falling revenues, unplanned capital investments).
- **Indirect impacts on business models are being neglected.** Companies have focused most of their attention on their fixed assets, and have underemphasised risks such as supply chain disruptions.

**3 Companies are more concerned about risks than opportunities.** Most companies see climate change primarily in terms of downside risk management. However, from an investment perspective, climate change may also present opportunities. For example, disruptions to electricity supply may lead to higher electricity prices, thereby benefiting companies whose generating facilities are not affected by the disruption.

**4 Weaknesses and inconsistencies in public policy are major obstacles to action.** Current regulation seems as likely to stymie effective industry responses as promote them. There are a number of different factors at play: policy time horizons that are incompatible with adaptation planning time horizons, adaptation not being an important factor for the primary regulator and competing policy priorities between regulatory bodies. For example, in the property sector, local authority planning policies often prevent businesses from installing embedded generation technology which enable property developers to develop more resilient property portfolios in the face of extreme weather events.

## Recommendations for investors

**1 Investors should be integrating climate change-related risks and opportunities into their investment analysis and decision-making processes.** Changes in weather patterns are already being seen (e.g. changes in summer electricity demand due to higher temperatures, increasing numbers of sewer flooding incidents). Companies are taking action to mitigate the negative impacts of these changes and are starting to take account of some of the longer-term effects of climate change in their investment decisions and business strategies. We believe that investors need to examine how the risks and opportunities associated with climate change adaptation affect company-specific business models, value drivers, strategy, governance, cashflows and assets. A first step in this process could be to encourage greater sell-side research in this area.

- 2 Investors should ensure that companies have appropriate governance and management systems in place.** Specifically, investors should ensure that companies have governance and management systems that are suited to the scale and nature of the challenge offered by climate change impacts. This would likely include: robust risk identification and assessment processes, clear strategies for managing and responding to climate change, and clear reporting on risk assessment and management processes and on the company's views on the materiality of climate change-related risks for their business.
- 3 Investors should play a much more proactive role in public policy debates on adaptation.** Well designed adaptation policy should provide economy-wide benefits through ensuring the resilience of critical assets, sending clear signals on where capital can best be deployed, and ensuring that economic and environmental policy are aligned. Investors should encourage policy makers to:
- Develop clear, long-term policies that enable companies to plan and invest appropriately.
  - Ensure that unsuitable/risky developments (for example, on flood plains) are either regulated against or are designed with appropriate adaptations measures.
  - Ensure that different regulators for the same sector work together more coherently.
  - Require companies to explicitly discuss the financial and other implications of climate change adaptation (and associated public policy) for their businesses.

## The adaptation imperative: the investor perspective

The world's climate is changing with immense, albeit still poorly understood, implications for investors. The changes – some of which are already observable – are expected to include changes in prevailing weather patterns as well as changes in the frequency and consequences of extreme weather events.

These changes and associated impacts, such as the potential damage to physical assets and the implications for supply chains, employees and customers, are likely to affect investors in sectors dependent on large fixed assets, such as tourism, water, property, construction, energy, and infrastructure, as well as other climate-sensitive sectors including health care, agriculture, forestry and insurance. While there are obvious risks associated with a changing climate, there will also be significant investment opportunities arising from adaptation. For example, the need to increase expenditure on flood defences will probably benefit companies specialising in the financing, management and engineering of large infrastructure projects.

Institutional investors, therefore, have a clear interest in integrating consideration of the physical impacts of climate change into their investment analysis as an integral part of generating long-term returns for their clients. However, while the broad consequences of climate change are increasingly well understood, there are significant uncertainties around how climate change will impact on specific companies or specific sectors. Moreover, properly understanding these risks is not a trivial matter and it requires that investors consider climate change risk on a sector-by-sector and company-by-company basis.

## The 'Managing the Unavoidable' project

In January 2008, Henderson Global Investors, Insight Investment, RAILPEN Investments and the Universities Superannuation Scheme (USS) launched the 'Managing the Unavoidable' project<sup>1</sup>. Our aims were, first, to identify how companies and their investors are likely to be affected by the physical impacts of climate change and, second and perhaps more importantly, to catalyse a wider discussion on the responsibilities of investors in this area.

To these ends, we have researched the implications of climate change adaptation for four sectors: electric utilities, oil & gas, real estate and water utilities<sup>2</sup>. The rationale was that these sectors have a number of common characteristics – owning or operating large fixed assets with long asset life times, that require significant capital investments and/or have high operational costs – that mean that (a) there is at least a *prima facie* case that the

<sup>1</sup> Rory Sullivan, David Russell and Nick Robins (2008), *Managing the Unavoidable: Understanding the Investment Implications of Adapting to Climate Change* (Henderson Global Investors, USS, RAILPEN Investments and Insight Investment, London). [www.acclimatise.uk.com/resources/investors](http://www.acclimatise.uk.com/resources/investors)

<sup>2</sup> This research has been conducted on our behalf by Acclimatise the specialist climate change risk management advisers. For each sector, Acclimatise prepared an initial report that provided a high-level review of the risks and opportunities for companies in the sector from an investment perspective, identified the specific investment drivers at risk and provided guidance on the questions investors could ask of companies in the sector. Each report, following a review by Henderson Global Investors, Insight Investment, RAILPEN Investments and USS, was discussed with industry experts. These discussions provided us with the opportunity to ensure the completeness and relevance of the report and to understand current practice in managing adaptation risks. The reports were then finalised by Acclimatise. The reports can be found at: [www.acclimatise.uk.com/resources/investors](http://www.acclimatise.uk.com/resources/investors)

physical impacts of climate change will be a relevant factor in management decisions (e.g., on the deployment of capital), and (b) there is a significant likelihood that climate change will impact on the company's existing assets (see, for example, Box 1). Within these sectors, attention was focused mostly on larger companies, as these are most likely to have well developed management and reporting systems and, hence, likely to be the best examples of how companies may respond.

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### Box 1 Case-study asset resilience: Mythe water treatment works 2007



The UK flooding events in summer 2007 were exceptional, with some areas seeing two months' worth of rainfall in just 12 hours. The design standard levels of protection for both sewers and in some areas main river flood defences proved to be inadequate.

