Callan

Chicago Teachers' Pension Fund

January 2019

CONFIDENTIAL

Real Assets Portfolio Review

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  - Performance Review
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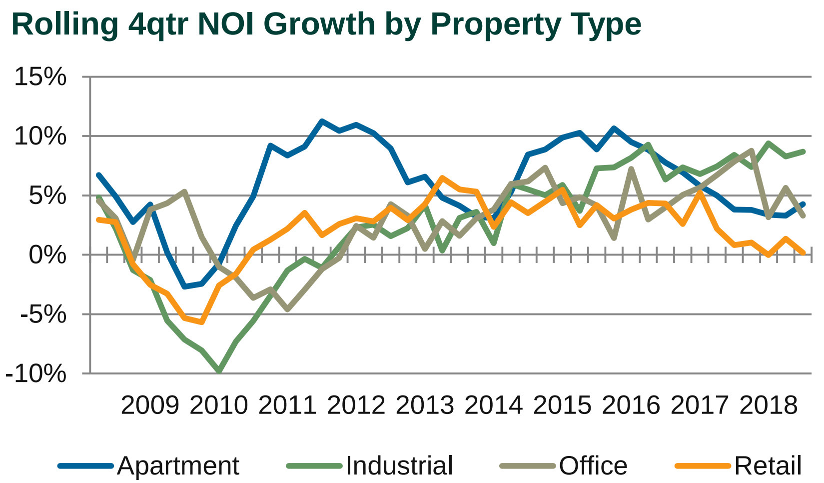
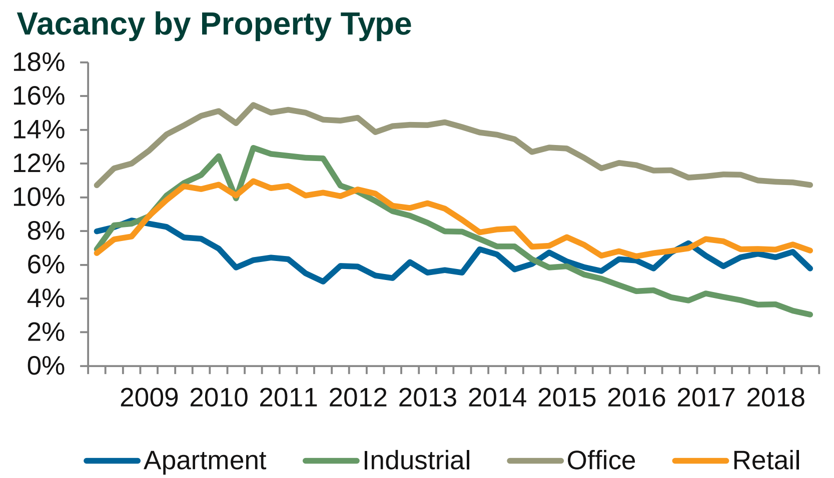
Real Estate Market Overview

