



Climate Change Implications for Real Estate Portfolio Allocation

Industry perspectives

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**Urban Land
Institute**

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Executive Summary

Climate change affects real estate portfolios in several important ways. There is clear scientific consensus that both the clearing of land and the burning of fossil fuels create climate-changing carbon emissions. Energy use in buildings accounts for around a third of global carbon dioxide emissions,¹ more than any other sector. Thus, changes to newly developed and existing buildings will play a significant role in mitigating climate change. At the same time, climate change impacts are already being felt. These impacts, from extreme weather events to changes in natural resource availability, pose a threat to real estate assets because they may cause severe impairment to and even loss of individual buildings. Because a core principle of the real estate industry is creating and maintaining value, climate risks need to be understood and assessed, so that they can be addressed and managed to avoid detrimental impacts on value.

This research report examines risk assessment and management strategies aimed at addressing climate change within real estate portfolios. The report draws on a survey—conducted between August 2014 and early 2015—of 50 senior executives at leading real estate investment and management firms, mainly based in Europe. The survey investigated whether and how respondents recognize the threat of climate change, what impact they expect climate change to have on their sector, and what their current and anticipated business practices are in response.



Awareness of Key Climate Change Impacts

Survey respondents had a good understanding of the main threats of climate change as well as regional variations in those impacts. Their views largely correspond with the scientific consensus on the topic. Survey respondents also understand the way that climate-related changes will affect their portfolios. In particular, they see:

- changing technological requirements that are likely to result from higher expectations around energy efficiency;
- higher operational costs, possibly as a result of rising energy and water prices, as well as new technologies; and

- human migration that results from climate change and that may affect supply and demand in key real estate markets.

However, some key impacts that will affect the real estate industry still do not appear to be fully understood. For example, respondents appeared to underestimate the risk of sea level rise to real estate assets. Respondents are most aware of project impacts in those regions where they are heavily invested, such as western and northern Europe. They are less aware about and less certain of impacts in regions outside their current areas of business focus.

Divergence in Investment and Climate Change Time Horizons

The survey revealed several ways in which timescale mismatches may create challenges in addressing climate change in real estate portfolios. Over three-quarters (77 percent) of survey respondents have holding periods of less than 20 years. Meanwhile, just 20 percent of respondents appraise their investments over timescales longer than 16 years. Many of the anticipated impacts of climate change, such as extreme sea level rise, however, are likely to be felt in future decades. This divergence in timescales could cause investors to neglect the long-term risks to investments, including the impact of climate change–induced risks on asset valuation. Because most cash flow projections end after ten years, modeled terminal values of assets may not include the detrimental effect of climate change on cash flow expectations. Likewise, only slightly over half (53 percent) of respondents reported that they perform climate-related risk assessments, and just 42 percent of those (less than one-quarter of all) perform scenario analyses, which may be most appropriate when dealing with the kinds of unpredictable risks posed by long-term climate change.



Growing Responses to Climate Change

Respondents are currently taking a variety of actions to address climate impacts. Just over half of respondents are undertaking risk assessments to better understand the issues they face from climate change. Of those not currently undertaking risk assessments, 35 percent intend to implement them over the next two years.

Respondents are also implementing a variety of practices to reduce the environmental footprint of buildings within their portfolios and increase efficiencies. For example, 94 percent are investing in improvements to building energy efficiency, 71 percent are investing in water efficiency improvements, and 78 percent are pursuing green building certificates, although in some cases these measures are applied to only a small percentage of their portfolios.

Nearly three-quarters of respondents are including measures to adapt to the impacts of climate change in their capital expenditure budgets. More than half of respondents expect to increase funding in their capital budgets for measures to adapt to the impact of climate change, although in general they anticipate only slight increases.

Barriers and Opportunities

Respondents also identified a number of key barriers to doing more to address climate change. These included insufficient market recognition of climate risks (76 percent) and insufficient financial incentives and rewards for enhanced climate resilience (over two-thirds). Furthermore, they cited high transaction costs (85 percent) and split-incentive problems (94 percent) as two of the most significant barriers to faster uptake of green retrofit technologies.

Many companies may have the need to increase their in-house sustainability expertise and capacity. More than one-quarter of the respondents said climate change and sustainability were not discussed at all at the board level, and another fifth said these topics were only minimally discussed. Although 58 percent of respondents' companies had full-time staff equivalents dedicated to sustainability issues, 42 percent had no dedicated staff at all. This work may be picked up in many companies by individual asset managers, or companies might potentially use specialist advisers to carry out these tasks. However, the survey also found some correlation between the existence of dedicated staff in this area and the company's level of commitment to addressing climate change, measured by respondents' statements on whether they expect to increase spending on adapting their portfolio.

Introduction

Climate change affects real estate portfolios in several important ways. Today, there is a strong scientific consensus that burning fossil fuels creates climate-changing carbon emissions. The effects of climate change, which include an increase in extreme weather events and changes in the availability of natural resources, have a substantial impact on the real estate industry. Because a core principle of the real estate industry is creating and maintaining value, climate risks need to be understood and assessed, so that they can be addressed and managed to avoid detrimental impacts on value.

The real estate industry has an important role to play in tackling climate change. Research undertaken for the Fourth Intergovernmental Panel on Climate Change (IPCC) report indicated that there is global potential to cost-effectively reduce carbon dioxide emissions in the residential and commercial buildings sectors by 29 percent by 2020 with

mature and widely available technologies.² This estimate was echoed in the Fifth IPCC report, which again highlighted that energy use may stay constant or even decline by 2050 if existing cost-effective practices and technologies are broadly diffused.

The building sector is one of the highest contributors to greenhouse gas (GHG) emissions. In 2010, buildings were responsible for 32 percent of total global final energy use and 19 percent of energy-related GHG emissions.³ Therefore, changes to newly developed and existing buildings will play a significant role in *mitigating* climate change. Investors and asset managers already face regulatory and market pressure to reduce carbon emissions from their properties; this pressure will only increase in the future.⁴ In addition, as the climate changes, direct environmental impacts from factors from extreme weather events to changes in natural

resource availability will increasingly pose a threat to real estate assets, because they may cause severe impairment to and even loss of individual buildings. The real estate industry also needs to adapt in order to build resilience to these and other impacts of climate change. (See table 1.)

This research report examines risk assessment and management aimed at addressing climate change within real estate portfolios. The report draws on a survey of 50 senior executives at leading real estate investment and management firms, mainly based in Europe. The survey—conducted from August 2014 to early 2015—investigated whether and how respondents recognize the threat of climate change, what impact they expect climate change to have on their sector, and what their current and anticipated business practices are in response.

Table 1: Definitions of Climate Change Mitigation and Adaptation

Climate Mitigation

Definition

Climate mitigation measures focus on tackling the causes of climate change. Included are measures to reduce, prevent the emission of, or capture the greenhouse gases that cause climate change.

Examples

- Switching from fossil fuels to renewable energies.
- Improving energy efficiency of equipment or buildings.
- Changing practices or behavior to reduce energy use.
- Protecting natural carbon sinks like forests and oceans, or creating new sinks by planting trees.

Climate Adaptation

Definition

Climate adaptation measures focus on tackling the actual or expected impacts of climate change, or taking advantage of the benefits it presents. These measures include adjustments to natural or human systems.

Examples

- Elevating buildings or roads to avoid flooding from sea-level rise and increasing coastal storms.
- Employing new, low-water technologies in areas anticipating drought.
- Adjusting agricultural growing seasons and crop varieties to match changes in temperature and precipitation.
- Installing cool roofs or cooling centers to address heat risk in cities.



Report Overview

The report has four sections. The first section introduces the research questions and the key characteristics of the survey respondents.

The second section addresses whether, and to what extent, real estate investors recognize the threat that climate change poses and the anticipated impacts of climate change on their sector. This section presents findings on respondents' perceptions of the regional impacts of climate change and compares those perceived effects with the impacts predicted by the IPCC. Respondents' perceptions of climate change impacts on business strategy both currently and in the future are also covered.

The third section covers the business practices being employed to address climate change within the respondents' portfolios. The focus is on risk assessments, green building certifications, building improvements and retrofits, and investments in climate resilience. This section also covers respondent observations about barriers and opportunities to more expansive action to address climate change within their portfolios.

The final section presents some conclusions and preliminary recommendations from the research.

Research Objectives and Respondents

The following three questions framed the research presented in this report:

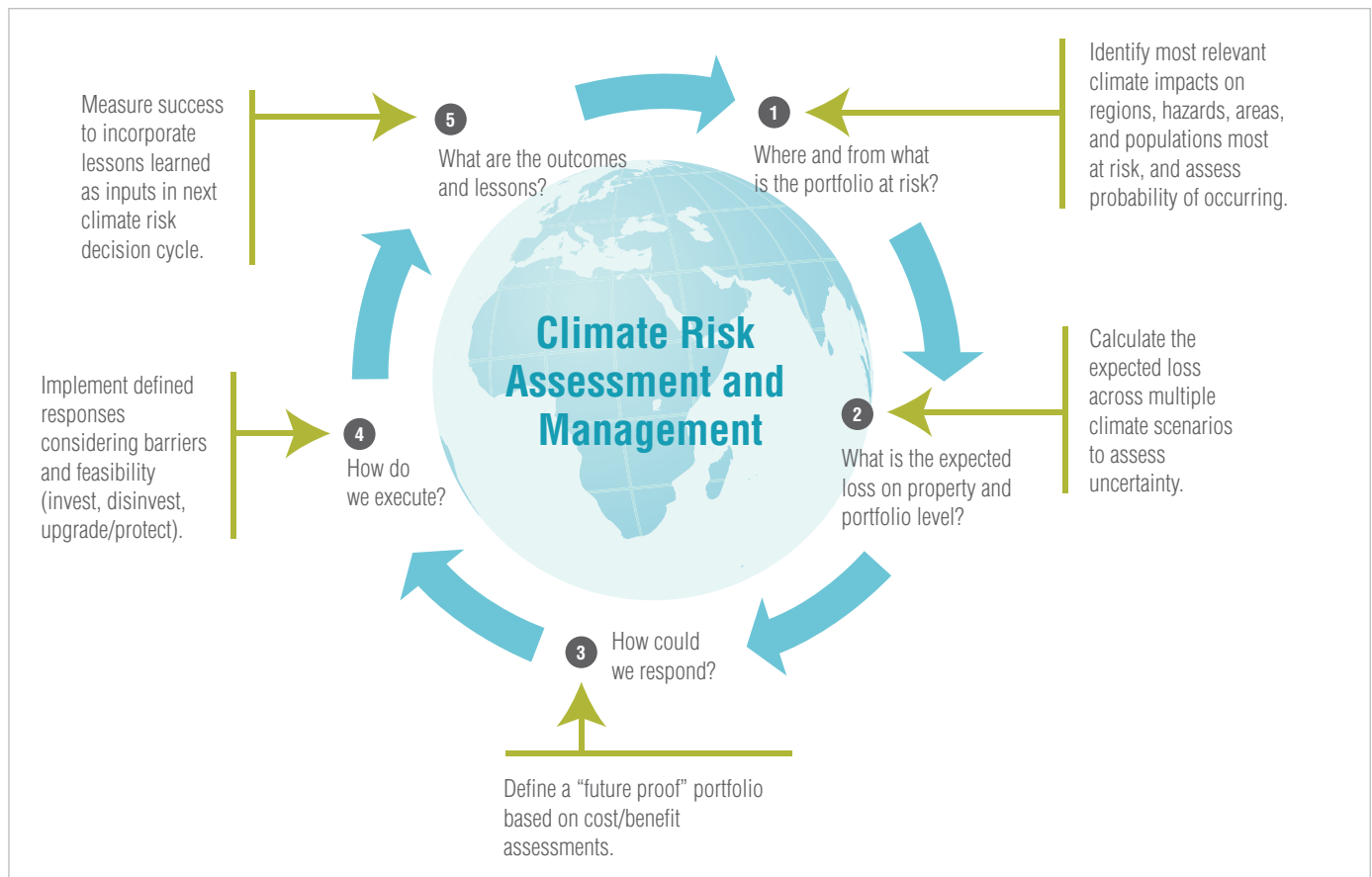
- What impact do real estate investors expect climate change to have across regions, and on their portfolios and business strategy?
- How are real estate investors and asset managers addressing climate change within their portfolios, and how do they expect those practices to change over time?

