

**CLIMATE
EVERYONE'S
BUSINESS**



Climate Change: Implications for Investors and Financial Institutions

Key Findings from the
Intergovernmental Panel
on Climate Change
Fifth Assessment Report





The Physical Science of Climate Change

Rising temperatures:

The Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) concludes that climate change is unequivocal, and that human activities, particularly emissions of carbon dioxide, are very likely to be the dominant cause. Changes are observed in all geographical regions: the atmosphere and oceans are warming, the extent and volume of snow and ice are diminishing, sea levels are rising and weather patterns are changing.

Projections:

Computer models of the climate used by the IPCC indicate that changes will continue under a range of possible greenhouse gas emission scenarios over the 21st century. If emissions continue to rise at the current rate, impacts by the end of this century are projected to include a global average temperature 2.6–4.8 degrees Celsius (°C) higher than at present, and sea levels 0.45–0.82 metres higher than at present.

To prevent the most severe impacts of climate change, parties to the UN Framework Convention on Climate Change (UNFCCC) agreed a target of keeping the rise in average global temperature since pre-industrial times below 2°C, and to consider lowering the target to 1.5°C in the near future.

The first instalment of AR5 in 2013 (Working Group I on the physical science basis of climate change) concluded that by 2011, we had already emitted about two-thirds of the maximum cumulative amount of carbon dioxide that we can emit if we are to have a better than two-thirds chance of meeting the 2°C target.

Impact of past emissions:

Even if emissions are stopped immediately, temperatures will remain elevated for centuries due to the effect of greenhouse gases from past human emissions already present in the atmosphere. Limiting temperature rise will require substantial and sustained reductions of greenhouse gas emissions.

About this document

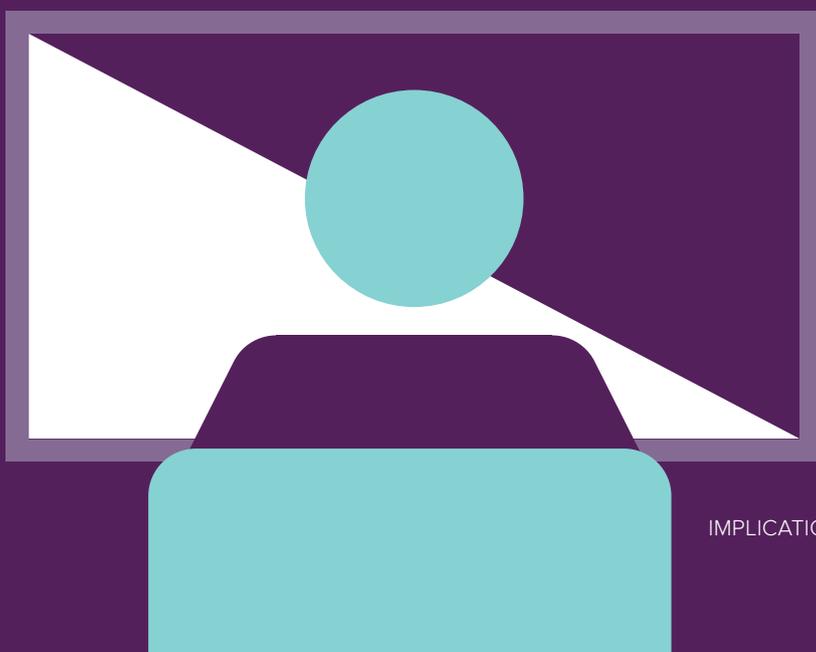
The Fifth Assessment Report from the Intergovernmental Panel on Climate Change is the most comprehensive and relevant analysis of our changing climate. It provides the scientific fact base that will be used around the world to formulate climate policies in the coming years.

This document is one of a series synthesizing the most pertinent findings of AR5 for finance and investment sectors. It was born of the belief that investors and financial institutions could make more use of AR5, which is long and highly technical, if it were distilled into an accurate, accessible, timely, relevant and readable summary.

