

Infrastructure Research Report

by

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I. Executive Summary

Infrastructure assets are the physical structures, facilities and networks which provide essential services to the public. These assets include transportation structures (roads, bridges, tunnels, railways, airports, seaports), energy and utility companies, communication entities and social services such as educational facilities and hospitals. While some of these assets are owned by the private sector, government entities own the majority of these facilities around the world. Private investment in infrastructure has been active in other countries such as Australia, the United Kingdom and Canada. Government entities in the United States have started to allow private investments in public assets as many infrastructure assets are in need of repair and modernization. Governments are financially constrained and are unable to finance these upgrades and new development projects. The private sector has recognized the financial benefits of owning, leasing via concession and operating infrastructure assets.

- ❖ Due to the funding shortages governments are utilizing the private sector for the financing, building, and operation of infrastructure assets. Public-private partnerships (PPPs) are the contractual arrangements formed between governments and private investors to address infrastructure activities.
- ❖ Infrastructure assets are long-lived assets which typically generate steady and predictable cash flows. They are also monopolistic in nature and exhibit high barriers to entry given the scale and capital intensive nature of the assets. Highways, bridges and toll roads are expensive to duplicate. They perform well during economic downturns and provide an inflation hedge. Infrastructure assets also have a low correlation to traditional asset classes and provide diversification in an investment portfolio.
- ❖ Infrastructure investments are attractive to pension plans as they assist with liability driven investments and provide duration hedging. These investments generate attractive yields (up to the middle teens) but have a lower risk profile than private equity investments.
- ❖ Foreign pension plans have an established track record of infrastructure activity. Many Australian and Canadian pension plans have identified opportunities within the sector and continue to play an active role by making direct and fund investments within infrastructure. These pension plans have made up to 15% allocations to infrastructure investments and now US pension plans are slowly starting to invest in infrastructure.
- ❖ There are risks associated within infrastructure investments including political, regulatory, volume and construction risks. The risk profile of an investment will vary depending on the stage of maturity of the asset (greenfield versus brownfield), the sector of investment (airports, roads, bridges, communications, etc.) and the geography and demographics of the investment.
- ❖ Infrastructure is a hybrid asset class that has characteristics similar to bonds, real estate and private equity. However, we believe that infrastructure should be either a separate asset class or a component of an inflation-linked asset class.

II. Introduction to Infrastructure

Investment in infrastructure assets is a new and growing area of investment opportunity for U.S. institutional investors as the investment community is witnessing an influx of newly formed vehicles and structures. There are two distinct types of infrastructure investment: (i) investing in completely private infrastructure companies (such as power plants, transmission lines and pipelines) and (ii) investing in public to private entities such as airports, highways, bridges and public buildings. Most public to private infrastructure assets are owned and operated by government authorities that are financially constrained to provide maintenance and development to address growing populations and demand levels. Governments are now turning to private sources to repair and expand the nation's infrastructure system. While investments in the infrastructure sector originated in Australia and have been very active in Canada and the United Kingdom for over a decade, the United States is only now beginning to embrace the investment strategy. Infrastructure, based upon the Australian and Canadian experience appears to have unique risk and return characteristics to support it being either a separate asset class or a part of an inflation-linked asset class. Pension plans may play an integral role within the infrastructure market. This paper addresses the history, characteristics, opportunities, and challenges a U.S. pension plan can expect to encounter in the infrastructure sector.

WHAT IS INFRASTRUCTURE?

Infrastructure assets are the physical structures, facilities, and networks which provide essential services within a community such as transportation, utility companies, water and communications systems as well as public facilities such as schools, hospitals, and government buildings. These assets and businesses provide primary services which are crucial to the success of economic development in society. When performing at a less than optimal level, these assets severely hamper a community's productivity and growth.

Many infrastructure assets currently are or have been owned by government entities. However, over the last three decades, high upfront costs and the resultant negative impact on government budgets have served to limit the amount of infrastructure investments in Organization for Economic Co-operation Development ("OECD") nations. Consequently, state and local governments have been exploring new ways to finance, maintain, modernize, and most importantly, build the new infrastructure services essential to ensuring continued economic productivity to accommodate growing populations. The world population is expected to grow at an average rate of 1.1% annually to reach 7.2 billion by 2015.¹ In the United States, infrastructure spending as a percent of total Gross Domestic Product ("GDP") has declined by one-third over the last 40 years from 3.0% of GDP in the 1960s to near 2.0% currently.² To alleviate these fiscal constraints, many government bodies are contemplating long-term leasing arrangements (concessions) or divestiture (sale) of infrastructure assets to private investors.

The range of investment opportunities in this sector is broad ranging from the least risky, fixed income assets to the most risky, venture capital-like structures. The institutional market has concentrated its consideration of assets in the middle of the risk spectrum and the remainder of the paper will address those types of opportunities.

¹ U.S. Consensus Bureau, August 2006.

² The Carlyle Group, Carlyle Infrastructure Partners, L.P.