- What barriers and opportunities are there to more expanded action within the real estate sector to address climate change?

Climate risk management processes can help real estate professionals understand the key implications of climate change for portfolios, as well as develop appropriate responses. Figure 1 presents a possible framework for understanding the process of climate change risk management. First, professionals should

identify possible climate change–related risks, the likelihood they will occur, and their potential impact on real estate portfolios. The next step is to identify possible responses and implement those that are most appropriate. The last stage is to assess outcomes and build lessons learned into the next cycle of risk assessment and management. The research presented in this report explores the extent to which this type of process is being used in relation to real estate portfolios.

Figure 1: Framework for Assessing and Addressing Total Climate Risk



Source: Adapted from Economics of Climate Adaptation Working Group, *Shaping Climate-Resilient Development: A Framework for Decision-making* (Zurich, Switzerland: Economics of Climate Adaptation, 2009); Available from media.swissre.com/documents/rethinking_shaping_climate_resilient_development_en.pdf.

Survey Respondent Profile

The research is based on a survey of 50 senior executives at leading real estate investment and management firms with a total of approximately €428 billion (US\$480 billion) of assets under management (AUM).

Figure 2 summarizes the main business activities of the respondents. Asset management is the business focus for almost a third of the respondents; for others, the primary focus includes property funds, property companies, and advisory services. The findings in this report are based on a primarily European perspective, as a result of the regional distribution of respondents' direct real estate portfolio (see figure 3). An appendix to this report contains a summary of the research methodology.

More than half of the respondents have holding periods of investments of less than ten years, though about a quarter of respondents do hold their properties for more than 20 years (see figure 4). The time horizon over which respondents appraise investments is relatively short—almost three-quarters appraise over ten years or less. As climate change impacts will worsen over time, with many of the most severe impacts (e.g., of extreme sea level rise) happening over several decades, this lack of long-term appraisals may mean that respondents are not accounting for such impacts or the possible resulting effects on the valuation of these properties.

Figure 2: Main Business Activity of Survey Respondents



Figure 3: Regions Covered by Respondents' Direct Real Estate Portfolio

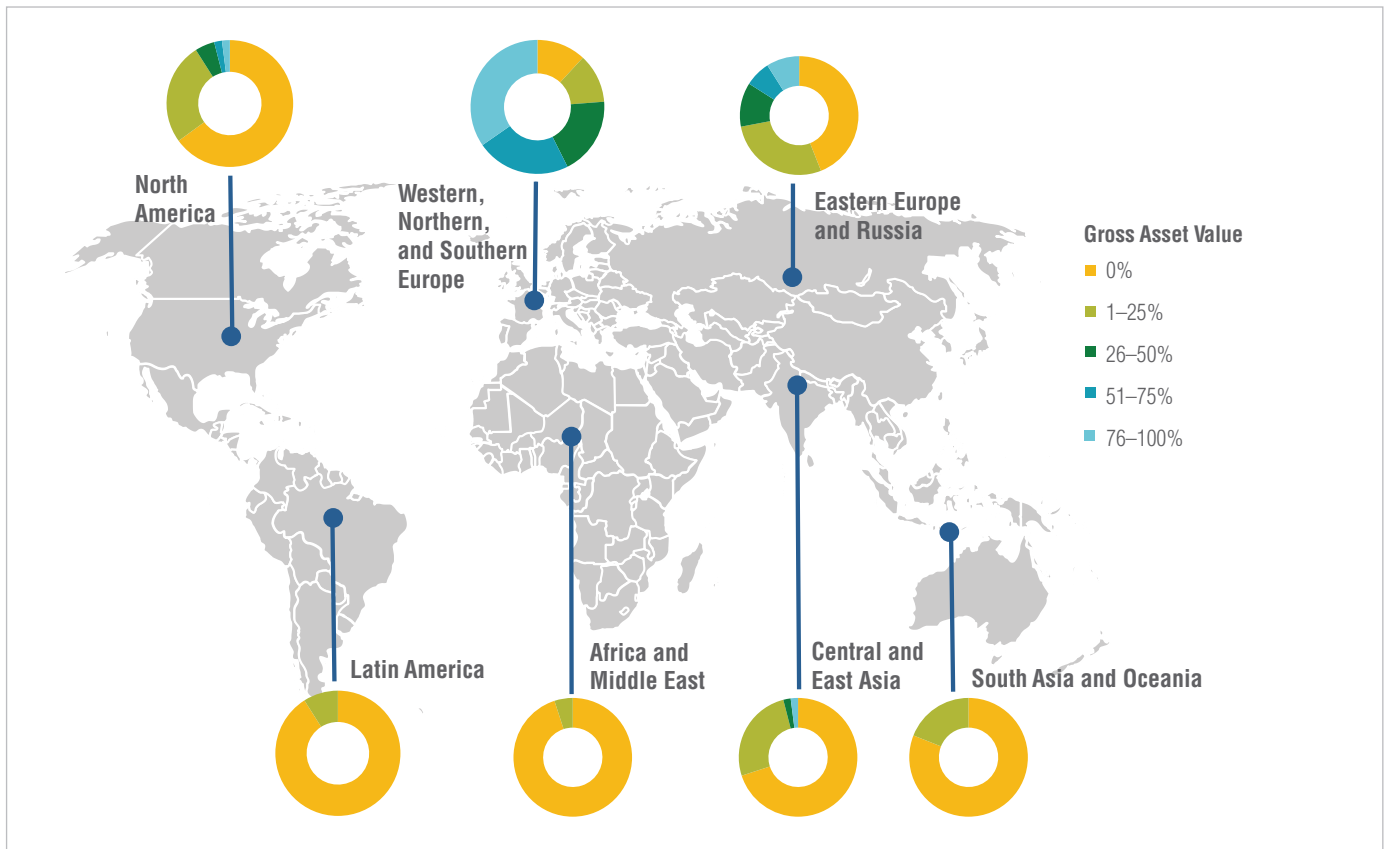
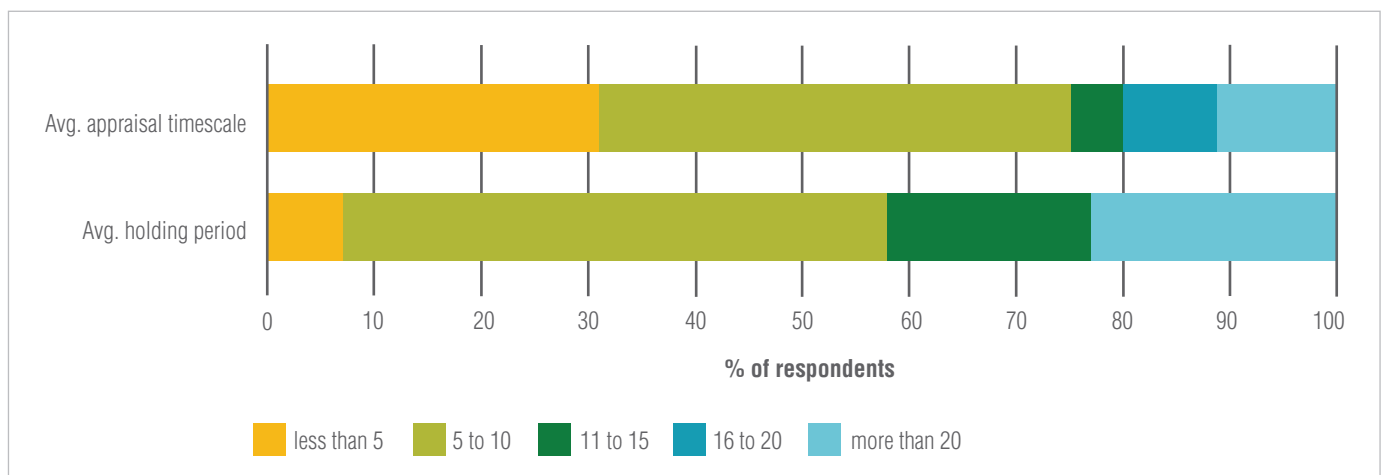


Figure 4: Average Holding Period of Respondents (in Years) and Average Timescale over Which Respondents Appraise Real Estate Investment Opportunities



