INFRASTRUCTURE EDUCATION

San Joaquin County Employees' Retirement Association

PCA
PENSION CONSULTING ALLIANCE

July 14, 2017

Infrastructure Definition

- **Definition**
  - Physical structures, facilities and networks which provide essential services within a community
  - Services provided are crucial to the economic productivity of a community
  - Assets are either privately owned or owned/operated by government entities

- **Major Categories**
  - Brownfield projects that are already operational and/or have a predecessor of some description at the same location
  - Greenfield assets that are in the planning, development, financing or construction stage

- **How to Invest**
  - Private/Unlisted Infrastructure (Debt/Equity)
  - Listed Infrastructure
  - Public Private Partnerships (PPPs/PFIs)
  - Municipal Bonds

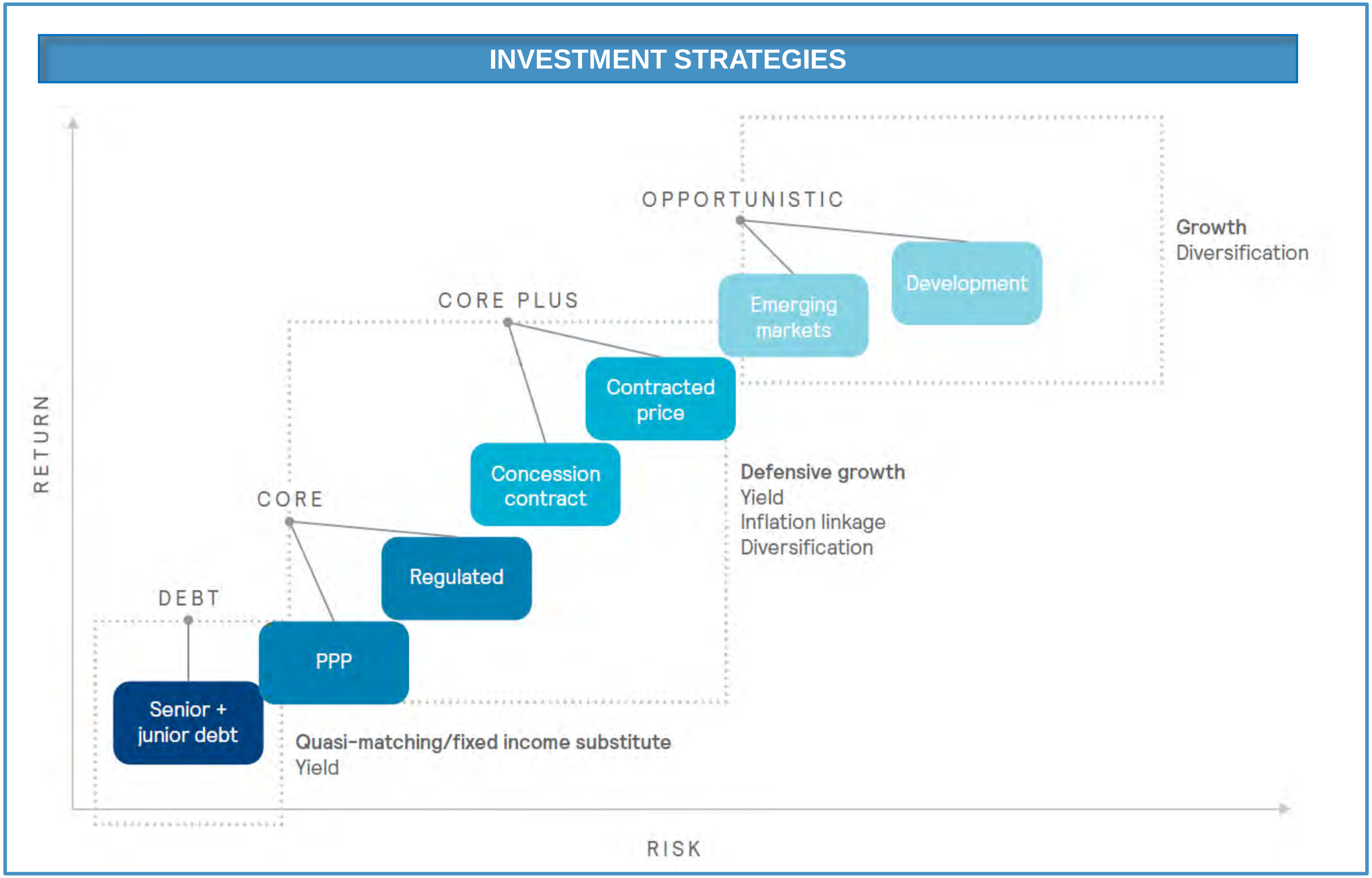
Benefits of Infrastructure Investments to Pension Plans

