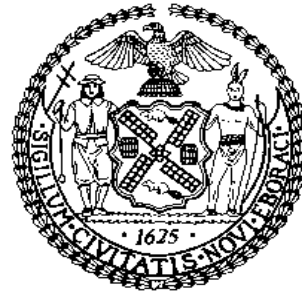




COMMON INVESTMENT MEETING Public Session



THE CITY OF NEW YORK
OFFICE OF THE COMPTROLLER

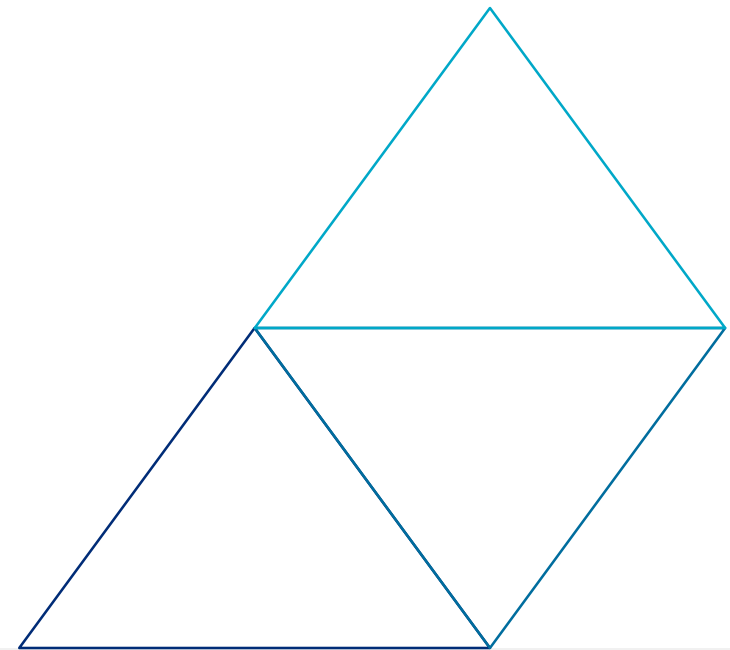
January 25, 2018

MERCER
Climate Change Investment Risk

NEW YORK CITY RETIREMENT SYSTEMS CLIMATE CHANGE RISK ASSESSMENT AND STRATEGY

JANUARY 25, 2018

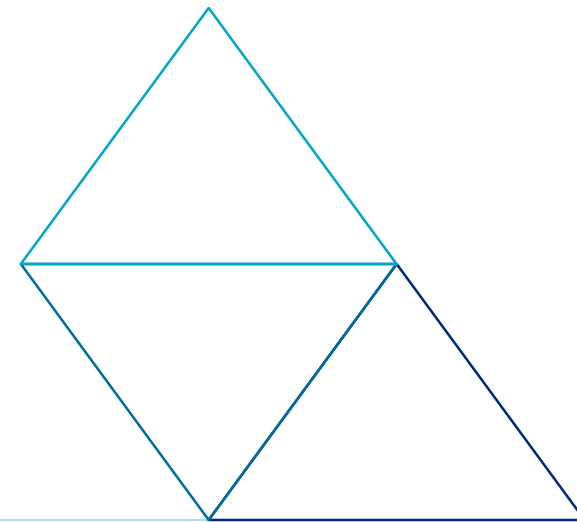
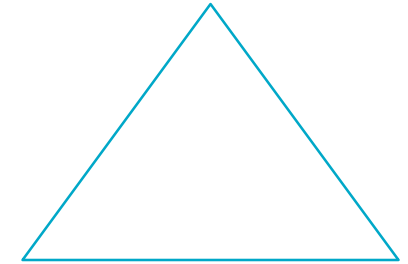
Jane Ambachtsheer
Alex Bernhardt



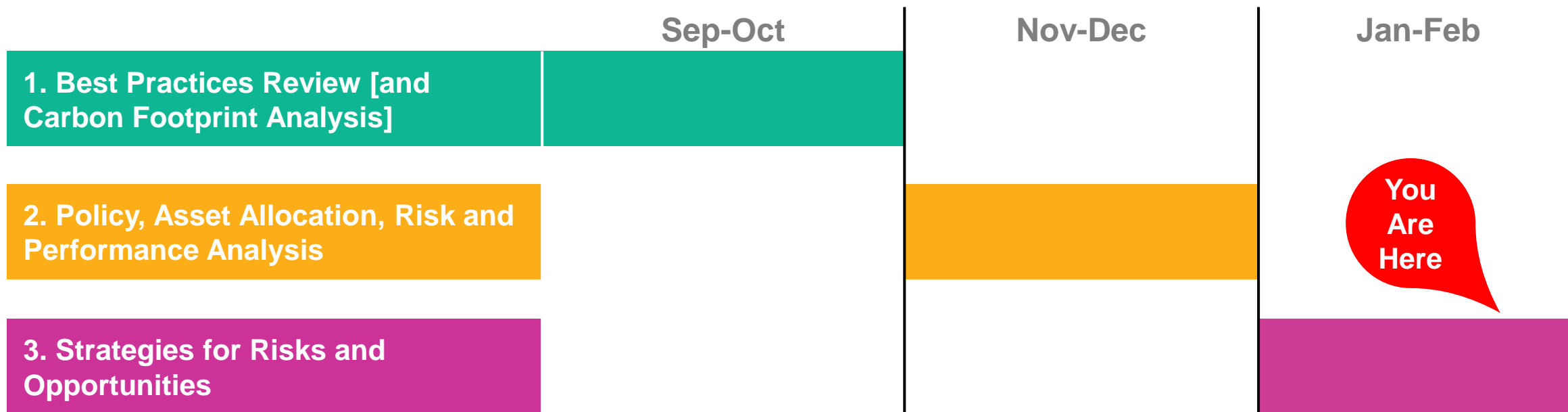
AGENDA

- Project Overview and Objectives
- Climate Change Risk Assessment: Methodology & Key Findings
- Developing a Climate Change Strategy

PROJECT OVERVIEW AND OBJECTIVES



WORK PLAN AND PROJECT OBJECTIVES



- **Objective 1: Develop an understanding of global best practices** on integrating consideration of climate change risks in investment policy and strategy, asset allocation, manager evaluation and selection and risk measurement and management
- **Objective 2: Quantitatively assess the risks to NYCRS portfolio from climate change** to help support the development of a comprehensive climate change risk management strategy
- **Objective 3: Obtain recommendations for how to address the risks and opportunities** created by climate change across asset classes

BEST PRACTICES REVIEW – OVERALL FINDINGS

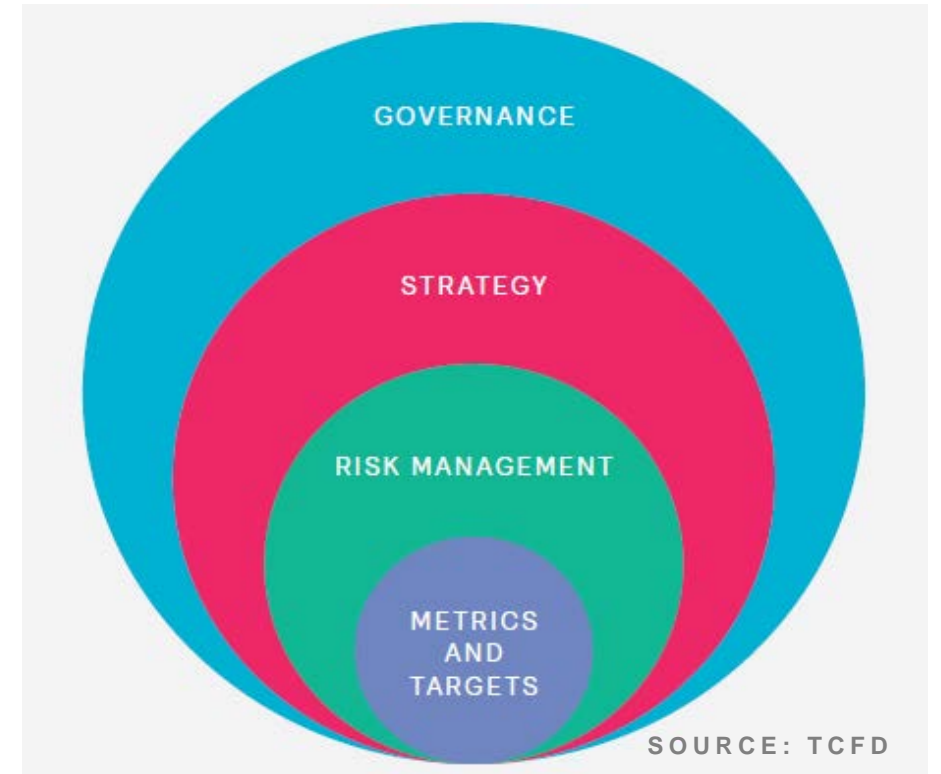
- There is no **‘one size fits all’** or **‘right way’** to address climate risk
- Most leading funds have been working on their approach over a **number of years**
- Progress has often been **slowest where external managers** are involved
- **Ambition, creativity and a shared enthusiasm** to make progress among board members and management has proven to be a critical element in success