Perceived Impacts of Climate Change on Real Estate

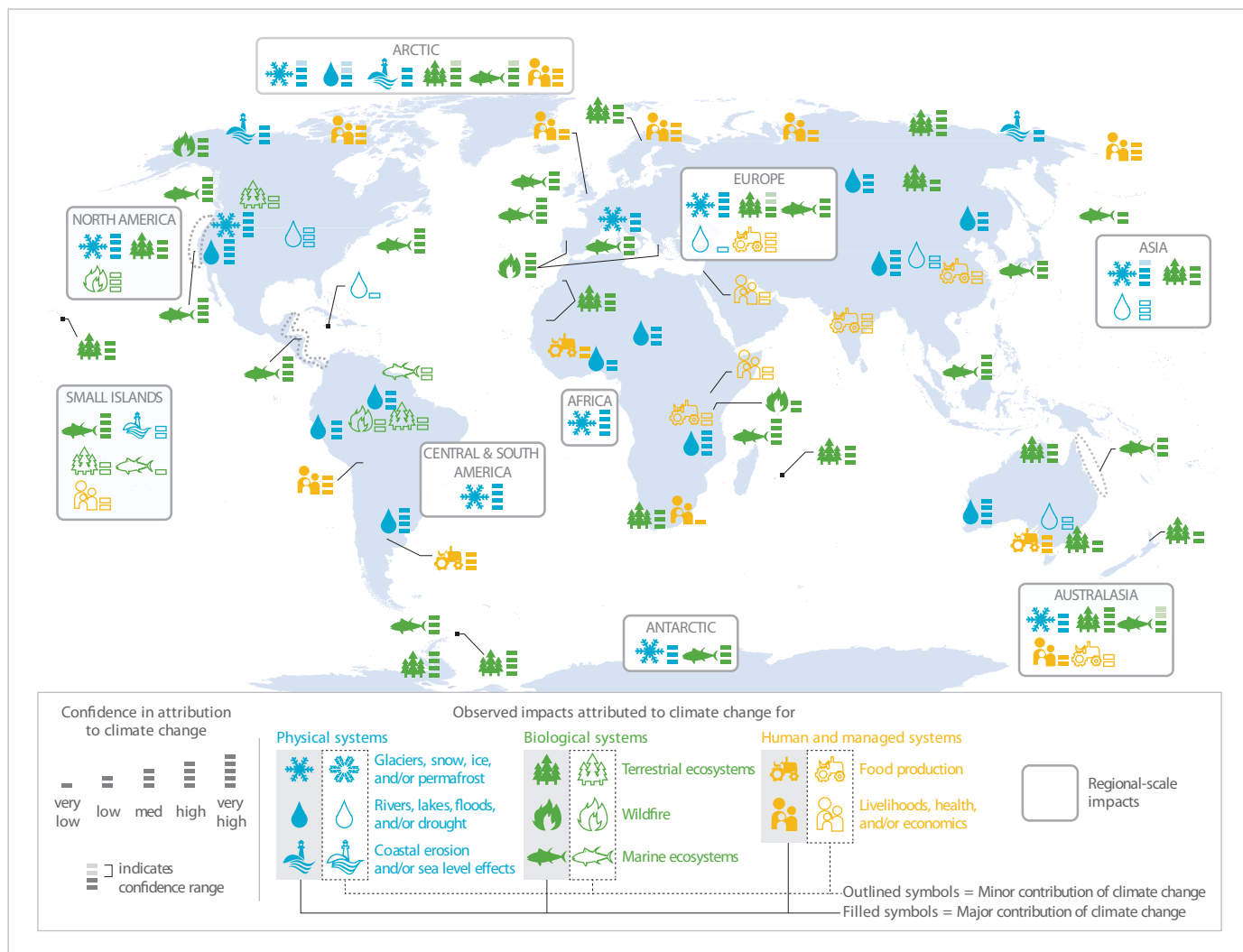
A core objective for real estate professionals is to create and maintain, if not increase, asset value over the duration of a holding period. Climate change may affect this value in a number of ways. The demand to reduce carbon emissions from buildings can result in new regulations and market expectations. Likewise, unavoidable impacts from climate change can cause damage to real estate.

Lloyd's, in collaboration with the Cambridge Centre for Risk Studies at the University of Cambridge Judge Business School, recently

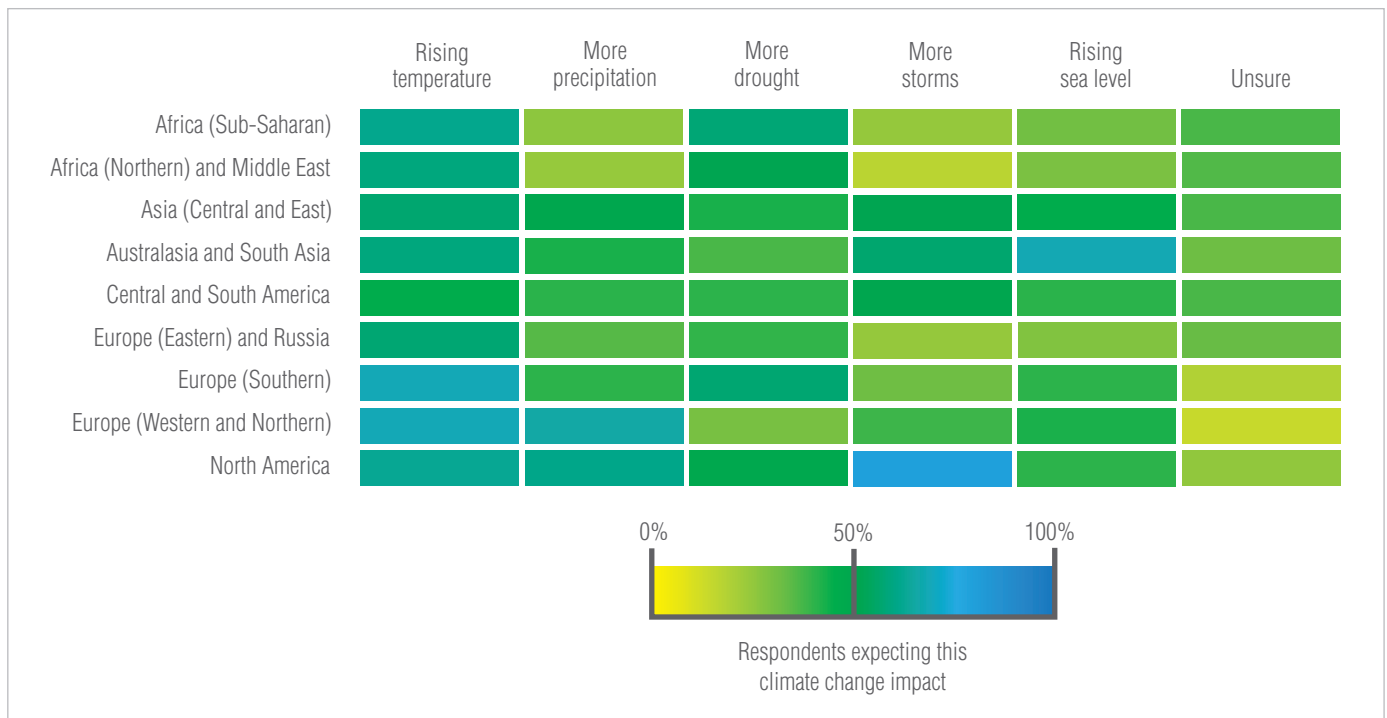
published an analysis of the potential impact on the economic output of 301 of the world's major cities from 18 humanmade and natural threats.⁵ In the City Risk Index, the potential losses from flooding events totaled over US\$432 billion, 43 percent of which was concentrated in the top 20 affected cities globally. Those included five major real estate markets in the United States (Los Angeles, California; New York, New York; Houston, Texas; Chicago, Illinois; and San Francisco, California) and three in Europe (London, U.K.; Paris, France; and Bern, Switzerland).

Zillow also recently released a more granular look at the impact of sea level rise on homes across the United States.⁶ Using flooding projections from the National Oceanic and Atmospheric Administration, they found that by 2100, almost 1.9 million homes worth a combined US\$882 billion are at risk of being underwater by 2100. The concentration of property loss in certain markets along the coasts is extreme. "Left unchecked," the study concluded, "it is clear that the threats posed by climate change and rising sea levels have the potential to destroy housing values on an enormous scale."⁷

Figure 5: Expected Climate Change Impacts across Regions



Source: IPCC, 2014. Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Geneva, Switzerland: IPCC.

Figure 6: Expected Climate Change Impacts across Regions

ULI's "Guide for Assessing Climate Change Risk" highlights that understanding risks can result in better methods for addressing and mitigating these risks, as prevention can be more cost-effective than recovery after disaster.⁸ To respond appropriately to climate change impacts, portfolio holders must understand what they are responding to—the first step of the risk management framework in section 1.

This section reviews the extent to which respondents recognize the threats of climate change to real estate portfolios by comparing the climate change impacts that they perceive with those predicted in the Fifth IPCC Assessment Report (shown in figure 5).⁹ The section then explores what extent the various impacts of climate change are anticipated to affect real estate investments or investment strategy.

Regional Impacts

The survey asked respondents what expected climate change impact they anticipated across regions, and how certain they were of those impacts. Results suggest that respondents have a general awareness of the threats of climate change and that many of their impressions track with the global scientific consensus on projected regional impacts from the IPCC.

In some areas, however, real estate portfolios may be affected, but the expectations of respondents deviate from IPCC predictions. The European focus of survey respondents is reflected in the fact that they expressed the least uncertainty around impacts in western, northern, and southern Europe. Only 13 percent of respondents are uncertain about the impact of climate change in the European region, but this level of uncertainty almost doubles for North America and almost triples for the other regions (see figure 6).

Primary differences between respondent perceptions and scientific predictions are summarized as follows.