Although the information presented here is a 'translation' of the key content relevant to this sector from AR5, this summary report adheres to the rigorous scientific basis of the original source material. Specific numbers and their references from AR5 chapters can be found in the Endnotes.

Grateful thanks are extended to all reviewers from both the science and business communities for their time, effort and invaluable feedback on this document.

The basis for information presented in this overview report can be found in the fully-referenced and peer-reviewed IPCC technical and scientific background reports at: www.ipcc.ch

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FOR MORE INFORMATION:

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Key Findings

- 1 Climate change will affect all sectors of the economy, and is relevant to investors and financial institutions.** However, not all macroeconomic changes and microeconomic conditions will apply equally to all investments.
- 2 There are risks and opportunities associated with policy measures directed at reducing greenhouse gas (GHG) emissions.** To meet the internationally agreed target of keeping the global average temperature rise since pre-industrial times below 2°C, patterns of investment will need to change considerably. This will include significant decreases in investment in fossil fuel extraction and conventional fossil fuel-based power generation, and significant increases in investment in low-carbon energy and energy efficiency.
- 3 Physical impacts of climate change will affect assets and investments.** Climate change and extreme weather events will affect agriculture and food supply, infrastructure, precipitation and the water supply in ways that are only partially understood.
- 4 Decisions made by private sector investors and financial institutions will have a major influence** on how society responds to climate change.
- 5 There will be significant demand for capital, with governments looking to the private sector to provide much of it.** To keep the global temperature increase below 2°C, additional investment required in the energy supply sector alone is estimated to be between USD 190 and 900 billion per year through to 2050¹, accompanied by a significant shift away from fossil fuels towards low-carbon sources such as renewables and nuclear.

Executive Summary

Investors and financial institutions are, and will continue to be, exposed to downside risks as a result of climate change. The risks include: macroeconomic impacts such as the expected reduction in productivity and economic growth in many developing countries, direct physical impacts of climate change such as flood and storm risks to coastal population centres, and the impacts of policy measures directed at reducing GHG emissions from electricity generation, large industrial sources, transport and other economic sectors.

The investment consequences may include dramatic reductions in the value of particular assets, such as conventional coal-fired power stations that are no longer permitted to operate because of constraints on their GHG emissions. There will be indirect and knock-on effects of climate change, such as the threat to social stability posed by high and volatile food prices resulting from changes in agricultural patterns.

Climate change also presents opportunities for investors and financial institutions. Policy measures directed at reducing GHG emissions are likely to increase opportunities for investment in areas such as renewable energy and energy efficiency, and in companies with expertise in areas such as flood prevention or flood response.

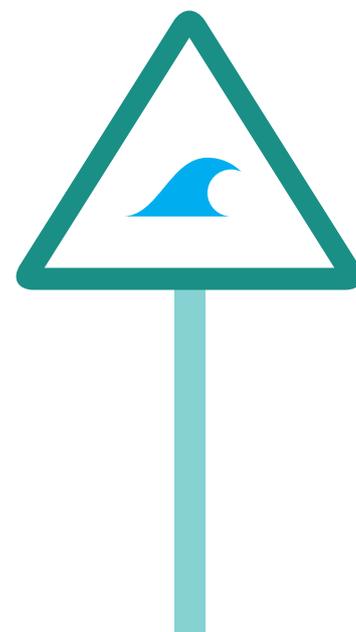
More generally, irrespective of the specific policy measures adopted, it is likely that governments will look to the private sector to provide much of the capital required to reduce emissions and to address, or respond to, the physical impacts of climate change.

The investment (or capital allocation) decisions that investors and financial institutions make will be critical in determining how society responds to climate change. This is particularly important for investments in areas such as infrastructure and power generation, where assets often have 'planned lifetimes' of many decades. Investment decisions made now are likely to continue to have a major influence on infrastructure, GHG emissions and society in 2050 and beyond.