Table I. Infrastructure Sectors			
Economic Infrastructure			Social Infrastructure
Transportation	Energy & Utilities	Communications	Educational Facilities
Toll Roads	Clean Energy	Broadcast & Wireless Towers	Healthcare Facilities
Bridges	Gas Pipelines	Cable Systems	Judicial Buildings
Tunnels	Power Distribution	Satellite Networks	Military Housing
Rail Systems	Power Transmission		Prisons
	Water Treatment & Distribution		

While the above table lists the standard sectors that represent the majority of infrastructure investment opportunities, some infrastructure participants have introduced other categories of investment such as lotteries, parking facilities, ferries, power generation, waste management, and storage facilities. It is important to note that infrastructure assets and businesses that meet the requirements of institutional investors usually possess certain unique investment characteristics which distinguish this sector from other investment asset classes such as:

- **Essential Service.** Infrastructure assets should provide services that are critical to society such as sewer and water treatment systems.
- **Long Life Asset.** Underlying assets should have a minimum 10-year lifespan which will give any related investment a long duration. Typical concessions for infrastructure assets span at least 25 years and may go out as far as 99 years.
- **Inflation Protection.** Revenues are often linked to inflation via a regulated return framework or a contracted rate of return.
- **Monopoly or Quasi-Monopoly Market Position.** Assets should possess strong competitive advantages. This, in most instances, creates an ongoing regulatory relationship (i.e. Public Utilities Commission, State Transportation Agency etc.).
- **High Barriers to Entry.** Assets should be difficult to duplicate due to scale, cost, and resources. For example, highways and bridges are enormously expensive to build and maintain.
- **Inelastic Demand.** The consumer demand profile should be relatively inelastic, predictable, and grow over time.
- **Steady and Predictable Cash Flow.** Assets should generate stable and recurring long-term cash flows which may support significant leverage levels and allow both strong current returns and some capital appreciation.
- **Low Correlation to Other Asset Classes.** Underlying assets should have a low beta and little correlation to equities, bonds, private equity and real estate thereby providing diversification benefits.
- **Limited Commodity Risk.** Underlying assets adopt a different, riskier profile should they be subject to market commodity pricing.
- **Insensitive to Changes in Technology.** Tangible long-term assets should bear little risk of redundancy or technology obsolescence.

GREENFIELD vs. BROWNFIELD INVESTMENTS

Infrastructure projects can be classified as either *greenfield* infrastructure projects or *brownfield* projects. Greenfield projects do not currently exist and need to be constructed. Investors fund the building of the infrastructure asset as well as the maintenance after it is designed, built, and

operational. This type of start-up infrastructure investing can generate higher returns but also has associated higher risks such as design and development, permits, environmental and public approval, construction, as well as operational/demand risk once the asset is completed (traffic flow, pricing, etc.). Some of the risks associated with greenfield projects can be minimized via contract negotiations or can be transferred to third parties such as construction developers, etc.

Alternatively, brownfield projects utilize existing assets and structures. Brownfield projects have fewer risks than greenfield projects and usually entail improvements, repairs, and expansion to structures that suffer from age, deferred maintenance and/or excessive usage. These assets can be easier to analyze and value given the availability of performance history. Operational risk is very pertinent with brownfield projects and other risks may occur if investors decide to perform major expansions. However, in general, brownfield projects have a lower risk/reward profile than greenfield infrastructure investments. Although the risk level is lower, the profit margin is also lower than that of the greenfield investments since the cost of purchasing the right to operate a brownfield asset is usually high and there is less room for the infrastructure asset itself to gain capital appreciation.³

However, with both greenfield and brownfield project investments it is important conceptually for all parties involved in the investment to share the risks and associated returns via a risk-sharing paradigm. As such, construction partners, in addition to fund investors, should make equity contributions to the financing of the investment. The interests of all parties should be outlined and aligned in the early stages of the investment process.

WHAT IS THE DEMAND FOR INFRASTRUCTURE?

The need for infrastructure investment is significant due to decades of severe underinvestment in both economic and social infrastructure assets and networks. Neglected and deteriorating assets, coupled with strong population growth, economic development, and soaring costs and scale of modernizing or replacing infrastructure assets, have facilitated an enormous supply and demand imbalance which is negatively impacting society and communities. Strong economic growth, measured by increasing GDP and increasing wealth among consumers, is likely to spur infrastructure investment, particularly in developing countries.⁴ Whereas governments are responsible for funding infrastructure improvements and greenfield projects, these entities are financially challenged to provide basic maintenance to aging structures. The costs to develop new assets and maintain brownfield assets have increased dramatically in recent years. Over the last three years, energy commodity prices have increased by 131% and prices for industrial metals have increased by 91%.⁵

Financing options for governments have further been limited by the growing healthcare and welfare liabilities of an aging population along with the political sensitivity of higher taxes. Raising taxes places burdens on tax payers and is most often met with political resistance, whereas issuing tax-exempt bonds places leverage and ratings pressures on municipalities and allows only a conservative amount of debt to fund projects. For example, raising the federal gas tax from its current 18.4 cent/gallon in order to fund public infrastructure investments would encounter substantial opposition, particularly during a period of sustained high gas prices.⁶

³ JP Morgan, Real Estate and Infrastructure Research, September 2006.

⁴ Macquarie Research, Infrastructure, May 2, 2007.

⁵ Dalio, Ray, and Jason Rotenberg. *Bridgewater Associates Daily Observations*, 5 December 2005: 5. Based on three-year changes in commodity sub-indices in U.S. dollars.