- Africa:** Respondents diverge from the IPCC in relation to storms. According to the IPCC, more frequent storms are expected as a result of higher temperatures. Storms are relevant to the real estate industry because they may cause damage to real estate. Only two respondents have assets in that region. One respondent correctly identified that storms will have an impact, but diverged from the IPCC's view by stating that overall precipitation will increase. With regard to rising temperatures and droughts, the respondents were in line with scientists.¹⁰

- **Asia:** Respondents' expectations diverge from predictions set out in the Fourth IPCC report in relation to precipitation and storms. Precipitation is difficult to predict because most areas of the Asian region lack sufficient observational records. Storms are expected to be more severe but not necessarily more frequent. This is a key difference because 90 percent of population in Asia is exposed to tropical cyclones, which are expected to be worsened by sea level rise, even if the frequency in storms does not increase.¹¹
- **Australasia:** The main difference between respondents' perceptions and those of the IPCC are the IPCC's prediction of more droughts. This prediction is significant because fires during hot, dry, and windy summers can cause substantial property damage. The IPCC identifies fire management as apt to become increasingly challenging because of the potential for policies to exacerbate existing conflicts between biodiversity conservation and protection of property. The IPCC also noted effects on property prices as a barrier to adaptation options to address river and local flooding and coastal erosion and inundation.¹²
- **Central and South America:** Only 45 percent of respondents correctly identified temperature increases as a risk for Latin America, despite the IPCC's prediction that temperatures in South America could increase by as much as 6.7 degrees Celsius by 2100. This increasing temperature is likely to exacerbate problems of water stress and intense precipitation events, both of which may result in property damage.¹³
- **Europe:** Respondents understood with the greatest degree of accuracy the implications of climate change in the European region. For Europe, the IPCC identified risks resulting from flooding in river and coastal regions as a result of sea level rise and more precipitation. Sixty-four percent of respondents expect the same in northern Europe. In southern Europe, the IPCC expects more frequent drought periods, while temperature rise and increased droughts are also expected by respondents. Close to 40 percent expect an increase in storm incidence in western and northern Europe due to climate change, but that is an impact not explicitly forecast by the IPCC for the European continent.¹⁴
- **North America:** The IPCC predicts a number of climate-related changes that may cause damage to and loss of real estate. These include sea level rise, increasing urban floods in riverine and coastal areas, and a likely increase in forest fires resulting from an increasing number and intensity of drought periods and rise in temperatures. The primary difference between the predictions of respondents and the IPCC is that the former do not sufficiently recognize the sea level rise risk. Sea level rise currently poses a medium threat, but it will increase in the medium term (2030–2040), and in the long term it could pose a high risk.¹⁵



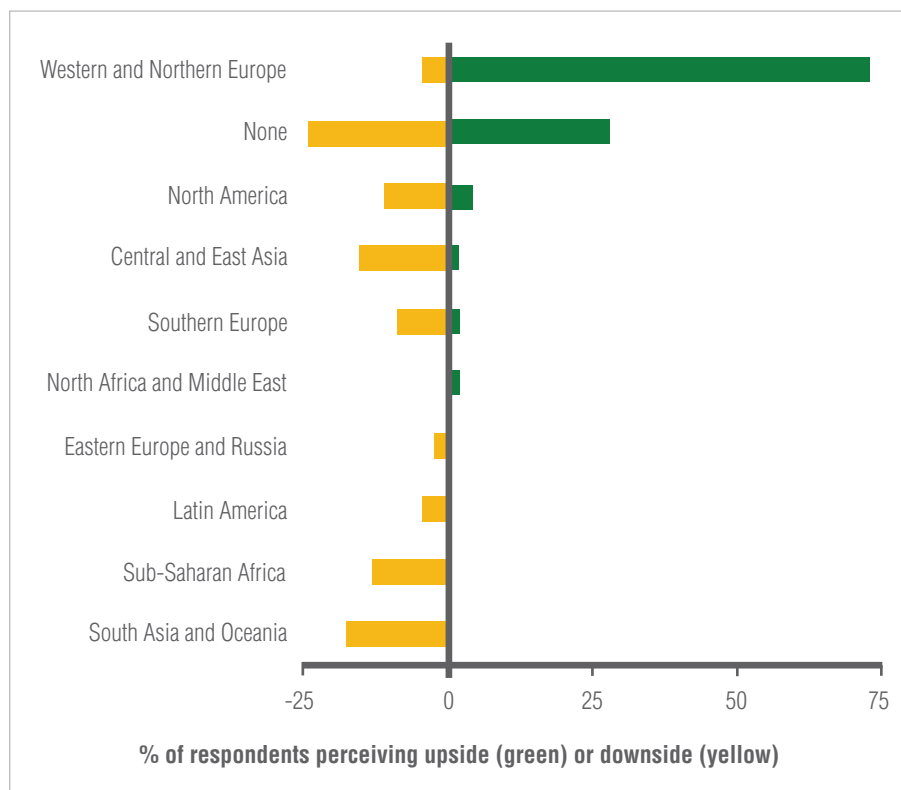
It is generally accepted that climate change will produce regional winners and losers.¹⁶

Some regions that are currently very cold, for example, may become milder, opening up new opportunities for agriculture. Meanwhile, other regions may lose arable land as deserts expand because of increased droughts.

Survey respondents were asked to identify which regions they perceive to have the biggest upside and downside potential as a result of climate change in the next 20 years. Their answers are summarized in figure 7. Nearly two-thirds of the respondents (61 percent) indicated that they expect western and northern Europe to be a “climate winner,” whereas 28 percent said no region would win. When it comes to climate losers, answers were more diverse. Nearly one-quarter of respondents perceived that no region would be a clear loser, whereas those who named regional losers picked South Asia and Oceania (17 percent), Central and East Asia (15 percent), Sub-Saharan Africa (13 percent), and North America (11 percent).

Those responses may reflect the regional bias of the survey participants, who are more heavily invested in—and more certain of climate impacts in—western and northern Europe. Interestingly, respondents do have a substantial number of assets in regions that at least some of them perceive at risk, including Eastern Europe and Russia and central and east Asia. Similarly, North America is identified as a loser by more respondents than as a winner, and it is another region where respondents have large amounts of assets.

Figure 7: Investment Regions Survey Respondents Perceive to Have the Biggest Upside and Downside Potential as a Result of Climate Change in the Next 20 Years



The winner-loser perceptions of respondents presented in figure 7 align in some cases with expectations of the scientific community, but not all. For example, in a study published in the widely respected journal *Nature*, Burke, Hsiang, and Miguel examined expected percentage change in gross domestic product (GDP) per capita to identify winners and losers.¹⁷ The authors identify Russia, Mongolia, and Canada as those countries that stand to gain most, presumably because warming temperatures open up more of their land area to agriculture and other activities. Overall, Europe is expected to benefit, North America to do slightly better, and central and east Asia only slightly worse. The vast majority of Oceania, Latin America, Middle East and North Africa, Southeast Asia, Sub-Saharan Africa, and South Asia are

expected to do worse (increasingly worse, in that order).¹⁸ The main difference between the work of Burke, Hsiang, and Miguel and the views of survey respondents are that respondents identified North America as an overall loser, whereas Burke, Hsiang, and Miguel found that it will be a winner. Inconsistent views of this region may be explained by the large geographic area it covers and the wide variety of climate change impacts. For example, agriculture in the United States is generally expected to benefit from climate change, but in the southern United States, it is likely to be adversely affected.¹⁹ Also Burke and coauthors focus on overall impacts while investors participating in this study refer only to real estate.

Impact on Investment and Strategy

Climate change stands to affect real estate investments in multiple ways: directly and through the responses of regulators, consumers, and investors. When asked how climate change is affecting their assets and investment strategies today, survey respondents identified four primary issues that are having a medium to high influence—all of these issues come from regulatory or market action to address climate change (figure 8). Nearly three-quarters of respondents cited increasing regulations (e.g., laws related to energy savings), whereas the majority noted higher costs (both construction and operational). Eighty percent see changing technological requirements as having an important influence, and this impact is also likely linked to their perceptions of new regulations and higher costs.

Interestingly, just over half of respondents cited migration of people as an important factor. Although demographic and population shifts certainly affect real estate demand and values, and although many geopolitical and security experts have noted the role that climate change may have in destabilizing regions and leading to mass migrations in the future,²⁰ the importance placed by respondents on this issue may have been influenced by current events in Europe, as well.

Respondents believe that over the next ten years, the same primary issues (increasing regulations, changing technological requirements, higher operational costs, and migration of people) will likely continue to have an impact, although 62 percent also mentioned rising fuel prices as a factor during this time period. Just over half of respondents also named increasing weather events, energy shortages, and rising insurance premiums as likely to have an impact on their portfolios.

Of some concern is the fact that direct and indirect impacts related to climate change itself were rated as not relevant at present. Even though the scientific direction of these changes in the long run is clear, some of these impacts are already playing out, and they certainly will be felt during the respondents' longer hold periods. Only 30 percent of respondents, for example, said gradual changes in precipitation and rising temperature had a medium to high influence on their assets and business strategies today, even though impacts on both fronts are already being seen in many regions.

Average global temperatures have risen 0.8 degrees Celsius (1.4 degrees Fahrenheit) since 1880,²¹ and the most intense rainstorms in the northeastern United States have increased more than 50 percent since 1901.²² These kinds of changes imply an increased number of cooling degree days and a stronger threat of flooding, which could affect operational costs and asset values. The impact of extreme weather seems to be having a slightly greater effect on business strategy, but 58 percent said it had little to no influence, despite a strong body of evidence from scientists and insurance companies about the increasing risks and costs of extreme events.²³

Respondents also saw little impact from rising sea levels, deterioration in air quality, or water shortages, with roughly four-fifths indicating that these issues had little to no influence on their strategies and assets today. Although the most severe impacts from sea level rise are anticipated several decades from now, global sea level in 2014 was 2.6 inches (67 mm) above the 1993 average, and sea level continues to rise at a rate of about one-eighth of an inch (3.2 mm) per year,²⁴ an increase which is already troubling low-lying markets like Miami with growth in the incidence of routine flooding.