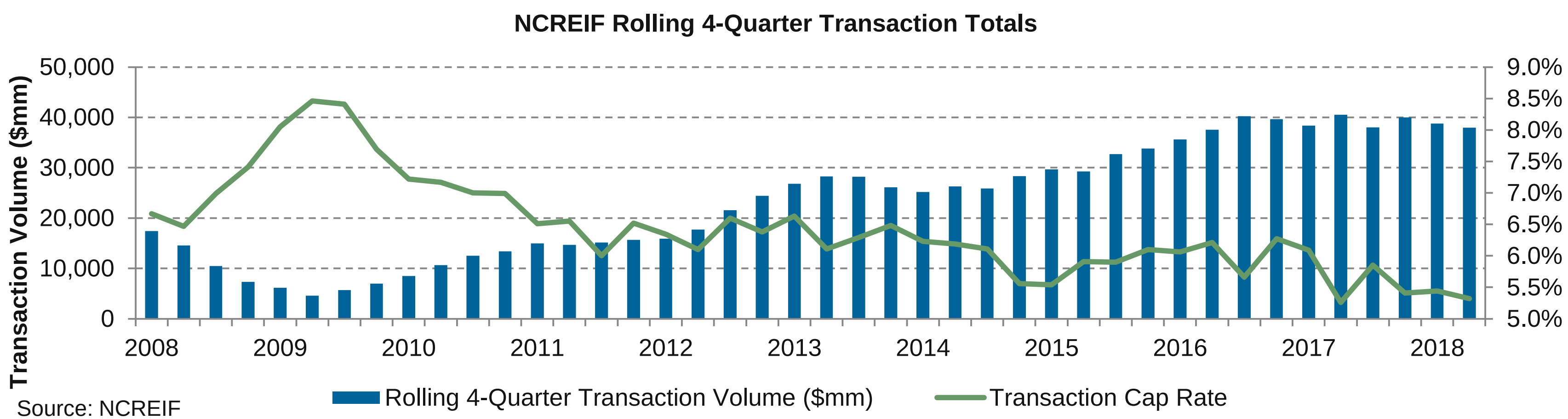
Market Overview

- 2018 marks the 9th year of the U.S. economic expansion and the U.S. economy continues to thrive. GDP clocked a solid 4.1% gain in the second quarter and a 3.4% in the third quarter.
- The unemployment rate increased slightly to 3.9% in December, although it is still low. Wages are inching up; consumer spending remains robust, as does consumer confidence.
- Inflation is gradually trending up but remains contained. Much of the recent rise is attributable to a rebound in oil prices; if prices remain steady, the increase in inflation is expected to abate.
- U.S. real estate fundamentals are healthy. The real estate sector continued to see steady returns driven by above inflation-level rent growth in many metros. In the third quarter, the NPI reported a total annual return of 6.9%, above the Barclay's U.S. Aggregate Bond Index annual return of -1.22% and below the S&P 500 annualized return of 16.3%.
- Within the NPI, the vacancy rate for U.S. property was 5.8% in the third quarter of 2018, near its lowest level since 2001. Vacancies were below their 20-year average in every major sector, however the rate of absorption has flattened.
- Net operating income has been growing annually, and is expected to be the primary driver of returns going forward as the real estate cycle is in a mature phase and appreciation has been moderating.
- Valuations continue to creep higher, although there is a dispersion between property sectors. The office sector has had varying levels of performance based on location, suburban versus CBD, as well as market, primary or secondary/tertiary. Industrial performance has been strong and multi-family may benefit from increased demand in the presence of declining home affordability.

Market Trends







Source: NCREIF

Real Assets Performance Review

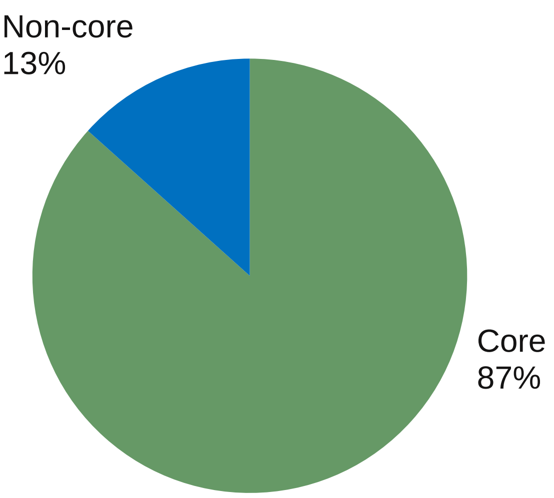
Real Estate Portfolio Summary

September 30, 2018

- Portfolio is below the target allocation. However, dividends are now being reinvested into core funds and additional capital will be allocated to PRISA II, Clarion LIT, and LaSalle Property Fund. Subsequent to quarter-end, the non-core real estate search concluded.
- Unfunded commitments as of September 30 include commitments to Longpoint, Basis Investment Group Real Estate Fund I, GreenOak US Fund III, Blackstone High Grade Debt Fund, Oak Street Real Estate Capital Fund IV, and Newport Capital Partners II.
- Portfolio is well positioned with 87% of the market value in funds that pursue "Core" strategies with income producing properties.

	$ Millions	(%)
CTPF Total Plan Assets	$11,000.67	100.00%
Real Estate Target	$990.06	9.00%
Plan's Real Estate Market Value	$765.57	6.96%
Unfunded Commitments	$108.40	0.99%
Market Value & Unfunded Commitments	$873.97	7.95%

