# MODELLING CLIMATE RISK IN INVESTMENT PORTFOLIOS

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# CLIMATE CHANGE
# INVESTMENT RISK MANAGEMENT

# THE MATERIALITY OF CLIMATE CHANGE
## REASONS TO ACT

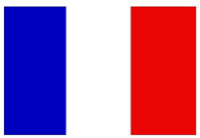
*"The challenges currently posed by climate change pale in significance compared with what might come…The more we invest with foresight; the less we will regret in hindsight."*
– Mark Carney, Governor of the Bank of England*

**Issues Underpinning Prospective Investment Impacts:**

- Renewable energy investments are at all-time highs
- Fossil fuel divestment campaigns continue unabated with notable acolytes
- Regulatory agreement, scrutiny and action continues to increase
- Oil price volatility continues to be a concern for fossil fuel/carbon-intensive sectors
- Shifting extreme weather patterns and the threat of climate litigation loom
- Scientific/academic research points to potentially significant economic impacts

*Source: Speech to Lloyds of London, September 2015

# NOTABLE INTERNATIONAL REGULATORY AND FINANCIAL INDUSTRY RESPONSES TO DATE

| | |
|---|---|
|  | SEC issues interpretive guidance on disclosure related to climate change (2010) and insurance commissioners in six states continue to administer NAIC climate risk disclosure survey. |
|   | California's insurance commissioner calls for voluntary coal divestment and will require disclosure of coal company holdings. |
|  | Institutional investors in France required to disclose how they are managing climate change risks. |
|  | The Financial Supervisory Authority in Sweden calls on the financial sector in Sweden to develop stress tests to capture climate change risks. |
|  | The Dutch Central Bank calls for more transparency (carbon foot-printing and energy transition plans) to help financial institutions assess climate risks. |
|  | European Systemic Risk Board report suggests that a “sudden-transition policy scenario” should be included in macroeconomic scenarios and in stress tests of financial institutions and the financial system as a whole. |

# WHAT ARE THE PROBLEMS THE TASK FORCE IS ADDRESSING?

TCFD | TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURES

## Three Problems: One Solution

1. Lack of a coherent financial reporting framework for climate related financial disclosures
2. Challenge for investors, creditors, and underwriters to effectively use existing disclosures in their financial decisions
3. Regulators struggle to use existing financial disclosures to determine whether financial systems might be vulnerable to climate-related risks

**Solution: a clear, efficient, and voluntary disclosure framework that improves the ease of producing and using financial disclosures**

| **Phase 1** — Complete | **Phase 2** — December 31, 2016 |
|---|---|
| Determine high-level objectives and principles of effective disclosure | Deliver recommendations to FSB and G20 to improve consistency, accessibility, usefulness of climate-related financial disclosures by financial sector participants |

