International focus centered on adapting and mitigating the effects of climate change has intensified in recent years. This was exemplified when nearly 200 countries agreed late last year to take steps to cut global emissions to a level that would avoid the worst effects of climate change. The agreement, termed the Paris Accord, comes on the heels of new research indicating the world is already facing the impacts of climate change. Scientists warn climate change could reach devastating levels without significant proactive efforts to curb emissions and increase resiliency. The Paris Accord could provide the impetus for a transition to a lower carbon world—as long as countries execute their commitments. Insurers will need to prepare for the adverse weather impacts from an unavoidable warmer world, as well as new risks arising from a transition to a low carbon future.

This article examines the Paris Accord, U.S. efforts to lower carbon emissions, and what scientists are telling us on the current and future environmental impacts of climate change. Additionally, the article identifies the risk of climate change to insurers and how they are responding to the low carbon movement.

♦ THE PARIS ACCORD
On Dec. 12, 2015, leaders from 195 countries signed a historic accord to limit the rise in greenhouse gas emissions to below 2% of the pre-industrial level at the 21st Conference of Parties (COP21) in Paris. The accord establishes a legally binding framework for countries to monitor and report their efforts to transition to a lower carbon world. As part of the framework, countries are required to submit their long-term emission-cutting plans by 2020. Countries are then required to reassess and adjust their plans and publicly report their progress on meeting their commitments every five years.

Limiting global warming to two degrees Celsius above pre-industrial levels is an important threshold. Many scientists predict this threshold cannot be surpassed if the worst effects of climate change are to be avoided. According to the Intergovernmental Panel on Climate Change (IPCC), the average global temperature rose 0.85 degrees Celsius between 1880–2012. Scientists warn nations will need to cut emissions substantially to stave off destructive and unstable weather patterns that would contribute to rising sea levels, droughts, flooding and water shortages. Many scientists have advocated for a stronger target to safely avoid irreversible devastating weather patterns. Additionally, several countries have advocated for a lower emissions target to limit the impact to small island states at risk of losing the most from climate change, despite contributing the least to it. For this reason, the accord also includes language to pursue efforts to limit long-term global temperature rise to 1.5 degrees Celsius.

♦ THE GAP
Although ambitious, the emission targets established during COP21 are estimated to achieve only about half of the necessary emissions cuts needed to reach the two-degree Celsius target and avoid the most devastating consequences of climate change. Many nations submitted their intended nationally determined contributions (INDC) prior to the conference, publicizing what climate actions they intend to take to cut emissions through 2030. The United Nations Environment Programme’s (UNEP) annually published Emissions Gap Report provides a scientific assessment of the mitigation contributions from the countries that submitted INDCs. The 2015 report analyzed 119 INDCs from 146 countries, representing 88% of global emissions. It estimated emission levels in 2030 from fully implemented INDCs would result in the earth warming to almost three degrees by the end of the century. An additional 12 gigatonne in emission cuts will be needed to reach the level sufficient to achieve the target of two degree Celsius by 2100.1 To bridge the gap, the report suggests an expansion of efforts around energy efficiency, renewable energy technologies, city and regional initiatives, and forest mitigation actions.

♦ THE RISK OF NONCOMPLIANCE
The accord provides an international framework for cutting emissions with legally required measuring and reporting requirements, but countries’ individual commitments are voluntary. As such, its success hinges largely on countries’ abilities to implement their agreed upon carbon reductions. The U.S. commitment was largely based on curbing carbon emissions from power plants, which account for about one-third of all domestic greenhouse gas emissions, and transitioning to renewable energy.2 As a first step, the U.S. Environmental Protection Agency (EPA) proposed carbon standards for new power plants in September 2013. In November 2014, the U.S. and China issued a bilateral announcement to jointly reduce emissions. In September 2015, the U.S. and China then issued a Joint Presidential Statement of Climate Change, building on the previous year’s agreement and

(Continued on page 17)

setting common goals for an agreement at COP21. This agreement between the U.S. and China, the world’s largest polluters, helped secure commitments from other nations.

However, the U.S.’s ability to comply with the accord has recently been put into question, leading to additional concerns on the commitments of other countries. On Feb. 9 of this year, the U.S. Supreme Court halted the implementation of the current administration’s Clean Power Plan following a lawsuit filed by 27 states challenging the plan’s legality. The plan was aimed at reducing carbon emissions 32% from 2005 levels by 2030 by setting carbon emission reduction standards for existing power plants and implementing incentives for states to transition to renewable energy. The D.C. Circuit Court of Appeals will take the issue up on June 2, 2016. Although any mandatory implementation of the plan’s regulations are suspended until after the Court takes up the issue, individual states can still choose to implement the plan voluntarily. Additionally, new power plants would still be addressed under the proposed EPA regulations, which the EPA has stated will be finalized by mid-summer 2016.