Real Estate Market Value

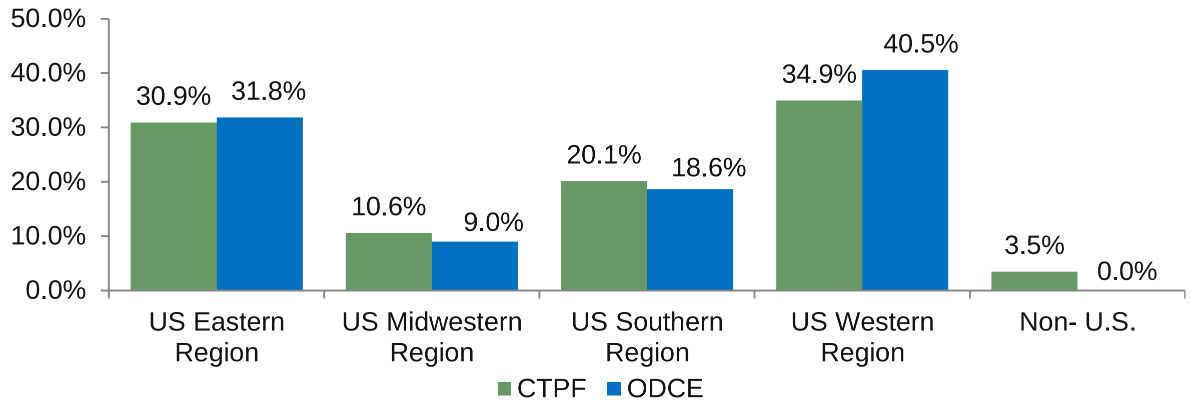


Real Estate Portfolio Diversification

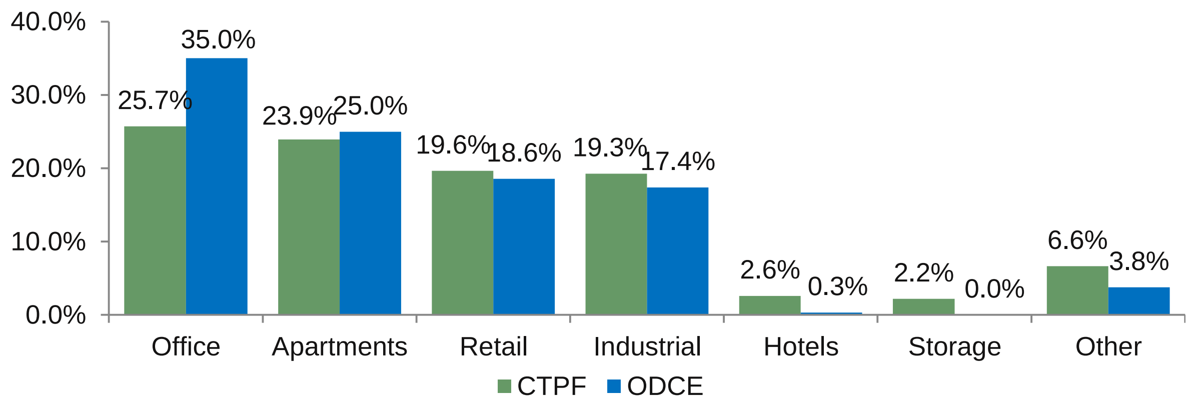
September 30, 2018

- The real estate portfolio is primarily located in the U.S. with only 3% in Non-U.S. markets including Asia, the United Kingdom, Continental Europe, and Mexico.
- Four core property types comprise 89% of the portfolio. Hotels, Storage and Other comprise 11%. Property Types in Other include mixed use, for sale residential, senior housing, land, diversified, parking, and health care. ODCE does not break Storage out from Other.
- Diversification will shift as changes in open end portfolio occur.

Geographic Diversification



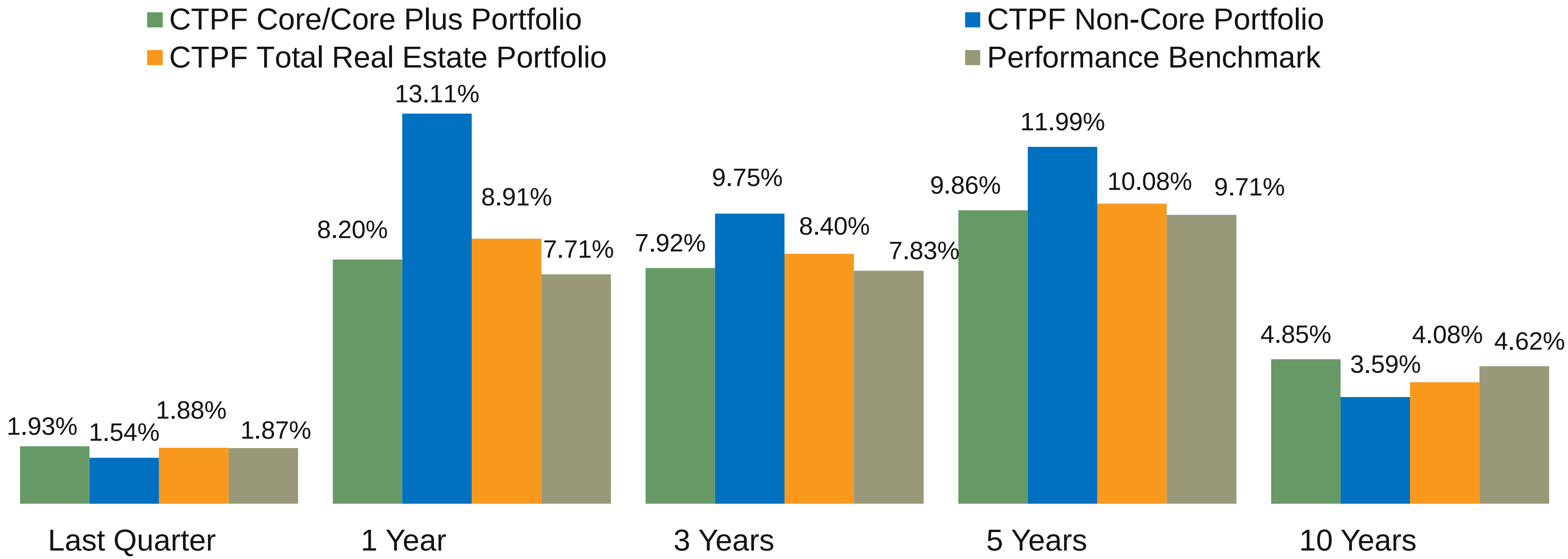
Property Type Diversification



Note: Subtotals reflect actual weights, not the sum of rounded weights shown.

Core/Core Plus and Non Core Real Estate Returns

Periods Ending September 30, 2018



- Four of seven funds in the Core/Core Plus Portfolio outperformed the benchmark. Lion Industrial Fund, driven by the outperformance of the industrial sector was the best overall performer. Lion Industrial Trust, PRISA and PRISA II all delivered income and appreciation above the benchmark, while LaSalle Property Fund also had an income return that outpaced the benchmark. JPMorgan Strategic Property Fund and PRISA income returns were below the benchmark.