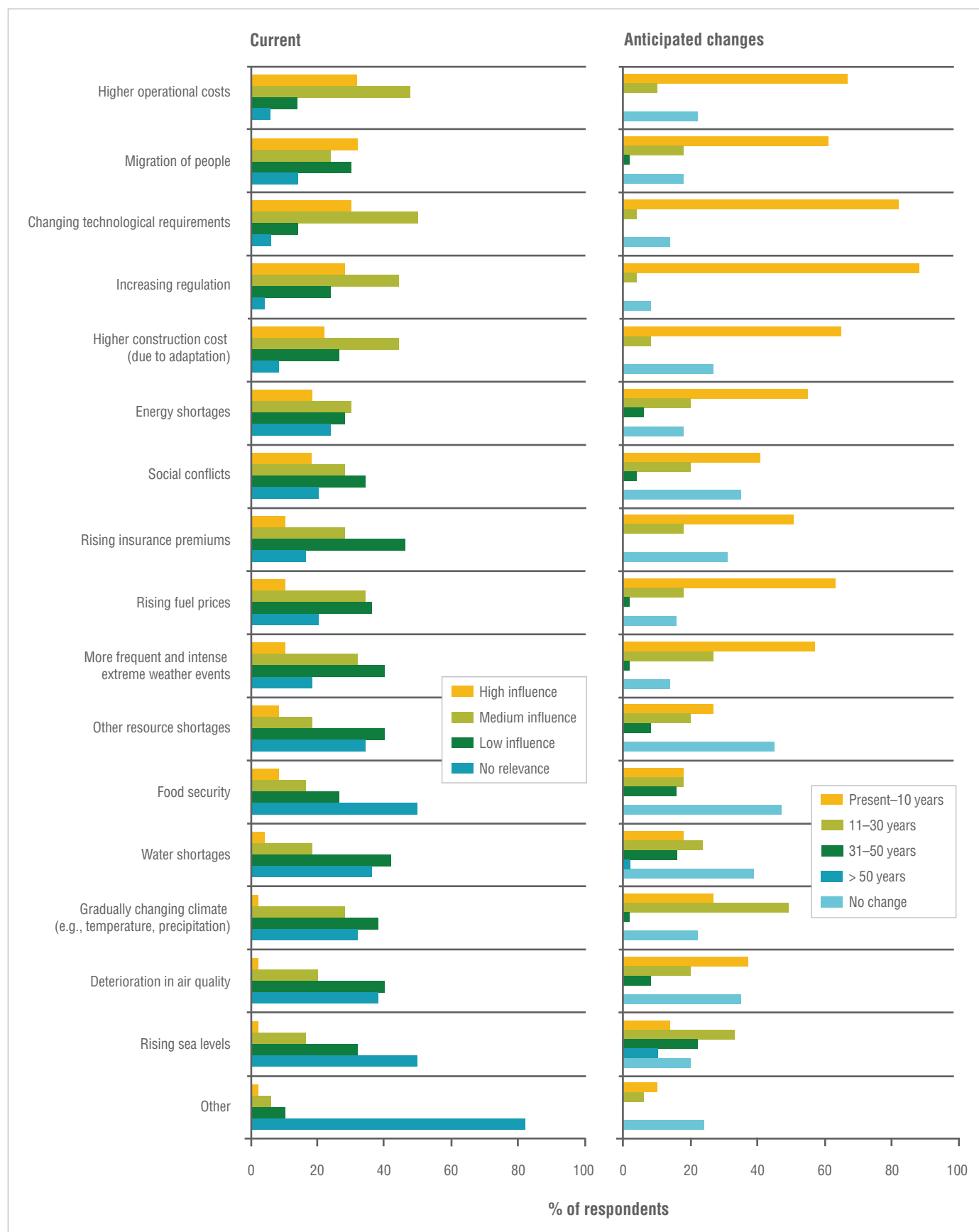
The long-term impacts of climate change may fail to significantly influence current investment strategies for a number of reasons. First, the lack of attention may demonstrate uncertainty. The survey found that the average uncertainty for regional impacts was almost 30 percent. And, although investors might recognize large-scale trends, they might need to obtain more granular forecasts of climate impacts at the market and property level before they are willing to address those effects in their business strategies.

Second, respondent profiles may explain their perspectives with regard to long-term changes: only about one-quarter of respondents have holding periods over 20 years, and only 10 percent of respondents appraise investments over more than 20 years.

Third and finally, some of the impacts anticipated over the long term may be less relevant to the regions most covered by respondents' portfolios. For example, sea level rise may not have been identified as influential today or in the future if respondents have no or few investments in coastal areas. Had the respondents had more significant levels of investment in East Asia, for example, air quality may have been identified as having a more significant influence.

Note that investors forecast major changes due to climate change in the next 30 years. Only a handful of individual respondents offered a prognosis for the two most remote periods of time, namely in 31 to 50 years and more than 50 years. That lack of foresight presumably stems from greater uncertainty about the reliability of projections and from the lack of instruments or information available to help investors make statements about periods so far ahead in the future.

Figure 8: Respondents' Perceived Effect of Current Climate Change Issues on Real Estate Investments and Investment Strategy (left), Compared with Respondents' Anticipated Effects of Those Issues in the Future (right)



Business Responses to Climate Change

Recognizing widespread climate change impacts and identifying which issues are particularly relevant to real estate portfolios are only the first two steps of the risk management process set out in figure 1. The next step is responding to these risks. This section reviews the extent to which survey respondents are taking action to address the climate change impacts identified in the preceding section in the short and long term.

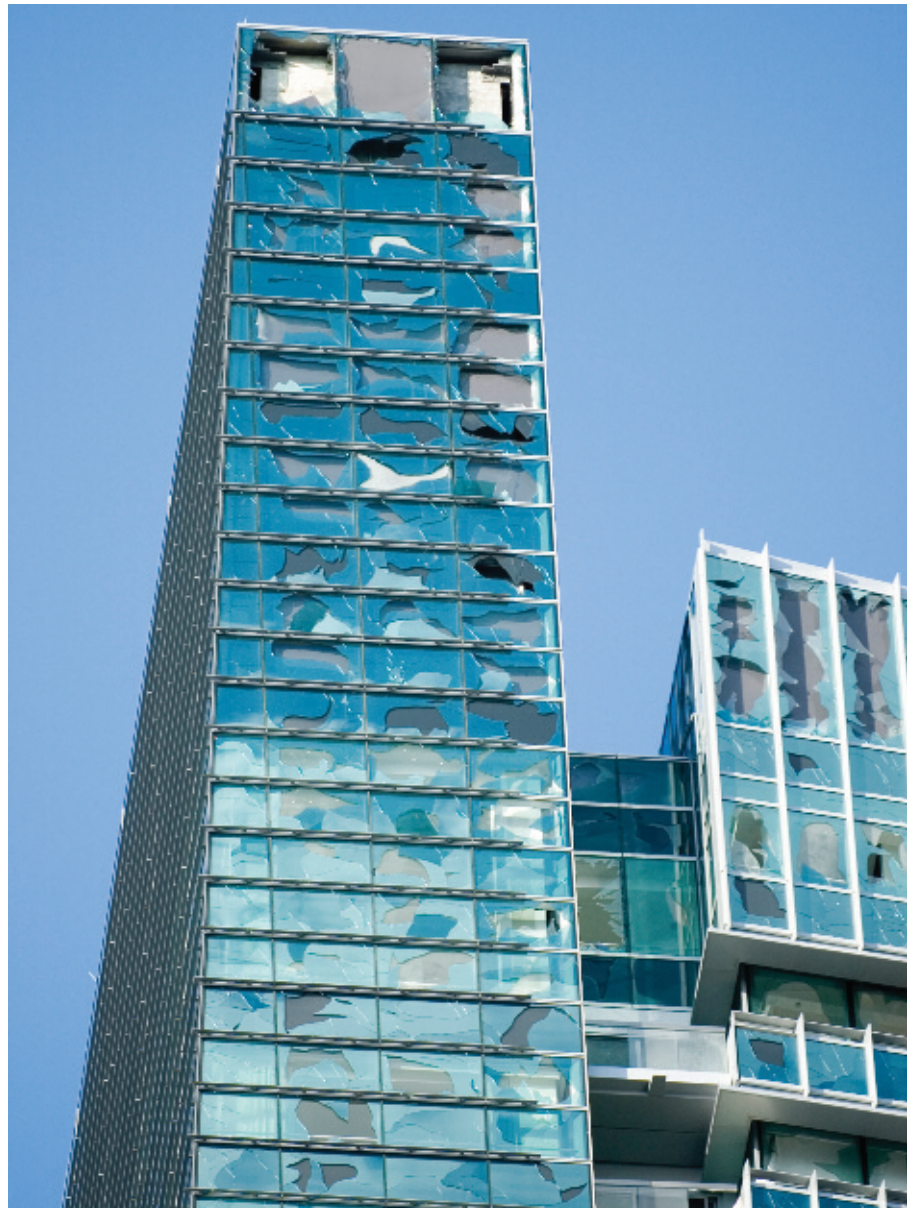
The section begins by examining how respondents are trying to improve their understanding of the specific effects that climate change will have on their businesses through risks assessments. It then reviews how respondents are moving to reduce emissions generated by their assets and to reduce vulnerabilities of their portfolios in the face of climate impacts.

Risk Assessments

Risk assessments can be helpful during planning and decision-making activities; risk assessments can inform decisions about where to direct investment appropriately and cost-effectively by identifying those areas that are most and least exposed to a variety of climate change risks.²⁵ Risk assessments have long been used by fund managers to assess their portfolios. In recent years, sustainability objectives have increasingly been incorporated into the assessment process.²⁶

Some common tools for measuring and assessing risk are the following:

- **Sustainability due diligence:** Assessment of standard of sustainability, either for existing buildings or new acquisitions.
- **Key performance indicators (KPI):** Quantifiable measures to assess the success of a company (or real estate asset or portfolio in this case) in achieving its strategic goals and objectives.



- **Scenario analysis:** Technique of analyzing expected value of a portfolio for a given time, taking into account possible key changes or events.
- **Sensitivity analysis:** Process to assess how different uncertainties may impact output.

Among the respondents who reported using risk assessments, the most common types they said that they used were sustainability due diligence assessments for both existing

buildings and new acquisitions and KPI measurements, with 81 percent, 96 percent, and 85 percent using those approaches, respectively (figure 9). Still, the measures are not necessarily being used across the respondents' entire portfolios.

The popularity of KPI measurements may be explained by the proliferation of benchmarking initiatives such as Global Real Estate Sustainability Benchmark (GRESB), Green Rating Alliance (GRA), and ULI's Greenprint Center for Building Performance.

The risk assessment technique used the least by respondents is scenario analysis. That type of analysis provides a more qualitative depiction of the future developments of portfolios and is used when potential risks are high but cannot necessarily be clearly quantified. Such an analysis is particularly relevant when considering the impact of climate change on real estate portfolios, because climate change–related risks can vary substantially depending on the assumptions made about future carbon emissions. Sensitivity analysis, which could reveal how much major changes in climate parameters would affect the results, is not being used frequently. The IPCC promotes scenario analysis as a useful tool because it helps characterize possible future socioeconomic pathways, climate change and its risks, and policy implications.²⁷

Despite the general recognition among respondents of the threats to their assets posed by climate change (as discussed in the previous section), figures 9 and 10 reveal that, at the time the survey was conducted, almost half of respondents' companies did not perform climate change risk assessments. There is no correlation between the average holding period of real estate and risk analysis. Half of the companies that invest for more than 20 years carry out climate change risk assessments, whereas just under half of those with short-term holds (less than ten years) also perform them.

Respondents did not expect that they would significantly change their approach to climate change risk assessment in the short term. At the time the survey was conducted, approximately two-thirds of those who were not undertaking any risk assessments currently did not intend to start doing so in the next two years.