Pension Fund	Beliefs	Processes	Portfolio	Overall
Peer A	Green	Green	Yellow-Green	Green
Peer B	Green	Yellow-Green	Yellow	Yellow-Green
Peer C	Green	Green	Orange	Yellow-Green
Peer D	Green	Yellow-Green	Orange	Yellow
Peer E	Green	Yellow-Green	Orange	Yellow
Peer F	Light Green	Orange	Orange	Orange
Peer G	Orange	Yellow-Green	Red	Orange
Peer H	Orange	Orange	Red	Red

Methodology: Green - leading approach among peers. Orange - moderate approach among peers. Red – Limited approach among peers

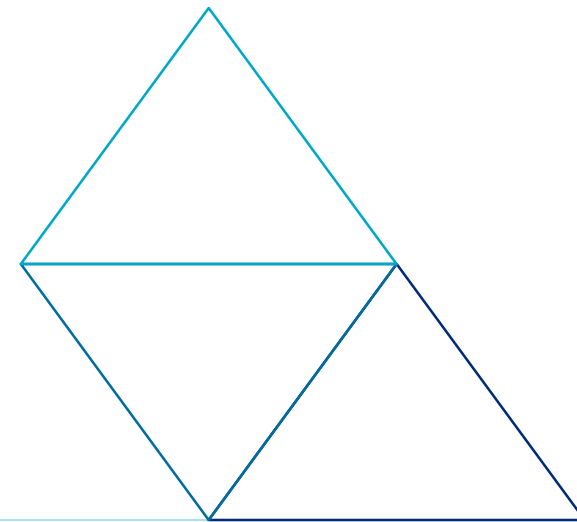
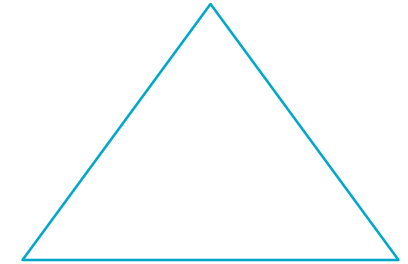
CLIMATE-RELATED DISCLOSURE ASSET OWNER RECOMMENDATIONS

- Recommendations apply to **companies, asset managers** and **asset owners** and are focused on **managing risks and identifying opportunities**.
- Asset owner clients should consider the following questions in order to prepare related disclosures:
 - **Governance:** Who has oversight of climate-related risks and disclosures (board / management)? Is this documented?
 - **Strategy:** Have you considered climate related risks and opportunities for inv. strategy? Different climate scenarios?
 - **Risk Management:** Have you established risk assessment and reduction processes, including engagement with managers and low-carbon allocations?
 - **Metrics & Targets:** Have you assessed your portfolio carbon emissions (carbon footprinting) and considered targets for improvements?

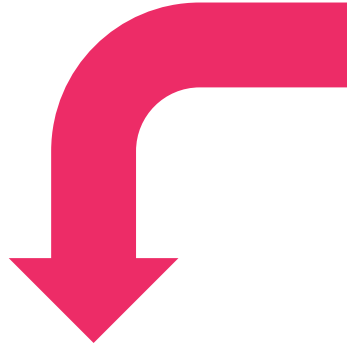
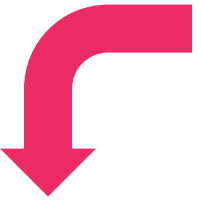


➤ **For Principles of Responsible Investment (PRI) signatories, TCFD aligned disclosure will be included in the 2017 reporting requirements.**

CLIMATE CHANGE RISK ASSESSMENT METHODOLOGY



HOLISTIC CLIMATE RISK MANAGEMENT PORTFOLIO RISK ASSESSMENT METHODS



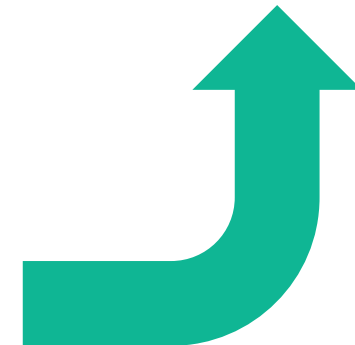
TOP-DOWN

- Asset-Liability Modeling
- Manager Monitoring / Selection Process

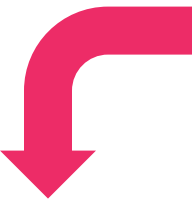
Investment Risk Management Strategy

BOTTOM-UP

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



TRAGEDY OF HORIZONS CHALLENGE AND OPPORTUNITY FOR LONG TERM INVESTORS



QUARTERLY
REVIEWS:
3 MONTHS

ANNUAL
REVIEWS:
1 YEAR

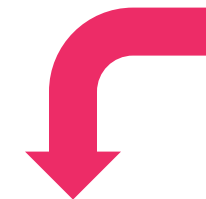
STRATEGIC
REVIEWS:
3 - 10 YEARS

MODELLING PERIOD
FOR
THIS ANALYSIS:
TO 2050

MOST SIGNIFICANT
PHYSICAL CLIMATE
CHANGE IMPACTS:
BEYOND 2050

SCENARIO ANALYSIS

A RANGE OF POTENTIAL OUTCOMES



**Optimistic
(green scenario)**

**Pessimistic
(brown scenario)**

Scenarios	Transformation	Coordination	Fragmentation
Mitigation response	Strong	Substantial	Limited
Change in temperature vs. pre-industrial era (2100)	<2°C	~3°C	>4°C
Emissions peak	2020	2030	2040
% fossil fuel in energy mix (2050)	<50%	75%	85%

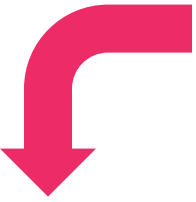
← **More Transition Risk**

- Controlled yet aggressive change
- Major short term impact but reduced long-term impact

More Physical Climate Risk →

- Uncontrolled change
- Limited short-term impact but major long-term impact

TRIP CLIMATE RISK FACTORS

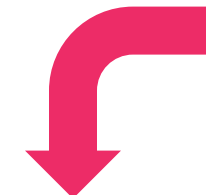


Transition Risks



Technology	Resource Availability	Impact of Physical Damages	Policy
The rate of progress and investment in technology supporting a transition to a low-carbon economy.	The impact of chronic weather patterns (long-term changes in temperature or precipitation) on resource production and availability.	The impact of acute weather risk (that is, extreme or catastrophic events) on physical assets and supply chains.	Regulations meant to reduce the risk of further climate change from human-induced greenhouse gas emissions.

ESTIMATING CLIMATE IMPACT ON RETURN CALCULATING MODEL OUTPUTS



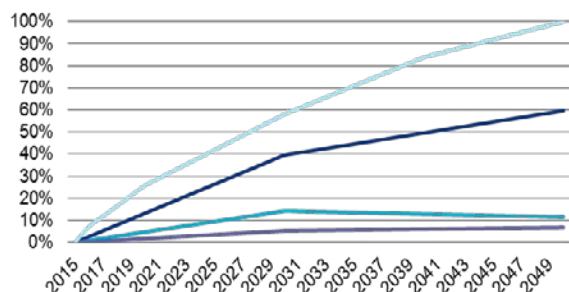
CLIMATE SCENARIOS

X

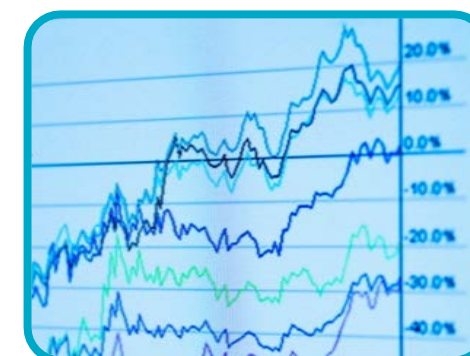
CLIMATE RISK FACTORS

=

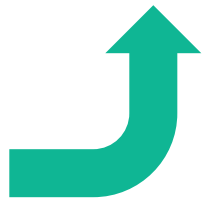
INVESTMENT IMPACTS



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



PORTFOLIO CARBON FOOTPRINT ANALYSIS



STRENGTHS

- Useful starting point for carbon exposure assessment
- Data is readily available and widely disclosed
- Relatively simple measure of “owned” portfolio emissions or portfolio carbon intensity
- Provides actionable risk management information:
 - If “portfolio decarbonisation” is an objective progress can be tracked
 - Enables sector- and benchmark-relative comparisons
- Highlights areas for further analysis and engagement, with:
 - Investment managers
 - Portfolio companies