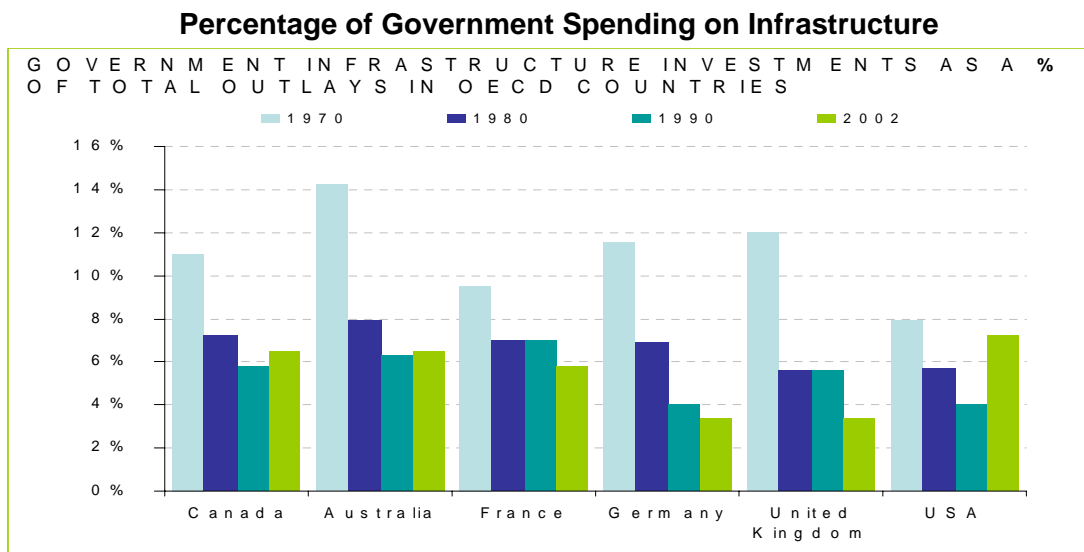
⁶ The Carlyle Group, Carlyle Infrastructure Partners, L.P.

According to The American Society of Civil Engineers' (ASCE) Report Card for America's Infrastructure in 2005, the assessed condition and capacity of the public works network for the United States was graded a "D" for its overall infrastructure conditions. In addition, the ASCE estimated that \$1.6 trillion of infrastructure investments will be required over the next five years alone to maintain existing assets and develop the systems necessary to accommodate a growing and changing U.S. population.

Table II. State of America's Infrastructure		
SECTOR	2005 GRADE	INVESTMENT NEED
Aviation/Aerospace	D+	\$16 billion/year
Bridges	C	\$9.4 billion/year
Dams	D+	\$10.1 billion/year
Drinking Water	D-	\$11 billion/year
Energy	D	\$493 billion
Hazardous Waste	D	\$1.9 billion/year
Navigable Water Ways	D-	\$125 billion
Public Parks & Recreation	C-	\$6.1 billion
Rail	C-	\$12-\$13 billion/year
Roads	D	\$34.6 billion/year
Solid Waste	C+	\$127 billion
Transit	D+	\$20.6 billion
Wastewater	D-	\$390 billion
Total	D	\$1.6 trillion

Source: American Society of Civil Engineers.

Government spending on infrastructure in OECD countries dropped to 2.2% of GDP in 1997-2003 from 2.6% in 1991-97. Government capital formation, as a percentage of GDP, fell from 7.5% in 1984 to 3.9% in 2002.

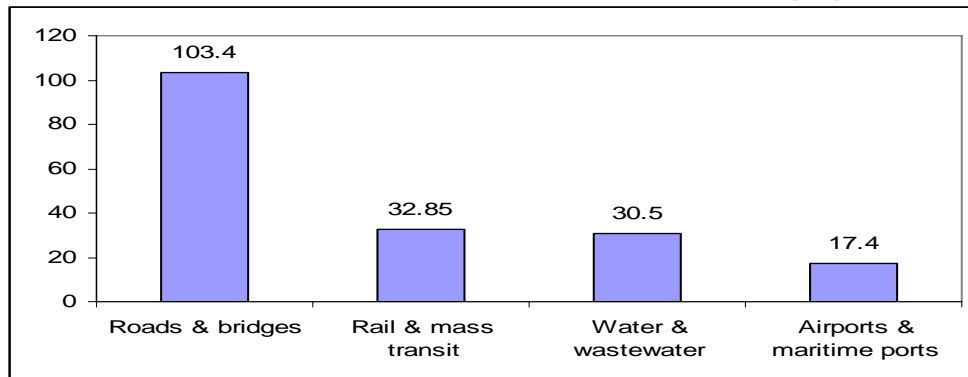


Note*: 2002 data not available for the U.S.
 Source: National Accounts, OECD, August 2006

The U.S. requires \$54 billion per year in repairs, operating costs, and lost productivity. To eliminate American bridge deficiencies a \$9.4 billion annual budget is required for the next 20

years. \$10.1 billion is required for the next twelve years to fix American dams. By 2020, an annual average of \$35 billion will be spent on power plants and electric transmission lines.⁷

Estimated Annual Capital Requirement for Certain Infrastructure Sub-Sectors in the U.S. (\$B)



Source: Carlyle Group/ASCE, Views and Estimates of the U.S. Congressional Committee on Transportation and Infrastructure for 2005

Over the next 20 years, modernizing water and sewer systems and repairing and building roads, bridges, and tunnels will cost in excess of \$1 trillion in the U.S. alone.⁸ Additional international investment in these assets, as well as rail links, airports, seaports, electricity distribution and transmission, and oil and gas pipelines, will cost trillions of dollars more. As a result of the massive financial requirements, private investment, privatization, and public-private partnerships will be needed to allow governments to access capital and redirect resources toward other vital functions within their communities.⁹

To focus on infrastructure opportunities from another perspective, the Bureau of Economic Analysis (BEA) estimates that as of 2004, the value of public (government-owned as opposed to publicly traded) and private infrastructure assets in the U.S. totaled \$5.65 trillion. The private infrastructure market is potentially \$3.0 trillion.