- UBS Trumbull Property Fund underperformed the benchmark by 71 basis points. CTPF's redemption request to fully redeem out of the UBS Fund was submitted and CTPF received its first redemption distribution in October 2018.

- The Non-Core Portfolio performance was driven by strong results from Oak Street IV and Fortress funds. Walton Street Fund IV and V lagged in the Non-Core Portfolio.

Performance numbers in this presentation are based on quarterly data collected from CTPF investment managers and calculated by Callan beginning in the fourth quarter of 2015. Quarterly performance history prior to the fourth quarter of 2015 was calculated and provided to Callan by the previous consultant, The Townsend Group. Benchmark is the NFI-ODCE Value-Weight Index, a time-weighted return Index with an inception date of 12/31/1977. The Index is comprised of 33 open-end commingled funds, in which 23 are still actively investing. Full definition is contained in the Appendix.

Infrastructure Performance Review

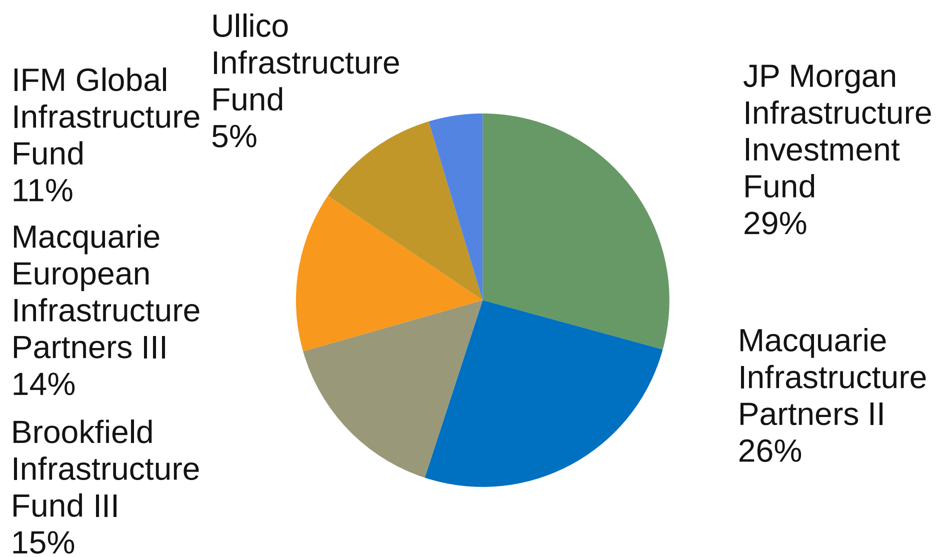
Infrastructure Portfolio Summary

September 30, 2018

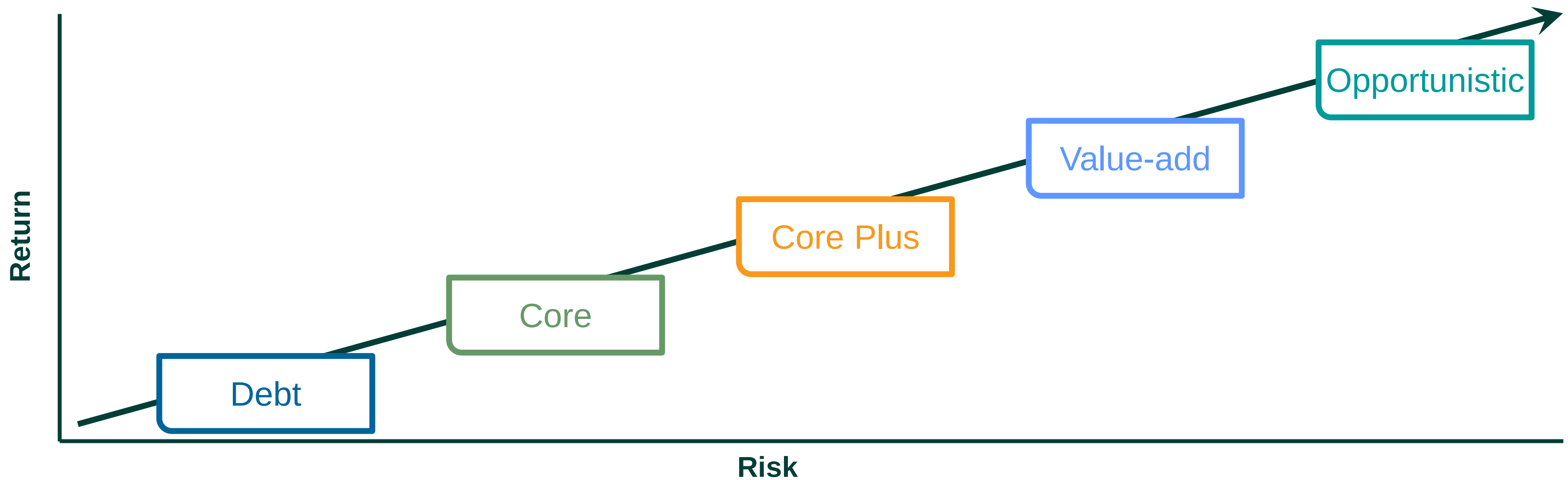
- Infrastructure comprised 2.24% of the total portfolio on a funded basis compared to a target of 2%, and range of 0-4%.
- CTPF's initial infrastructure investments were made in 2008 and 2009. CTPF resumed investment in the asset class in 2016 with a $50 million commitment to Brookfield and two commitments approved in 2018 -- IFM ($35 million) and Ullico ($15 million).
- Macquarie represents 40% of current infrastructure exposure for CTPF, this concentration will decline as the existing funds exit their investments.