Gloucestershire was particularly badly affected during the floods. The Mythe water treatment works near Tewkesbury was flooded leaving 350,000 people without mains water supplies. Severn Trent Water implemented its emergency plan to maintain drinking water supplies by deploying 1,400 bowzers and distributing bottled water supplies. Water supplies were restored 17 days later. The total costs to Severn Trent Water arising from the Mythe flooding event were £29.6 million. The costs to other businesses affected by the disruption in supply are not known.

Extreme flooding events are becoming more regular in the UK as a result of inevitable climate change, causing millions of pounds of damage, requiring extensive adaptation measures and increasing capital expenditure. Following the flooding events of 2007, Ofwat requested that all water utilities prepare a flood risk assessment to identify critical assets and develop action plans to mitigate the risks to these assets.

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## About this report

In this report we present the wider findings from our research<sup>3</sup>. The report is divided into two sections. The first presents the key findings in relation to current business practice on managing and responding to climate change. The second presents a series of recommendations for investor action in the areas of investment research and decision-making, engagement with companies and engagement with policy makers.

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<sup>3</sup> Although the focus of our project was largely on UK-listed companies, the conclusions are generally applicable to companies in other countries, and to investors in asset classes other than equities.

## Key findings

Adaptation from a business perspective can be defined as actions taken to cope with a changing climate, with the objective of reducing risk and damage, and exploiting potential benefits. Within this frame of reference, company actions involve trading-off the costs incurred in taking action to respond to climate change and the potential costs associated with the residual risks that remain after the adaptation actions (if any) have been taken.

Our earlier report “Managing the Unavoidable: Understanding the Investment Implications of Adapting to Climate Change”<sup>4</sup> set out the view that company management, as with any other business risk, is responsible for evaluating the risks and opportunities associated with the need to adapt to climate change, and for ensuring that corporate risk management and strategy processes take proper account of these risks.

In relation to company disclosure, we noted that where climate change-related risks impinge on the ability of the company to deliver on its business strategy and/or create opportunities, this information should be provided to investors. Specifically, we suggested that companies should explain how climate change-related risks and opportunities are identified and assessed, describe the actions that are taken to address these (i.e. to minimise downside risks and maximise upside opportunities) and discuss the financial implications (e.g. costs incurred, residual risks) of the actions taken.

## Governance and management

### Key Finding 1

#### Climate change adaptation is not necessarily managed as a discrete issue

We found that climate change adaptation is not necessarily managed as a single issue but, rather, responsibility is often spread across operational and head office. In many of our company meetings, the companies were able to explain how this functioned in practice and how they ensured that specific dimensions of climate change adaptation did not ‘fall between the cracks’. However, we were left with the impression – with the notable exception of the water sector – that climate change adaptation is not yet recognised as a strategic issue warranting board-level attention and oversight.

We do not see that it is appropriate for us to demand or specify specific forms of management structure for dealing with climate change/weather-related risks, although we are of the view that climate change is clearly a risk that companies need to manage. We do, however, believe that companies should be able to explain to their investors how they manage these risks, and that they should have established a management structure that is appropriate to the risks and opportunities presented to the business.

<sup>4</sup> Sullivan *et al.* (2008) (Note 1).

# Risk identification and assessment

## Key Finding 2

### There is wide variation in the rigour of company risk assessment processes

From our meetings with companies we found a significant variation in the depth and level of rigour of companies' risk identification and analysis processes. This variation seemed primarily attributable to a combination of the manner in which sectors are regulated and the impacts that companies have already experienced, rather than a company-specific phenomenon, with the water (notably, in their Strategic Direction Statements to Ofwat) and electricity (see Box 2) sectors approaching this process in a particularly structured manner. The other two sectors (oil and gas, and real estate) demonstrated an understanding of the issue, though this was typically limited to ad hoc initiatives rather than a corporate-wide approach.

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### Box 2 Case-study: Electricity sector research

The UK energy industry has been undertaking collaborative research on climate change adaptation. National Grid, EDF Energy and E.ON UK commissioned the Met Office to undertake a scoping study<sup>5</sup> to qualitatively assess the scale of climate change impacts in the UK. The report, published in 2006, identified a number of potential impact areas – including, rising temperatures affecting the efficiency and performance of plant and equipment, and reduced river flows leading to restrictions on water abstractions – based on desk-top reviews of available literature and interviews with industry personnel. The report concluded that the industry should continue a collaborative research programme and explore/analyse:

- The development of new methods to project impacts dependent on succession and combinations of weather parameters.
- The application of the new methods to probabilistic climate projections for risk management, and extreme event information to be released through the UKCP09 climate change scenarios.
- The socio-economic context and future adaptive capacity of the UK.
- The costs (and savings) of the impacts of climate change, and the costs and net benefits of adaptation.

A second research project 'Impact of climate change on the UK energy industry – exploring risks, reducing exposure, increasing resilience' has been completed (although the results have not been published), funded by a consortium including E.ON, Centrica and Scottish and Southern Energy.

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## Key Finding 3

### Incremental changes are being under-emphasised

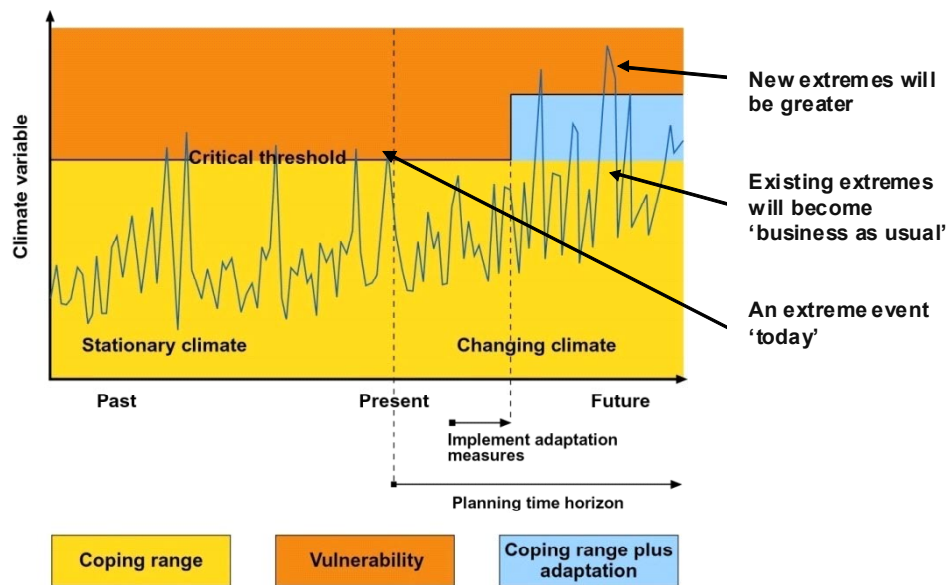
The increasing severity and frequency of extreme events due to climate change has grabbed the media headlines. From our discussions with companies, it is these events that have received the most attention in corporate risk identification and assessment processes. In contrast, 'creeping' average changes appear to have received much less attention, at least to date. Incremental changes to our climate are more subtle and their impacts on business models may pass undetected until critical thresholds are breached. The responses may