The 30 member countries of the OECD are expected to spend in excess of \$500 to \$600 billion annually on electricity, road, rail, and water infrastructure over the next 25 years.¹⁰ Power sector infrastructure improvements in OECD countries will require almost \$4 trillion in the next 30 years as well. In addition, over the next 25 years, modernizing and expanding water, electricity, and transportation systems in cities worldwide will require approximately \$40 trillion – including \$16 trillion in the United States, Canada, and Western Europe alone.¹¹

In developing economies, there is also a great need to refurbish existing infrastructure assets as well as undertake further investments to meet rapid growth in demand. While GDP growth rates for developing economies have been high, investment in infrastructure has been low at 2%-4% of GDP. The World Bank estimates that to maintain projected growth rates in the coming years, developing economies would need to spend 5.5% of GDP annually and low income economies

⁷ American Society of Civil Engineers, 2005 Report Card for America's Infrastructure.

⁸ *Business Week*, December 2006.

⁹ JPMorgan Asset Management, Ten Things to Know About Investing in Infrastructure, April 2006.

¹⁰ Infrastructure to 2030 Telecom, Land Transport, Water and Electricity, OECD 2006

¹¹ Booz Allen Hamilton. 2006. Strategy & Business. *JP Morgan: Investing in Infrastructure* Issue 46: Spring 2006.

would need to spend as much as 9% of GDP annually. Given that investments in infrastructure for developing economies could exceed \$460 billion in the coming years, there is a growing recognition that the private sector will play a critical role.¹²

Although the dollar amount needed for infrastructure can be continuously debated, it is clear that the global need for infrastructure investments is imminent and will not dissipate in the near future. With such vast needs, local governments are incapable of addressing the pressing infrastructure needs of their constituents independently. Infrastructure investments from private sources can provide the capital needed by local, state, and federal governments to repair, modernize, maintain, and build the new physical structures and networks that allow communities to function — without increasing taxes or incurring additional debt.

PUBLIC-PRIVATE PARTNERSHIPS (PPPs)

To address the funding deficits, governments are turning to the private sector for the financing, building, and operation of infrastructure assets. However, private financing for public projects has occurred in society for years -privately owned companies built the railroads in the U.S. in the 1800s. As public-private partnerships (PPPs) are flourishing, they afford governments and municipalities the opportunity to transfer financing, construction, operation, and maintenance risk to the private sector in exchange for financial payments which can relieve budgetary constraints. Public-private partnerships define the contractual agreement between a government entity and a private sector entity that allows for greater private sector participation in the delivery of public infrastructure projects. Both economic and social infrastructure projects can be executed via PPPs. Public private partnerships can be structured in numerous ways depending on the project and degree of risk to be transferred to the private sector. Examples of PPP models are stated below.¹³

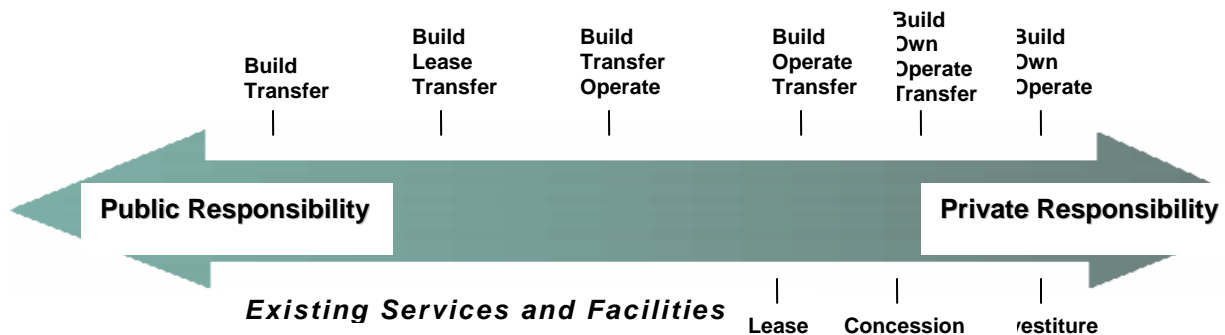
- **Build-Transfer (BT):** The government contracts with a private partner to design and build a facility in accordance with the requirements set by the government. Upon completion, the government assumes responsibility for operating and maintaining the asset. This method of procurement is also sometimes called Design-Build (DB).
- **Build-Lease-Transfer (BLT):** This model is similar to Build-Transfer, except that after the facility is completed it is leased to the public sector until the lease is fully paid, at which time the asset is transferred to the public sector at no additional cost. The public sector retains responsibility for operations during the lease period.
- **Build-Transfer-Operate (BTO):** Under this model, the private sector designs and builds a facility. Once the facility is completed, the title for the new facility is transferred to the public sector, while the private sector operates the facility for a specified period. This procurement model is also known as Design-Build-Operate (DBO).
- **Build-Own-Operate-Transfer (BOOT):** Here the government grants a private partner a franchise to finance, design, build, and operate a facility for a specific period of time. Ownership of the facility goes back to the public sector at the end of that period.