	$ Millions	(%)
CTPF Total Plan Assets	$11,000.67	100%
Infrastructure Target	$220.01	2.00%
Plan's Infrastructure Market Value	$246.34	2.24%
Unfunded Commitments	$73.79	0.67%
Market Value & Unfunded Commitments	$320.13	2.91%

Market Value & Unfunded Commitments, by Fund



Infrastructure – Relative Risk/Return



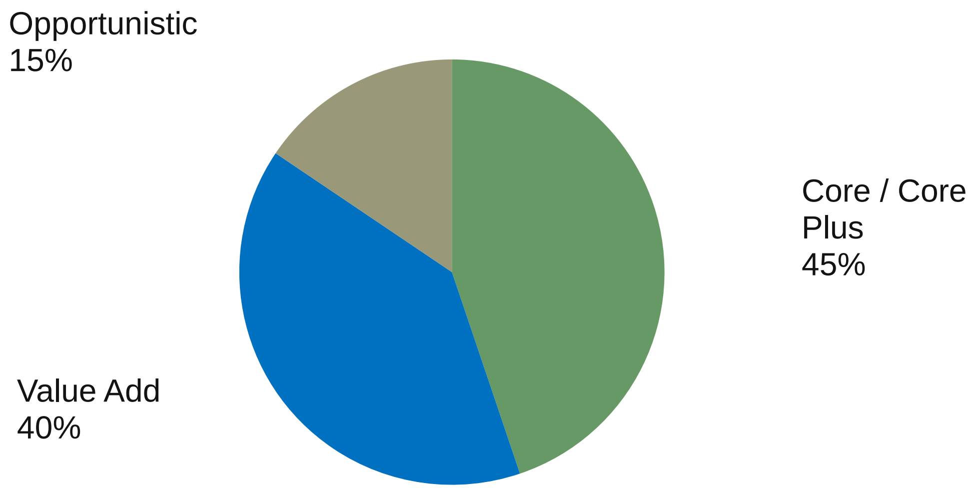
	Debt	Core	Core Plus	Value-add	Opportunistic
Net Return estimate	Typically 3-5% over a fixed rate e.g. LIBOR	5-7%	8-10%	10-12%	13%+
Asset	Asset level Corporate level	Stable asset	Existing asset	Enhancement of existing asset	Enhancement of existing asset, potential for new assets
Cash flow to investors	Interest payments	Regular distributions from operating cash flow	Semi-regular distributions from operating cash flow	Cash flow may be reinvested and not paid to investors until enhancement is complete	Less/no cash flow initially, depending on the type of asset and complexity
Investment stage	Debt	Brownfield	Brownfield	Brownfield	Brownfield Greenfield potential

Portfolio By Risk Profile – Market Value and Committed Capital

September 30, 2018

- Core / Core Plus represents the open-end fund investments (JP Morgan, IFM and Ullico).
- Value Add includes the earlier investments (both Macquarie funds), which are approaching the end of their investment life cycle and selling assets.
- Opportunistic represents the Brookfield Infrastructure Fund III, which is investing capital and is not fully funded.

Risk Profile

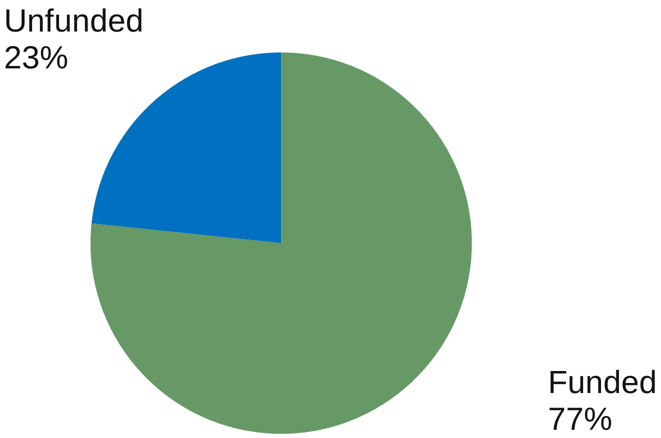


Portfolio – Share of Funded and Unfunded Commitments

September 30, 2018

- Unfunded commitments are comprised of the 2018 open-end commitments approved to IFM Global Infrastructure and Ullico Infrastructure Fund, and the remaining commitment to Brookfield Infrastructure Fund III.
- The majority of unfunded commitments will likely be called in 2019, with some commitments called in 2020.
- Ullico is focused on N. American investments, while Brookfield and IFM pursue investments in global, developed markets.