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<sup>5</sup> Met Office (2006), *Scoping Study – Climate Change Impacts on the UK Energy Industry* (Met Office, Exeter).

result in 'step-changes' for a company, increasing operational costs beyond forecasts, falling revenues, unplanned capital investment and additional balance sheet financing to manage the consequences. This is illustrated graphically in Figure 1, which underlines the importance of identifying climatic sensitivities and critical thresholds. These provide the boundaries between tolerable and intolerable levels of risk. The effect of climate change is to increase the risk of extreme events and incremental changes exceeding critical thresholds.

**Figure 1 Impact of extreme events and incremental change on critical thresholds<sup>6</sup>**



#### Key Finding 4

##### Indirect impacts on businesses may be significant and are typically underexplored

Reflecting our comments about companies' focus on extreme weather events, we found that companies seem to have focused most of their attention on their fixed assets. While this, quite understandably, reflects where companies have the greatest capital investments and where the impacts are most obvious, it also suggests that companies are overlooking the indirect and compound impacts operating through a company's business model (Box 3 presents an example of indirect effects on water utilities)<sup>7</sup>. While ensuring asset integrity is clearly one dimension of a company's climate change response, companies also need to consider the risks and opportunities associated with their wider business environment as that may actually prove to be of greater financial significance than impacts to fixed assets. Therefore, when assessing climate change impacts, companies should consider the impacts on aspects such as natural resources and raw materials, supply chains and logistics, and their markets, products and services.

<sup>6</sup> Robert Willows and Richenda Connell (eds.) (2003), *Climate Adaptation: Risk, Uncertainty and Decision-making* (UK Climate Impacts Programme (UKCIP), Oxford).

<sup>7</sup> We acknowledge that this bias, in part, reflects the four sectors that we examined. All four sectors have a common characteristic of large capital investments in fixed assets and, hence, a focus on the implications of climate change for these assets is unsurprising. However, we suspect that – reflecting the relatively recent and, to date, relatively limited, focus on the environmental and social impacts in supply chains – our suggestion that there is a lack of attention being paid to adaptation across business models is probably accurate.

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### Box 3 Indirect impacts on water resources

Climate change is expected to impact significantly on the availability and quality of water resources due to direct changes in precipitation and temperature and is further compounded by indirect impacts arising from changes in:

- The ecology of the water resource (this may lead to restrictions on water abstractions to protect species and habitats under stress).
  - Raw water quality (with implications for the operation and performance of water treatment assets, leading to potential statutory compliance issues and/or taste complaints from consumers).
  - Water demands from other users as they respond to climate change and compete for a larger share of a diminishing resource.
  - Waste water treatment discharge standards to surface waters used for abstraction to provide increased protection and maintain water quality.
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For example, the increasing stress on water resources (a major raw material for many companies) due to changes in precipitation, temperature and demand, creates further problems for the operation and performance of assets, leading to potential implications for production and workforce health and safety. Equally, in real estate, flood modelling may indicate that a specific property is not at risk but that supporting services – such as transport links and utilities – may still be impacted rendering the property unusable even where the property itself is not directly affected.

## Strategy

### Key Finding 5

#### Companies are more concerned about risks than opportunities

We noted that companies continue to see climate change primarily in terms of downside risk management. However, from an investment perspective, climate change may also present opportunities. For example, for the water sector, requirements to increase capital expenditures in areas such as sewerage or water resources, may have the effect of increasing companies' regulatory asset base and, hence, their permitted rates of return. Furthermore, events that have negative implications for one company may actually be positive for others, as illustrated by the example in Box 4 where other companies benefited from higher prices as a result of nuclear power plant outages.

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#### Box 4 Nuclear power facilities shutting down in the 2003 heat wave



During heat waves, which are becoming more frequent and intense due to climate change, nuclear power plants are often forced to reduce their output or even shut down. At the same time, energy demand during heat waves increases due to greater use of air conditioning. For example, during the European heat wave of 2003, 17 reactors in France had to reduce output or were shut down, and in Germany, the Obrigheim nuclear power plant was shut down, and two other reactors could only operate at 80% capacity.

This combination of nuclear plant outages and increased electricity demand can result in higher energy prices. For example, in France, during the 2003 heat wave, EDF had to buy power from other countries on the open market, resulting in a spike in wholesale electricity prices. EDF was not allowed to pass these extra costs on to its consumers, which cost the company \$300 million. The supply restrictions in France had a knock-on effect in the UK and elsewhere, creating significant price fluctuations.

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#### Key Finding 6

##### Companies' responses to climate change remain relatively unsophisticated

From the disclosure we have seen and the impression we have from the companies that we met in the course of this project, we believe that, perhaps unsurprisingly, many companies have yet to fully understand the new competitive dynamics created by the adaptation agenda. For example, as companies have become more comfortable with the climate change mitigation agenda, so we have seen businesses seeking to extract competitive advantage through their positioning on climate change (e.g. through new technology development, branding or operational efficiencies).

Similarly, as the climate change adaptation imperative becomes clearer, we would also expect companies to develop competitive positioning with regard to the resilience of their operations to more extreme weather conditions. Alternatively, companies may consider that the most appropriate response is collaborative rather than competitive and seek to work together in analysing and understanding the adaptation agenda (as in the studies commissioned by the electricity industry in Box 2) and in financing new investments that protect the industry as a whole.