¹² Development Committee of the World Bank and the IMF, *Infrastructure and The World Bank*, 2005.

¹³ Adapted from the National Council for Public Private Partnerships and Closing America's Infrastructure Gap: *The Role of Public-Private Partnerships*, A Deloitte Research Study, 2007.

- **Build-Own-Operate (BOO):** In this model, the government grants a private entity the right to finance, design, build, operate, and maintain a project. This entity retains ownership of the project.
- **Design-Build-Finance-Operate/Maintain (DBFO, DBFM, or DBFO/M):** Under this model, the private sector designs, builds, finances, operates, and/or maintains a new facility under a long-term lease. At the end of the lease term, the facility is transferred to the public sector.
- **Lease:** The government grants a private entity a leasehold interest in an asset. The private partner operates and maintains the asset in accordance with the terms of the lease.
- **Concession:** The government grants a private entity exclusive right to provide, operate, and maintain an asset over a long period in accordance with performance requirements set out by the government. The public sector retains ownership of the asset, but the private operator retains ownership over any improvements made during the concession period. Concessions can last from 10 to 99 years.
- **Divestiture:** The government transfers all or part of an asset to the private sector. Generally, the government includes certain conditions on the sale to require that the asset be improved and services be continued.

New Projects



Source: Adapted from the National Council for Public Private Partnerships

HISTORY OF PPPs

Private-public partnerships are being used to finance transportation, energy, water, defense facilities, and social infrastructure initiatives. While PPPs are in the early stages of development in the United States, they are well formulated in the United Kingdom, Australia, and Europe. Infrastructure investing started in the UK in the early 1980s and quickly spread to Australia in the early 1990s. Through its Private Finance Initiatives (PFI), the UK government utilized partnership models to develop and deliver all of types of infrastructure investments from schools to defense facilities. PFI projects now represent between 10% and 13% of all UK investments in

public infrastructure.¹⁴ In Europe, the volume of PPPs is doubling, tripling, and even quadrupling year to year in many countries.¹⁵ During the last five years, infrastructure investing by the private sector in Europe has exceeded \$200 billion.¹⁶

PPPs became popular in Australia as a result of the Macquarie Group partnering with various government entities in the early 1990s. As numerous government municipalities faced severe financial problems, privatizing public assets was a logical solution to address immediate budgetary needs. In 1992 the Australian government established laws which required workers to earmark a percentage of their earnings for retirement savings and consequently superannuation funds (the equivalent to pension plans) were formed. Superannuation funds, armed with significant cash contributions which needed to be invested in order to meet future pension plan liabilities, began to play an integral role in infrastructure investing. However, in Australia a current saturation of infrastructure projects is beginning to drive domestic capital flows into foreign projects.¹⁷ These cash flows, while partly fueling the emerging infrastructure market in the U.S., supplement the increasing amount of funds being raised dedicated to the U.S. infrastructure market, support greater competition and fuel higher transaction prices and valuation multiples.

INFRASTRUCTURE INVESTING AND PENSION PLANS

Booming demand for infrastructure assets saw almost US\$100 billion raised globally to fund deals in the sector during the first half of 2006, a year-on-year increase of about 71%. Demand is being fed by the number of pension funds looking to infrastructure assets for stable, long-term returns that are higher than government bonds.¹⁸ Investing in infrastructure has the potential to become a significant part of institutional portfolios given the inherent characteristics of well structured and priced infrastructure assets. Most infrastructure investments have underlying long-term assets and cash flows that offer longer durations. This is attractive to pension funds that need yield-generating assets with durations that match their liabilities. As pension plans in the United States face reforms and adjustments in fair value accounting, the need to better match a particular fund's liabilities with its assets is becoming increasingly important.¹⁹ Another key characteristic of infrastructure assets is that they are relatively inelastic to demand and pricing. As such, these assets perform well during economic downturns. Infrastructure assets have low volatility and generate strong, predictable, and growing cash flows. At times they are compared to core real estate assets due to the stabilized and long-term cash yield components of return but they have in most instances less capital appreciation. Infrastructure assets also offer diversification within a portfolio due to low correlation of returns with bonds, equity, private equity, and real estate.

Properly structured infrastructure investments also possess attractive inflation protection attributes as operating cash flows respond to changes in inflation, thereby providing a natural hedge to inflation. Revenues of infrastructure projects structured with user fees (i.e. toll roads,

¹⁴ World Bank Infrastructure Governance Rountable, UK, PPP Forum.

¹⁵ Closing America's Infrastructure Gap: the Role of Public-Private Partnerships, A Deloitte Research Study, 2007, page 7.

¹⁶ JPMorgan Asset Management, *Investing in Infrastructure*, April 2007.

¹⁷ Sidebottom, Kate. Investment Opportunities in the Infrastructure Space. Parish Capital Advisors, June 2006: 8.

¹⁸ *Financial Times*, July 19, 2006.