High stable yields	• Attractive risk adjusted returns
Low correlation	• Low beta relative to traditional asset classes portfolio diversification
Duration hedging	• Long lived assets to match liability duration 15 to 99 year cash flows
Inflation protection	• Regulation or concession within pricing
Low cyclicality	• Inelastic demand and monopolistic position support stable cash flows
Risk transfer	• Risks transferred to subcontractors or back to public entity via partnership arrangements
Low volatility	• Limited exposure to economic downturns
Greenfield projects	• Job creation

Infrastructure Investment Concerns for Pension Plans

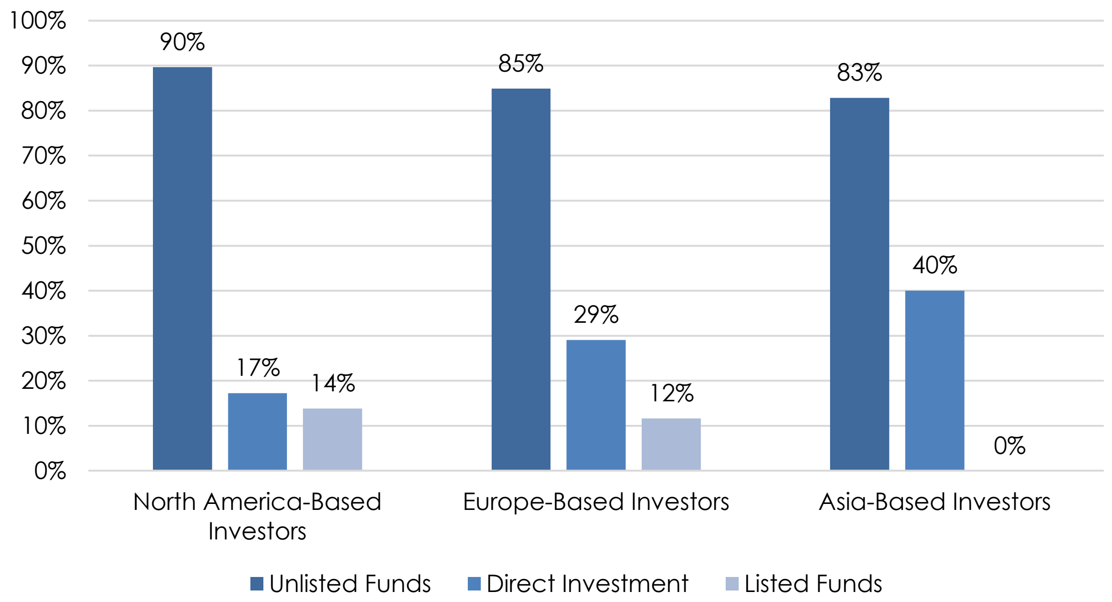
Leverage	• Deals are typically leveraged between 50% and 90%
Market Inefficiency	• Competitive auctions - overpaying • Current pricing – deal outliers or trend setters • Management teams with proven track record are crucial • Limited history and track record in infrastructure space
Political & Headline Risk	• Public acceptance of privatization • Different political landscape in every state and municipality
Regulatory Risk	• Regulated assets subject to changes • Government influence on pricing • Potential negative impact bottom line
Construction & Development	• Project overruns and delays transfer to construction partners • Volume/demand risk for new developments; availability payments
Worker Impact	• Greenfield projects would generate new jobs • Concession agreements must address jobs and involve union/worker participation
Asset Control	• Stipulations via concession agreements limit some management control (pricing, growth, decision approvals, etc.)
Benchmarking	• There is no standard benchmark for the asset class