To date, most companies seem to be dealing with adaptation issues in an incremental manner, preferring to defer significant allocations of capital until they have assessed the specific implications of climate change for their business and until the form of the public policy response becomes clearer. We do not wish to prescribe the specific responses that should be adopted by companies and we recognise that the specific responses will

inevitably evolve over time. For example, an incremental response may be appropriate initially (e.g. incrementally increasing design standards on water cooling equipment), but then if risks continue to grow, alternative approaches entirely may become a better response (e.g. shifting to air cooling equipment). The point we would like to emphasise again is that decisions must be based on a proper understanding of the risks and opportunities presented by climate change, and the significance of these risks and opportunities for the business.

## Monitoring and reporting

### Key Finding 7

#### Risk monitoring remains underdeveloped

Adapting to climate change is not a static process, but rather needs to be regularly monitored and reviewed to check implementation and take account of new information and developments. It should therefore be built into the usual formal risk monitoring process. Based on the documentation supplied to us during the research process, it is clear that most companies are only just beginning to think about this in a structured way, but that there is increasingly a recognition that risk monitoring needs to become more formalised in most companies. Specifically, we note that, at present, monitoring is usually conducted at the site or operational level but that there is limited centralised oversight (to capture wider trends, to ensure that knowledge is captured and shared). We therefore believe that a more centralised monitoring/oversight process would, for many companies, be a valuable first step in ensuring that risks are identified early and appropriately incorporated into business decisions.

### Key Finding 8

#### Reporting on adaptation is highly variable

We found that reporting varied widely between sectors and companies. We found that there is quite a lot of detailed analysis in the water and, to a lesser extent, electricity and property sectors but that the issue receives limited explicit attention in reports from the oil and gas sector. Below, we present some examples<sup>8</sup> of the type of commentary and disclosure being provided in the different sectors, as well as offering our views on the relationship between disclosure and the quality of risk management processes.

#### Water

For the water sector, climate change is clearly central both to asset quality and to the regulatory regime, and this is reflected in the quality of reporting from companies. For example, in its December 2007 Strategic Direction Statement, South West Water states that *"We need to adapt to the flooding risk from the extreme weather events that are expected as a result of climate change. Extreme weather events already account for 60% of the flooding incidents caused by overloaded sewers, more for South West Water than most other companies."*

Northumbrian Water Limited in its Strategic Direction Statement recognises that significant investment is likely to be required to deal with climate change, particularly to manage the risk of flooding caused by surface water from more intense rainfall, and has identified *"future proofing our operations against climate change"* as one of the four key challenges facing the company.

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<sup>8</sup> Full references for the examples and quotes are provided in the four sector reports prepared by Acclimatise for this project. See [www.acclimatise.uk.com/resources/investors](http://www.acclimatise.uk.com/resources/investors).

Similarly, Severn Trent plc refers to climate change adaptation as one of a number of named non-negotiable corporate responsibility issues which have particular importance for the water industry when compared with other FTSE100 companies. In its Corporate Responsibility Report for 2007 Severn Trent states *"Whatever actions are taken over the coming years to reduce emissions, it is clear that climate change already has serious implications for our operations and strategic development. We therefore need to understand the impacts of climate change on areas such as water supply, water usage, and sewerage, and to develop adaptation strategies."*

### **Electricity**

For the electricity sector, most major companies provide commentary on at least some aspects of climate change adaptation issues. For example:

- British Energy recognises that all of its nuclear power stations are situated close to the coast and are therefore at risk from the physical risks of climate change. The company has undertaken a safety assessment for each of its power stations against extreme weather events and has taken steps to provide additional protection where necessary. In addition, it routinely monitors flood risk and undertakes remedial works to sea defences when necessary.
- Centrica recognises that the effects of climate change will have a number of operational and commercial challenges, and that these present both risks and opportunities for their business. In 2006, Centrica established a climate change advisory committee to guide the company in establishing its position on climate change both in terms of adaptive and mitigation strategies and programmes. Centrica states that it has undertaken work in order to develop a coordinated and effective response to climate change. This work underpins its climate change strategy and determines how Centrica can adapt to and mitigate against the effects of climate change on the Company and on society as a whole.
- E.ON recognises that its operations could be negatively affected by changes in precipitation and by a summer with higher than average temperatures leading to reduced hydro-electric generation. The company also recognises that climatic changes will have implications for cooling water discharges. E.ON expects seasonal and weather-related fluctuations in revenues to continue and will take steps to improve its optimisation of power station outputs.

### **Oil and gas**

A review of publicly disclosed information on adaptation would leave investors with the impression that this sector was paying limited attention to this issue. We would, however, caution against jumping to the conclusion that such limitations in reporting *de facto* mean that the sector is not effectively managing these risks. From discussions with companies, it appeared that many of the climate change-related risks (e.g., extreme weather events) are actually identified and managed through other processes; for example, design processes (e.g., for new offshore platforms) explicitly consider potential variations in weather conditions which in turn reflect understanding of how weather patterns are likely to change over time.

It is also clear that the sector is experiencing growing costs associated with extreme weather events. For example, in 2005 Shell reported production losses of 85,000 barrels of oil equivalent per day during the hurricanes in the Gulf of Mexico, with asset utilisation rates reduced by 3%. Shell also reported that consequential damage to onshore pipelines caused a total of 3,900 tonnes of oil to be spilled. BP also reported impairment charges of \$266 million. The major element of this was a charge of \$226 million relating to fields and assets in the Gulf of Mexico damaged by hurricane activity.

## **Real estate**

The three major real estate companies that we met – Land Securities, Liberty International, PRUPIM – all make at least some disclosures around their efforts to research and assess the implications of inevitable climate change, discussing issues such as how future flood risk and drought are incorporated into decisions related to property acquisitions and sales, and how relationships with occupiers can help improve energy efficiency and raise climate change awareness. PRUPIM goes furthest in acknowledging that climate change will potentially shorten the lifespan of buildings and make maintenance more costly.

