MERCER
MAKE TOMORROW, TODAY

INVESTING IN A TIME OF CLIMATE CHANGE:

CALIFORNIA STATE TEACHERS RETIREMENT SYSTEM PORTFOLIO CLIMATE CHANGE RISK ASSESSMENT EXECUTIVE SUMMARY

FEBRUARY 23, 2016

MARSH & McLENNAN COMPANIES

EXECUTIVE SUMMARY

The California State Teachers' Retirement System (CalSTRS) has recently partnered with Mercer and 17 other participants in a research study ("the Study") to gain further insights into the investment implications of climate change. The timing is no coincidence: 2015 was a critical year, with global governments meeting in Paris in December to negotiate a new global climate change agreement.

Climate change is an environmental, social and economic risk, expected to have its greatest physical impact in the long term. To address it, and avoid dangerous temperature increases, policy action is needed now. With the recent Paris Agreement, countries committed to lower their greenhouse gas emissions sufficiently to keep a global temperature rise well below 2°C this century relative to pre-industrial levels. Though much uncertainty remains regarding the collective ability of agreement signatories to meet this commitment.

To seek to quantify the risks and opportunities which arise in a time of climate change, and appropriate actions as a result of them, the Study brought together a cross-section of the global investment industry including asset owners, investment managers, insurance companies and private banking firms. The Study also benefitted from the input of an advisory group composed of renowned experts in the fields of investment and climate finance.

The public report – *Investing in a Time of Climate Change* – provides a comprehensive review of the Study's research, methodology and findings. This Executive Summary of CalSTRS' tailored climate change risk assessment report focuses on the key findings and implications of this research for CalSTRS.

CALSTRS – ACTIONS AND MOTIVATIONS

CalSTRS has already taken a number of steps in developing its approach to the management of environmental, social and governance (ESG) risks and opportunities. The organization's motivations for joining this Study were to:

- Gain a broader understanding of climate risk and opportunity, and how these interact with the asset classes and sectors to which CalSTRS has exposure;
- Determine the appropriate positioning for CalSTRS' investment portfolio in relation to climate change by identifying relevant risks and opportunities;
- Develop a series of specific steps which CalSTRS can take to evolve its investment approach in the context of climate change in order to optimize risk-adjusted returns for members over the long term.

KEY FINDINGS FOR CALSTRS

This Executive Summary provides highlights of the estimated return implications under the four climate scenarios and four climate risk factors, modeled between 2015 and 2050, with commentary on the specific implications of these findings for CalSTRS. The return estimates developed as part of this research apply at the total portfolio, asset class and industry sector levels. Key findings for CalSTRS based upon the analysis follow:

The impact of climate change on the total portfolio is variable across scenarios and potentially significant.

After assessing the aggregate impact of the TRIP factors under each climate scenario on CalSTRS' total portfolio we find it would be reasonably well insulated from loss under a Coordination and Fragmentation (Lower Damages) scenarios. However it would be quite vulnerable under a Transformation scenario where CalSTRS could see a -0.32% per annum impact on median returns over the coming decade and a -0.17% per annum impact on median returns over 35 years. For $192 billion[1] in assets invested in 2015 this relates to a cumulative loss to CalSTRS of approximately $12 billion by 2025 and $123 billion by 2050[2]. CalSTRS would also be increasingly vulnerable to a Fragmentation (Higher Damages) scenario over time with median annual return impacts of -0.12% over the 35-year time horizon leading to a cumulative loss to CalSTRS of $83 billion by 2050[3].

CalSTRS' total portfolio would be most negatively impacted by a Transformation scenario due to large allocations to developed market equity.

Given the strength and scale of response required to place the economy on a 2^{o}C trajectory, the impact of the TRIP factors on investment portfolio returns is strongest under the Transformation scenario. Both the US and Developed Market Equity asset classes – which together make up nearly half of CalSTRS' total exposures – are expected to be negatively impacted. Add Private Equity into the mix and exposures with significant negative median return impacts at the 35-year and 10-year time horizons would account for over 60% of CalSTRS total fund. CalSTRS can seek to address these risks through the following activities (some of which are already underway):

- Reallocating a portion of passive exposures towards lower-carbon indices or exploring other forms of alternative indexing.
- Allocating a (larger) portion of active equities towards thematic manager(s) focused on sustainability and/or green/resilient investments.
- Increasing exposure to Emerging Market Equity (public or private), which is expected to be positively impacted under a Transformation scenario, keeping in mind other macro factors influencing the attractiveness of the region, or taking other steps to diversify growth assets.