Figure 9: Risk Assessment Methods

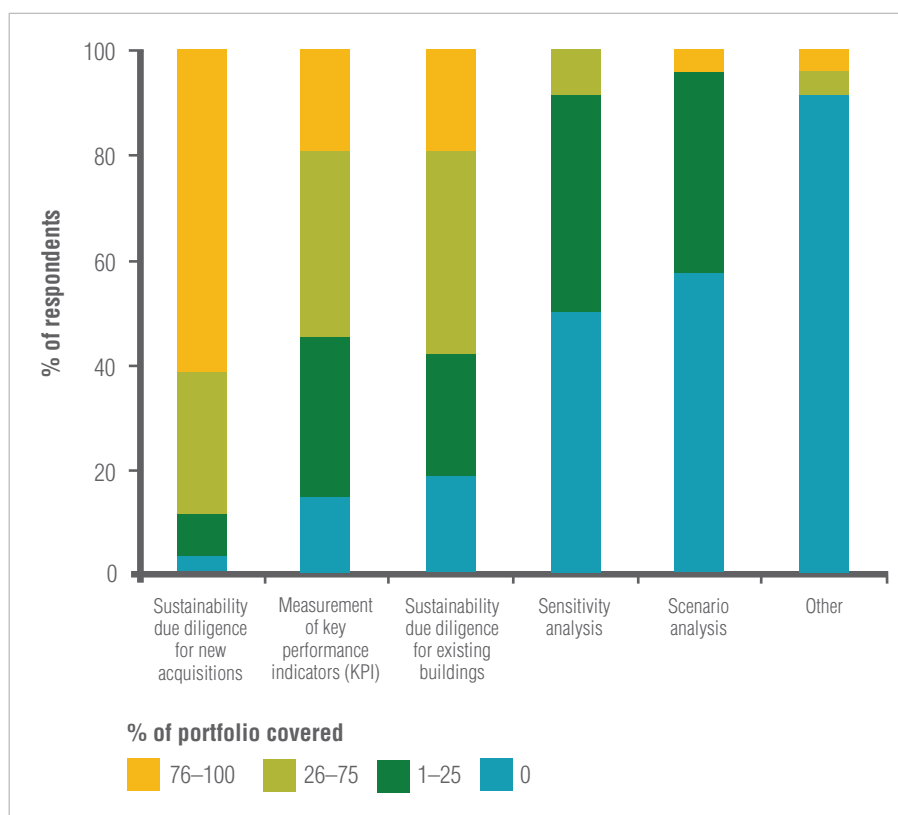
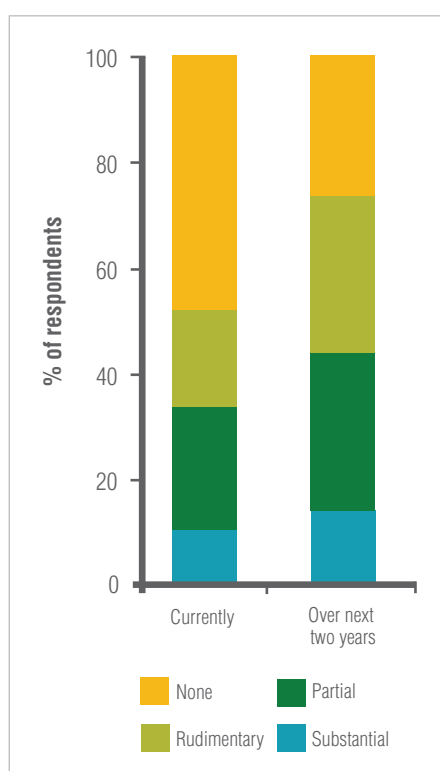


Figure 10: Level of Climate Change Risk Assessment Undertaken for Respondents' Portfolios



Where risk assessments are performed, they are not expected to result in major changes to levels of investment in real estate, or to locations of that investment (figure 11). When asked what conclusions respondents had drawn as a result of risk assessments, 56 percent said that their investment levels in real estate would be unaltered. Despite recognized differences in regional climate impacts, 63 percent of respondents do not necessarily believe that risk assessments would result in exclusion of a whole region. Two-thirds of respondents also do not believe that risk assessments would result in exclusion of specific real estate asset types.

Instead, the key implications of risk assessments are likely to be around investment decisions at the property level. In other words, the companies will choose to not invest in or to divest of specific properties with insufficient risk profiles, will seek reinforced adaptation measures for existing properties, and will require a higher rate of return on properties with insufficient climate resilience.

Figure 11: Conclusions Respondents Have Drawn from Their Climate Change Risk Assessments

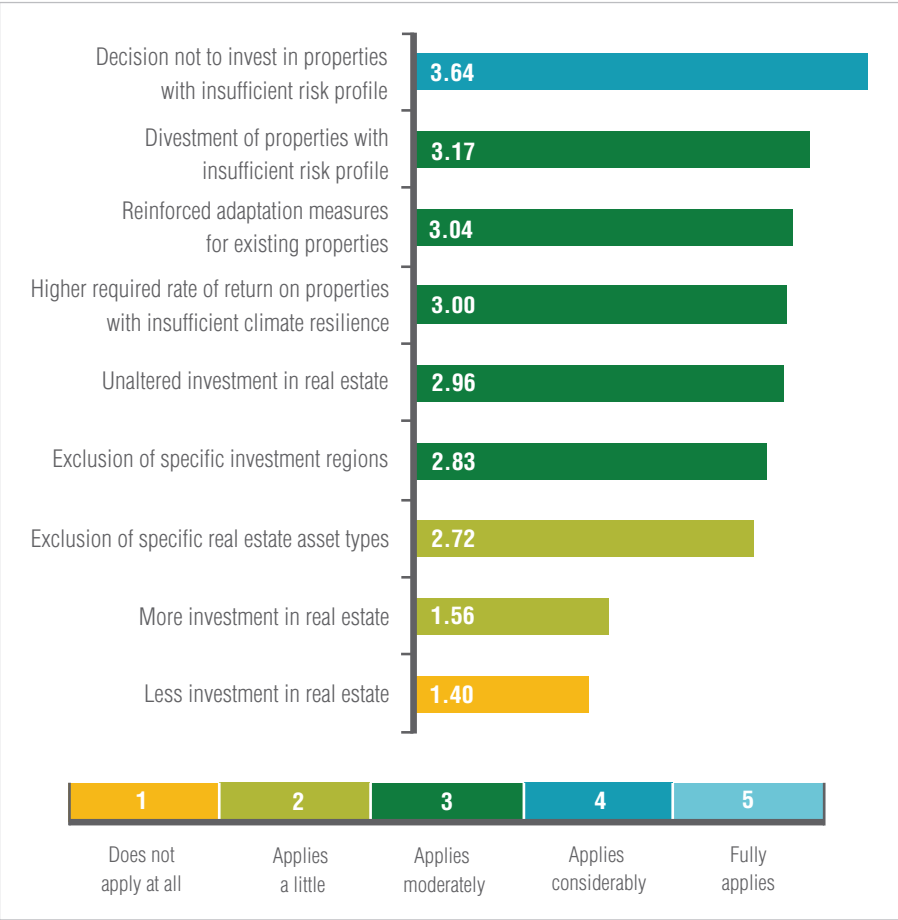


Figure 12: Green Building Certification Applied to Existing Properties in Portfolios

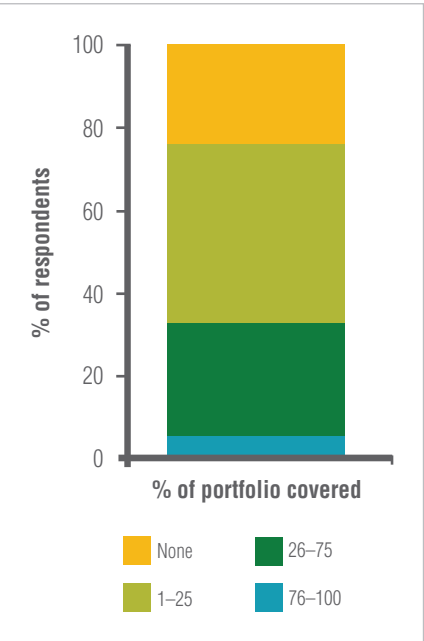
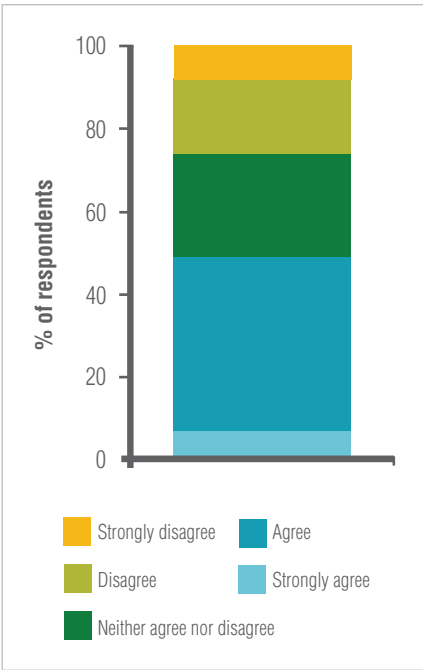


Figure 13: Responses to the Statement “Green Building Certificates Are an Appropriate Indicator for the Climate Resilience of Properties”



Measures to Improve Portfolio Performance

This section reviews methods currently employed to reduce portfolio risks from, and contributions to, climate change. The methods include green building certifications and green leases to various types of building improvements, including those to increase energy efficiency and investments in improved resiliency. Such tools address design and construction measures that improve the sustainability performance of existing buildings, reduce their contribution to climate change, and enhance their ability to withstand climate impacts.

Green Building Certifications

As a proxy for achieving general and specific improvements in the environmental footprint that buildings cause, many real estate players pursue green building certifications, such as LEED (Leadership in Energy and Environmental Design) or BREEAM (the Building Research Establishment Environmental Assessment Method) (figure 12). Green certifications are typically voluntary assessment methods that score new and existing buildings against a series of set criteria or requirements. Adherence with the criteria and scoring system is subject to independent, third-party verification before certifications are issued.

Half of respondents agree that green building certificates are an appropriate indicator for the climate resilience of properties (figure 13). Given that most certification programs are designed to address energy use and other environmental impacts of buildings, it is curious that respondents see them as indicators of resilience, which typically refers to the ability (of buildings) to withstand climate impacts.²⁸ This finding may indicate the need for additional tools that address resilience, or the need for an enhanced understanding of the term.