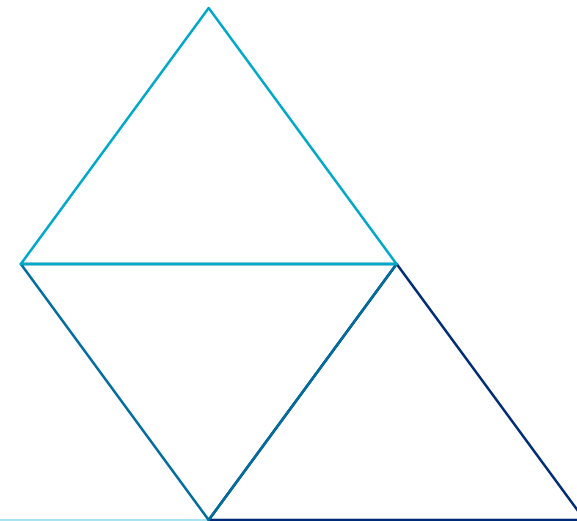
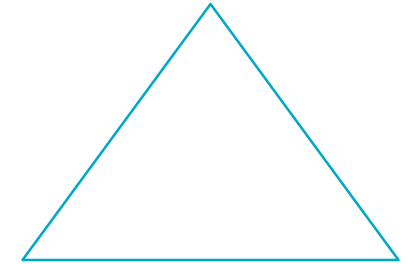


WEAKNESSES

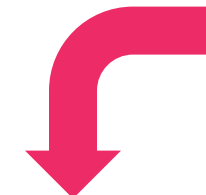
- Disclosure risk:
 - Inconsistent company disclosure
 - Scope 3 missing
 - Comparability: CO₂; CO₂e; other Greenhouse Gases (GHGs)
 - Bias towards Large Caps and developed markets (EM data largely absent)
 - Limited data verification
- Relevance risk:
 - Scopes 1+2 emissions may not correlate to climate policy or market risk
- Measurement risk:
 - Estimation is required to fill gaps (e.g., by data vendors)
 - Methodologies (and results) vary

CLIMATE CHANGE RISK ASSESSMENT

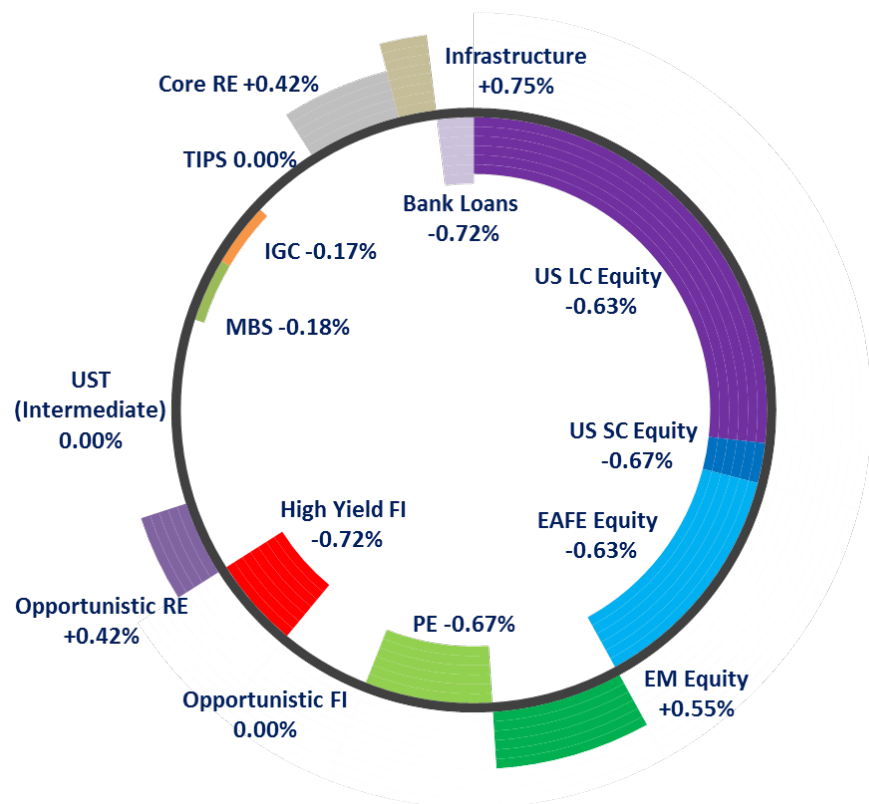
KEY FINDINGS



SAMPLE FUND CLIMATE SCENARIO RESULTS

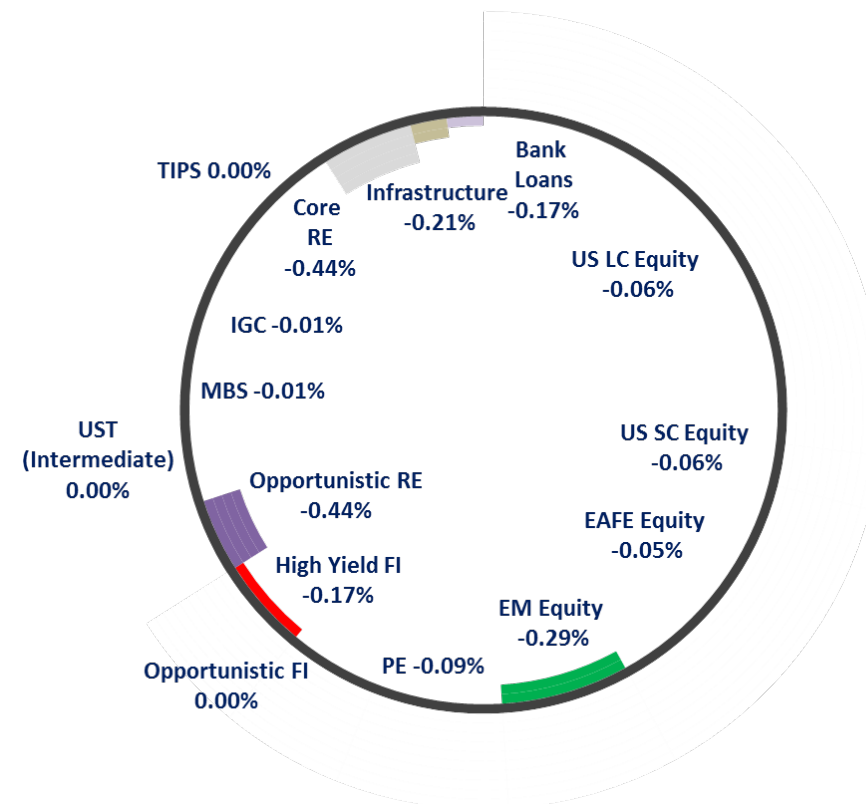


2°C SCENARIO – 10 YEAR RETURN IMPACT



Portfolio Return in 2°C Scenario	vs. Base Case	vs. Base Case (\$)*
6.59%	-0.27%	-\$2.7B

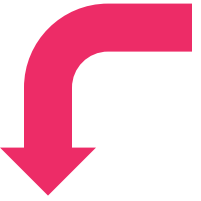
4°C SCENARIO – 10 YEAR RETURN IMPACT



Portfolio Return in 4°C Scenario	vs. Base Case	vs. Base Case (\$)*
6.75%	-0.10%	-\$1.1B

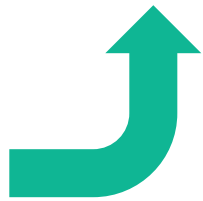
*Expected returns compounded linearly over 10 years based on starting fund value of \$56.9B

KEY FINDINGS FROM CLIMATE SCENARIO RISK ASSESSMENTS



- Each System's portfolio was analyzed separately; while there are some differences, the key takeaways are broadly consistent as follows:
- Portfolio Level Results
 - **A 2°C scenario has the most significant – and negative – impact** on each portfolio in the time horizons considered (10 years and out to 2050)
 - **A 4°C scenario would be expected to be the most impactful over time** – particularly in the 2nd half of the century – as the physical impacts of climate change become more severe
- Asset Class/Sector Level Results
 - **Asset class return impacts can be material** although the impact varies widely across scenarios
 - Exposure to **developed market equities** drives the negative portfolio outcome in a 2°C scenario
 - In a 2°C scenario, expected returns for **emerging market equities and real assets are positively impacted** whereas in a 4°C scenario they are **negatively impacted**
 - **(Sub)Sector return impacts are most significant and typically unidirectional**; Materials, Utilities, Oil and Coal are negatively impacted in all scenarios with the greatest potential for loss in 2°C