*Climate Change is Here*

The COP21 accord comes at an important time. The world is already beginning to experience the effects of climate change, making the need to respond to the inherent risks both a current and a long-term need. Given its probability and potential for significant worldwide disruption, the World Economic Forum 2016 Global Risks Survey identified failure to adapt and mitigate climate change as the risk with the greatest potential impact in 2016. Additionally, the report found climate change is amplifying other risks such as water crisis, food shortages, migration and security, which in turn further hampers mitigation and adaptation efforts. The report is based off of an annual survey of 750 experts’ perspectives on 29 global risks over a 10-year time frame.

The IPCC’s Fifth Assessment Report (AR5) found the globally averaged combined land and ocean surface temperatures warmed 0.85 degrees Celsius between 1880–2012 (Figure 1). Figure 1 also shows global average surface temperatures warmed 1 degree Celsius from the preindustrial mean temperature. Additionally, the IPCC AR5 found emissions of greenhouse gases have continued to rise over the last three decades and are currently the highest in history. The report found more than half of the earth’s warming is linked to human activities. The recent rise in temperature was primarily driven by economic and population growth increasing fossil fuel carbon emissions, particularly from coal. The IPCC report is designed to inform policymakers and assist the work of the United Nations Framework Convention on Climate Change (UNFCCC). The IPCC is an intergovernmental organization that leverages the research of scientists globally to produce reports on climate change. The UNFCCC is the main international treaty on climate change.

![Figure 1: Climate Change Indicators](image)

Source: IPCC AR5 Synthesis.

The implication of a warming world is evidenced across the globe. The IPCC AR5 concluded rising surface temperatures have likely changed the global water cycle, contributing to the Arctic sea-ice melting, ocean warming and sea-level rise observed since the mid-20th century. Arctic sea-ice has decreased every decade since 1979. In annualized mean terms, Artic sea-ice decreased 3.5% to 4% per decade between 1979–2012. More than 90% of the earth’s temperature rise between 1971–2010 is stored in oceans. This has resulted in a 0.11 degree Celsius increase in temperature in the upper ocean during this period, as well as a 26% increase in water acidity from pre-industrial times. Terrestrial ice melts from higher surface temperatures and water expansion from ocean warming continue to increase sea levels. Global average sea level rose 19 cm to 21 cm from 1901 to 2010.

These environmental changes have been accompanied by changes in the earth’s ecosystems, weather patterns and crop yields. Additionally, changing precipitation patterns combined with snow and ice melt are affecting water quantity and quality in many regions. Weather-related extremes—such as heat waves across Europe, Asia and Australia; droughts; floods from extreme precipitation; and wildfires—are increasing in frequency.

It should be noted there is still some controversy surrounding the anthropogenic nature underlying climate change. However, the AR5 report points out changes in the climate are responsible for these observed impacts on natural systems, regardless of attribution to the cause of climate change.

**Future Climate Change Predictions**

Climate change is projected to continue to increase in the coming decades, but the extent to which it will change depends greatly on how and when the world responds. The IPCC AR5 predicts average global surface temperatures will likely rise by 0.3 degrees Celsius to 4.8 degrees Celsius above the 1986–2005 average by 2100. This prediction is based on a range of emissions scenarios predicting future climate change (Figure 2). The scenarios incorporate various assumptions such as climate policy, advances in technology, energy demand, and population and economic growth. The scenarios assess the resulting impact of various response levels, ranging from no actions to aggressive actions, taken to mitigate climate change.

(Continued on page 19)

**Figure 2: Comparison of IPCC Most Aggressive Mitigation Scenario to ‘Business as Usual’ Scenario**

| (a) Change in average surface temperature (1986–2005 to 2081–2100) |
|-------------------------|-------------------|
| RCP2.6                  | RCP8.5            |
| 32                      | 39                |

| (b) Change in average precipitation (1986–2005 to 2081–2100) |
|-------------------------|-------------------|
| 32                      | 39                |

Change in average surface temperature (a) and change in average precipitation (b) based on multi-model mean projections for 2081–2100 relative to 1986–2005 under the RCP2.6 (left) and RCP8.5 (right) scenarios. The number of models used to calculate the multi-model mean is indicated in the upper right corner of each panel. Source: IPCC AR5 Synthesis.
Climate Change and the Insurance Industry

There is a growing movement among insurers on the need to prepare for the potential impact of climate change-related risks. Many insurance segments are facing changing risks from the increase in frequency and severity of extreme weather events in recent decades. Beyond weather-related risks from a warming world, insurers could also face risks from a changing economy. As the world prepares to mitigate the most extreme effects of climate change through international policy agreements, insurers could face additional risk from changing economic conditions.