Figure 14: Improvement Measures Applied to Existing Properties in Portfolios

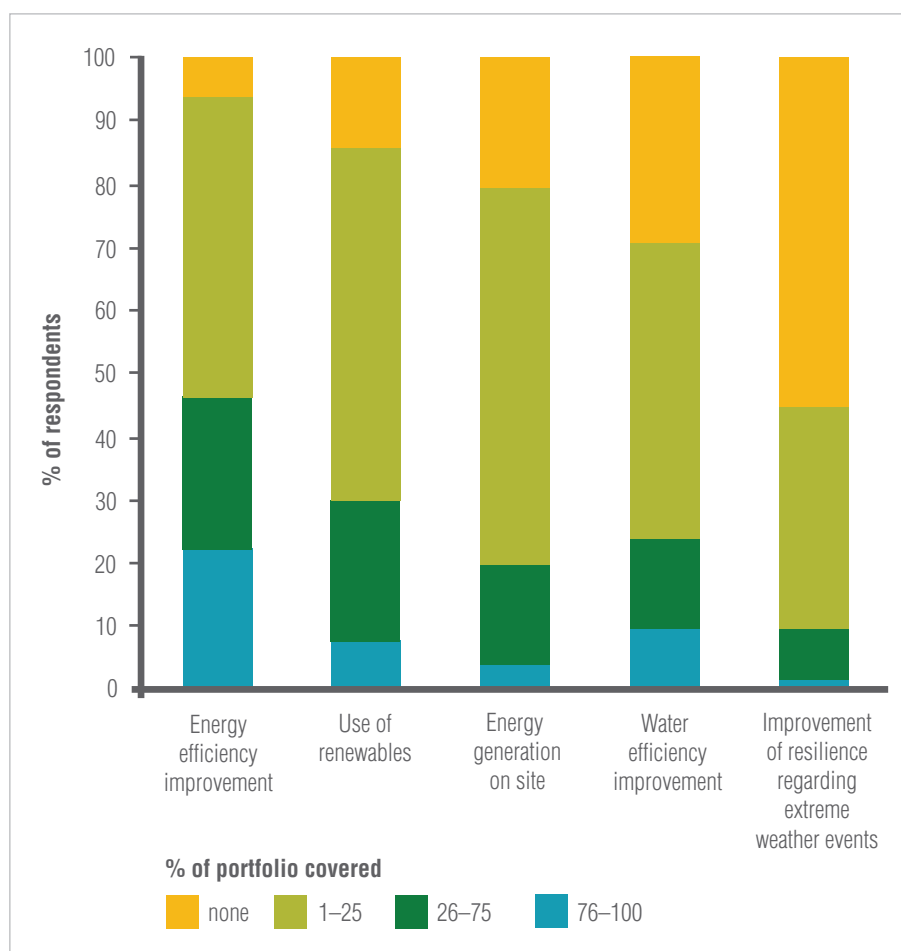
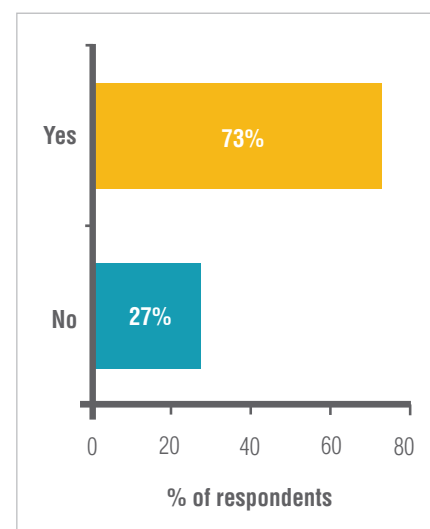


Figure 15: Respondents Who Reported That Adaptation Measures for Properties Were Included in Current Capital Expenditures Budget



Building Improvements

Although green building certificates may indicate design or construction measures aimed at improving the sustainability of a building (including reducing its energy use), reducing the greenhouse gas emissions of existing buildings requires investments in building improvements. Most survey respondents indicated that they are performing improvements on buildings in their portfolios, with energy retrofitting measures the most commonly reported type (figure 14). This rate is likely to increase, as indicated in a recent survey that highlights the growing importance of retrofitting.²⁹ Government policies will also be a driver for further improvements to existing

building stock. Following the signing of the Paris Agreement at COP 21 in 2015, and the agreement's subsequent ratification in 2016, countries are moving to achieve the goals set out in their Intended Nationally Determined Contributions (INDCs)—individual nations' pledges of action under the Paris Agreement. For example, Germany's INDC stated an aim of doubling the annual retrofitting rate for existing buildings, to around 2 percent.

Respondents are also implementing practice changes such as green procurement (69 percent) and green leases (63 percent) that drive environmental improvements.

The world needs to adapt to a changing climate, as well as prevent the cause to the extent possible. Almost three-quarters of respondents already include adaptation measures for properties in their capital expenditures budgets, but a quarter of respondents still do not include such measures (figure 15).

Although more than half of respondents expect an increase in their budgets for adaptation measures over the next five years, the majority of them expect that the increase will be very slight (5 to 10 percent). See figure 16.

Figure 16: Expected Growth in Capital Expenditures to Be Used for Adaptation Measures for Properties in the Next Five Years

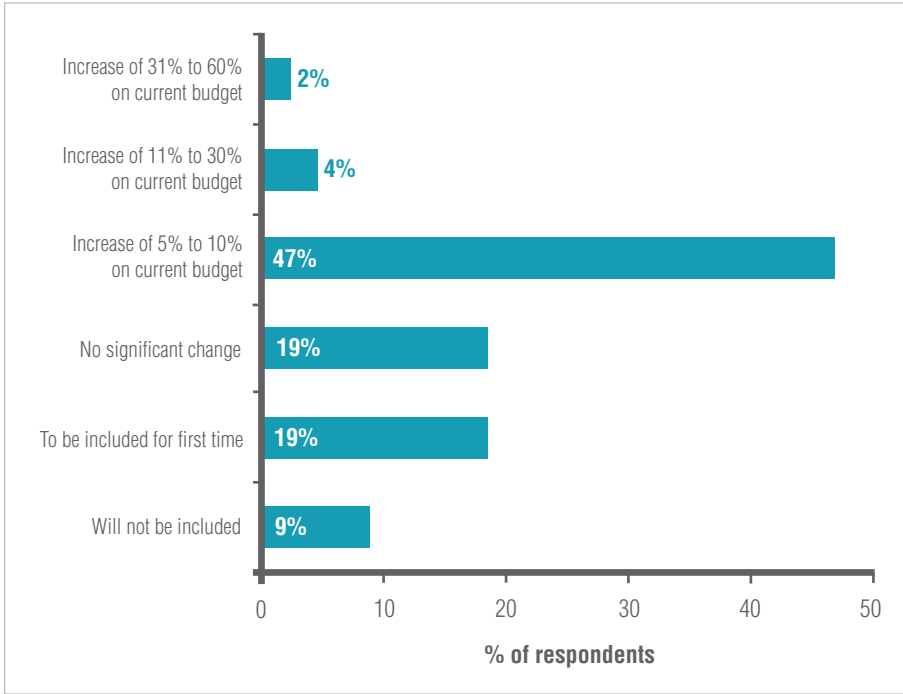
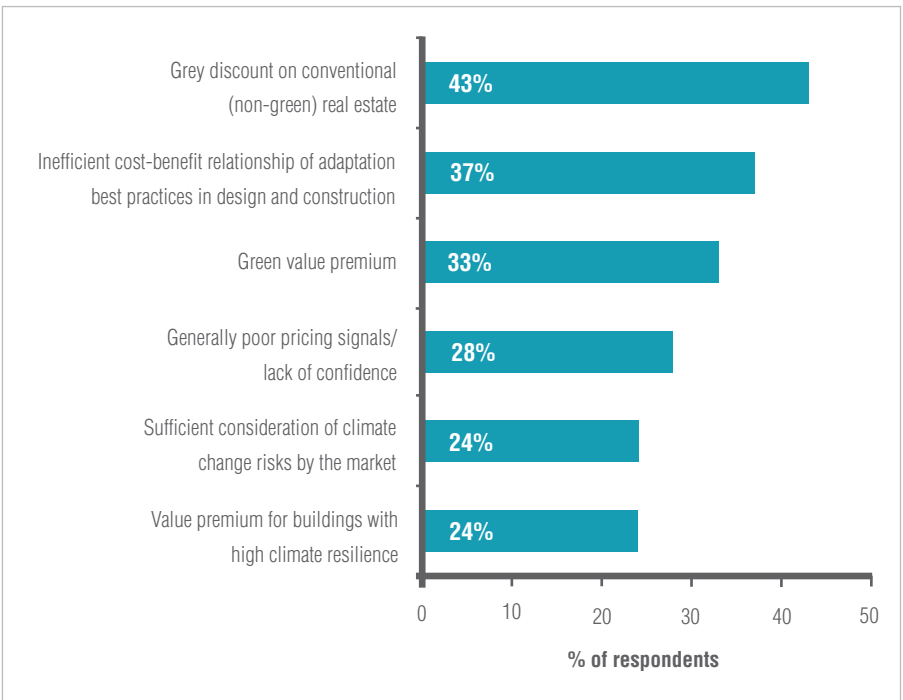