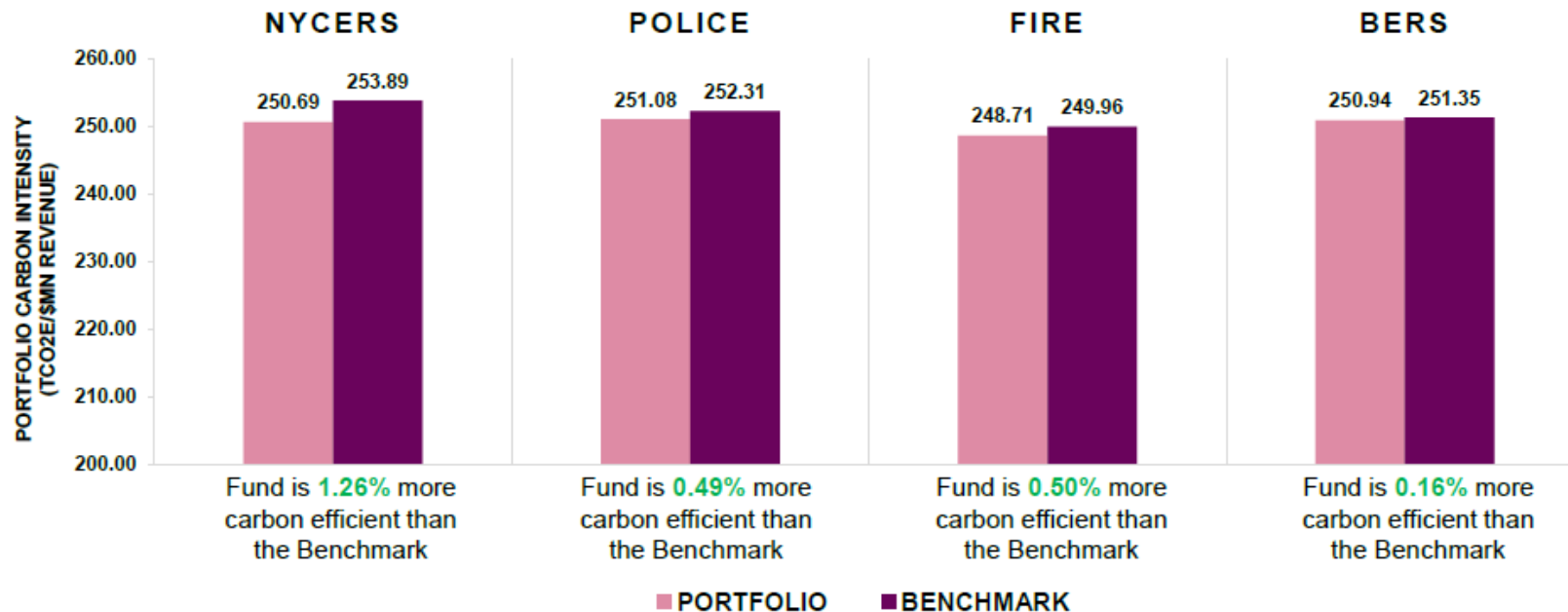
TRUCOST CARBON FOOTPRINT RESULTS SUMMARY



Summary of Findings: Relative to Benchmark

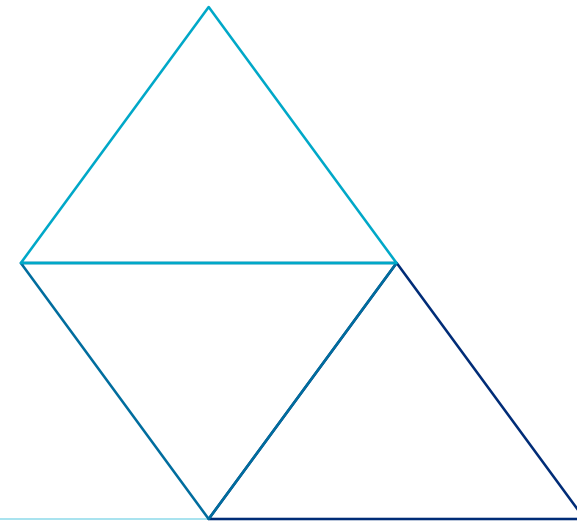
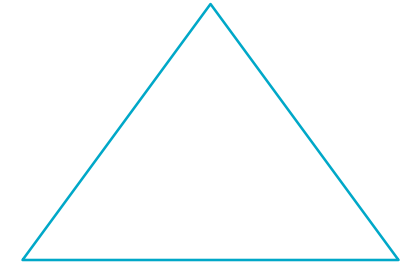


All of the systems have slightly lower carbon intensities than their benchmark, making them more carbon efficient than their benchmarks.



- Portfolios are very similar to benchmarks (within 1.5%)
- For each System the **Materials** sector negatively contributes to portfolio carbon intensity vs. benchmarks
- For all portfolios the **top ten holdings** contribute 18% or more to total portfolio carbon intensity
 - Most are **Utilities** which rank poorly amongst peers in terms of carbon intensity
 - Some are **Energy** companies which also rank poorly amongst peers in terms of carbon intensity

DEVELOPING A CLIMATE CHANGE STRATEGY RECOMMENDATIONS

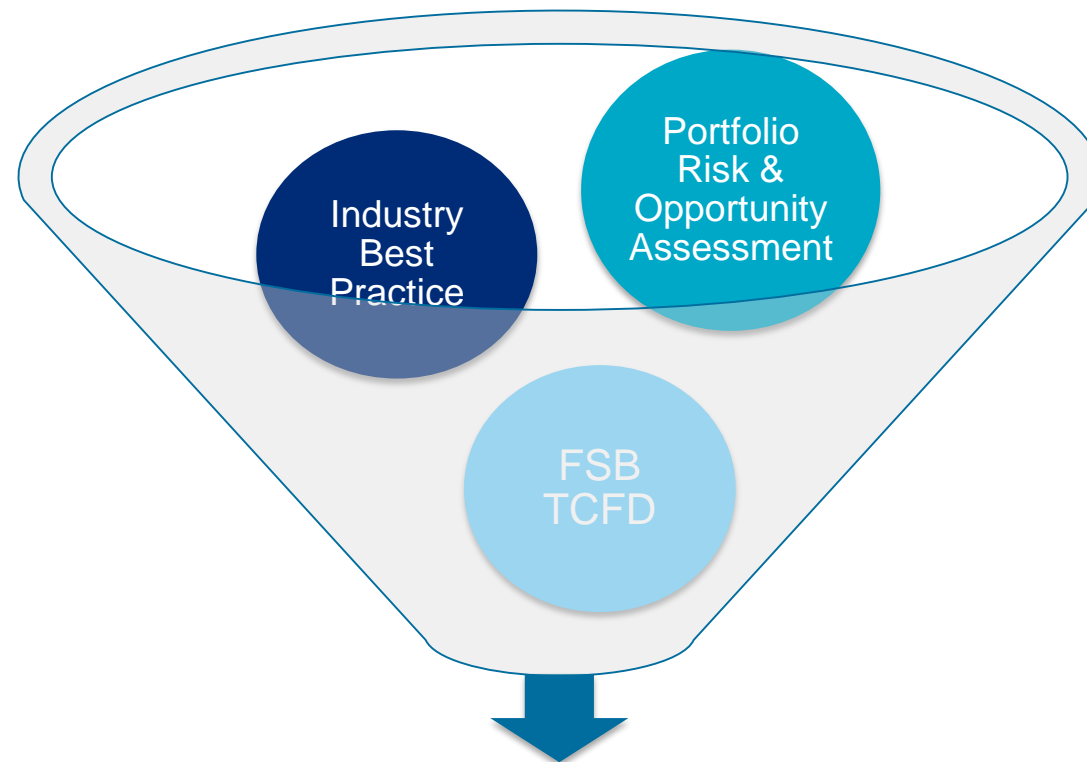


CLIMATE CHANGE RISK MANAGEMENT STRATEGY

Why?