¹⁹ Fair value pension accounting moving towards companies putting their pension plan assets and liabilities on their balance sheet at their fair values; due to the under-funded status of many plans, this trend could trigger economic distress as debt covenants could be violated and benefit plans terminated. For more information on pension accounting reforms, see: Jilak, Paddy, and Scherchan, Arbin. *Global Investor Digest: A Duration Dilemma*. Credit Suisse Equity Research. 5 April 2005:9.

regulated utilities, etc.) are typically linked to CPI or GDP. Another attractive attribute of infrastructure investments is that the transactions are of significant economic scale and magnitude, allowing pension plans to outlay a sizable amount of capital.

Interest in investments with these characteristics is likely to grow further due to demographic shifts increasing both the overall level of pension funds' savings and the demand for good quality income-oriented investments that can match long term liabilities. In addition, there is a series of social and political benefits associated with pension fund support of infrastructure investments. In particular, such investments provide tangible assets with which their members can identify and which demonstrate support for the community and economic development.²⁰ Infrastructure investments could allow pension plans to play an integral role in the development of their states and communities which can lead to job creation and economic prosperity while generating competitive risk adjusted rates of return.

However, pension plans should be cautious with respect to infrastructure projects and the possible loss of labor positions. Greenfield projects may generate significant job opportunities for labor members. However, privatization efforts often result operating efficiencies, including potential job loss, and it is important for pension plans to be cognizant of the relationship between private investors and operators and labor representatives. While infrastructure investments may generate attractive returns this could be diminished by the political backlash associated with labor job loss. Concession agreements need to properly address labor positions and benefits. With Chicago Skyway transaction in 2005, all labor members were offered employment by the concessionaire. However, issues related to the vesting of labor members' pension plans were not completely structured given the 90 day closing deadline under which both parties operated. As a result, no labor members accepted full time employment with the concessionaire and the City of Chicago redeployed all Skyway employees into other positions within city government.

INFRASTRUCTURE RISKS

While the many attributes of an infrastructure strategy provide significant opportunities for institutional investors, investors will be exposed to many risks within this investment space. As with any other emerging asset class, investors must properly evaluate the risk and return profile of transactions before making significant capital and resource outlays. The different risk profiles of investments will translate into varying pricing and costs of capital.

- **Regulatory Risk.** There are certain degrees of regulatory risk associated with transportation, energy/utilities and water companies. Changes in regulatory conditions could severely impact revenues, growth dynamics, and operating efficiencies.
- **Public and Political Risk.** Lack of public and political acceptance of ownership and/or operation of assets by the private sector can cause enormous problems for infrastructure activities. While public acceptance has been favorable in other countries (Australia, Canada and Western Europe), there may be some initial challenges in the U.S. pertaining to public approval of foreign ownership of domestic assets. In addition, state and local laws will apply to most infrastructure projects as opposed to federal jurisdiction. State law makers and officials will have different outlooks and opinions with regard to infrastructure activities. For example, Texas currently has a moratorium on privately

²⁰ RREEF Research.

financed toll roads which impacts future projects such as the State Highway 121. For foreign investments, many developing countries have extreme infrastructure needs. However, some of these markets have low transparency and a high risk profile due to political, regulatory, currency, and development issues.

- **Market Inefficiencies.** While market inefficiencies can provide first mover advantage opportunities, they also generate challenges with regard to experience and knowledge within the infrastructure space. The sudden influx of new infrastructure funds and investors can cause a supply and demand imbalance within the market. It is important to establish clear definitions and attributes for infrastructure. In addition, investors need to be wary of highly contested auctions which will tend to inflate purchase prices and valuations. A few current transactions have resulted in bid discrepancies greater than \$700 million.
- **Leverage.** Infrastructure deals are typically investment grade, have relatively low default rates and on average have a bond stability rating of 96.65%. Deals can be leveraged 30% to 90% in an effort to enhance equity returns. In the 2005 Chicago Skyway transaction debt levels were over 80%. Excessive debt capital structures can alter a project's risk profile with interest rate changes, market downturns, asset non-performance, and debt service requirements. Also, with highly leveraged deals refinancing risks are also high as credit may be expensive or less available when debt comes due.
- **Deal and Partnership Risk.** Initial due diligence activities can entail significant upfront costs, time, and analysis related to a potential investment. In addition, as funds are pressured to deliver investments and returns to investors, fund managers may have incentives to overpay in order to win transactions and build up portfolios.
- **Construction and Development Risks.** Infrastructure transactions typically involve many parties responsible for different elements of the project (design, construction, operations, etc.) and the proper partnerships need to be developed to ensure that all parties' interests are aligned. The proper transfer of construction and development risk needs to be outlined in contracts and concession agreements.
- **Labor Issues.** Infrastructure transactions often involve assets and businesses that employ public and/or private sector workers. How those employees are treated by the sponsor of the transaction can have a significant impact on both the viability of the transaction and its success. The privatization of public sector jobs has and will be a matter that must be addressed in the formulation of infrastructure policy and transactions. Development projects could require that employers retain responsible contractors or other conditions that address employment practices. However, some brownfield projects are structured to save costs and improve operating efficiencies that may result in the redundancy or redeployment of employees who are pension plan contributors. This presents public and investment policy considerations that should be addressed prior to making these investments to mitigate the risks created.
- **Professional/Personnel Risk.** Infrastructure investments are labor intensive and require the knowledge of skilled, experienced professionals and strong senior management and operations teams. Investment performances can be negatively impacted without the guidance and expertise of the proper professionals.