### **Key Finding 9**

#### **Regulatory frameworks are key but may impede effective industry responses**

Regulators are beginning to require businesses to consider adaptation to climate change as a function of their operating licences. For many sectors including both real estate and water the nature of this regulatory intervention is likely to be a key catalyst for action. However, current regulation is as likely to stymie effective industry responses as promote them. There are a number of different factors at play: policy time horizons that are incompatible with adaptation planning time horizons, adaptation not being an important factor for the primary regulator and competing policy priorities between regulatory bodies.

For example in the water industry the current regulatory planning horizon is typically limited to a five year period, thereby limiting the ability of the industry to make investments (for example in habitat restoration that provides more stable base water flows during dry weather) that have pay-back periods of more than 5 years. The UK regulator, Ofwat, is taking steps to remedy this situation (through requiring water companies to develop 25 year 'strategic direction statements') but there is still a perceived bias against projects with longer-term pay-backs and research and development projects, both of which include many adaptation projects. Similarly in the property sector, local authority planning policies often prevent businesses from installing embedded generation technologies which enable property developers to develop more resilient property portfolios in the face of extreme weather events.

It is also evident that Ofgem's position on the impact of climate change is at odds with the positions being taken by companies in the electricity sector, given its failure to include the impacts of a changing climate in its Project Discovery Scenarios 2009<sup>9</sup>. Investors will need to carefully assess wider stakeholder policies and understand potential conflicts with company strategies.

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<sup>9</sup> [http://www.ofgem.gov.uk/markets/whlmkts/discovery/documents1/discovery\\_scenarios\\_condoc\\_final.pdf](http://www.ofgem.gov.uk/markets/whlmkts/discovery/documents1/discovery_scenarios_condoc_final.pdf)

## Recommendations for investors

We strongly believe that the nature of climate change demands that all businesses take ownership of their climate change risks. We also believe that we as long-term investors must examine the performance of the companies in which we are invested and expect best practice performance from them in this regard. Our research has opened up a number of important lines of inquiry for investors, which we have divided as follows:

- Research to understand the risks and opportunities associated with adaptation. This project is a critical initial step, but it is only a start in the process of developing the necessary tools for investment analysts and fund managers.
- Incorporation of climate change risks and opportunities into investment analysis and decision-making.
- Engagement with companies to ensure that they recognise climate change adaptation as a potentially strategic issue, that they explain to investors how they have assessed the issue, and that they have established appropriate systems and processes in response.
- Engagement/dialogue with public policy makers to both encourage policy development in this area, and to ensure that the views of long-term investors are taken into account.

### Investment research and decision-making

In our earlier report, “Managing the Unavoidable: Understanding the Investment Implications of Adapting to Climate Change”, we noted that the world’s climate is changing with immense, albeit still poorly understood, implications for investors. We also argued that properly understanding this agenda is not a trivial matter, requiring investors to consider climate change impacts on a sector-by-sector and company-by-company basis. Therefore, a significant focus of our work since then has simply been on identifying the potential climate change impacts for the four sectors we analysed (oil and gas, real estate, water utilities and electricity generation utilities).

In the meetings we had with companies, there were numerous examples presented of how changes in weather patterns are already being seen (e.g. changes in summer electricity demand due to higher temperatures, increasing numbers of sewer flooding incidents, and permafrost thaw affecting operational activities in the oil and gas sector) and how companies are taking action to mitigate the negative impacts. We also heard about how companies are starting to take account of some of the longer-term effects of climate change in their investment decisions and business strategies.

One issue that we have identified is that the timeframe over which many significant impacts associated with a changing climate will occur is significantly longer than the timeframe used in most investment decisions being made now. This disconnect does not mean that institutional investors should not be concerned about them. Our analysis of the four sectors demonstrates that companies are making investment decisions now for assets which will have very long lives. It is therefore essential that we as investors challenge them on the assumptions they are making regarding the long-term performance of those assets.

## **Recommendation 1**

### **Focus on the business model**

It is possible to identify a whole series of pathways whereby climate change can impact on companies. The key for investors is to understand how these affect the business – its assets, cashflows, strategy, etc. The approach we took in this research was to focus on the key investment value drivers in each of the four sectors and then to ask whether climate change could affect these value drivers. We analysed these in a largely generic manner at the sector level. This is a useful starting point for stock or company-specific research as it provides a broad indication of where climate change effects are likely to be seen.

However, we are clear that this ‘top level’ assessment is only a start. For institutional investors, the central question is how climate change will affect the companies and assets in which they are invested. This requires that the risks and opportunities associated with climate change adaptation are analysed and understood in the context of company-specific business models, value drivers, strategy, governance, cashflows and assets. This leads to our second point which is that materiality (i.e. the financial significance) of adaptation must be assessed at the company level.

## **Recommendation 2**

### **Materiality is company specific**

Our starting point for this project is that while we agree with the broad conclusions of the Stern Review on the Economics of Climate Change<sup>10</sup>, it is by no means clear that climate change adaptation is necessarily a significant financial risk for companies or for their investors. There are a number of dimensions to this.

- The impacts of climate change are not evenly distributed across economies or markets and so the specific implications for specific sectors and for specific companies within sectors can only be assessed on a company-by-company basis.
- Analysing the financial implications of climate change requires that attention is paid not only to a company’s exposure to climate change but to the manner in which the company is positioned to respond (i.e. the company’s own adaptation strategies and risk management processes). In many cases, the costs of adaptation will be much lower than the predicted impacts, and the residual risk (i.e. after management action) may actually be negligible in the context of the business. Expressed another way, investment analysis should not only consider exposure but also the company’s response. In this context, it is also important to recognise that a certain amount of resilience to changing weather patterns is already incorporated into much existing infrastructure and it should not be assumed that this infrastructure is not able to withstand quite significant changes in weather conditions.
- Companies face a range of risks, of which climate change is just one. While climate change may be an important risk, it may not be the most significant of the risks faced by the business.

## **Recommendation 3**

### **Encourage better sell-side research**

Our research suggests that relatively little attention, with some honourable exceptions (see Box 5), has been paid by the sell-side to climate change adaptation. The sell-side has a particularly important role to play in raising awareness of climate change as an issue for management attention and as an issue for investors. Reflecting the experience with climate change mitigation, sell-side research is likely to evolve in two stages. The first will, as with the Citigroup example in Box 5, focus on the broad, macroeconomic effects of climate change. Such analysis is important to make the case that investors should explicitly

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<sup>10</sup> Nicholas Stern (2006), *Stern Review: The Economics of Climate Change* (Cambridge University Press, Cambridge).

analyse the implications of climate change for their investments. However, such research is only a prelude to the second stage, where the sell-side assesses the risks, opportunities and investment implications for specific stocks. It is at this point that sell-side research will start to meaningfully affect investment decisions.