# HOLISTIC CLIMATE RISK MANAGEMENT
## PORTFOLIO RISK ASSESSMENT METHODS

### TOP-DOWN

- Asset-Liability Modeling
- Manager Monitoring / Selection Process

Investment Risk Management Strategy

### BOTTOM-UP

- Company, Sector, and Geographic Analysis
- Direct investment process

# INVESTING IN A TIME OF CLIMATE CHANGE

**"The report ...is, to date, the most comprehensive from an asset-allocation perspective..."**

The New Economics of Climate Change, The New Yorker, July 2015

## 16 Investor Partners

$1.5T

## 2 Sister Companies

NERA Economic Consulting

GUY CARPENTER


## 13 Expert Advisors

## 2 Public Partners

IFC International Finance Corporation WORLD BANK GROUP

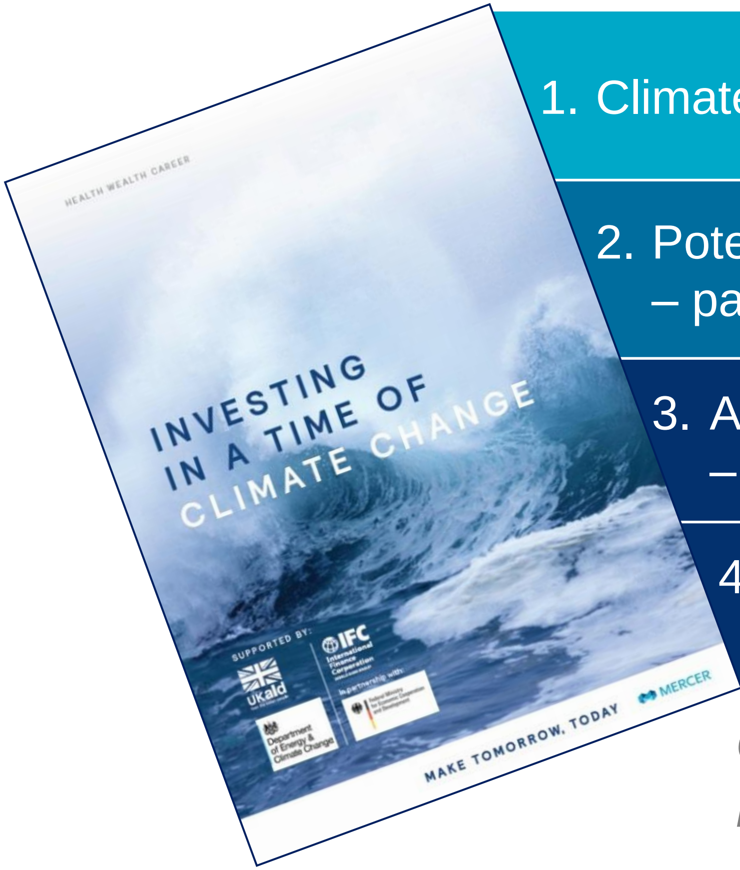
UKaid from the British people

Federal Ministry for Economic Cooperation and Development

Department of Energy & Climate Change

**A novel top-down framework for considering climate change risks**

# INVESTING IN A TIME OF CLIMATE CHANGE
## FOUR KEY FINDINGS

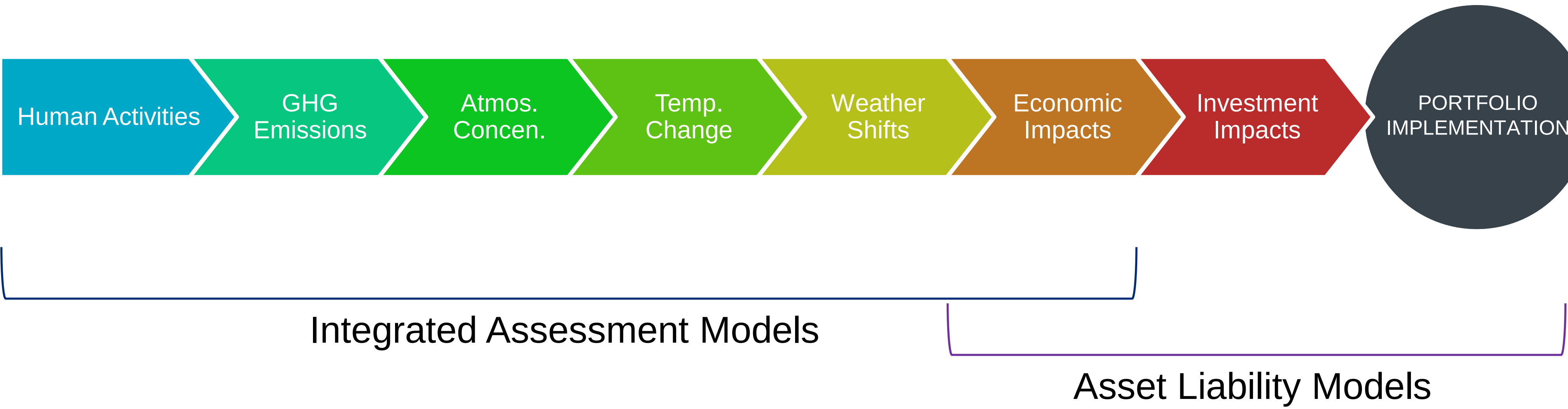



1. Climate change will have an impact regardless of scenario.
2. Potential sector impacts are most meaningful – particularly over the next 10 years to 2025.
3. Asset class impacts can also be material – and vary by climate scenario.
4. A 2ºC (Transformation) scenario need not harm total diversified portfolio returns out to 2050.