These additional risks were outlined in the Prudential Regulation Authority (PRA) of the Bank of England report, *The Impact of Climate Change on the U.K. Insurance Sector.* The report identifies three main channels through which climate change may affect the insurance sector: 1) direct and indirect physical risks from weather-related events; 2) transition risks from the transition to a lower-carbon economy; and 3) liability risks from parties who have suffered loss and damage from climate change and are attributing causation to the insured.

**Physical Risks**

The PRA report warned increases in physical risks due to climate change could present significant challenges to insurers’ business models. Physical risks include losses stemming from weather-related events. According to Munich Re, severe weather events, heat waves, droughts, floods and tropical storms have accounted for 85%–90% of natural hazards since 2005. Insurers’ exposure to physical risks is largely from indirect exposure to the physical assets they insure. Additionally, insurers face potential losses from first-party claims to business interruption, contingent business interruption and builders’ risk from weather disasters. Insurers may also face direct losses to real estate holdings, which could pressure the asset side of the balance sheet. It is well accepted that potential losses from physical risks are rising as populations migrate to areas with higher natural catastrophe risk, such as coastlines and wildfire-prone regions. However, the PRA warns there are indications climate change is also influencing loss patterns, which could challenge insurers’ modeling assumptions because of higher weather volatility.

**Liability Risks**

The PRA report highlighted coverage for insured liability risks from climate change is an emerging risk for insurers providing liability coverage. Climate change could affect third-party claim costs for coverages such as directors’ and officers’ liability, comprehensive general liability, employers’ liability, and errors and omissions liability. The PRA report points out liability insurers could be legally liable for losses from parties seeking compensation for the insured’s alleged failure to prevent climate change damages. Legal liability for climate change damages could potentially result from the insured’s failure to mitigate and adapt to climate change. This would include acts such as failure to reduce emissions, protect against physical risks or institute proper governance. Failure to properly disclose climate-related risks or comply with climate legislation or regulations could also potentially be a legal liability for insurers.

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6 Ibid.
7 Ibid.
8 Available at: www.bankofengland.co.uk/prd/documents/supervision/activities/pradefra0915.pdf
Transition Risks
The PRA warned insurers face potential risks from the transition to a lower-carbon world. Climate policies, technology advances and physical asset risks could potentially devalue certain assets. This could place pressure on insurers’ assets and investment income.

According to IPCC AR5 emissions scenarios, the world will reach its carbon budget limit—the maximum emitted carbon allowable to remain at the 2-degree Celsius warming target—in approximately 20 years. This will leave a good deal of the earth’s oil, gas and coal reserves as undeveloped. Assets dependent on fossil fuels would become stranded, resulting in the repricing of carbon-heavy investments. Insurers who do not account for this potential in repricing could see negative impacts to their long-term assets and the liabilities they were meant to match.

Regulations or climate policies can also negatively affect fossil fuel prices, leading to stranded assets. Additionally, economic factors unrelated to climate change could affect the production and pricing of fossil fuels. Changes in investor preferences and sentiment can also affect asset values. For instance, a large natural catastrophe or new climate science findings can change investor preferences related to fossil fuel investments. Furthermore, technological advances could facilitate a shift from high-carbon to low-carbon energy sources by making clean technologies more affordable. Shifts in investment strategies from companies voluntarily embracing the social campaign for fossil fuel divestment could also intensify a demand shift from high- to low-carbon investments.

Assessing Investment Portfolio Carbon Risk
As some of the world’s largest investors, insurers must assess the asset implications of an international move to lower-carbon energy sources. Insurers should anticipate the potential risks arising from this transition and allocate investments in a way that supports their strategic long-term objectives. Insurers who fail to adequately address climate-related risks in their investment portfolios expose themselves to reputational risk and potential solvency stresses.

In January 2015, Towers Watson published a paper, Fossil Fuels: Exploring the Stranded Assets Debate, outlining a framework for investor response to fossil fuel investments. In the paper, the consultancy firm stated it did not advocate for a particular response but it did believe companies with medium- to long-term investments should consider the potential for stranded asset risk. Companies are anticipated to use the framework based on their individual exposure assessments and unique investor beliefs and strategies. The framework calls on investors concerned with stranded assets to influence policy and investor practices through engagement. Investors may limit downside risk by reducing their portfolio’s exposure to carbon-intensive investments. Another strategy is to hedge against downside risk by investing in clean and renewable technologies. Additionally, investors may choose to eliminate stranded asset potential by divesting carbon intensive investments.

Timing of divestiture is a key market consideration. The fluidity in assumptions required in predicting the path of carbon-intensive asset demand and prices will complicate insurers’ ability to identify which fossil fuels to prioritize for divestiture. Additionally, unpredictability in timing of investment risk could potentially leave insurers at risk for divesting too soon or too late.