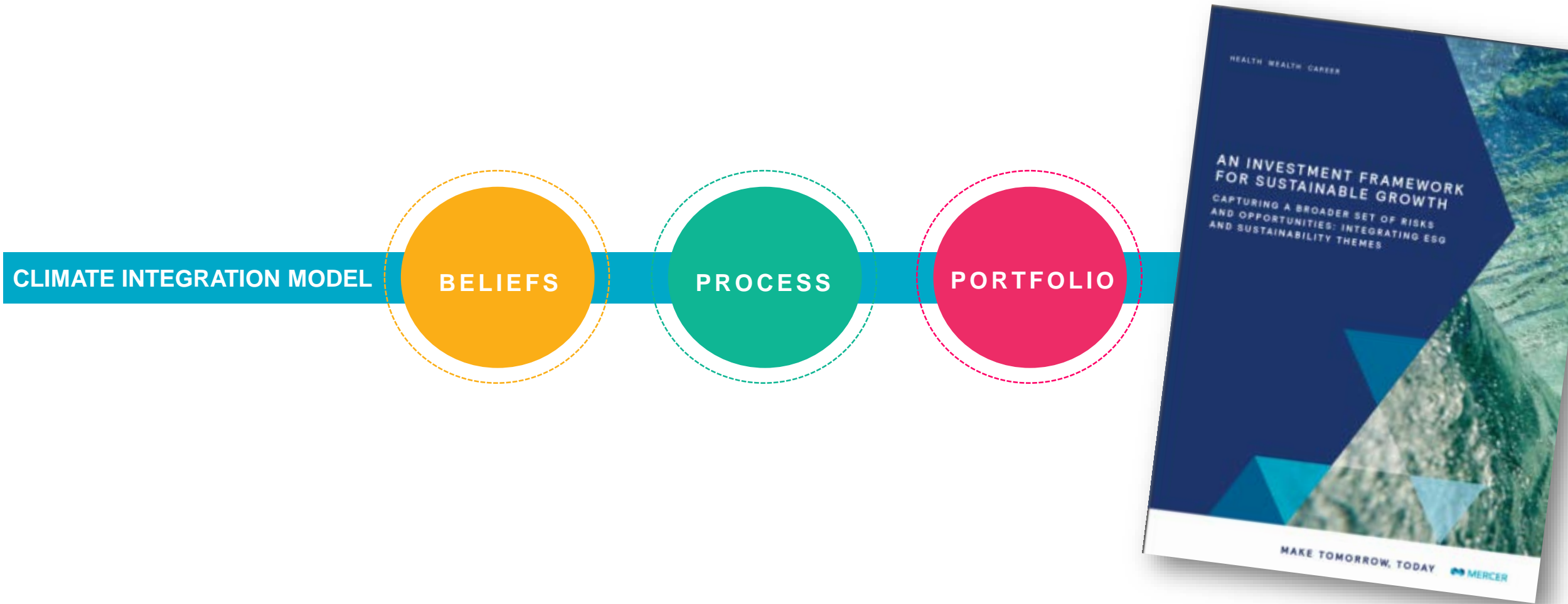
- Climate change risks and opportunities are likely significant, irrespective of scenario outcomes
- Regardless of the extent of physical climate impacts, regulatory/market actions are causing disruption
- The tragedy of horizons presents a challenge and opportunity for long-term investors
- Climate change risk is likely not being fully priced by markets today due to:
 - Time frame mismatches
 - Lack of historical data on climate change impacts
 - Behavioral economics
 - Low rate of adoption of climate change strategies amongst investors
 - Uncertainty regarding likely climate outcome

How?



Building Blocks for a Robust Climate Change Risk Management Strategy

MERCER'S FRAMEWORK FOR SUSTAINABLE GROWTH

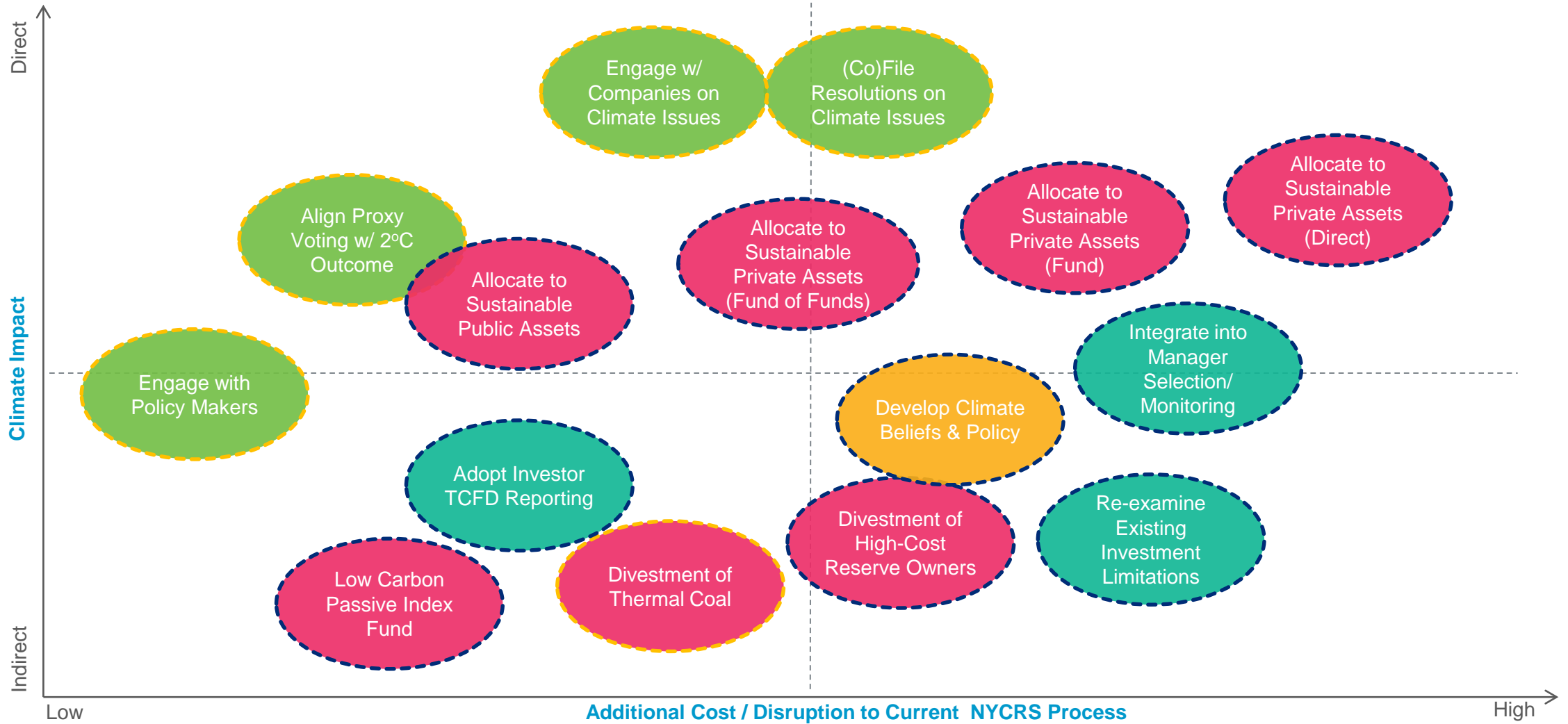


MERCER'S RECOMMENDATIONS FOR NYCERS

BELIEFS	PROCESS	PORTFOLIO
<ul style="list-style-type: none">• Develop one or more investment beliefs on climate change.	<ul style="list-style-type: none">• Reflect approach to climate risk management in IPS• Develop a climate change strategy document• Clarify corporate governance expectations with respect to Paris Agreement and TCFD• Document a policy on advocating for reasonable climate related policies and regulations across jurisdictions.• Adopt reference to climate related risks in overall risk management framework• Conduct a climate risk review of external managers and reflect any new expectations during due diligence• Report under the new PR/TCFD climate-related guidelines• Provide annual updates against the climate change strategy	<ul style="list-style-type: none">• Review divestment approach and consider expanding to high-cost, high-carbon reserve owners and thermal coal power utilities.• Move a portion of existing market-cap-weighted passive equity towards an ESG or low-carbon alternative• Target an aggregate allocation of 1% to sustainability-themed investments across all asset classes to be deployed by 2020• Re-examine existing limitations on private equity investments

MERCER RECOMMENDATIONS

IMPACT ON NYCRS AND THE CLIMATE



IN CLOSING

“The point is that the more we invest with *foresight*, the less we will regret in *hindsight*.”

Mark Carney*

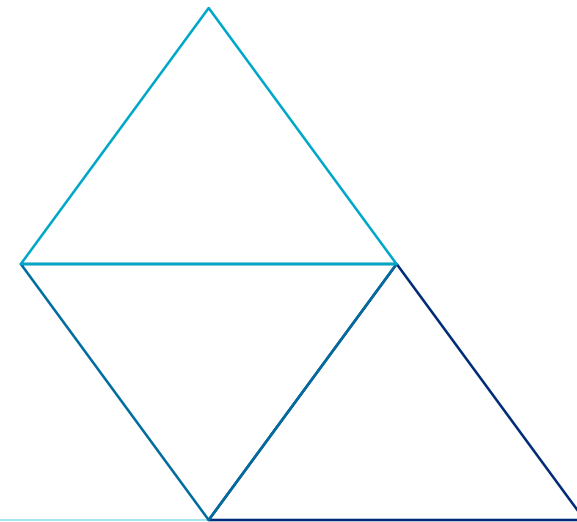
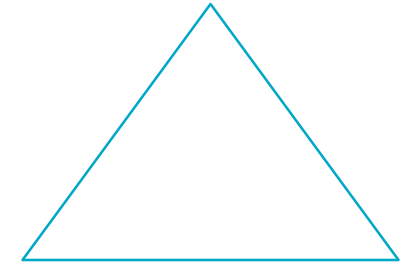
*2016 speech at Lloyd's of London entitled “*Breaking the Tragedy of the Horizon – climate change and financial stability*” by Mark Carney, Governor of the Bank of England and Chair, FSB.