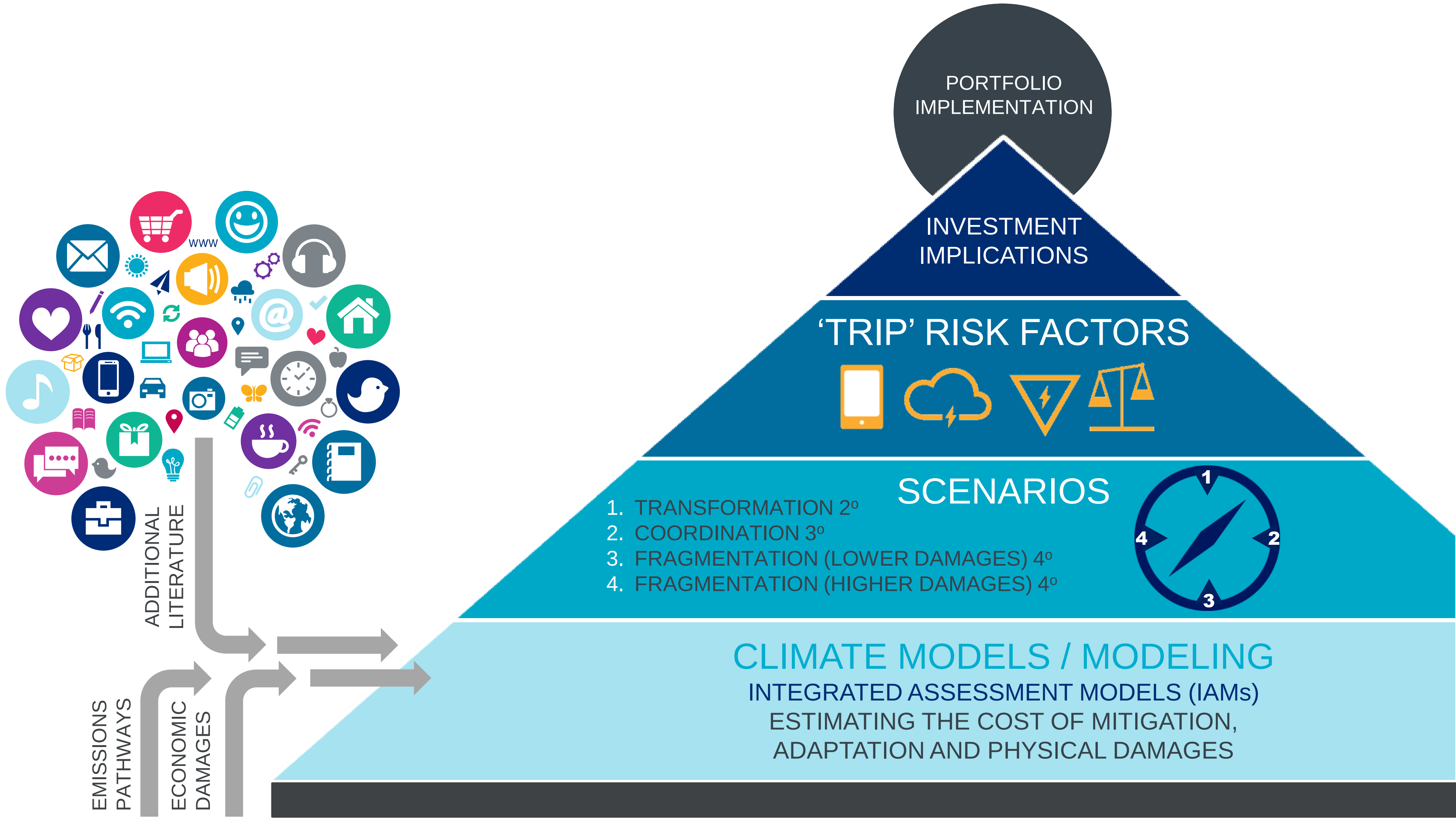
***Commissioned by 16 investors representing $1.5 trillion AUM***

Available at: http://www.mercer.com/our-thinking/investing-in-a-time-of-climate-change.html

# THE CHALLENGE
# MANAGING THROUGH UNCERTAINTY



# MERCER'S MODELING PROCESS
# ASSESSING CLIMATE CHANGE RISK



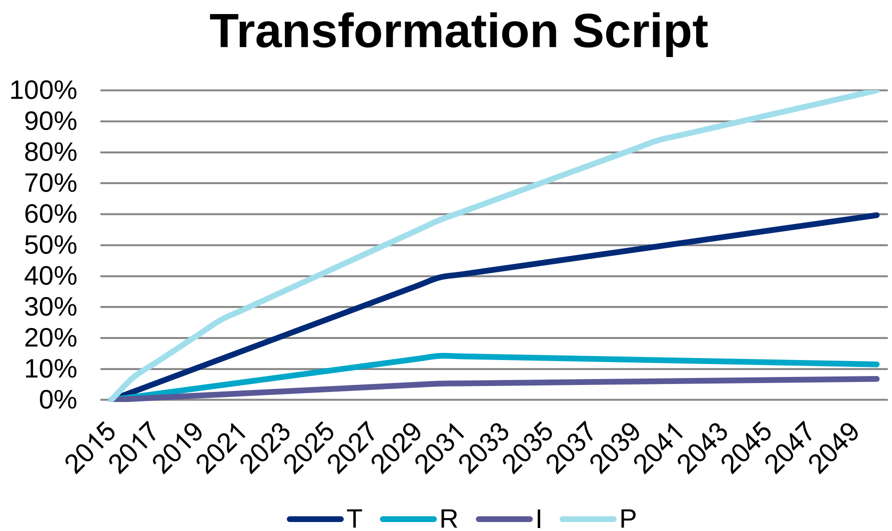
## SCENARIOS
# A BROAD RANGE OF POTENTIAL OUTCOMES