We are not advocating that climate change adaptation is relevant to all companies or to all sectors. Rather, where adaptation is or may be material, we would expect that the sell-side assesses which companies may be materially exposed, and seeks to quantify the financial implications. It is important that we, as investors, signal to the sell-side that we expect them to look at climate change adaptation in their research and that we reward providers who do good work in this area (as with other environmental, social and governance issues).

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#### **Box 5 Case-study: sell-side research on climate change adaptation<sup>10</sup>**

*“Economic costs relating to the physical impacts of climate change could amount to €6.2 billion per year by 2020 with lower crop yields and problems with fresh water availability most significant in Italy, Greece and Spain according to a draft EU Commission Report. Heat waves and wildfires are also a possibility in the Mediterranean and Balkan regions. The report warns that the cost could rise to around €60 billion per year by 2060 if action to adapt to the impacts of climate change is not taken.”*

*“EU policy to date has been focused on emissions abatement. With medium term targets now agreed (20% reduction by 2020), the Commission will now start to look at necessary adaptation measures. While acting as a reminder for the need of emission reductions on policy makers, the report is also a practical approach to starting to plan for changing weather patterns thought to be already locked into the climate system.”*

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#### **Recommendation 4**

##### **Don't forget about the opportunities**

It is important to recognise that there will also be significant investment opportunities arising from adaptation. For example, the need to increase expenditure on flood defences such as higher sea walls, increased drainage capacity and new reservoirs will probably benefit companies specialising in the financing, management and engineering of large infrastructure projects. Other adaptation opportunities are likely to be found in financial markets, in particular the insurance sector, and the emerging business of insuring against climate risk. In this sector, the opportunities will not be confined to the obvious area of weather-related insurance products, but may extend into potential new domains of risk such as insurance against rising health problems resulting from global warming. An example of how changing weather patterns may have positive and negative implications for companies is presented in Box 6.

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<sup>11</sup> Citigroup (2009), 'Weekly Update on Renewable Energy & Climate Change, 3 March 2009' (Citigroup, London).

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## Box 6 Permafrost thaw: risk or opportunity for oil companies?



The number of days in which oil exploration activities on the tundra are allowed under the Alaska Department of Natural Resources standards has halved over the past 30 years. This is due to permafrost thaw, which is disrupting transportation, damaging buildings and assets, and increasing the risk of pollution. Operational costs are increasing for oil and gas companies. Companies have a range of options to manage these risks, including:

- Repair, maintain and upgrade company transport infrastructure.
- Engage with government and transport providers to ensure infrastructure is resilient under a changing climate.
- Consider investment in private transport links for vulnerable routes or locations.
- Consider projected rates of warming and impacts on permafrost during design of new assets.
- Increase storage of supplies and materials on site.
- Develop new transport links with remote sites e.g. port facilities in northern Canada will open up other areas for exploration.

Permafrost thaw potentially offers the prospect of creating significant opportunities for companies through opening up new transport routes and potentially making some reserves more accessible. However, melting permafrost and ice flows have seen the emergence of disputes over international boundaries; for example, Canada and Denmark have both staked their claim to Hans Island, off the coast of Greenland. Oil and gas companies will need to review their strategies and assets to understand the implications of potential changes in maritime boundaries, and existing licences may be the subject of international disputes as boundaries change.

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## Engagement

### Recommendation 5

**Investors should ensure that companies have appropriate governance and management systems in place**

Investors engage with companies for a variety of reasons – to understand the company's strategy and management of a particular issue, to understand how practice is developing across a sector or universe of companies, and to effect change or influence corporate performance. The objectives of the engagement will clearly influence the specific questions asked and the conclusions drawn.

We recognise that there may be a tension between engagement for the purposes of investment research and engagement for the purposes of encouraging improvements in corporate performance. We also recognise that there may be a disconnect between the timeframes over which investors make many of their investment decisions and the timeframes over which climate change is a relevant factor for companies. Relying simply on the process of allocating capital as a means of expressing investors' views of a company's quality of management of climate change issues (or wider corporate responsibility issues) is unlikely to capture all of the factors that are likely to be relevant, and may even have the effect of signalling to companies that certain factors/impacts are actually outside the interests of investors. We therefore consider it essential that institutional investors explicitly encourage companies to take a proactive approach to the management of climate change-related risks. Specifically, investors should ensure that companies have:

- Appropriate governance and management systems in place.
- Robust risk identification and assessment processes. This includes monitoring the development of public policy and ensuring that business strategies and risk management processes respond to the rapidly changing public policy debate.
- Clear strategies for managing and responding to climate change.
- Clear reporting on their risk assessment and management processes and on the company's views on the materiality of climate change-related risks for their business.

In the course of our research, we identified a series of generic governance and management questions that are likely to be relevant to all companies, as well as sector-specific questions for each of the four sectors that we reviewed<sup>12</sup>. We present these in Appendix 1.

We wish to emphasise that these are not intended as 'tick box' questions, or that we expect companies to develop a series of standard, homogeneous answers to these. Rather, we view engagement as a dialogue between companies and their investors and these questions are intended to provide a framework for these discussions. The objective should be to enable investors to develop a rounded understanding of how companies are preparing themselves to respond to the challenges presented by climate change, and to assess the appropriateness of these responses in the context of the business as a whole.

## Public policy

### Recommendation 6

#### Investors should play a much more proactive role in public policy debates on adaptation

As the profile of climate change rises and as the pressure on governments to take action increases, we can expect the rate of policy development on adaptation to accelerate. The suite of potential policy options is immense, and could include development restrictions, tighter regulations on construction, demands for new or improved infrastructure (e.g., for the future-proofing of water distribution and treatment infrastructure), maximum workplace temperatures and mandatory insurance. At this point, it is not possible for us to say with confidence what policy measures will be adopted, when they will be adopted or what the specific financial implications for companies will be. We are however clear that public policy is a key influence on how companies respond, and that national, regional and international policy will critically influence how companies operate and how assets are developed.