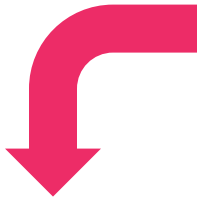
MERCER

MAKE TOMORROW, TODAY

APPENDIX



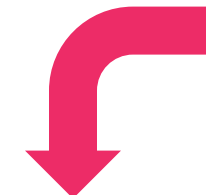
TRIP RISK FACTOR SENSITIVITIES BY ASSET CLASS



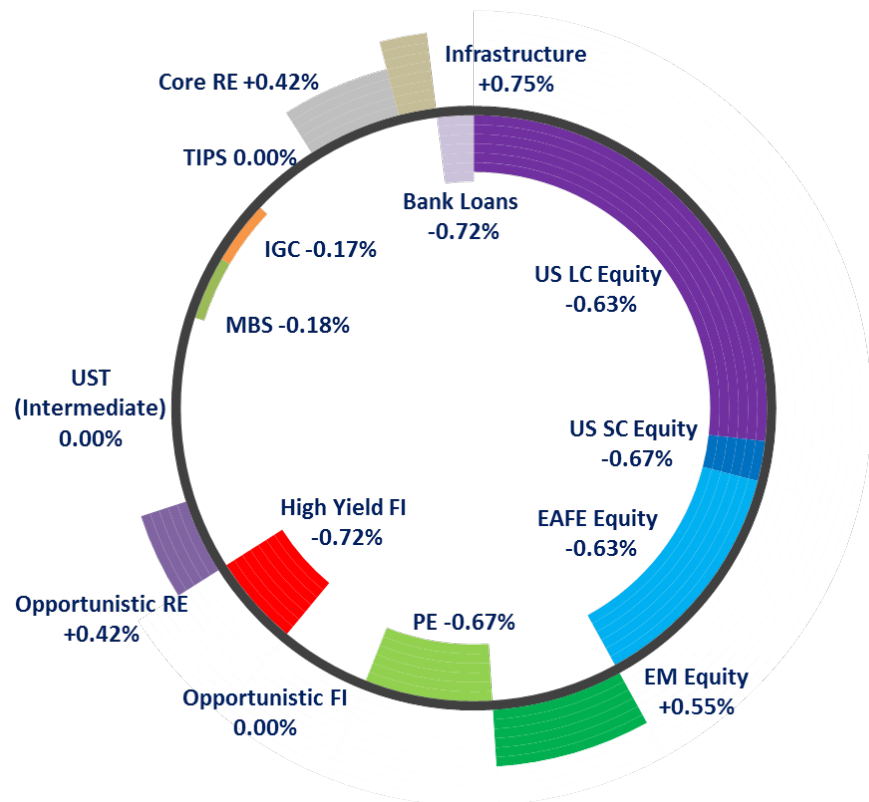
Asset Class	T	R	I	P
US Large / Medium Cap Equity	0.2	-0.2	-0.2	-0.2
US Small Cap Equity	0.22	-0.22	-0.22	-0.22
EAFE Equity	0.2	-0.2	-0.2	-0.2
Emerging Market Equity	0.2	-0.25	-0.5	0.1
Private Equity	0.2	-0.2	-0.25	-0.2
Hedge Funds	0	0	0	0
Opportunistic Fixed Income	0	0	0	0
High Yield Fixed Income	0	-0.12	-0.15	-0.12
Opportunistic Real Estate	0.1	0	-0.75	0.1
US Treasuries (20 year +)	0	0	0	0
US Treasuries (Intermediate)	0	0	0	0
Mortgages- Inv. Grade	0.06	-0.06	-0.06	-0.06
Credit- Investment Grade	0.06	-0.06	-0.06	-0.06
TIPS	0	0	0	0
Core Real Estate	0.1	0	-0.75	0.1
Infrastructure	0.25	-0.2	-0.5	0.1
Bank Loans	0.06	-0.06	-0.06	-0.06

Negative  Positive

NYCERS CLIMATE SCENARIO RESULTS

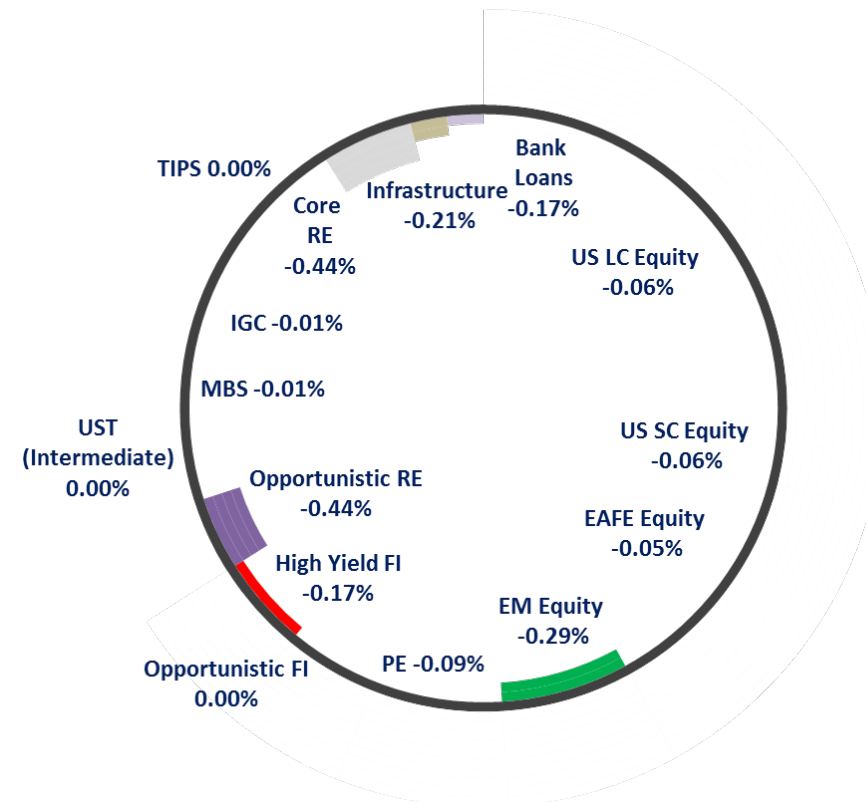


2°C SCENARIO – 10 YEAR RETURN IMPACT



Portfolio Return in 2°C Scenario	vs. Base Case	vs. Base Case (\$)*
6.59%	-0.27%	-\$2.7B

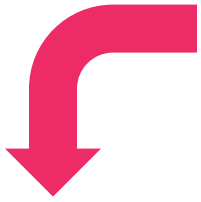
4°C SCENARIO – 10 YEAR RETURN IMPACT



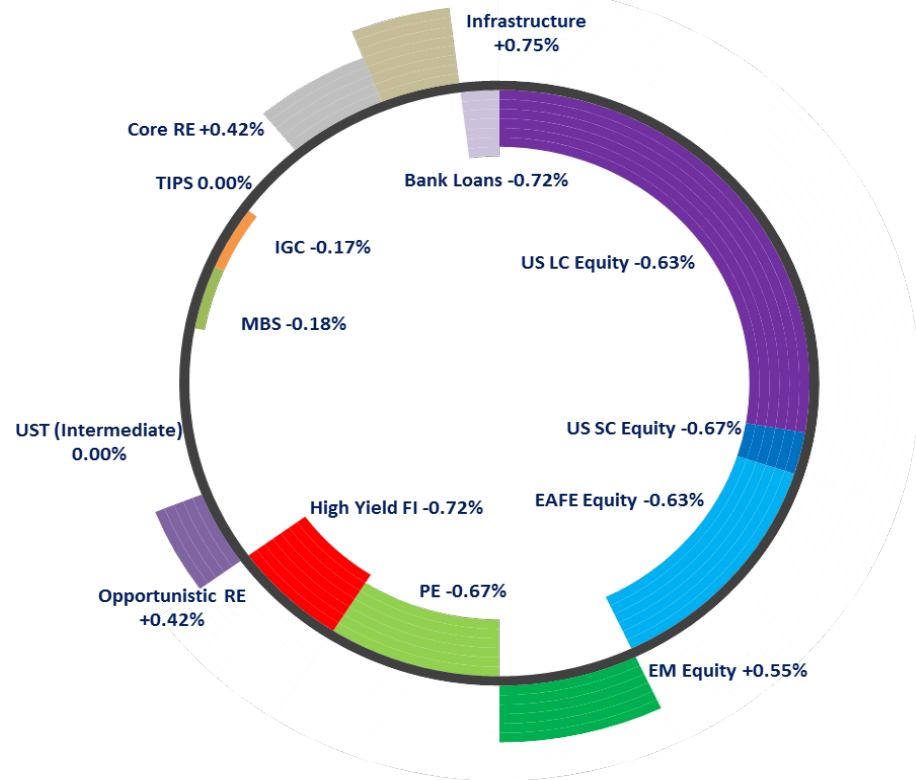
Portfolio Return in 4°C Scenario	vs. Base Case	vs. Base Case (\$)*
6.75%	-0.10%	-\$1.1B

*Expected returns compounded linearly over 10 years based on starting fund value of \$56.9B