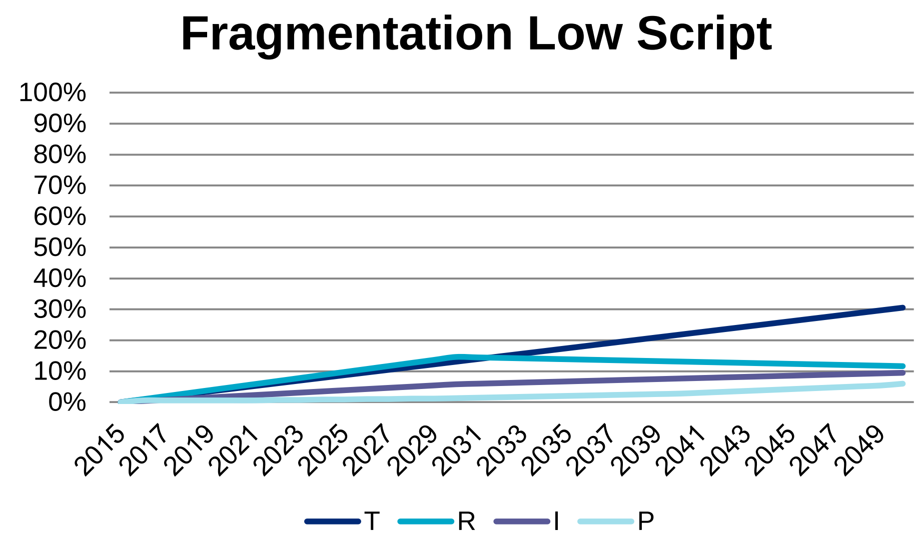
- The future is uncertain, thus scenarios are a useful tool
  - Current policies have us on a pathway to Fragmentation (+4ºC)
  - Combination of existing pledges still has Coordination (+3ºC) as a high probability
  - Ambitious goals in Paris for a +2ºC pathway (stretch goal of 1.5ºC) suggests Transformation is increasingly possible
- Most funds focus on the impact of +2ºC and +4ºC for planning purposes

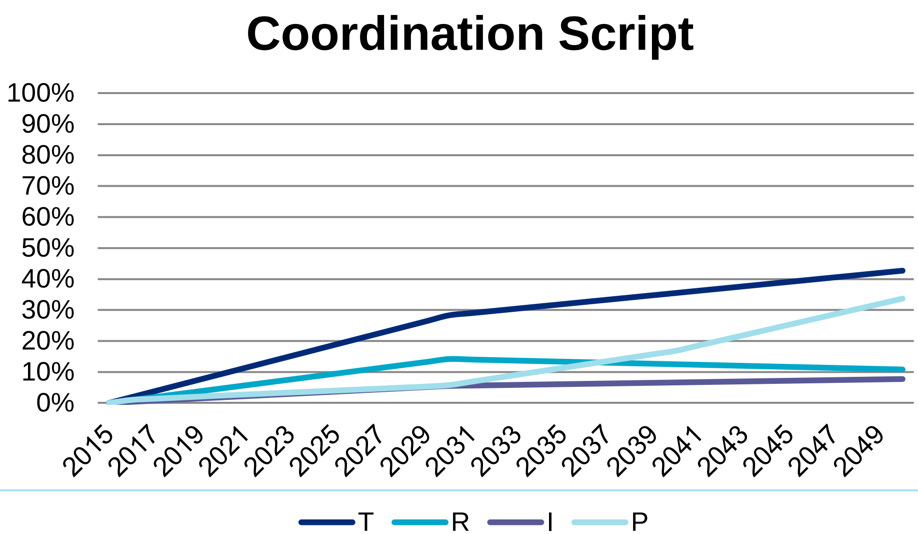
| | MITIGATION | PERCENTAGE FOSSIL FUELS* | EMISSIONS PEAK | TEMPERATURE** |
|---|---|---|---|---|
| TRANSFORMATION | STRONG | <50% | AFTER 2020 | +2ºC |
| COORDINATION | SUBSTANTIAL | 75% | AFTER 2030 | +3ºC |
| FRAGMENTATION*** | LIMITED | 85% | AFTER 2040 | +4ºC |

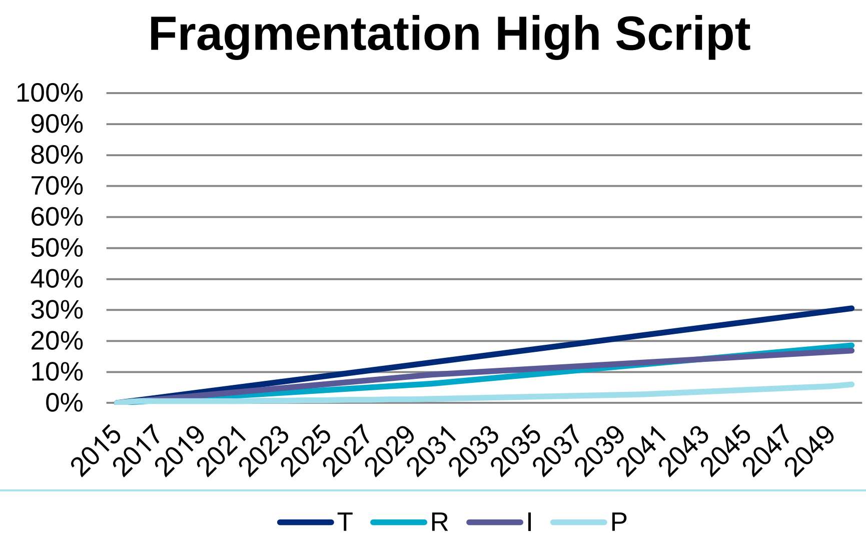
* As % of energy mix by 2050; ** By 2100, since pre-Industrial era; *** The Study models two variants of this scenario