Figure 17: Market Impacts of Climate Change Observed by Respondents



Barriers and Opportunities

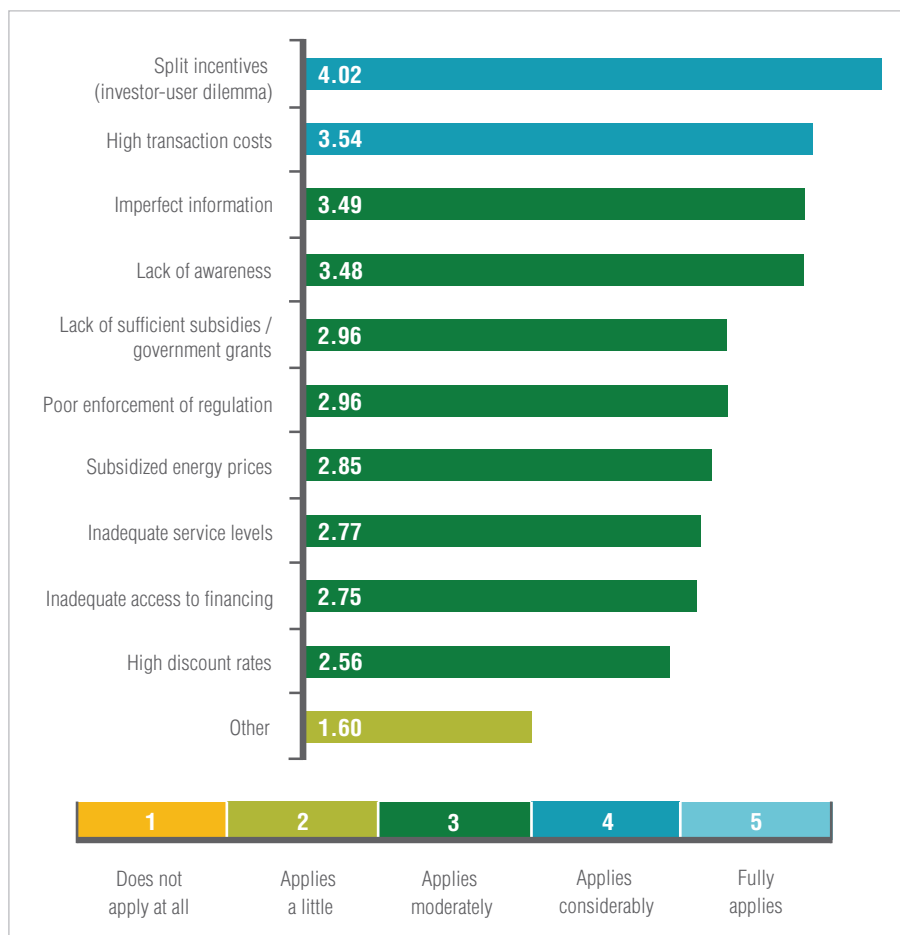
Market Responses

Market trends and signals have a key effect on real estate values and on practices throughout the industry. Investors may include new expectations and requirements in due diligence processes, and consumer preferences may shift because of an increased awareness of climate change. Survey respondents cited their observations of some market measures that already reflect a trend toward addressing climate change in real estate (see figure 17). The most commonly observed phenomenon is gray discount on conventional (non-green) real estate. There are, however, areas where market signals are not yet particularly strong. For example, only 24 percent of respondents observe that the market sufficiently considers climate change risks or awards value premiums for buildings with high climate resilience. This weak market reaction may explain responses in the previous section about expectations of growth in capital spending for climate adaptation.

Barriers to Making Building Improvements

Respondents identified several primary barriers to more expansive building improvement programs. Those included split incentives (94 percent), high transaction costs for sustainability-related investments and technologies (85 percent), insufficient information (83 percent), and lack of awareness (83 percent) (see figure 18). Transaction costs and split incentives could be addressed through further implementation of green leases. Green leases enable cost savings achieved through the implementation of more sustainable technologies to be shared by both landlords and tenants, and they permit more expansive use of tenant-space submetering. Likewise, landlord support of energy-efficient tenant buildouts, such as those implemented through the ULI Tenant Energy Optimization Program,³⁰ can help overcome the transaction cost concerns by demonstrating attractive returns on those investments.

Figure 18: Main Market Barriers for Faster Uptake of Green Retrofit Technology for Real Estate, as Identified by Respondents



In-House Sustainability Expertise Gap

Climate change is complex. Arguably, this complexity has worked against comprehensive climate action by the real estate industry.³¹ The lack of dedicated expertise on this topic may exacerbate the challenge. Less than a quarter of respondents indicated that climate change and sustainability are significant topics of discussion at the board level in their businesses, while nearly half say it is not discussed at all or only minimally (figure 19). Together, survey respondents (who represent €428 billion [US\$480 billion] AUM) have less than 100 people dealing with sustainability, but close to half of respondents have no full-time staff to address sustainability issues, and another fifth have only one person (figure 20).

Of those respondents who do not include adaptation measures in their capital expenditures budget, more than half have no full-time staff equivalent dedicated to sustainability issues. The absence of in-house sustainability expertise may result in insufficient knowledge to respond to climate change impacts, but it simultaneously presents an opportunity that the real estate industry can address itself more easily than it can the difficulty in affecting market responses. The sustainability work may be picked up in many companies by individual asset managers, or companies may use specialist advisers to carry out those tasks. What options, if any, are taken should be a topic for future research.

Figure 19: Extent to Which Climate Change and Sustainability Are a Topic of Board-Level Discussion, by Percentage of Respondents

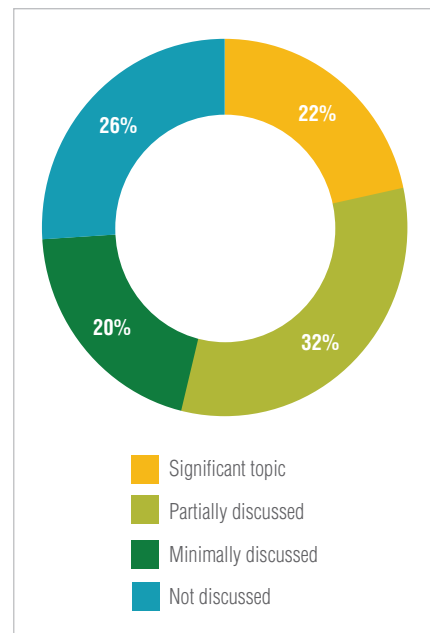
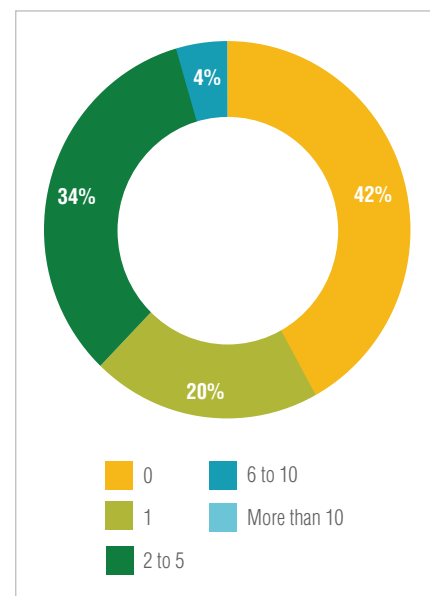


Figure 20: Number of Full-Time Equivalent Staff Dedicated to Sustainability Issues, by Percentage of Respondents



Conclusion

This report has focused on both the potential impact that climate change may have on real estate portfolio management and the actions that portfolio holders are taking in response.

In terms of their awareness of the effects of climate change, survey respondents, in general, were fairly well informed, but there is room for improvement. Key current and anticipated future issues that may result from climate change are changing technological requirements and increasing higher operational costs and migration. The first two will have cost implications for the real estate sector, whereas the latest will affect demand.

Respondents broadly recognize the need to understand the risks that climate change impacts pose to their real estate portfolios. Respondents are most comfortable with undertaking risk assessments by using sustainability due diligence and KPI measurements. However, the key tools recommended by the IPCC—scenario and sensitivity analyses—remain underused. Almost all respondents use green building certifications for at least a share of their portfolio and see them as a proxy for enhanced resilience. Most respondents are also retrofitting with indications that such work will continue to increase.

When it comes to taking action to respond to climate change risks, a number of barriers exist in the real estate sector. Greater investment in building improvements is prevented by factors that include high transaction costs, lack of awareness, and insufficient information for retrofitting. In addition, the market does not yet fully value some investments, such as improvements to building resilience. Many opportunities are available for improving portfolio management, such as increasing in-house expertise on assessing and responding to climate risk.

Implications and Future Research

The findings addressed in this report indicate some actions that are advisable for dealing with the future implications of climate change for portfolio management, and for the real estate industry more broadly.

- **Address knowledge gaps.** Portfolio managers and other real estate professionals will need to enhance their understanding of and strategies for addressing climate change within their portfolios, both in terms of the direct impacts that climate change will have on assets and in the ways in which regulatory and market responses may affect demand and costs. In cases in which dedicated staff members are not employed, investors and asset managers should ensure that relevant staff members, advisers, and board members have the required expertise.
- **Enhance risk assessments.** Risk assessments that include sustainability and climate change factors are critical for informing business strategy. Expanding the application and rigor of these tools is necessary to improve decision making in the face of climate change, including about whether to divest of assets or markets or about how much to invest in resilience or energy efficiency measures. Given uncertainties around climate impacts, more robust tools—such as scenario and sensitivity analyses—should be more widely used. Portfolios should be screened for highly vulnerable properties in regions where significant negative impacts are anticipated, and exit or adaptation strategies should be developed.

- **Prevent timescale mismatches.** Although extreme temperatures, sea level changes, and other climate effects are expected to have the most impact from 2025 onward, regulations, technology, and consumer preferences are evolving quickly and may be relevant today and within the next decade. Short-term investment horizons and limited holding periods might be misleading because terminal values are potentially affected by climate change in any case. Long-hold investors should assess climate impacts beyond the next ten years and should include both direct climate changes (temperature, precipitation, sea level rise) and potential carbon constraints imposed by regulations and market demands.

As the implications of climate change become ever more apparent, a variety of drivers, from public policy and market shifts to tenant demand and corporate responsibility strategies will continue to push the real estate industry to respond and adapt. Future research on this rapidly changing area of real estate practice should focus on

- Data management needs and applicability of downscaled climate data for real estate decision making; and
- Development of the relevant tools for strategic planning, asset screening, and portfolio analysis.

Appendix: Methodology

The research used to develop this report was conducted using a survey. Participants were selected using “purposive sampling.”³² Senior executives at leading real estate investment and management firms were identified and asked to participate in the survey. An overview of the profiles of the 50 survey participants is provided in section 1 of the report.

The survey comprised 22 questions, with two types of closed questions used: multiple choice and ranking questions. Multiple choice questions facilitated analysis of frequencies and trends, whereas ranking questions allowed comparisons of perceptions of respondents. The survey used ranking questions to investigate real estate investors’ expectations of climate change impacts across regions, their

portfolios and businesses, and their expected severity of impacts. It used multiple choice questions to investigate how real estate investors and managers address climate change within their portfolios, what changes they expect in their practices over time, what different measures and responses they use, and which barriers and opportunities to more expanded action exist within the real estate sector. The survey included the opportunity for respondents to provide additional comments on certain questions, but only one respondent used this option.

Both types of questions yield quantitative data that researchers interpreted using Excel software. A limitation of relying solely on quantitative research is that it does not provide

explanations for responses. To address this limitation of the work, the ULI staff and members provided expert input to provide further detail and clarifications.

The method presents reliability and validity challenges. A reliable measurement procedure can be replicated by different researchers and still produce the same results, while a valid measurement procedure measures the “real” meaning of the concepts being investigated.³³ This research addresses reliability concerns by adopting a clear and structured research methodology. Validity is achieved through cross-referencing between the quantitative survey data and the input from ULI experts.



Notes

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¹³ G. O. Magrin et al., "Central and South America," in *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, ed. V. R. Barros et al. (Cambridge, U.K.: Cambridge University Press, 2014), 1499–1566.

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