BERS CLIMATE SCENARIO RESULTS

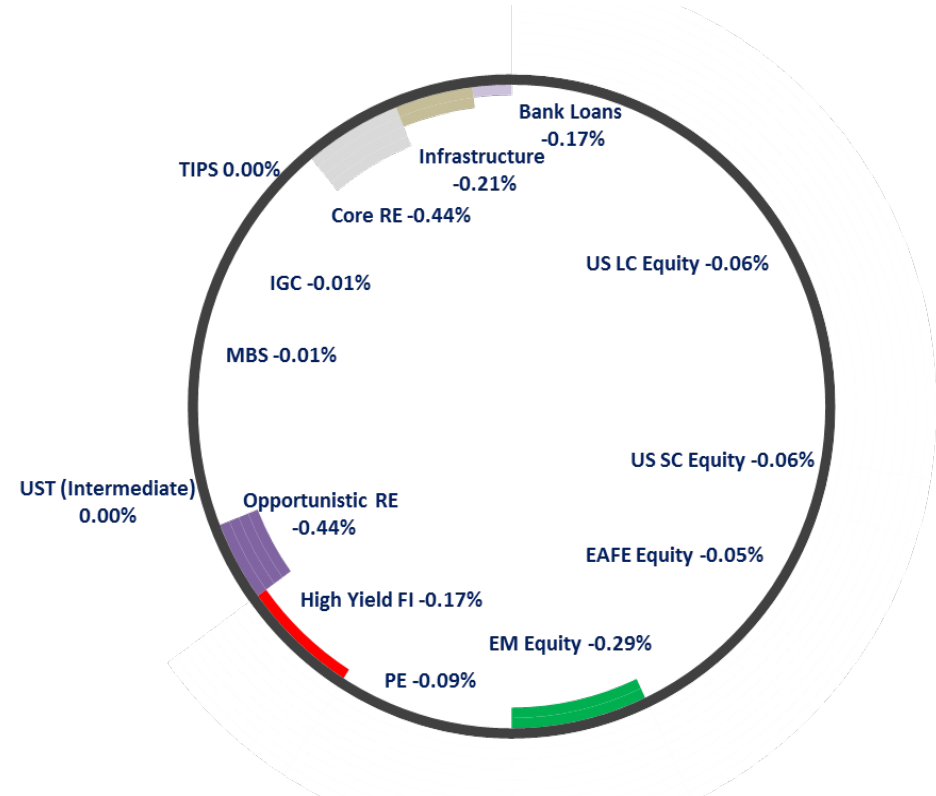


2°C SCENARIO – 10 YEAR RETURN IMPACT



Portfolio Return in 2°C Scenario	vs. Base Case	vs. Base Case (\$)*
7.00%	-0.28%	-\$250M

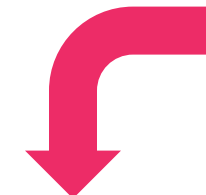
4°C SCENARIO – 10 YEAR RETURN IMPACT



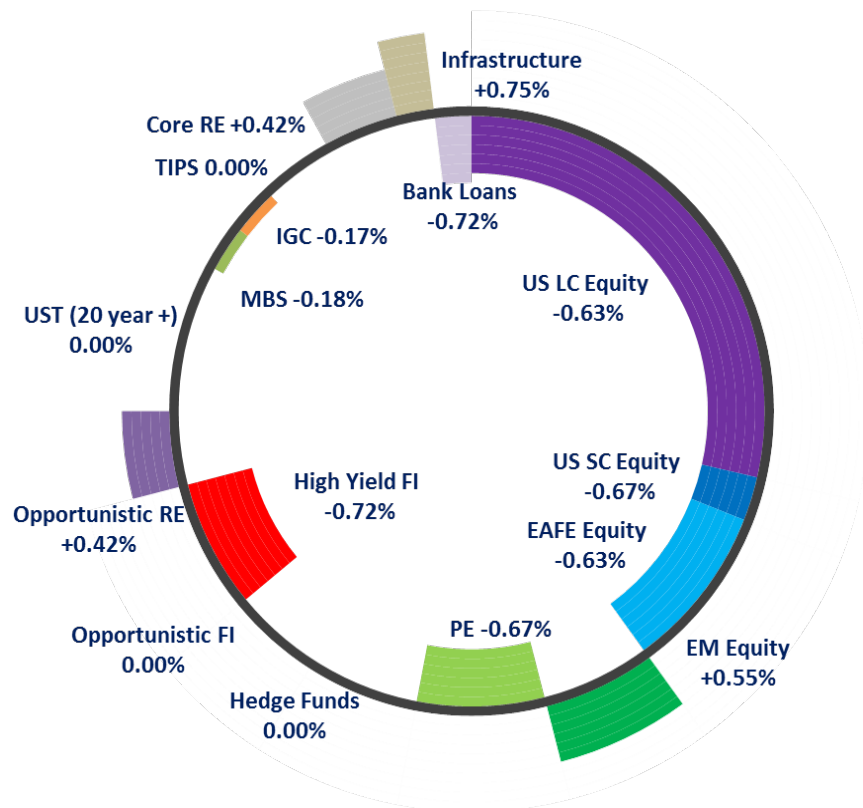
Portfolio Return in 4°C Scenario	vs. Base Case	vs. Base Case (\$)*
7.16%	-0.12%	-\$101M

*Expected returns compounded linearly over 10 years based on starting fund value of \$4.8B

FIRE CLIMATE SCENARIO RESULTS

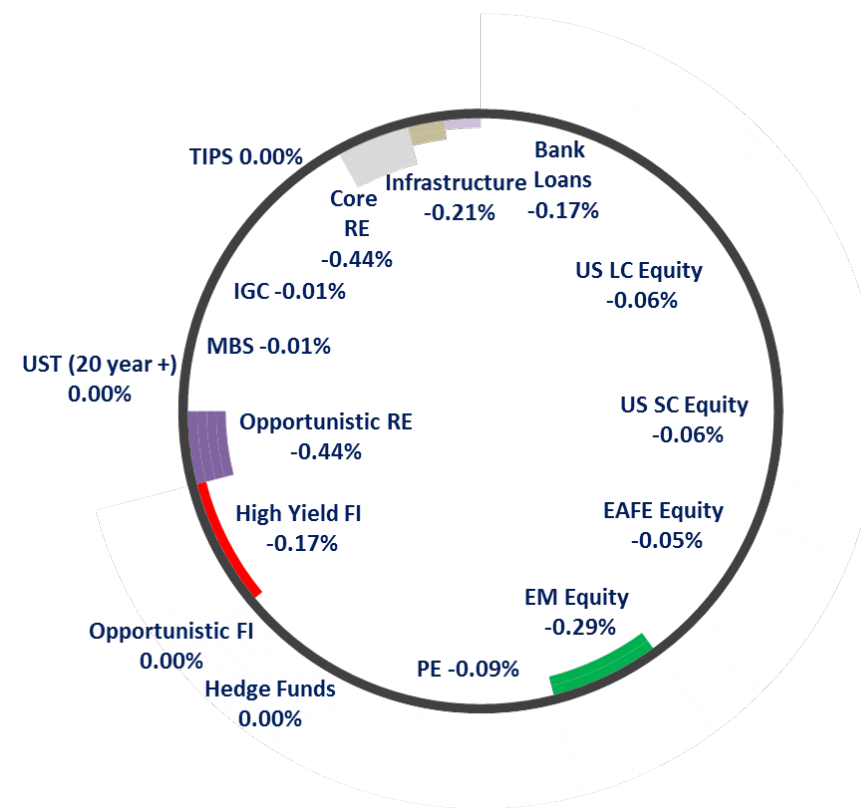


2°C SCENARIO – 10 YEAR RETURN IMPACT



Portfolio Return in 2°C Scenario	vs. Base Case	vs. Base Case (\$)*
7.30%	-0.27%	-\$596M