# SCENARIO PATHWAYS
# DETERMINISTIC MODEL SCRIPTS



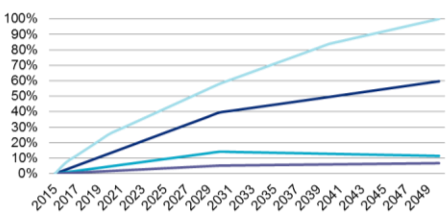
# RISK FACTORS: SECTOR AND ASSET CLASS SENSITIVITY (EXAMPLE – ENERGY SECTOR)

| | T | R | I | P |
|---|---|---|---|---|
| | TECHNOLOGY | RESOURCE AVAILABILITY | IMPACT | POLICY |
| OIL | -0.50 | -0.75 | -0.75 | -0.75 |
| GAS | <0.25 | -0.50 | -0.75 | <0.25 |
| COAL | -0.50 | -0.75 | -0.75 | -1.00 |
| RENEWABLES | 0.50 | -0.25 | -0.25 | 1.00 |

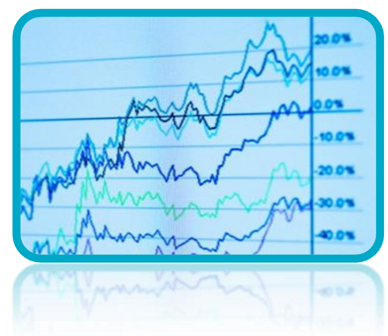
*Values assigned between -1 and +1*

# ESTIMATING CLIMATE IMPACT ON RETURN
## CALCULATING MODEL OUTPUTS

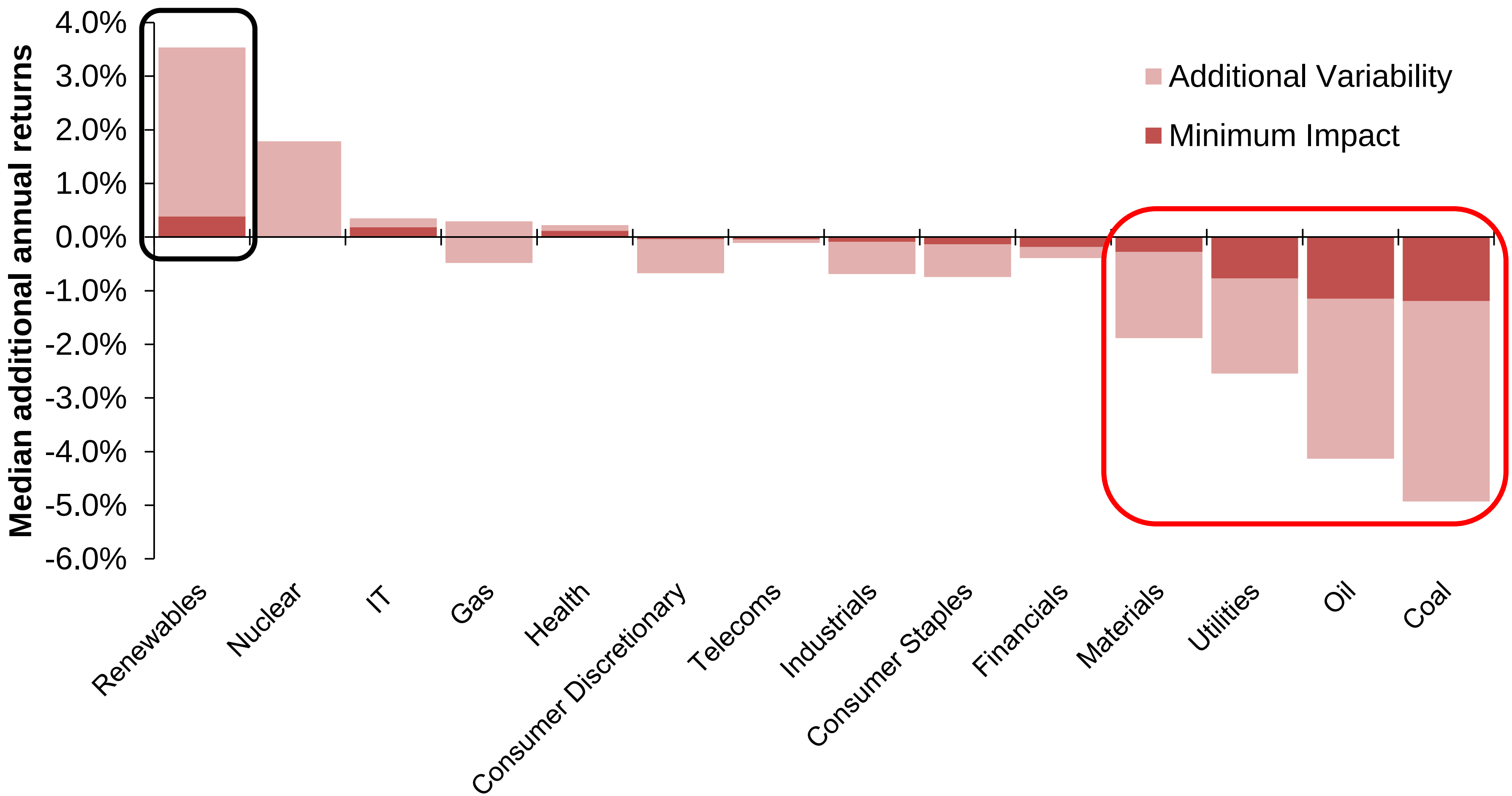
**CLIMATE SCENARIOS** X **CLIMATE RISK FACTORS** = **INVESTMENT IMPACTS**




| T | R | I | P |
|---|---|---|---|
| -0.25 | -0.75 | -0.75 | -0.75 |
| -0.50 | -0.75 | -0.75 | -0.75 |
| <0.25 | -0.50 | -0.75 | <0.25 |
| -0.50 | -0.75 | -0.75 | -1.00 |
| 0.50 | -0.25 | -0.25 | 1.00 |
| 0.50 | -0.75 | -0.25 | 0.50 |