[1] Approximate total fund balance as of June, 2015.

[2] These figures are based off of a comparative analysis of CalSTRS portfolio between a baseline no-climate-change scenario and Transformation outputs using linear median return calculations (Fund Value * ((1+Expected Return) ^ N Years)). Without the influence of climate change our baseline median annual portfolio return expectations are 7.93% over 10 years and 7.27% over 35 years.

[3] Ibid

- Updating CalSTRS' engagement strategy with clear objectives focused on gaining clarity from holding companies about their "2^{o}C business plans" (whether conducted through passive managers, active managers and/or directly by CalSTRS).

CalSTRS' active equity managers have sector exposures largely in line with their respective benchmarks.

While some slight sector tilts in CalSTRS active equity mandates across geographies might offer protection against climate change outcomes, these are not significant by comparison to the more deliberate tilts away from highly exposed sectors – notably Energy and Utilities – exhibited by sustainability-themed managers. CalSTRS active equity managers thus are not well positioned altogether to withstand adverse climate change outcomes versus passive alternatives. To address this CalSTRS might consider allocating a (larger) portion of active equities towards thematic manager(s) focused on sustainability and/or green/resilient investments. A more deliberate approach to climate change risk management at the portfolio level might also be warranted with strategic allocations to active mandates looking to take more advantage of/protect against the structural economic shifts which will accompany the successful implementation of the Paris Agreement, whether gradual or abrupt.

RECOMMENDATIONS FOR CALSTRS

The Study recommends integrating climate considerations to achieve sustainable growth by following a holistic and thoughtful Beliefs, Process and Portfolio framework. This report captures which of the study's recommendations for action have already been addressed by CalSTRS and where, given the findings, CalSTRS could focus its attention next. We have organized our summary of recommended actions immediately following into two categories – Objectives and Tasks. The former include *general* aspirations to support CalSTRS' overall strategic portfolio management of climate change risk. The second are *specific* short-term tasks which the various teams within CalSTRS can undertake to evolve CalSTRS' strategic approach to climate change risk management and opportunity capture.

Objectives

- **Develop a "house view" of climate change risk** based on the results of this study and other climate risk assessment efforts underway or being contemplated. The scenario or combination of scenarios used for planning purposes will influence risk management decisions and help to determine CalSTRS' desired role as a Future Taker or Future Maker. The recent Paris Agreement (which reflects the ambitions of our Transformation scenario) is a relevant consideration in this regard.
- **Continue to collaborate across departments and asset classes** to embed climate change risk management practices throughout the organization.
- **Develop a holistic climate change risk management strategy** which reflects house view of risk and outlines a work plan for future one-time and ongoing activities, and related monitoring and reporting.
- **Address resourcing needs** to ensure appropriate execution of climate change strategy.

Tasks

- **Finalize investment beliefs** at board level and ensure inclusion of appropriate references to ESG and climate change risk/opportunity.
- **Initiate a review of the 21 ESG risk factors** and approach to ESG investing currently outlined in the Investment Policy and Management Plan to ensure compliance with CalSTRS current practices and industry best practices.
- **Risk assessment and monitoring:**
  - **Integrate ESG risk assessments** in portfolio risk management and manager selection/monitoring.
  - **Undertake environmental and climate resilience assessment** of all Real Estate and Real Asset holdings (directly, or in conjunction with managers/third-parties).
  - **Continue to work across departments** aligning the ESG risk assessments already conducted by the Corporate Governance team with financial risk assessments conducted by the Risk Management team.
- **Portfolio construction**:
  - **Equities**: With close to a 60% allocation to Public and Private Equity and with a decidedly developed-world focus, CalSTRS has a significant exposure to climate policy action as contemplated under the Transformation scenario. If CalSTRS believes a Transformation outcome or similar is likely in the near term (e.g. next five years) CalSTRS should consider diminishing this exposure in one or multiple of the following ways:
    - **Regional Equities**: Consider diversifying regional exposure to include more Emerging Market Equities (at least in line with global benchmarks) keeping in mind other macro factors influencing the attractiveness of the region while possibly diminishing exposure to US/Developed Market Equities.
    - **Active equities**: Consider adding more thematic sustainability manager(s) to the global equity mix and/or other means of managing sector exposures within equity allocations.
    - **Passive Equities**: Continue efforts to reallocate a portion of passive equity holdings to alternatives (e.g. low-carbon tilted strategies) which may offer climate policy protection.
    - **Private Equity**: Consider further allocations to emerging market or thematic strategies focused on sustainability.
  - **Real Assets**:
    - **Infrastructure**: Consider a larger allocation to this asset class with a focus on green/resilient infrastructure.
    - **Timber and Agriculture**: Explore the possibility of strategic allocations to these asset classes with a focus on sustainable forestry/farming assets.