Funded vs Unfunded Commitments

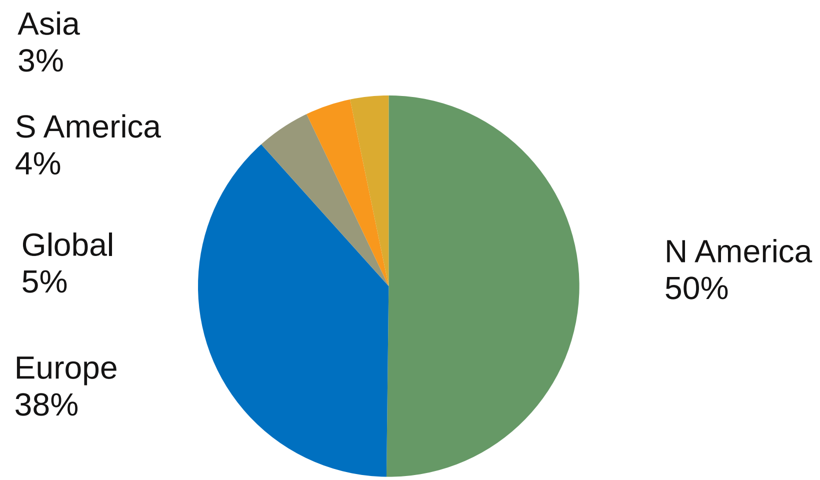


Portfolio Diversification Based on Funded Commitments

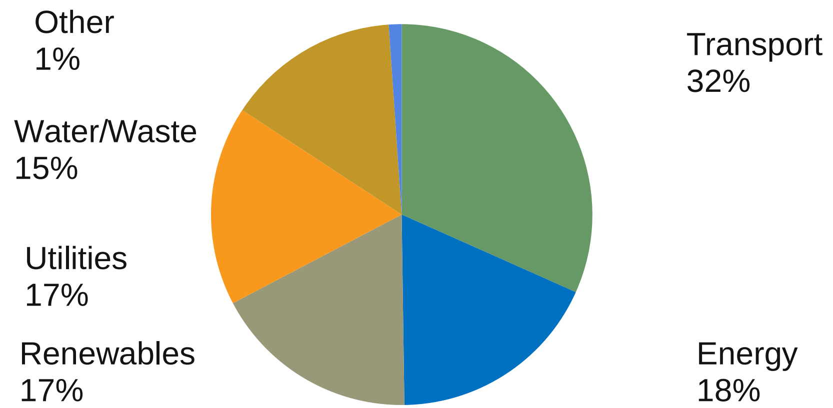
September 30, 2018

- The funded portfolio is fairly concentrated by manager and investment position.
- The portfolio has the largest exposure in major developed markets.
- By sector, transportation comprises the largest share of the portfolio. Other is comprised primarily of communication investment.

Geographic Diversification

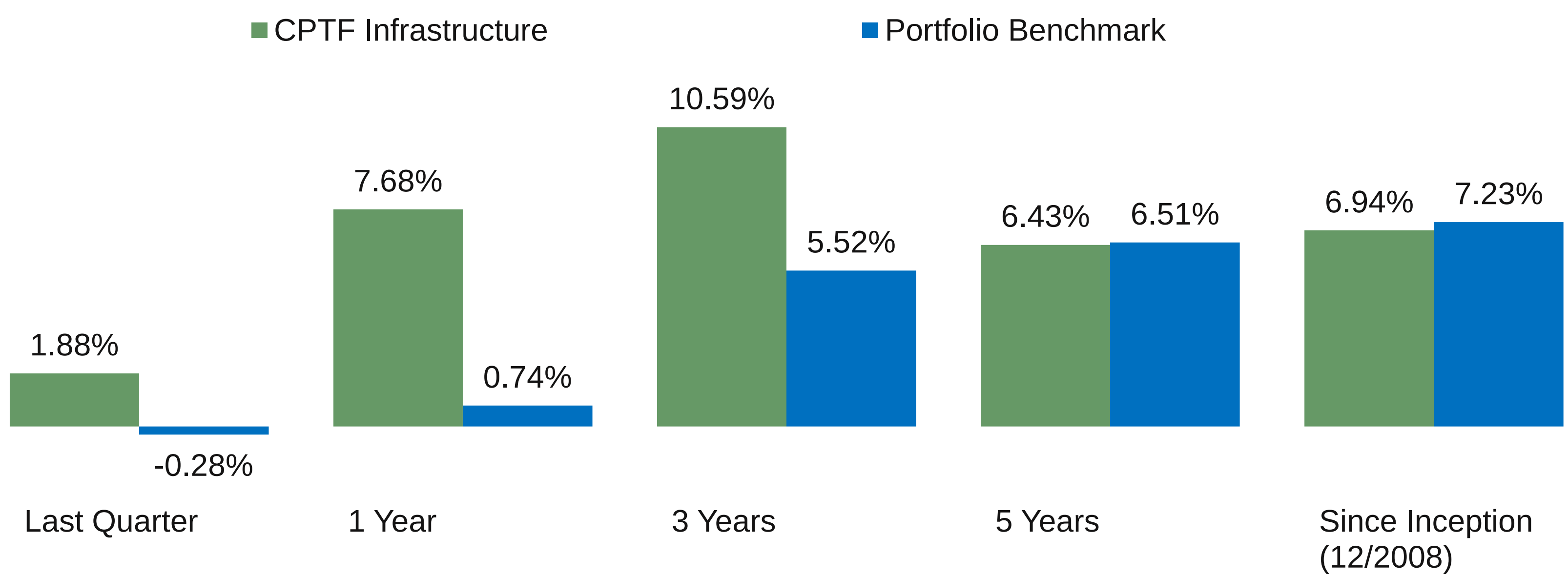


Sector Diversification



Infrastructure Portfolio Performance

Periods Ending September 30, 2018



- Infrastructure is a developing asset class and as of today, there is no industry standard benchmark for private infrastructure investors.
- The CTPF infrastructure portfolio outperformed the benchmark during the quarter. Brookfield Infrastructure III had strong income performance.
- One Year performance was strong due to the Macquarie European Infrastructure III exit of the Copenhagen airport at an attractive valuation in Q4 2017.