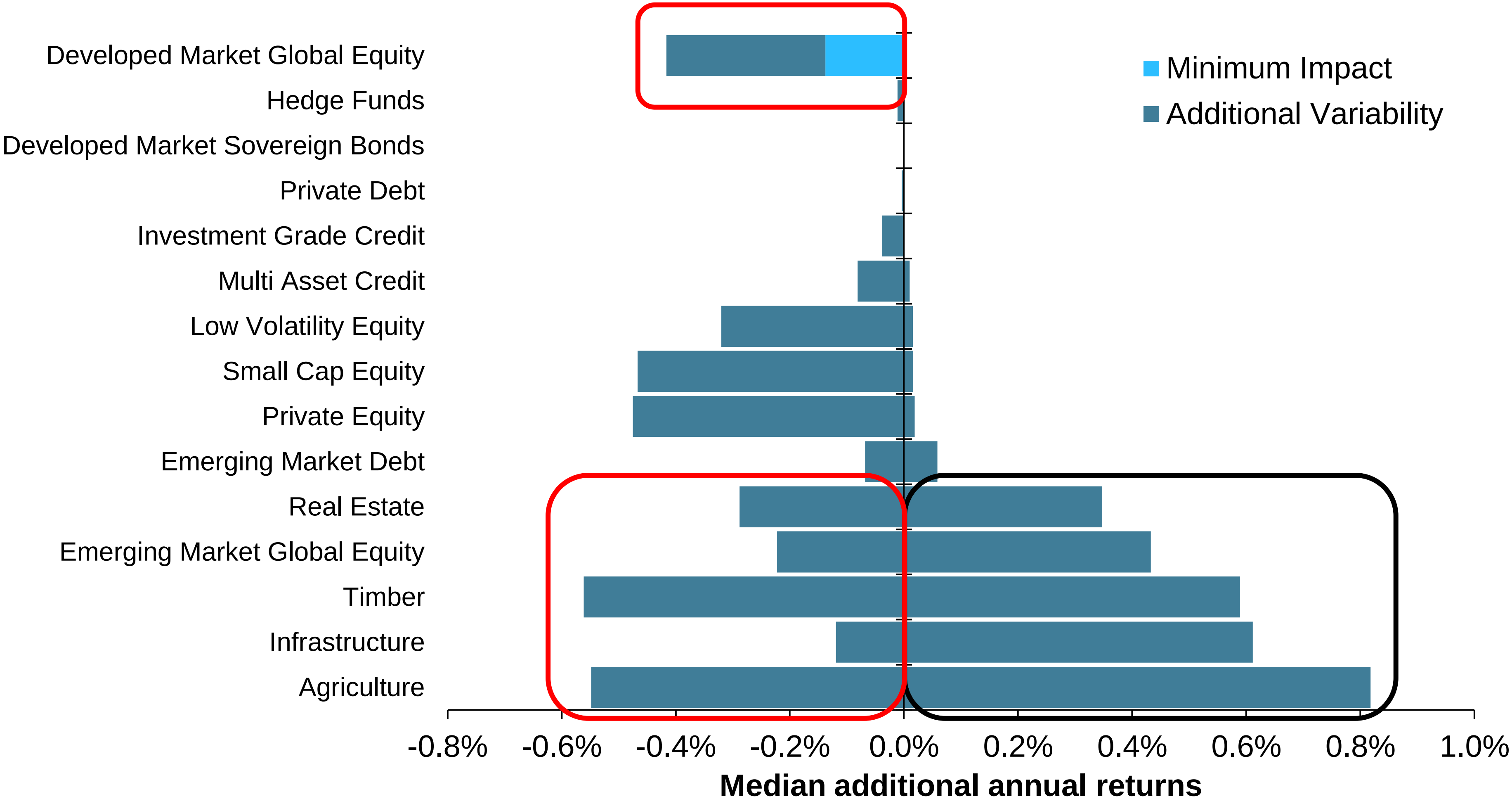


# CLIMATE IMPACT ON FUTURE RETURNS
## MEDIAN RETURN IMPACT BY INDUSTRY SECTOR (35 YEARS)