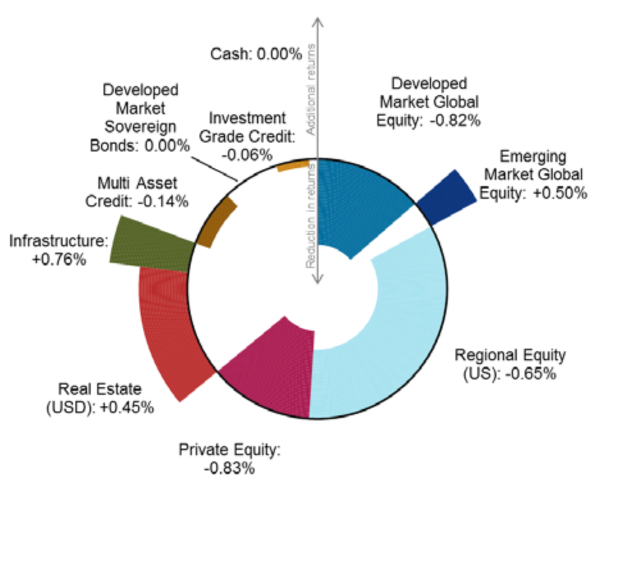
KEY FINANCIAL OUTPUTS

Key financial results from CalSTRS tailored report follow for ease of reference including: asset class impact circles for the Transformation (2^{o}C) scenario and; Cumulative/Annualized total portfolio return impact charts. Both are presented at 10- and 35-year time horizons.

Figure 1: Median asset class return impacts at 10 and 35 years – Transformation Scenario.

Total Fund – Transformation Scenario Impact

10 Years



35 Years

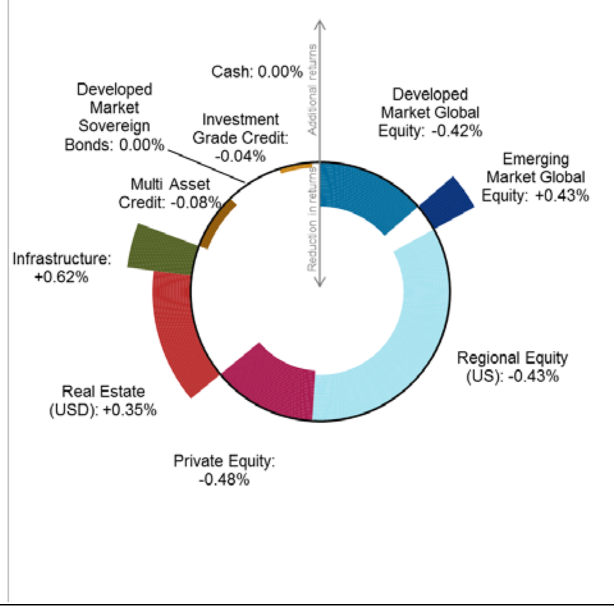
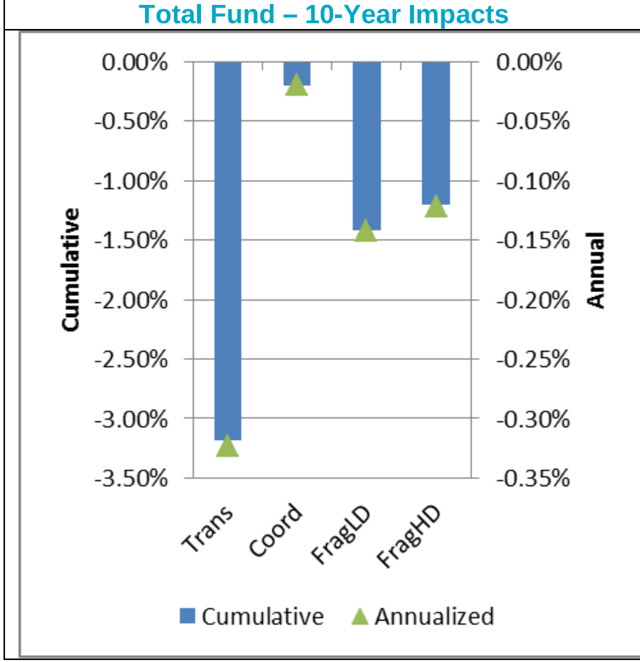