Infrastructure Investments Risk-Reward Profile



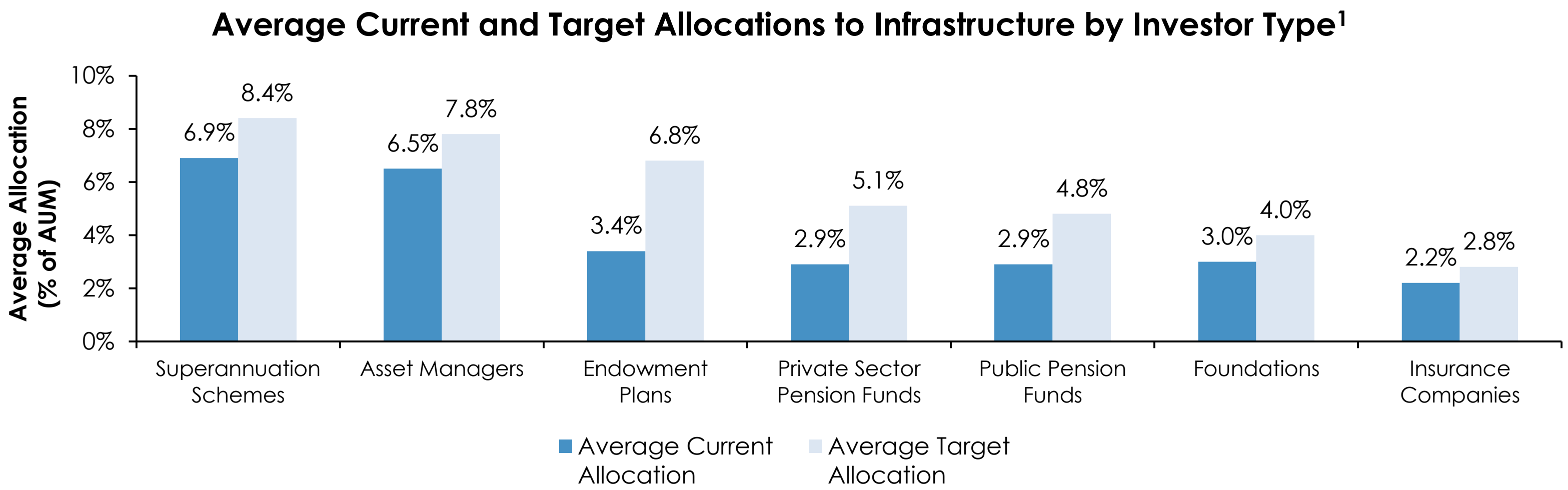
Preferred Routes to Market - Infrastructure

- Most institutional investors seek to invest via unlisted infrastructure funds, primarily in domestically based investments
- Percentage of investors seeking direct investments has increased over the years, with North American investors having the least focus on these types of investments
- Listed funds continue to be the least preferred route to market



Source: Preqin Infrastructure Online, 1Q 2017

Investor Allocations to Infrastructure



Jurisdiction	Typical Pension Fund Allocation to Infrastructure
Western Europe	3% - 5%
Australia	5% -10%
Canada	5% -10%
U.S.	0% - 5%

[1]Investor universe includes investors in 80 countries worldwide   Source: Preqin, Stonepeak Infrastructure Partners

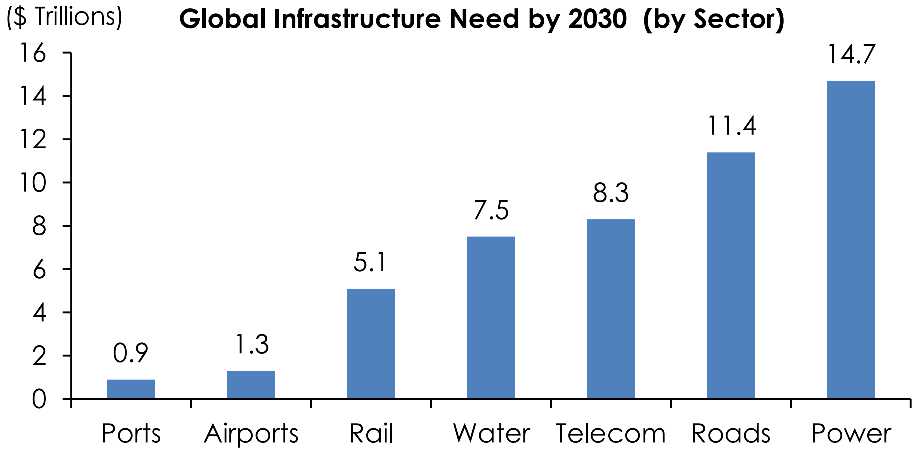
U.S. Public Pension Plan Infrastructure Participation