# CLIMATE IMPACT ON FUTURE RETURNS

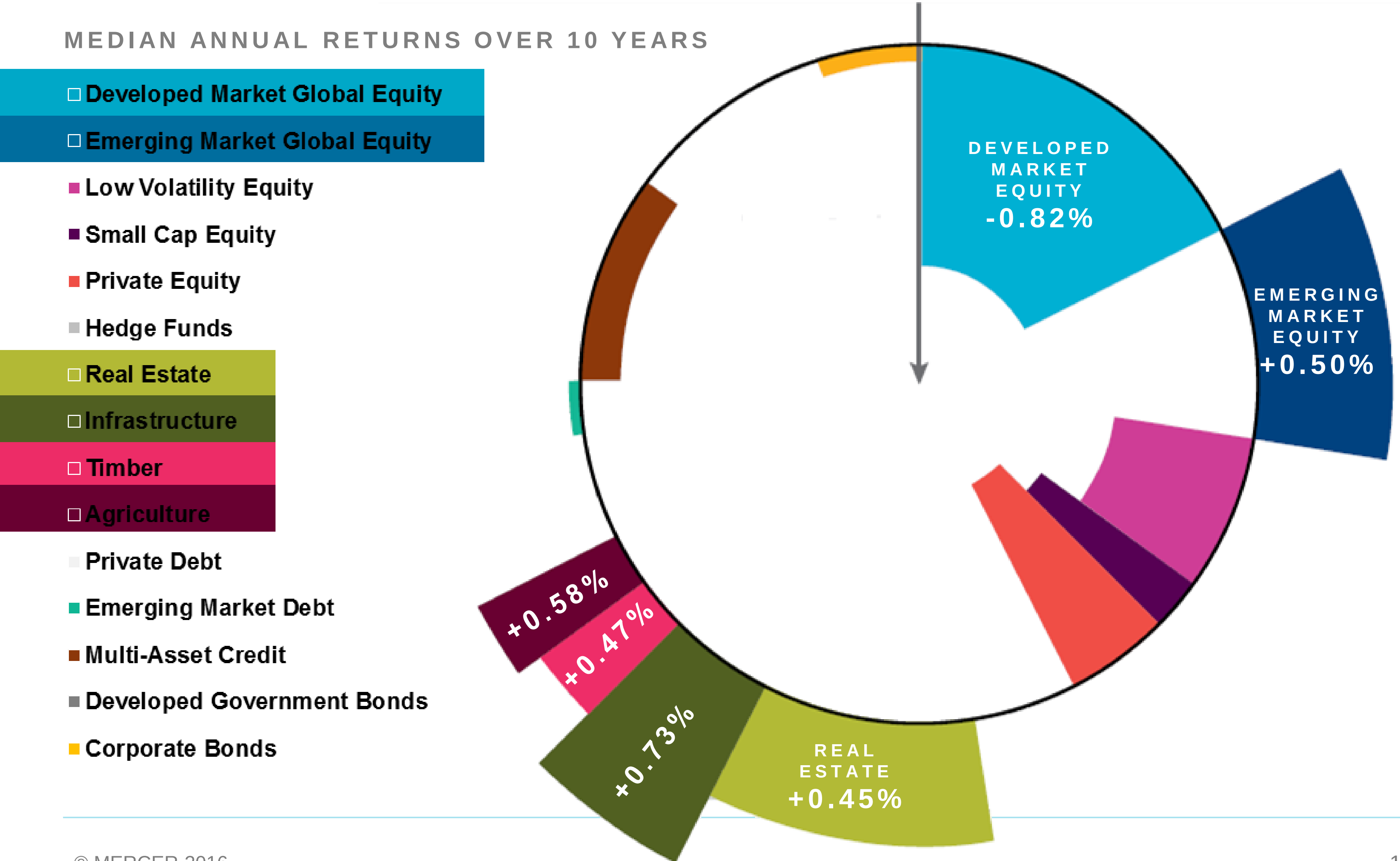
## MEDIAN RETURN IMPACT BY ASSET CLASS (35 YEARS)