Investors and Financial Institutions

This report focuses on private sector providers (or sources) of capital, and the intermediaries responsible for deployment of this capital. These intermediaries include banks and asset managers. Asset owners include pension funds, insurance companies, sovereign wealth funds, mutual funds and foundations. Together these investors and financial institutions manage the pensions and savings of individual citizens.

Physical Impacts of Climate Change



Governments are likely to look to the private sector to provide much of the capital required to deliver significant reductions in GHG emissions and respond to physical impacts of climate change.

Exposure of Investors and Financial Institutions

Sea-level rise, floods and drought

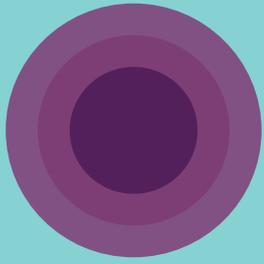
Between the 1950s and 1990s, the annual economic losses from large extreme weather events, including floods and droughts, increased ten-fold. In the period from 1990 to 1996 alone, there were 22 floods with losses exceeding US dollar (USD) 1 billion each².

The Low Elevation Coastal Zone (LECZ) is particularly exposed to the effects of climate change. This zone constitutes 2% of the world's land area but contains 10% of its population. The number of people exposed to the 1-in-100 year extreme sea-level event (i.e. the sea level that has a 1% chance of being exceeded every year) increased by 95% between 1970 and 2010. By 2010, about 270 million people and USD 13 trillion worth of assets were exposed to the 1-in-100 year extreme sea-level event³. It is estimated that over USD 3 trillion in port infrastructure assets in 136 of the world's largest port cities are vulnerable to extreme weather events.

A number of studies have projected that mean annual insured heavy rainfall and flood losses will rise in countries such as the UK, the Netherlands and Germany, and in specific regions such as southern Norway and the Canadian province of Ontario. These increases are partially attributable to climate change but also reflect socio-economic trends such as income growth and consequent increases in the assets exposed to floods and droughts, migration to areas (e.g. coastal cities) that are exposed to these impacts, and increases in the level of insurance coverage.

Changes to rainfall patterns are projected to increase both flooding and drought in different parts of the world, with escalating impacts for economic sectors including agriculture. A changed and more variable water supply is likely to affect electricity generation from fossil fuel, nuclear and hydropower sources, with additional investment needed for adaptation.





Food security

Climate impacts on agriculture from factors such as changing rainfall patterns, rising temperatures and movement of crop pests are expected to lead to higher prices and increased volatility in agricultural markets. These will affect the cost base of many companies (retailers, food processors etc.) and may mean that higher proportions of household incomes are spent on food, with knock-on effects for expenditure in other areas. Higher and more volatile prices may also affect socio-political stability (e.g. the potential for food riots in some countries).

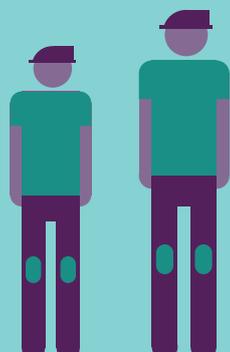
Labour

The importance of considering indirect effects is illustrated by the impacts of environmental heat stress on labour capacity and productivity. Worker productivity has already declined during the hottest and wettest seasons in parts of Africa and Asia. By 2050, more than half of the afternoon hours of outdoor work are projected to be

lost to the need for rest breaks in South East Asia⁴. These changes could significantly reduce economic output in sectors involving heavy labour (e.g. construction), or may require significant investments (e.g. in cooling equipment) to enable economic output to be maintained.

Liability

Investors and financial institutions may wish to consider how climate change might affect their liabilities. For example, the effects of changing climatic conditions on individuals' health may affect their ability to work, or need for health insurance.