In the fourth quarter of 2017, the annualized 8% infrastructure benchmark was replaced with the FTSE Developed Core Infrastructure 50/50 Index.

Infrastructure Appendix

Key Characteristics of an Infrastructure Asset

Long-lived assets critical to society

- Tangible assets
- Extended useful lives
- Difficult to replace

Steady, sustainable cash flows with high predictability

- Contractual agreements
- Regulatory frameworks
- Limited commodity exposure
- Long term contracts

Significant barriers to entry

- High upfront costs
- Other obstacles that make it difficult to enter market

Attractive risk-adjusted returns

- High operating margins, not linked to business cycles
- Inflation protections

What is the Driver for Infrastructure Investment Today?

Aging Infrastructure, Renewable Energy Targets and U.S. Energy Discoveries

Sector	Demand driver	Infrastructure Type
Renewables	Trend for reduced carbon emissions and non-nuclear power	Wind, solar, hydro, geothermal power, new transmission technology
Transport	Historic underinvestment and aging infrastructure	Airports, roads, ports, parking structures
Communications	Increased demand with new technology	Telecom, fiber optic, cellphone towers
Energy	Oil and shale resources in the US	Mid-stream energy related transmission and storage
Utilities	Historic underinvestment and aging infrastructure	Electric and water utilities, wastewater systems
Social	Insufficient municipal budgets	Healthcare, judicial, education facilities, Public Private Partnerships

Glossary of Terms and Disclaimer

Definitions

Style Groups

Total Real Estate DB: The Total Real Estate Funds Database consists of both open and closed-end commingled funds managed by real estate firms that report to the Callan Database.

Open-End Real Estate: The Open-End Real Estate Database consists of all open end real estate funds that report to the Callan Database.

Real Estate Value Added: The Real Estate Value Added Database consists of all real estate funds that manage to a value add strategy and report to the Callan Database.

Real Estate Opportunistic: The Real Estate Opportunistic Database consists of all real estate funds that manage to a value add strategy and report to the Callan Database.

REIT Global DB: The REIT Global Database consists of products investing in global equity real estate through portfolios consisting primarily of equity Real Estate Investment Trusts (REIT). The Database is comprised of returns for both separate account composites and commingled vehicles.

*The above groups are based on time-weighted returns.

Vintage Year Database Groups: The Vintage Year Groups are comprised of all funds that report to the database with the initial drawdown taking place in the labeled year. These groups are based on IRRs derived from the cash flows submitted to the Callan Database.

Indices

Stylized Index: Weights the various style group participants to be comparable to the investor portfolio holdings for each period.

NAREIT Equity Index: This is an index of Equity Real Estate Investment Trust returns reflecting the stock value changes of REIT issues as determined through public market transactions.

The NFI-ODCE Value-Weight Index is a time-weighted return Index with an inception date of 12/31/1977. The Index is comprised of 33 open-end commingled funds, in which 23 are still actively investing. Inclusion within the Index requires (a) minimum of 80% of net fund assets invested in the multifamily, retail, industrial, office, or hotel property type, (b) maximum of 20% of net fund assets invested in real estate debt or private/public company equity, (c) at least 80% of net assets invested in properties with a minimum occupancy of 60%, (d) no more than 70% of real estate net assets invested in a single property type or region, (e) maximum of 40% leverage, and (f) at least 95% of net real estate assets invested within the U.S. market.

Definitions

Terms

Beginning Market Value: Value of real estate, cash and other holdings from prior period end.

Contributions: Cash funded to the investment for acquisition and capital items (i.e., initial investment cost or significant capital improvements).

Distributions: Actual cash returned from the investment, representing distributions of income from operations. Withdrawals: Cash returned from the investment, representing returns of capital or net sales proceeds.

Ending Market Value: The value of an investment as determined by actual sales dollars invested and withdrawn plus the effects of appreciation and reinvestment; market value is equal to the ending cumulative balance of the cash flow statement (NAV).

Unfunded Commitments: Capital allocated to managers which remains to be called for investment. Amounts are as reported by managers.

Remaining Allocation: The difference between the ending market value + the unfunded commitments and the target allocation. This figure represents dollars available for allocation.

Core: Direct investments in operating, fully leased, office, retail, industrial, or multifamily properties using little or no leverage (normally less than 30%).

Value-Added: Core returning investments that take on moderate additional risk from one or more of the following sources: leasing, re-development, exposure to non-traditional property types, the use of leverage.

Opportunistic: Investments that take on additional risk in order to achieve a higher return. Typical sources of risks are: development, land investing, operating company investing, international exposure, high leverage, distressed properties.