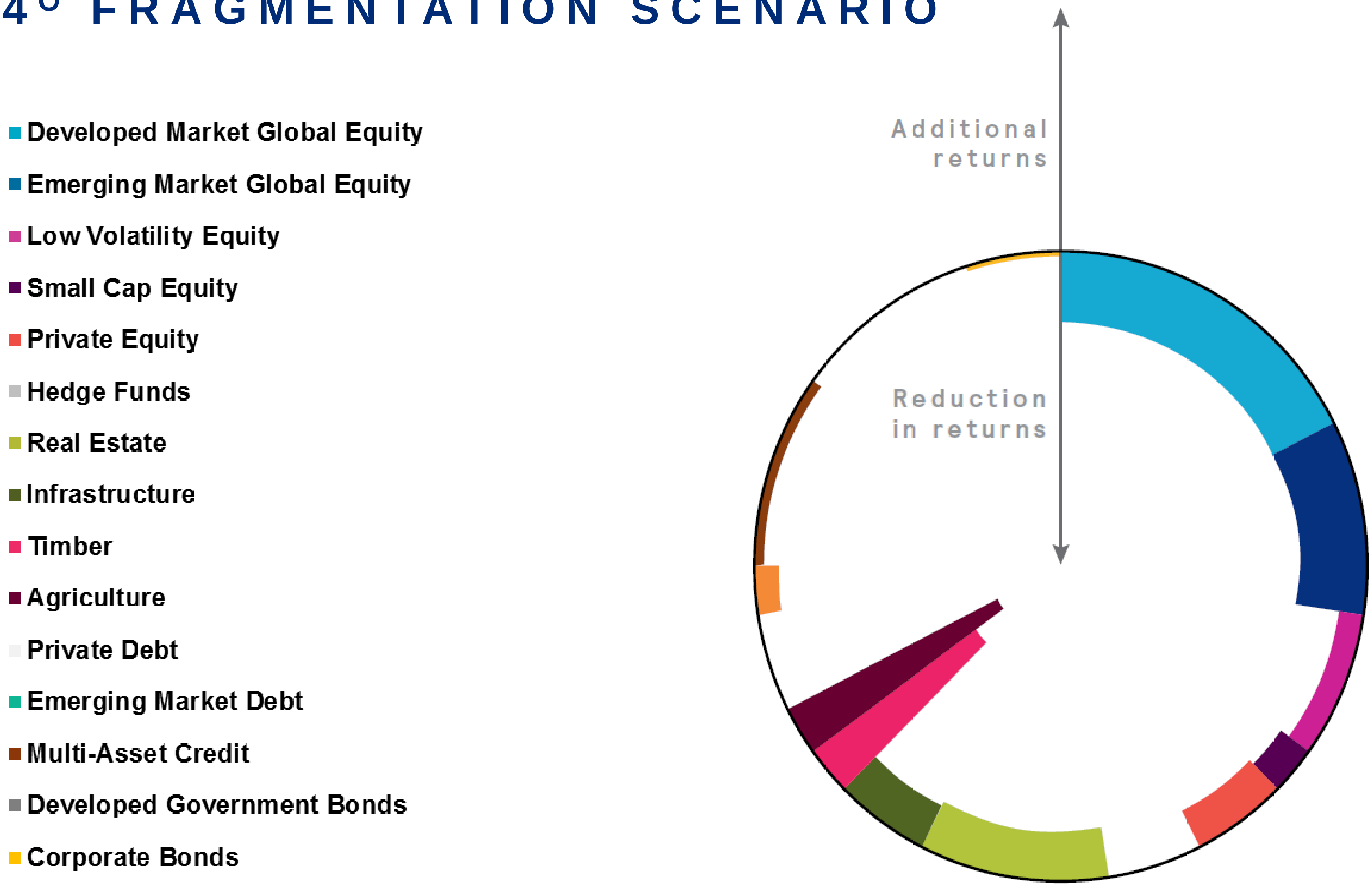
# QUANTIFYING IMPACT FOR THE TOTAL PORTFOLIO

## IMPACT OF 2° SCENARIO = RISK & OPPORTUNITY

MEDIAN ANNUAL RETURNS OVER 10 YEARS



# QUANTIFYING IMPACT FOR THE TOTAL PORTFOLIO
## 4° FRAGMENTATION SCENARIO



# CLIMATE RISK MANAGEMENT
## PORTFOLIO IMPLEMENTATION OPTIONS

**Reallocate**

- Divestment
- Sustainability themes

**Hedge**

- Low-carbon index
- Derivative overlay

**Engage**

- Strategy, leadership, disclosure
- Policy and physical risk

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MAKE
TOMORROW,
TODAY