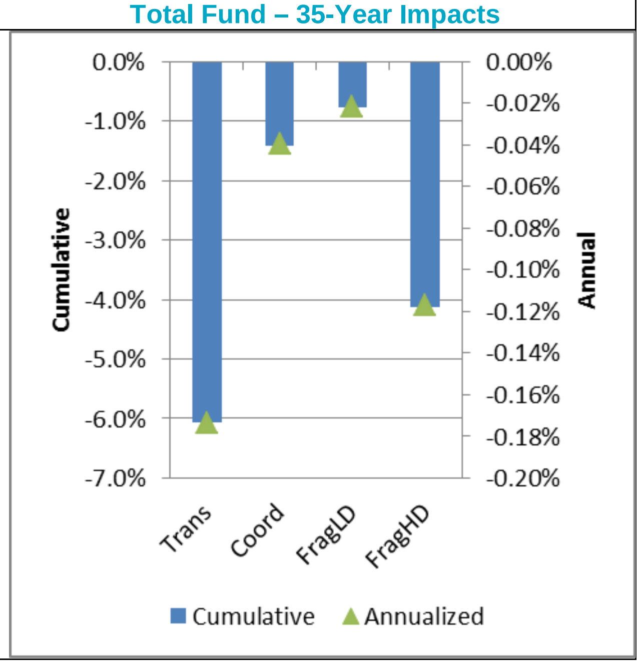
Figure 2: Impact on total portfolio median returns by scenario

Cumulative return impact over 10 years (to 2025) and 35 years (to 2050)

Total Fund – 10-Year Impacts



Total Fund – 35-Year Impacts



Important Notices

References to Mercer shall be construed to include Mercer LLC and/or its associated companies.

This contains confidential and proprietary information of Mercer and is intended for the exclusive use of the parties to whom it was provided by Mercer. Its content may not be modified, sold or otherwise provided, in whole or in part, to any other person or entity, without Mercer's prior written permission.

Mercer does not provide tax or legal advice. You should contact your tax advisor, accountant and/or attorney before making any decisions with tax or legal implications.

The findings, ratings and/or opinions expressed herein are the intellectual property of Mercer and are subject to change without notice. They are not intended to convey any guarantees as to the future performance of the investment products, asset classes or capital markets discussed. Past performance does not guarantee future results. Mercer's ratings do not constitute individualized investment advice.

Information contained herein has been obtained from a range of third party sources. While the information is believed to be reliable, Mercer has not sought to verify it independently. As such, Mercer makes no representations or warranties as to the accuracy of the information presented and takes no responsibility or liability (including for indirect, consequential or incidental damages), for any error, omission or inaccuracy in the data supplied by any third party.

This does not constitute an offer or a solicitation of an offer to buy or sell securities, commodities and/or any other financial instruments or products or constitute a solicitation on behalf of any of the investment managers, their affiliates, products or strategies that Mercer may evaluate or recommend.

The value of your investments can go down as well as up, and you may not get back the amount you have invested. Investments denominated in a foreign currency will fluctuate with the value of the currency. Certain investments, such as securities issued by small capitalization, foreign and emerging market issuers, real property, and illiquid, leveraged or high-yield funds, carry additional risks that should be considered before choosing an investment manager or making an investment decision.

For the most recent approved ratings of an investment strategy, and a fuller explanation of their meanings, contact your Mercer representative.

For Mercer's conflict of interest disclosures, contact your Mercer representative or see www.mercer.com/conflictsofinterest.

THE FOLLOWING PROVISIONS APPLY TO DATA OR OTHER SERVICES PROVIDED BY THE FOLLOWING COMPANIES: Where "End User" appears before the Vendor name, a direct end-user license with the Vendor is required to receive some indices. You are responsible for ensuring you have in place all such licenses as are required by Vendors.

Investment advisory services provided by Mercer Investment Consulting LLC.

Mercer Investment Consulting LLC is a federally registered investment advisor under the Investment Advisers Act of 1940, as amended, providing nondiscretionary and discretionary investment advice to its clients on an individual basis. Registration as an investment advisor does not imply a certain level of skill or training. The oral and written communications of an advisor provide you with information about which you determine to hire or retain an advisor. Mercer's Form ADV Part 2A & 2B can be obtained by written request directed to: Compliance Department, Mercer Investments, 701 Market Street, Suite 1100, St. Louis, MO 63011.

MERCER

MAKE TOMORROW, TODAY

Mercer Investment Consulting LLC.
1301 5th Avenue Suite 1900
Seattle, WA 98101