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<sup>12</sup> The questions in Appendix 1 are derived from the four sector reports prepared by Acclimatise. These reports provide additional questions that can be used for more in-depth analysis.

From an investment perspective, we see that public policy could have a material impact – although we are not in a position to comment on whether these impacts are positive or negative – on companies’ strategies, cash flows and asset values. There are however two points that we can make with confidence. The first is that the general absence of coherent national adaptation policies is a huge issue for investors as it means that companies are less willing to commit capital to infrastructure projects because of the risk that such assets could be left stranded or unable to earn reasonable returns because of the adaptation policy risk overhang. The second is that well designed adaptation policy should provide real economy-wide benefits through ensuring the resilience of critical assets, through sending clear signals on where capital can best be deployed, and through ensuring that economic and environmental policy are aligned.

Investors have a role in ensuring their views on the development and implementation of public policy as it affects the assets in which they invest are heard. We think that there are two messages that are particularly important to communicate to policy makers: (a) the importance of having clear national strategies on adaptation, (b) the importance of ensuring that adaptation policy is aligned with other areas of public policy. This latter point is particularly relevant to regulated industries, for example, the water utilities sector in the UK, where the regulator (Ofwat) specifically dictates the levels of investment that the companies can put into adaptation focussed projects.

Investors should encourage policy makers to:

- Develop policies that are clear and long-term in their nature to enable companies to plan appropriately
- Ensure that unsuitable/risky developments (for example, on flood plains) are either regulated against or are designed with appropriate adaptation measures.
- Ensure that appropriate information and guidance on adaptation techniques is made available to provide companies with the tools they need.
- Ensure that different regulators for the same sector work together more coherently.
- Require companies to explicitly discuss the financial and other implications of climate change adaptation (and associated public policy) for their businesses.

# Appendix 1 Engagement questions

This Appendix is divided into two parts. The first provides generic quality of management questions that are likely to be relevant to all companies. The second provides sector-specific questions for each of the four sectors that we reviewed (oil and gas, real estate, water utilities, electricity generation utilities), that can be used to structure a discussion around a company's exposure to adaptation risk and its response to these risks.

## Generic quality of management

### Describe how you manage climate change adaptation and related issues

- Who is responsible for managing adaptation-related risks?
- To what extent is the Board, or one of its committees, involved and how does it take ownership if at all?
- Have you engaged with key stakeholders to understand their views on climate change-related risks? What have the outcomes of these discussions been?

### Describe your process for assessing the risks and opportunities associated with climate change adaptation

- How do you identify risks/opportunities?
- How do you define/assess the significance of these risks/opportunities?
- What are the key risks you have identified?
- Have you identified any opportunities?
- Are there any specific knowledge gaps where further information is required?
- Do you see climate change as a material risk?

### Describe the major actions you are taking to respond to the physical impacts of climate change

- What is the cost of these actions?
- What is the residual risk?

### Will you be taking any steps in the next 12 months to review your business strategies and your major projects to assess the risks and opportunities posed by climatic change?

### Are you engaged in any discussions with your suppliers and customers on the impacts of climate change on their businesses?

- What steps have you taken with your suppliers to ensure they are aware of and responsive to the need to adapt to climate change?

## Oil and gas

### How will changing climatic conditions affect your production capacity and downtime?

- Have climatic changes already affected your production? How?

### Will changes in water quality and/or water resources due to climate change affect your operational processes?

- What are the consequences for operational expenditures?
- Are you facing conflict with other users over access to water resources? What actions have you taken in response?
- Have you assessed the consequences for your assets in locations where the availability of water resources is already recognised as creating a geo-political risk? What decisions have you taken as a result?

### How will rising temperatures affect the performance of plant and equipment?

- What are the implications for energy consumption and maintenance requirements? What are the cashflow implications?
- Will you need to invest additional capital at existing facilities to ensure they are protected from changes in climatic conditions?

### How are changes in extreme weather conditions, increasing variability and incremental climatic changes considered in project analysis?

- How are you factoring climate change into your asset design and operational performance forecasts?
- What are the implications for capital and operating expenditures?

### How might logistics and supply-chains be impacted by climate change?

- Have you engaged key suppliers in discussions about climate change adaptation?
- What are the implications for future cash flows arising from changes in oil and gas prices and in energy demands driven by climatic change?

### Have you assessed the implications of future changes in legislation on your operations?

- What steps are you taking to monitor such changes and to engage with regulatory agencies in policy development?

### Have you assessed the impact of climate change on national internal security and the risk of territorial disputes in those countries where your legacy assets are located?

- What level of risk is there that your operations will be disrupted?

### What are the impacts on asset life and depreciation after factoring in climate change?

- What are the implications for asset write-off and future profits?

## Electricity

### **How will changing climatic conditions affect your production capacity and downtime?**

- Have climatic changes already affected your production across your generating fleet, including renewables?
- How have electricity demand patterns changed in recent years and how much of this can be attributed to changing weather patterns?

### **Will changes in water quality and/or water resources due to climate change affect your operational processes?**

- What are the consequences for operational expenditure?
- Are there any specific risks regarding cooling water abstractions and discharges and regulatory consent compliance during warm summers?

### **How will rising temperatures affect the efficiency and performance of plant and equipment?**

- What are the implications for energy consumption and maintenance requirements? What are the cashflow implications?
- Will you need to invest additional capital at existing facilities to ensure they are protected from changes in climatic conditions?

### **How are changes in extreme weather conditions, increasing variability and incremental climatic changes considered in project analysis?**

- How are you factoring climate change into your asset design and operational performance forecasts?
- What are the implications for capital and operating expenditures?

### **How will seasonal changes in energy demands (e.g. increase in summer and decrease in winter in the Northern Hemisphere) affect your revenue projections?**

- What are the implications for future cash flows arising from changes in fuel prices and energy demands driven by climatic change?

### **Have you assessed the implications of changes in legislation for your operations?**

- What steps are you taking to monitor such changes and to engage with regulatory agencies in policy development?