Asset stress testing should be an important part of an insurer’s risk management protocols. Additionally, insurers should consider related investments along the value chain when measuring their portfolio’s carbon exposure. There are several methods used to measuring carbon risk in equity and credit investments. The most commonly used approach is the Greenhouse Gas Protocol (GHGP), which categorizes carbon emissions as either direct or indirect. Other practices include measuring exposure to fossil fuels in relation to a particular financial metric.

The Insurance Industry Begins to Respond to the Low-Carbon Movement
Insurers contribute to climate change initiatives in several ways. They support financial viability and sustainability by compensating damages from extreme events and lowering risks through mitigation initiatives. Insurers enable renewable energy products and green infrastructure development by providing innovative product coverage. Additionally, a growing number of insurers are supporting a lower carbon economy through investments in clean and renewable technologies and energy efficiency.

In May 2015, AXA announced it would divest $554 million in coal investments. The company stated it would divest investments in mining companies with more than half their

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9 Ibid.
11 Ibid.
turnover from coal mining. It also planned to divest electrical utilities with more than half their energy derived from thermal coal plants. Additionally, the company committed to tripling its green investments to $3.3 billion by 2020 and providing more climate related disclosures.\(^1\) QBE announced the following month a three-year plan to invest up to $78.11 million in green bonds. Zurich has also stated it will invest more than $2 billion in green bonds.\(^1\)

Aviva joined the list of companies entering divestment campaigns in July 2015 when it announced it would divest from fossil fuel companies not investing in emissions reduction technologies.\(^2\) It also stated it planned to invest £500 million ($698 million) a year over five years in low-carbon technologies. In November, Alliance also stated it would eliminate €4 billion ($4.4 billion) in coal investments in favor of wind power investments.\(^3\) Additionally, Munich Re reached its goal to become carbon-neutral in 2015.\(^4\)

In January of this year, California Insurance Commissioner Dave Jones called for U.S. insurers doing business in his state to join the list of international insurers de-carbonizing their investment portfolios. The divestment request is the first from a state insurance regulator. Divestment is voluntary and applies to thermal coal investments or any company deriving 30% or more of its revenues from thermal coal. Commissioner Jones also stated an annual data call will be initiated this April requiring insurers licensed in California and writing more than $100 million in premium to disclose carbon-based investments. In his announcement, Commissioner Jones stated public disclosures will assist regulators, policyholders and investors in examining financial risk from carbon-based assets.\(^5\)

California’s call for coal divestiture is aimed at protecting insurers from the potential for stranded assets. Recent price devaluations for both coal and coal extraction companies illustrate the potential for stranded assets. The coal industry has lost about three-quarters of its value, with coal prices falling to $50/tonne in 2015 from its peak of $200/tonne almost seven years earlier.\(^6\) Falling prices are the result of declining demand and rising coal supplies. The reduction in demand is linked in part to reduced consumption from coal’s biggest consumer, China, as it transitions to renewable energy sources. In the U.S., cheaper natural gas prices and new regulations have decreased the demand for coal. It should be noted that coal accounts for about half of the world’s carbon risk.\(^7\) Future prices and mine asset valuations could deteriorate further as the world transitions to lower carbon energy sources.

\section*{THE FUTURE}
As the IPCC AR5 illustrates, the effects of a changing climate are becoming more prevalent. The frequency and intensity of extreme weather events, likely exacerbated by climate change, have increased notably in recent decades. Furthermore, even the best-case emissions reduction scenario reported in the IPCC AR5 predicts irreversible warming. If left unchecked, the world could face trillions of dollars in financial losses. This could challenge insurers’ existing business models and have adverse effects on the availability and affordability of insurance. Many researchers warn the interconnectivity of risk will eventually result in every asset being directly or indirectly affected by climate change. Many insurance segments are already facing changing risks. As such, it is important insurers examine their role in the transition to a lower carbon world. Adaptation and mitigation of the worst of climate change’s impacts should be a central focus to help stabilize vulnerability to the changing risk landscape.

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Anne Obersteadt is a researcher with the NAIC Center for Insurance Policy and Research. Since 2000, she has been at the NAIC performing financial, statistical and research analysis on all insurance sectors. In her current role, she has authored several articles for the CIPR Newsletter, a CIPR Study on the State of the Life Insurance Industry, organized forums on insurance related issues, and provided support for NAIC working groups. Before joining CIPR, she worked in other NAIC Departments where she published statistical reports, provided insurance guidance and statistical data for external parties, analyzed insurer financial filings for solvency issues, and authored commentaries on the financial performance of the life and property and casualty insurance sectors. Prior to the NAIC, she worked as a commercial loan officer for U.S. Bank. Ms. Obersteadt has a bachelor’s degree in business administration and an MBA in finance.

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