Non Core: Includes both value added and opportunistic strategies

Vintage Year: Year of first drawdown

Definitions - Performance

Capitalization rate: Commonly known as cap rate, is a rate that helps in evaluating a real estate investment. Cap rate = Net operating income / Current market value (Sales price) of the asset.

Net operating income: Commonly known as NOI, is the annual income generated by an income-producing property after taking into account all income collected from operations, and deducting all expenses incurred from operations.

Real Estate Appraisal: The act of estimating the value of property. A real estate appraisal may take into account the quality of the property, values of surrounding properties, and market conditions in the area.

Income Return ("INC"): Net operating income net of debt service before deduction of capital items (e.g., roof replacement, renovations, etc.)

Appreciation Return ("APP"): Increase or decrease in investment's value based on internal or third party appraisal, recognition of capital expenditures which did not add value or uncollectible accrued income, or realized gain or loss from sales.

Total Gross Return: The sum of the income return and appreciation return before adjusting for fees paid to and/or accrued by the manager.

Total Net Return: Total gross return less Advisor fees reported. All fees requested (asset management, accrued incentives, paid incentives). No fee data is verified.

Inception Returns: The total net return for an investment or portfolio over the period of time the client has funds invested. Total portfolio Inception Returns include returns from investments no longer held in the current portfolio.

Net IRR: IRR after advisory fees, incentive and promote. This includes actual cash flows and a reversion representing the LP Net Assets at market value as of the period end reporting date.

Equity Multiple: The ratio of Total Value to Paid-in-Capital (TVPIC). It represents the Total Return of the investment to the original investment not taking into consideration the time invested. Total Value is computed by adding the Residual Value and Distributions. It is calculated net of all investment advisory and incentive fees and promote.

DPI Multiple: The ratio of distributions paid to the investor divided by the amount of contributions paid by the investor. It is calculated net of all investment advisory and incentive fees and promote.

Sharpe Ratio: Sharpe Ratio is a measure of the risk-adjusted return of a portfolio. The ratio represents the return gained per unit of risk taken. The risk of the portfolio is the Standard Deviation of the portfolio returns.

NCREIF Region Map

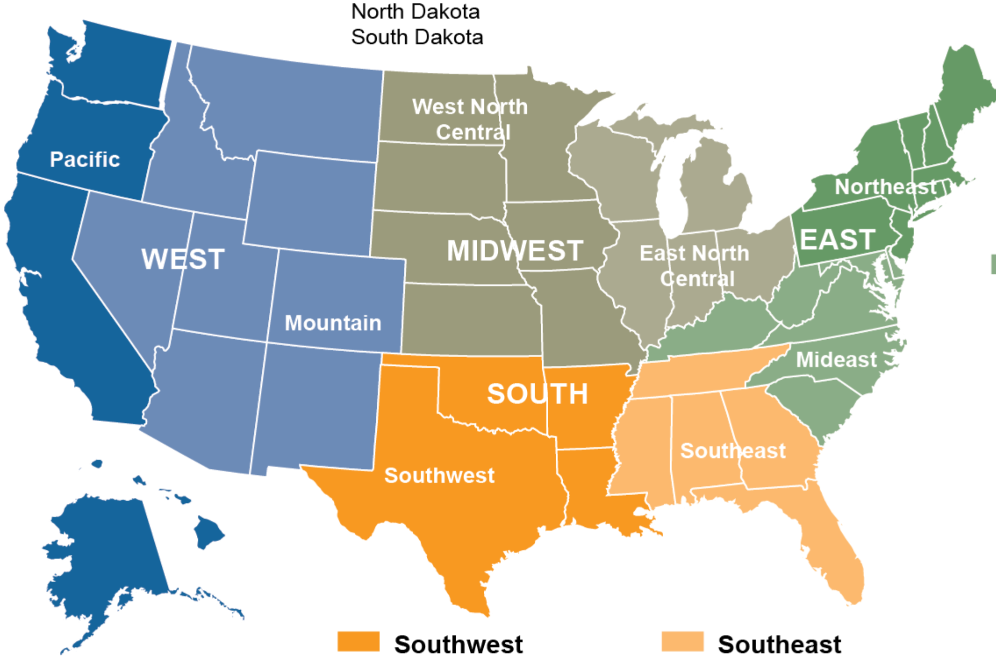
Geographic Regions and Divisions

West North Central
Iowa
Kansas
Minnesota
Missouri
Nebraska
North Dakota
South Dakota

East North Central
Illinois
Indiana
Michigan
Ohio
Wisconsin

Pacific
Alaska
California
Hawaii
Oregon
Washington

Mountain
Arizona
Colorado
Idaho
Montana
Nevada
New Mexico
Utah
Wyoming



Northeast
Connecticut
Maine
Massachusetts
New Hampshire
New Jersey
New York
Pennsylvania
Rhode Island
Vermont

Mideast
Delaware
Kentucky
Maryland
North Carolina
South Carolina
Virginia
Washington, DC
West Virginia

Southwest
Arkansas
Louisiana
Oklahoma
Texas

Southeast
Alabama
Florida
Georgia
Mississippi
Tennessee

Source: NCREIF

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