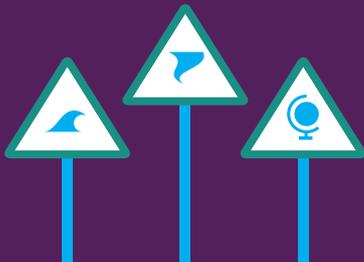




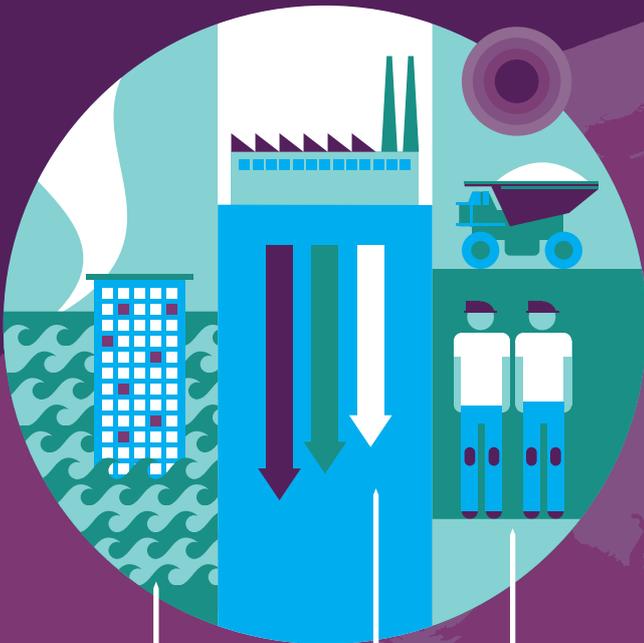
Climate Change: Investors and Financial Institutions

Impacts of climate change can have significant effects on investments by introducing previously unforeseen risks. Policies to restrain climate change can also affect investments. However, opportunities are likely to open up in fields such as renewable energy and energy efficiency.

Impacts



Physical risks and policy measures could have major impacts on investors and financial institutions



Extreme Weather Events
Between the 1950s and 1990s, the annual economic losses from large extreme events, such as floods and droughts, increased ten-fold. In the period 1990 to 1996 alone, there were 22 floods with losses exceeding USD 1 billion each.

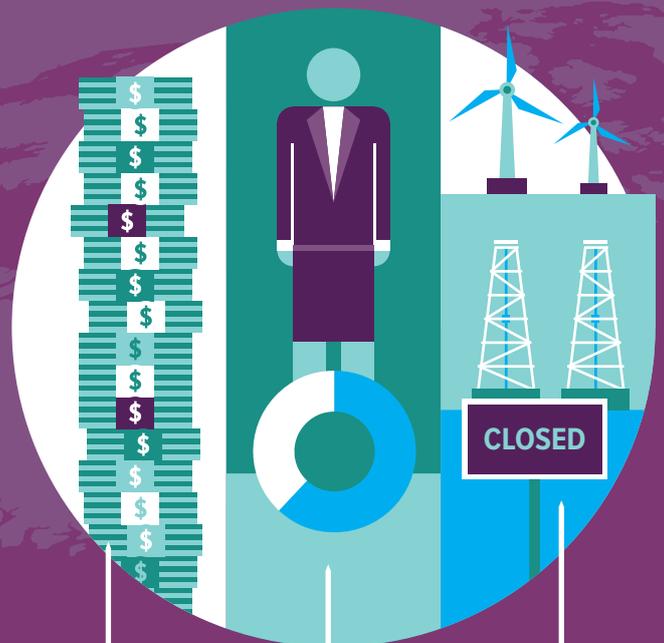
Stranded Assets
Assets become stranded for a number of different reasons: they can be supplanted by greener alternatives or technological innovations, or in sectors experiencing change due to new regulations or resource constraints.

Food Security
Climate impacts on agriculture are expected to lead to higher prices and increased volatility in agricultural markets. Higher and more volatile prices may affect socio-political stability.