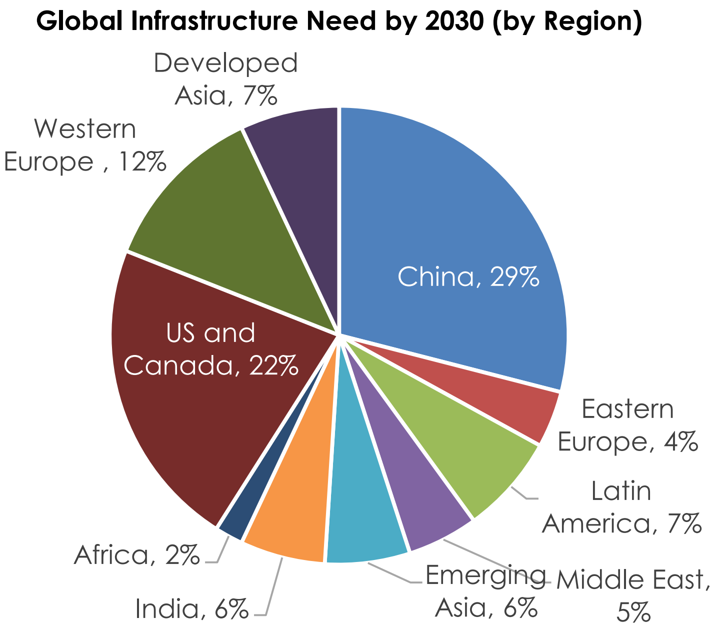
	CalPERS	CalSTRS	Employees Retirement System of Rhode Island	New Mexico Educational Retirement Board	Oregon Investment Council	Teacher Retirement System of Texas	Washington State Investment Board
Fund Size **(As of)**	**$305.5 Billion (12/31/16)**	**$196.5 Billion (12/31/16)**	**$7.7 Billion (12/31/16)**	**$11.7 Billion (12/31/2016)**	**$69.9 Billion (12/31/16)**	**$132.0 Billion (12/31/16)**	**$112.4 Billion (12/31/16)**
Infrastructure Policy	Yes	Yes	Yes	Yes	Yes	No	Yes
Target Infrastructure Allocation	1%. Included in the Real Assets class along with real estate and forestland	Part of 4% target allocation to inflation sensitive assets which also include global treasury inflation securities	3%	Part of 8% real assets allocation	2.5%	Part of 5% target allocation to energy, natural resources, and infrastructure.	Part of 5% target allocation to tangible assets which also include natural resource rights and timber
Benchmark	CPI + 4%	CPI + 4%	CPI + 4%	CPI + 4%	CPI + 5%	CPI + 5%	CPI + 4%
Returns	As of 06/30/16, 1-yr (Net): 4.5% 3-yr (Net): 4.4% 5-yr (Net): 4.4%	As of 01/31/17*, FYTD (Net): 4.6% 3-yr (Net): 14.0% 5-yr (Net): 12.0%	As of 09/30/16, 1-yr (Net): 11.5%	As of 09/30/2016, since inception Net IRR of 4.2%	N/A	N/A	N/A

* Returns for the total inflation sensitive portfolio
Source: Plan CAFRs

Global Infrastructure Needs

- Global infrastructure investment need is massive
- Developed economies face challenges posed by neglected and deteriorating infrastructure
- Many developing countries aspire to meet basic human development needs including providing sanitation, wide access to power and safe drinking water
- According to McKinsey estimates, $49.1 trillion in infrastructure investments will be required to support projected global GDP growth, through 2030
- The world needs to invest an average of $3.3 trillion annually to support expected rates of growth





Source: McKinsey & Co.

Current Investment Landscape

- Large funds continue to dominate the market place
  - The first quarter of 2017 saw 16 funds closed representing $29 billion in capital commitments ($16 billion more than during the fourth quarter of 2016)
  - The largest infrastructure fund ever, Global Infrastructure Partners III, closed in January 2017 on $15.8 billion
- With the fundraising environment improving, more funds come to the market
  - At the end of the first quarter 2017, there were 168 unlisted infrastructure funds in market seeking a combined capital amount of $102 billion
- During the first quarter of 2017, 339 transactions were completed worth an estimated $206 billion
  - Fifty-seven percent (57%) of infrastructure deals were renewable energy deals, accounting for the greatest proportion of any sector
  - The quarter also saw the highest average deal size at $607 million, compared to $407 million during the fourth quarter of 2016

Source: 2016 Infrastructure Investor Annual Fundraising Report, 2017 Preqin Global Infrastructure Report

Current Investment Landscape (Continued)

- The amount of global infrastructure dry powder is at an all time high, estimated at $147 billion at the end of the first quarter 2017

- The proportion of uncalled capital held in mega funds has increased to account for almost half of all infrastructure dry powder, a reflection of the largest funds dominating the market

    - The competitive deal environment continues to push up prices for assets
    - With strong competition for core assets in developed markets, managers are increasingly looking outside the traditional developed markets of Europe and North America when deploying capital
    - 26% of funds in the market focus on regions outside of North America, Europe and Asia