- **Unrelated Business Taxable Income (UBTI) and Tax Issues.** UBTI may be an issue for tax-exempt investors involved in direct infrastructure investments. Investors should consult experienced and qualified tax professionals about all tax related issues pertaining to infrastructure investments.
- **Illiquidity.** Privately held investments may not have a secondary market for asset dispositions. As infrastructure investments are large in scale and capital, investors may be limited in options for exit strategies.
- **Disposition Risk.** Pension plans should monitor exit strategies related to the disposition of assets within infrastructure funds. Pension plans are attracted to infrastructure as the underlying assets are long lived assets (at least 10 years) and their cash flows have long duration. Closed-end funds have target maturity dates which can be extended by the general partners for one to three years. Pension plans need to evaluate alternatives to selling underlying assets should the pension plans want to maintain the duration attributes of their investments.
- **Limited Infrastructure Market Information.** While infrastructure has been prevalent in other countries, limited performance data of private transactions is available. Many infrastructure investments are still in developmental stages and returns have not been realized.

III. Is Infrastructure a Separate Asset Class?

In order to properly assess infrastructure investments, it is important to view the risk and return profile associated with infrastructure assets. However, one of the challenges encountered in researching the infrastructure sector has been the lack of historical data pertinent to constructing standard evaluation models and tests within an asset liability framework. It is also not possible to analyze cash flow and duration statistics for infrastructure in the same way as for stocks or bonds because infrastructure has numerous sub-sectors which contain different types of investment risk from highly speculative to very conservative while investing in toll roads, utilities, pipelines, communications networks, social infrastructure, etc. Each of these sub-sectors has different cash flow structures and revenue drivers.

In analyzing infrastructure, many investors have compared the sector with real estate due to their many common characteristics. Both real estate and infrastructure have underlying tangible assets with long lives, cash flows that provide long duration, and generate returns that are sensitive to real returns. Infrastructure's risk and return profile for sub-sectors can be compared with real estate's core and core plus (later stage infrastructure), value-added (development infrastructure) and opportunistic (opportunistic/early stage infrastructure) categories.

Core and Core Plus	Value-Added	Opportunistic
Bridges, tunnels, toll roads in OECD countries	Airports, seaports	Development projects
Pipelines, energy transmission and distribution	Rail links	Satellite networks
Water and wastewater systems	Contracted power generation	Merchant power generation
Private Finance Initiatives	Rapid rail transit	Non-OECD country infrastructure



Source: JPMorgan Asset Management

Some infrastructure investments are also similar to bonds as they are both less risky than private equity and real estate, generate steady and predictable cash flows, and offer a cash yield. Infrastructure may also be similar to private equity given the equity contribution in investments as well as possible illiquidity risks. However, investors have to also recognize the differences between infrastructure and bonds, equities, private equity, and real estate to appreciate the unique characteristics associated with infrastructure investments.

Table III. Infrastructure Contrasted with Direct Real Estate and Traditional Private Equity

	Infrastructure Investment	Direct Real Estate Investment	Traditional Private Equity
Valuation	<ul style="list-style-type: none"> Based on long term (ten year +) forecasts of cash flow/dividend yield No exit assumed/desired by institutional investors or listed funds 	<ul style="list-style-type: none"> Based on long term projections of lease payments and residual real estate value Quoted on yield/cap rate (%) 	<ul style="list-style-type: none"> Five year cash flow forecast Exit crucial. Exit assumptions tested based on exit alternatives, IPO or trade sale – critical to return
Operational Considerations	<ul style="list-style-type: none"> Operating improvements are often mild and relatively straightforward Regulated assets typically return operating improvements every five years Most assets are simple in operation (increasing electronic tolling, cost reduction, yield management) 	<ul style="list-style-type: none"> Operational requirements differ between investments, but generally include maintenance and rent review/re-letting requirements 	<ul style="list-style-type: none"> Transactions often driven by operating improvements, performance Cost reductions, synergies, turn-around strategies Add-on acquisitions, roll-ups, consolidation plays
Financing	<ul style="list-style-type: none"> Long term and investment grade Significant value create through financing (long term, bullet structures) Dividend flexibility Tenor of financing hedges risk of changes in real rates 	<ul style="list-style-type: none"> Loan-to-value based, secured financing Substantial investment grade capacity Potential for mezzanine tranche 	<ul style="list-style-type: none"> Conventional bank, mezzanine and high yield markets Relatively short-term amortizing bank debt Mezzanine or high yield increases leverage Second lien paper on mezzanine increases exit flexibility
Target Returns	<ul style="list-style-type: none"> Typically 6% to 12% long term returns depending on sub sector More similar to long term mezzanine risk, but without prepayment risk Returns sensitive to changes in inflation 	<ul style="list-style-type: none"> Historical average fund returns based on the asset risk profile Core: appr. 6% to 8% Value added: appr 10% to 15% Opportunity: > 16% 	<ul style="list-style-type: none"> Generally mainstream private equity funds target returns of greater than 17%

Source: Goldman Sachs.

As infrastructure has similarities and differences with bonds, private equity, and real estate, its risk and return profile must be attractive for investors. The table below outlines a risk and return profile for infrastructure. Given the various sub-sectors in infrastructure and the many risks associated with individual infrastructure deals (country and currency risks, greenfield versus brownfield projects, etc.), there is a broad range of returns that apply to infrastructure assets. Infrastructure risk will also change based on the political environment, pricing, and the investment thesis. The analysis below should be used for illustrative purposes only.