Integration



Effective responses to climate change will require major capital investment and finance



Scale of the Challenge
To keep the global temperature increase below 2°C, additional investment required in the energy supply sector alone is estimated to be between USD 190 and 900 billion per year through to 2050.

New Sources of Capital?
USD 340 billion was invested in reducing global GHG emissions in 2011/12, with some 62% of this amount provided by the private sector.

Changing Patterns of Investment
The energy supply sector is likely to see a significant shift away from fossil fuels towards nuclear and low-carbon sources such as renewables. In 2012, renewables made up more than half of worldwide investment in the electricity sector.



Impacts



Integration and Response



Uncertainty



Influence

Responding to Climate Change

Investors and financial institutions will continue to be exposed to downside risks as a result of climate change. Investment consequences may include dramatic reductions in the value of particular assets and, for banks, reductions in the creditworthiness and solvency of clients. However, they may also include new openings and opportunities.

Uncertainty



The specific investment made and the financing mobilised will depend on government policy

Influence



Investors' and financial institutions' decisions are a critical influence on society's response to climate change



Policy Signals

The amount of capital required and allocated for emissions reduction and in addressing the physical impacts of climate change will depend on the specific policy measures adopted.

Macroeconomic Impacts

There are significant challenges in estimating the global economic impacts from climate change – both in terms of the costs associated with the physical impacts and in terms of the cost of GHG emissions mitigation.

Trade-offs

Decoupling economic growth from GHG emissions will have profound implications for capital allocation decisions and risk-adjusted returns.



Expectations

Governments are likely to look to the private sector to provide much of the capital required to deliver significant reductions in GHG emissions and to respond to physical impacts of climate change.

Dependencies

Decisions made by private sector investors and financial institutions will have a major influence on how society responds to climate change.

Investments

The willingness of private investors and financial institutions to provide this capital will depend on the risk exposure of potential investments, including policy risk, and on the incentives that are provided.



Resilience

Many of the major adaptation-related investments such as flood protection have the classic characteristics of public goods. That is, the benefits accrue widely rather than specifically to the organisation making the investment. There are compelling macroeconomic arguments for protecting large parts of the world's coastline against flood damage and land loss, but there is often a weak case for individual private sector investors and financial institutions supporting these investments. In practice, for the private sector to play a meaningful role in financing such investments requires significant levels of public support through the provision of capital, other financial support, and by allowing the private sector to capture at least some of the benefits from the investment.

A Comment on the Economics

There are significant challenges in estimating the global economic impacts from climate change – both in terms of the costs associated with the physical impacts and in terms of the cost of GHG emissions mitigation. Estimates of the aggregate economic impacts of climate change and estimates of the costs of mitigation both vary widely, and are highly dependent on factors such as core assumptions, model design, sectoral coverage and scenario selection. Specifically on climate change impacts, economic estimates often do not account for catastrophic changes, tipping points, and other relevant factors (and, therefore, may underestimate costs). The IPCC comments that projected losses associated with additional warming of around 2°C are more likely than not to be greater, rather than smaller, than the best estimates to date. It further notes that while losses accelerate with greater warming, few quantitative estimates have been completed for additional warming of around 3°C or above.

The page features two stylized teal clouds at the top. On the right side, there is a large, stylized teal wind turbine with three blades and a central hub, extending from the top to the bottom of the page.

Reducing Greenhouse Gas Emissions

Opportunities and Risks for Investors and Financial Institutions

The IPCC estimates that approximately USD 340 billion was invested in mitigating climate change in 2011/12, with 62% of this amount provided by the private sector⁵. It is important to qualify this statement by noting that these numbers include all financial flows whose expected effect was to reduce net emissions and/or to enhance resilience to the impacts of climate variability. That is, these numbers cover the full value of the financial flow rather than the share associated with the climate change benefit. For example, they cover the entire investment in a wind turbine (which may also contribute to improved security of electricity supply) rather than the proportion of the investment attributed to emission reductions.