### **With the increasing energy demands in summer due to higher temperatures, do you foresee any implications for traditional maintenance programmes for major generating plant?**

- What are the impacts on required generating capacity as a consequence of rising energy demand in summer?

### **What are the impacts on asset life and depreciation after factoring in climate change?**

- What are the implications for asset write-off and future profits?

## Water

### **How will rising temperatures affect the efficiency and performance of plant and equipment?**

- What are the implications for energy consumption and maintenance requirements? What are the cashflow implications?
- Will you need to invest additional capital at existing facilities to ensure they are protected from changes in climatic conditions?

### **How are changes in extreme weather conditions, increasing variability and incremental climatic changes considered in project analysis?**

- How are you factoring climate change into your asset design and operational performance forecasts?
- What are the implications for capital and operating expenditures?

### **Have you assessed the implications of changes in legislation for your operations?**

- What steps are you taking to monitor such changes and to engage with regulatory agencies in policy development?

### **Are you taking any actions to assess the implications of future changes in regulations, legislation and codes of practices on your operations in response to inevitable climate change?**

- What steps are you taking to monitor such changes and to engage with regulatory agencies in policy development?
- How will the provisions of the Climate Change Act 2008 affect your company?
- How will these changes affect operational costs and revenue?

### **Ofwat has stated that it will not accept water resource schemes in PR09 (Price Review 09) until an analysis has been completed using the UK Climate Projections UKCP09. What actions do you intend to take over the next 12 months to review both your strategies and your major projects?**

- What are the financial, regulatory and service level implications if Ofwat does not accept water resource schemes through the notification process?

### **The government has acknowledged that on their own, measures to control demand are unlikely to be sufficient to meet future requirements. On the supply side, new water resources are likely to be required if the levels of service that consumers expect are to be met.**

- What are the financial performance implications of the demand and supply measures?
- Are significant new water resources required?
- What are your views on surface water issues and what role do you intend to play in catchment management?

**What are the OPEX and CAPEX implications of delivering critical asset resilience to extreme events (flooding, droughts, heatwaves and storms)?**

**Are you engaged in any discussions with regulatory agencies on the impacts of climate change for regulatory compliance?**

- Do you foresee any issues with regard to compliance with water abstraction licences and discharge consents?

**What impacts are changing climatic conditions predicted to have on your water resource and water treatment capacity?**

- What steps are you taking to monitor current performance relative to changes in climate?
- Have you identified the impacts on energy usage?

**How are changes in raw water quality and water resources due to climate change predicted to affect your drinking water operational processes?**

- What are the consequences for operational expenditure?
- What are the consequences for capital investment?
- If additional treatment is required, what are the energy cost and greenhouse gas implications?

**How will predicted changes in water quality, low flows, ecological resource, temperature and precipitation affect your waste water treatment processes?**

- What are the consequences for operational expenditure?
- What are the consequences for capital investment?
- If additional treatment is required, what are the energy cost and greenhouse gas implications?

## Property

### **What steps are you taking to assess the vulnerability of existing and future assets to changing climatic risks?**

- Are there any specific knowledge gaps where further information is required?
- Have you commissioned any external research?

### **What actions are you taking to ensure that those supplying goods and services (including utilities) to your property assets are climate resilient?**

- How is the performance of your suppliers monitored?
- What are the implications for your critical infrastructure providers (telecoms, water, sewerage, energy, transport)?

### **Does your property portfolio contain assets located in areas vulnerable to climate change impacts (for example, flooding)?**

- What are the revenue and operational cost implications arising from potential impacts?
- How will the risks change over time?
- How will you manage these risks?
- Do you need to consider flood risk assessments to cover transport systems and utilities, in addition to those required for your own assets?

### **Have you assessed your ability to secure more favourable insurance cover by demonstrating strong operational risk management processes and a responsible climate aware business?**

- What are the results of discussions with your insurers?
- Should the climate risk assessments undertaken by your tenants, where they are known to you, be disclosed to your insurers under your duty of utmost care?

### **What actions are you taking to assess the implications of climate change derived business impacts on the depreciation of property assets before normal end-of-life?**

### **How will the value of your asset portfolio change over time in response to the risks presented by both extreme events and incremental climatic changes?**

- Are there any opportunities to increase asset values?

### **How are the direct impacts of climate change and related changes in policy and regulation being taken into account in the buy, hold and sell decisions being made on properties; development, redevelopment and refurbishment of properties; and management and leasing of properties?**

**How are changes in extreme weather conditions, increasing variability and incremental climatic changes considered in the design phases for new developments and refits for existing assets?**

- How are you factoring climate change into your asset design and operational performance forecasts?
- What specific adaptation measures are you including within your new developments and refits?

**Are you taking steps to ensure that your standard lease conditions provide landlords access to undertake adaptation measures?**

**Are there any rental and cash flow implications if assets fail to meet required accommodation standards (RAS) covering internal temperatures?**

- What actions will you take to review RAS service level agreements and potential exposures?

**Have you assessed the business risks associated with climate change impacts for your tenants?**

- What are the implications arising from disruptions to tenants, for example, loss of trade due to flooding?
- How will offsite impacts affect your tenants and the rental value of your assets (for example, flooding of transport systems)?

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**Henderson Global Investors**

**Nick Robins**

**HSBC**

**Acclimatise**

Hexgreave Hall  
Farnsfield  
Newark  
Nottinghamshire  
NG22 8LS  
01623 884347  
[www.acclimatise.uk.com](http://www.acclimatise.uk.com)

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**Henderson Global Investors**

201 Bishopsgate  
London  
EC2M 3AE  
020 7818 1818  
[www.henderson.com](http://www.henderson.com)

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**Insight Investment**

33 Old Broad Street  
London EC2N 1HZ  
020 7930 5474  
[www.insightinvestment.com](http://www.insightinvestment.com)

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**RAILPEN Investments**

6th Floor  
Broad Street House  
55 Old Broad Street  
London, EC2M 1LJ  
020 7256 8003  
[www.railpen.co.uk](http://www.railpen.co.uk)

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**Universities Superannuation Scheme**

2nd Floor  
Royal Liver Building  
Liverpool  
L3 1PY  
0151 227 4711  
[www.uss.co.uk](http://www.uss.co.uk)