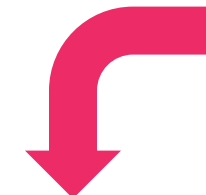
4°C SCENARIO – 10 YEAR RETURN IMPACT



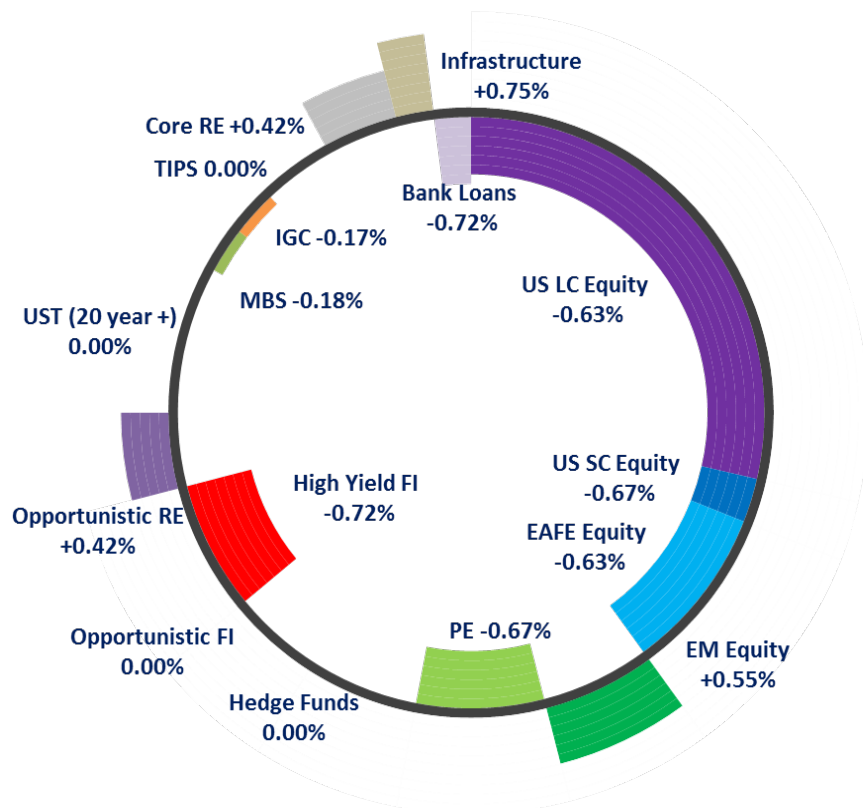
Portfolio Return in 4°C Scenario	vs. Base Case	vs. Base Case (\$)*
7.47%	-0.10%	-\$216M

*Expected returns compounded linearly over 10 years based on starting fund value of \$11.6B

POLICE CLIMATE SCENARIO RESULTS

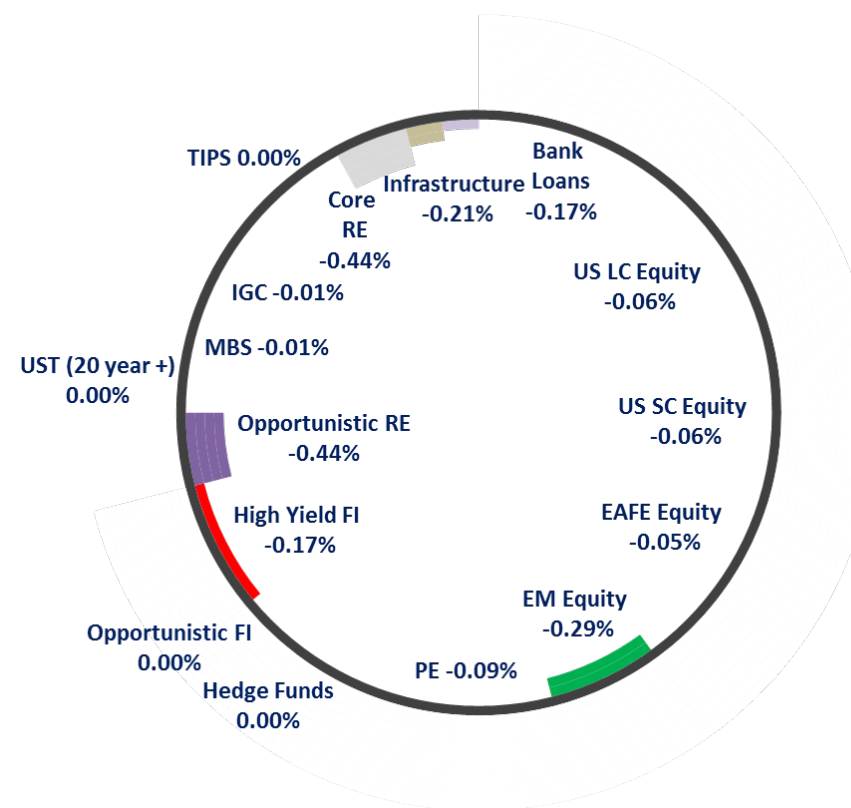


2°C SCENARIO – 10 YEAR RETURN IMPACT



Portfolio Return in 2°C Scenario	vs. Base Case	vs. Base Case (\$)*
5.18%	-0.17%	-\$1.5B

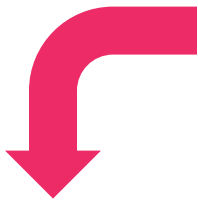
4°C SCENARIO – 10 YEAR RETURN IMPACT



Portfolio Return in 4°C Scenario	vs. Base Case	vs. Base Case (\$)*
5.35%	-0.10%	-\$556M

*Expected returns compounded linearly over 10 years based on starting fund value of \$35.5B

CLIMATE SCENARIO RISK DASHBOARD



NYCERS					
Horizon	Metric	Zero TRIP	2°C	3°C	4°C
10 Year	Return	6.85%	6.59%	6.85%	6.75%
	Risk	13.88%	14.06%	13.92%	13.91%
	Return/Risk	0.49	0.47	0.49	0.49
34 Year	Return	6.85%	6.69%	6.82%	6.76%
	Risk	13.88%	14.06%	13.93%	13.91%
	Return/Risk	0.49	0.48	0.49	0.49

BERS					
Horizon	Metric	Zero TRIP	2°C	3°C	4°C
10 Year	Return	7.28%	7.00%	7.28%	7.16%
	Risk	13.28%	13.46%	13.33%	13.31%
	Return/Risk	0.55	0.52	0.55	0.54
34 Year	Return	7.28%	7.11%	7.24%	7.17%
	Risk	13.28%	13.47%	13.33%	13.31%
	Return/Risk	0.55	0.53	0.54	0.54

NYCFDPF					
Horizon	Metric	Zero TRIP	2°C	3°C	4°C
10 Year	Return	7.57%	7.30%	7.56%	7.47%
	Risk	12.09%	12.25%	12.13%	12.12%
	Return/Risk	0.63	0.60	0.62	0.62
34 Year	Return	7.57%	7.40%	7.53%	7.47%
	Risk	12.09%	12.25%	12.14%	12.12%
	Return/Risk	0.63	0.60	0.62	0.62

NYCPPF					
Horizon	Metric	Zero TRIP	2°C	3°C	4°C
10 Year	Return	5.45%	5.18%	5.44%	5.35%
	Risk	11.89%	12.05%	11.93%	11.91%
	Return/Risk	0.46	0.43	0.46	0.45
34 Year	Return	5.45%	5.28%	5.41%	5.35%
	Risk	11.89%	12.05%	11.93%	11.92%
	Return/Risk	0.46	0.44	0.45	0.45

SUSTAINABLE ASSET CLASS DESCRIPTIONS

Asset Class	Description
Sustainable Public Equity	Sustainable equities are expected to capture upside from a low carbon transition through greater exposure to climate change solutions providers. Relative to the broader market, this segment of the equity market is expected to disproportionately benefit from a growth in climate mitigation related policy and technological advancement.
Sustainable Private Equity	Mostly venture and growth funds at this stage of the market's development focused on clean technology investments or on companies with services supporting environmental sustainability.
Sustainable Infrastructure	Sustainable infrastructure consists of a broad range of projects and solutions including renewable energy, water and waste management, and energy efficiency investments. These areas are expected to benefit from clean technological innovation and strong policy action to combat emissions. Similar to other sustainability themed asset classes, sustainable infrastructure would benefit from avoiding exposure to assets which may become stranded in a low-carbon transition.
Green Bonds	The green bond market is currently dominated by government/supranational issuances, but more corporate issuance is expected going forward. Corporate green bonds will be issued by organizations that have, in general, proactive climate risk management practices overall and thus be less susceptible to climate-related default risk.

IMPLEMENTATION OF SUSTAINABLE INVESTMENT MANDATE

Asset Class	Universe Size and Near Term Implementation Feasibility *	Near Term Implementation Feasibility Considerations for NYCRS
Sustainable Public Equity	A large number of mature and high quality sustainability-themed strategies are available globally	Developing a nuanced allocation across multiple regions or styles could pose challenges though NYCRS' size could support customization and seeding of new products as needed
Sustainable Private Equity	A large and growing number of strategies exist targeting sustainability-oriented businesses in various sectors beyond clean tech	NYCRS' size, region and venture constraints severely limit universe
Sustainable Infrastructure	A large and growing number of strategies exist targeting renewable energy installations (utility and community scale) and other forms of sustainable infrastructure	NYCRS's size constraints limit universe
Green Bonds	Green bond issuance is increasing but there remain some market liquidity concerns and few mature dedicated fund offerings; more generally sustainable product innovation in fixed income has lagged public equity	Green bonds are already owned in many traditional portfolios and concentration could potentially be increased in separately managed accounts; NYCRS' size could also support customization and seeding of new products as needed

* Based in part on the absolute availability of ESG1 rated strategies in Mercer GIMD, where available. Red: <5; Amber: 5-10; Yellow: 10-20; Light Green: 20-40; Dark Green: >40; near term here means next 1-3 years.



QUESTIONS?

MAYOR DE BLASIO & COMPTROLLER STRINGER

**Resolution Regarding NYC Pension Funds
Divestment & Exclusion Strategy
for Fossil Fuel Reserve Owners**

QUESTIONS?