Policies aimed at decoupling economic growth from GHG emissions will have profound implications for capital allocation decisions. A transformation to a low-carbon economy implies new patterns of investment, requiring increased investment

in areas such as renewable energy and reduced investments in areas such as fossil fuel extraction and conventional fossil fuel-based power generation. In order to keep the global average temperature rise since pre-industrial times below 2°C, the additional investment required in the energy supply sector is estimated to be between USD 190 and 900 billion per year through to 2050⁶, accompanied by a significant shift away from fossil fuels towards low-carbon sources such as renewables, nuclear and fossil fuel burning with carbon capture and storage (CCS), and towards energy efficiency. Constraints on the use of fossil fuels would affect the price of commodities such as coal and oil, and have consequent implications for the mining, oil and gas companies in investors' portfolios.



Policies aimed at decoupling economic growth from GHG emissions will have profound implications for capital allocation decisions.

This transformation to a low-carbon economy may result in 'stranded assets', where the value of these assets is significantly reduced because they are rendered obsolete or non-performing. Energy intensive sectors and fossil fuel-based industries are particularly exposed to this risk. In the case of the electricity sector, coal-fired power stations may be stranded for a variety of reasons including increased use of renewable energy (which displaces electricity from coal), energy efficiency (which reduces demand for electricity) and direct regulation of GHG emissions (which may reduce operating hours or permitted electricity output).

Private finance has a critical role to play in financing the transition to a low-carbon economy, which brings both market and non-market benefits such as improved energy security, enhanced employment and better air quality.

The willingness of the private sector to provide this finance, however, is dependent on public policy and the wider political and institutional context within which investments are made. There has been a considerable increase in national policies and institutions to address climate change

in the period 2005 to 2012, with the IPCC estimating that some 67% of global GHG emissions are now covered by some form of legislation or national strategy.⁷ Many of these policies and strategies are in the early stages of implementation and there is inadequate evidence to assess their impact on future emissions.

Investors are likely to consider whether policies provide clear incentives for investment through creating new markets or business obligations, or whether to delay or reduce investment because policies create risk and uncertainty.

Investors pay close attention to:

- the returns that can be achieved and to the policy risks associated with these investments, in particular the level and dependability of public support
- to the robustness of the institutions and organisations responsible for implementing policy
- the technological and operational risks, in particular when dealing with newer or less proven technologies.

Climate change presents
real risks and opportunities.



Conclusion

Climate change presents real risks and opportunities for investors and financial institutions across all asset classes and across all time frames including the very short-term. Despite uncertainties in the projected economic impacts and in the effects on investment portfolios, it is clear that investors and financial institutions cannot completely insulate themselves from the impacts of climate change on their investments. There is a need to analyse the risks and opportunities to investments presented by the physical impacts of climate change and by policy measures directed at reducing GHG emissions. Investors and financial institutions will then be able to respond to these risks and opportunities.

Climate change is likely to significantly alter patterns of capital investment. As warming increases, transport, processing and retailing are all potentially affected as links in the supply chain are exposed to climate risks, such as disruption of operations and the need for more extensive temperature control.

It is estimated that to keep the rise in global average temperature since pre-industrial times below 2°C, an additional investment of between USD 190 and 900 billion per year through to 2050 would be required in the energy supply sector alone. Significant amounts of capital will also be required in order to respond to climate change.

Governments are likely to look to the private sector to provide much of the capital required to deliver significant reductions in GHG emissions and to support efforts to address, or respond to, the physical impacts of climate change. While the societal case for action is clear, the willingness of private investors and financial institutions to provide this capital will depend on how they view the risks associated with policy and the incentives provided.

Glossary

ADAPTATION

The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In natural systems, human intervention may facilitate adjustment to expected climate and its effects.

CLIMATE CHANGE

Any significant change in climate that persists for an extended period, typically decades or longer.