- Strategic investors bring sizeable synergies and often lower return hurdles

- Infrastructure investment in North America and Europe is expected to grow at 2% to 4% annually until 2020, totaling over $11 trillion from 2015 to 2020

Source: Infrastructure Investor March 2017, 2017 Preqin Global Infrastructure Report

Sector Updates

Transportation

- More than $350 billion is invested in U.S. transportation annually, yet by 2020 the transportation investment shortfall is expected to exceed $1 trillion
- Increased PPPs in transportation in the U.S. are driven by structural budget deficits and debt capacity limits for state and local governments
  - Airports: Average age of U.S. airports is approximately 40 years, and historical funding sources are drying up
    - Estimated $75.7 billion of infrastructure spending through 2019
- Deal activity in the global transportation and logistics sector remained stable in the first quarter of 2017, with total deal value growing by 2%; however ,deal volume declined by 9%
  - Asia dominated deal activity during the quarter, accounting for 41% of value and 51% of volume

Water

- The U.S. is facing a potential water infrastructure crisis
  - According to the American Society of Civil Engineers 2017 Infrastructure Report Card, drinking water and waste water infrastructure rated a D+
- The American Water Works Association has estimated $1 trillion of investment necessary to maintain and adequately expand drinking water services to meet U.S. demand over the next 25 years
  - An estimated $270 billion is needed to meet current and future demands for wastewater treatment in the U.S.

Source: OakTrree, EQT, PwC

Sector Updates (Continued)

Communications & Social Infrastructure

- Wireless data load growth has led to sustained record-high investment in wireless infrastructure
  - With the launch of 5G telecom standards expected by 2020, required capital spend across the sector is expected to rise
- In the U.S. social infrastructure sector, growth is projected to accelerate to an average of 4% per year until 2025, according to PwC estimates
- Approximately $2.3 trillion forecasted spending on social infrastructure in the European Union's seven largest economies alone through 2020

Source: OakTrree, EQT, PwC

Sector Updates (Continued)

Crude Oil

- Price stabilized at the $50/barrel range since mid-2016
- Global inventory overhang is expected to correct following supply and demand rebalancing in 2017
- OPEC agreement to cut supply by 1.2 mmb/d during the first half of 2017 is expected to have positive impact on crude balances and market sentiment
- U.S. crude production proved more resilient than originally projected, with 2016 average production exceeding projections by ~250 mb/d
- Potential for U.S. producers to add significant volumes to the world market is likely to cap oil prices in the near term

Natural Gas

- Natural gas demand continues to rise in 2017, increasing 2.1% year over year
- 2017 demand outlook is expected to remain strong driven by continued growth from exports (LNG to Mexico), partially offset by expected declines in power burn
- Supply is expected to resume growth in 2017 on the back of higher prices, however growth is predicated on new pipelines coming in-service on time
- In the UK, political sentiment is focused on replacing coal with gas as the main source of power generation

Source: Carlyle, Tortoise Capital Advisors

Sector Updates (Continued)

Power Generation & Transmission

- Fundamental shifts in the U.S. power generation markets are driven by abundance of domestic natural gas, environmental regulations and age of existing power generation fleet
  - Substantial investment required in conventional generation, renewables and alternate solutions
- Overcapacity continued to affect European utilities, resulting in continued deleveraging through disposals in Europe, and investment focus shifts to faster growing, emerging geographies, and regulated areas of energy services, including renewables

Renewable Energy

- The renewable share of U.S. power generation capacity is expected to increase from 19% to 30% between 2016 and 2035
- The energy storage market is expected to grown from an annual capacity size of 6 GW in 2017 to 40 GW by 2022
- The market has many global first and second generation renewable assets with uneconomic financing and contract structures
  - This results in the opportunity to purchase assets that require contract restructurings at attractive prices

Midstream MLPs

- MLP acquisition activities have increased in 2017 with the rebound in energy and capital markets since 2015
  - Acquisitions are estimated to total $63 billion from 2016 through 2018 with healthy dropdown visibility
- MLPs remain 40% below 2014 valuation levels despite a positive economic landscape
  - Continued rebound in pricing is likely to occur as more investors access the space, resulting in significant price appreciation
- There is a large growth component to the MLP equity market, as the U.S. continues on a volume growth path, and the debt market is currently attractive with coupon rates averaging 5.1%
  - These conditions allow for attractive project-level returns

Source: Carlyle, Tortoise Capital Advisors, Harvest

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