CLIMATE IMPACT

The effects of climate change on natural and human systems.

DOWNSIDE RISK

The amount of financial loss that could be sustained by an investor as a result of the decline in the value of an asset or investment.

ENERGY SECURITY

The goal of a given country, or the global community as a whole, to maintain an adequate, stable, and predictable energy supply.

FOSSIL FUEL

Carbon-based fuel from fossil hydrocarbon deposits, including coal, peat, oil, and natural gas.

GREENHOUSE GAS (GHG)

A gas in the atmosphere, of natural and human origin, that absorbs and emits thermal infrared radiation. Water vapour, carbon dioxide, nitrous oxide, methane and ozone are the main greenhouse gases in the Earth's atmosphere. Their net impact is to trap heat within the climate system.

MITIGATION

A human intervention to reduce the sources or enhance the sinks of greenhouse gases.

PRE-INDUSTRIAL PERIOD

The period before 1750, that is, before the period of rapid industrial growth referred to as the 'industrial revolution'.

PROJECTION

A potential future evolution of a quantity or set of quantities, often computed by a model. Projections involve assumptions that may or may not be realized, and are therefore subject to substantial uncertainty; they are not predictions.

RENEWABLE ENERGY

Any form of energy from solar, geophysical or biological sources that is replenished by natural processes at a rate that equals or exceeds its rate of use.

RESILIENCE

The capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity, and structure.

STRANDED ASSET

An asset that has become obsolete, or non-performant, but must be recorded on the balance sheet as a loss of profit.

TIPPING POINT

A hypothesised critical threshold when global or regional climate changes from one stable state to another stable state. The tipping point event may be irreversible.

ENDNOTES

¹ IPCC AR5 WG III, Chapter 7

² IPCC AR5 WG II, Chapter 10

³ IPCC AR5 WG II, Chapter 5

⁴ IPCC AR5 WG II, Chapter 10

⁵ IPCC AR5 WG III, Chapter 16

⁶ IPCC AR5 WG II, Chapter 10

⁷ IPCC AR5 WGIII, Chapter 15

“Continued emissions of greenhouse gases will cause further warming and changes in all components of the climate system. Limiting climate change will require substantial and sustained reductions of greenhouse gas emissions.”

IPCC, 2013

Disclaimer:

This publication has been developed and released by the European Climate Foundation (ECF), the Institutional Investors Group on Climate Change (IIGCC), the United Nations Environment Programme Finance Initiatives (UNEP FI) and the University of Cambridge’s Judge Business School (CJBS) and Institute for Sustainability Leadership (CISL).

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The family of summaries, of which this report is part, is not meant to represent the entirety of the IPCC’s Fifth Assessment Report (AR5) and they are not official IPCC documents. The report is not intended to provide, and should not be relied on for accounting, legal or tax advice or investment recommendations. IIGCC is not providing investment advice.

The summaries have been peer-reviewed by experts both from the business and science communities. The English version constitutes the official version.

About us:

The University of Cambridge Institute for Sustainability Leadership (CISL) brings together business, government and academia to find solutions to critical sustainability challenges.

Cambridge Judge Business School (CJBS) is in the business of transformation. Many of our academics are leaders in their field, creating new insight and applying the latest thinking to real-world issues.

The Institutional Investors Group on Climate Change (IIGCC) is a forum for collaboration on climate change for investors. IIGCC provides investors with a collaborative platform to encourage public policies, investment practices, and corporate behaviour that address long-term risks and opportunities associated with climate change.

UNEP FI is a global partnership between UNEP and the financial sector. Over 200 institutions, including banks, insurers and fund managers, work with UNEP to understand the impacts of environmental and social considerations on financial performance. Through its Climate Change Advisory Group (CCAG), UNEP FI aims to understand the roles, potentials and needs of the finance sector in addressing climate change, and to advance the integration of climate change factors - both risks and opportunities - into financial decision-making.

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