Table IV. Illustrative Investment Performance

Asset Type	Risk	Cash Yield	Avg. Equity IRR	Capital Appreciation
Toll Roads	Low-Medium	4-9%	8-12%	Limited
PFI/P3s	Low-Medium	6-12%	9-14%	Limited
Regulated Assets	Low-Medium	6-10%	10-15%	Limited
Rail	Medium	8-12%	14-18%	Yes
Airports	Medium	5-10%	15-18%	Yes
Toll Roads-Greenfield	Medium-High	3-5%	12-16%	Yes
Broadcast Networks	Medium-High	8-10%	15-20%	Yes
Power Generation	High	4-12%	12-25%	Yes
Average	Medium	5-9%	10-15%	Modest

Source: JPMorgan Asset Management

As with all asset classes the degree to which diversification may be enhanced is a key consideration. To analyze the diversification characteristics of infrastructure investments we looked at the mature Australian infrastructure market. We examined the correlation of infrastructure investments to bonds, public equities, private equity and real estate from a ten year historical context. The analysis below demonstrates how infrastructure has a low correlation to other asset classes.

	Infrastructure	Australian Equities	Australian Bonds	Property (Listed)	International Equities (A\$)
Infrastructure	1.00	0.32	0.04	0.16	0.00
Australian Equities		1.00	0.02	0.52	0.66
Australian Bonds			1.00	0.50	0.00
Property (Listed)				1.00	0.48
International Equities (A\$)					1.00

Sources: Standard & Poor's, Factset, JPMSI, MSCI, JPMorgan Asset Management data from 1995 through December 2006. Data points and time series for the analysis are not sufficiently robust to prove the hypothesis to a statistically significant degree.

In addition to having a low correlation to other traditional assets, infrastructure assets have a low default rate as well. S&P Risk Solutions and Morgan Stanley analyzed the default rates on infrastructure projects as well as corporate projects. Infrastructure projects in emerging economies had a default rate of 2.73% and 14.69% for one-year and five-years versus 4.29% and 19.56% for one-year and five-years for corporate bonds. In non-emerging countries, infrastructure projects had one-year and five-year default rates of 0.25% and 1.23% versus one-year and five-year corporate bond default rates of 1.82% and 7.82%.

S&P Risk Solutions also looked at rating stability, also referred to as ratings transitions, which measures the number of projects with a particular rating to be rated the same rating grade over a specified period: the higher the number, the lower the ratings volatility. Infrastructure projects had a 96.65% average ratings transition over the period 1992–2003, compared to corporate ratings in the infrastructure sector of 76.05%.²¹

Sector	Average Ratings Transition
Infrastructure Projects	96.65%
Corporate	76.05%
Infrastructure Projects – Emerging Countries	86.89%
Corporate Debt in Emerging Countries	74.80%
Infrastructure Projects in Non-Emerging Countries	98.34%
Corporate Debt in Non-Emerging Countries	76.42%

Source: S&P Risk Solutions, November 2006. Infrastructure Project Finance Defaults and Ratings Transitions Study—1992-2003

²¹ Morgan Stanley, Investing in Infrastructure: A Primer. May 2006.

Infrastructure can be either a separate asset class or a component of an inflation-sensitive asset class. Infrastructure as an asset class has a distinct profile and should therefore not be considered as an extension of any of the existing asset classes. Infrastructure is hybrid in nature as it reflects features of both bonds and equities. It has a long-term investment horizon and provides stable fixed income, a characteristic similar to bonds. However, infrastructure assets provide equity-like returns with moderate volatility, moderate to low liquidity, and upside growth potential. Its distinct profile enables it to provide greater diversification benefits to an investor with low beta compared to traditional types of investments.²²

The inherent inflation protection element of the asset class is an attractive attribute for pension plans looking to hedge against the cost of paying inflation protected pensions. The asset class also enables pension plans to better match plan assets with liabilities. Investors may also view infrastructure as an attractive alternative to Treasury Inflation-Protected Securities (TIPS), mezzanine and high yield debt, and private equity with lower risk.²³ Infrastructure assets generate strong cash returns with less dependence on asset appreciation.

However, infrastructure assets are labor intensive and require staffing/management by skilled and experienced individuals with a proven track record. As infrastructure deals typically have high leverage, meeting performance levels is key so that leverage does not contribute additional deal risk.

PENSION PLAN ACTIVITIES IN INFRASTRUCTURE

While U.S. pension plans are beginning to embrace infrastructure, their Australian, Canadian, and European counterparts are very experienced within the asset class. Today, Australian superannuation funds have significant allocations to infrastructure ranging from 2% to 15% of their portfolios. Many of them invest in infrastructure through the likes of the Macquarie Group and its related funds, as well as investment management firms which are owned by a consortium of superannuation funds such as QIC, Industry Funds Management (IFM), and government related funds management companies such as Victorian Funds Management Corporation (VFMC).

Canadian pension plans are adept at making direct investments in infrastructure assets and play a significant role within the infrastructure market. The Ontario Municipal Employees Retirement System (OMERS) has established a separate infrastructure entity, Borealis, to invest in infrastructure transactions. OMERS has been a key player in the infrastructure space since 1997. Borealis is a self-sufficient entity with approximately 50 employees (consisting of engineers, investment bankers, and transactional, legal, and industry experts, etc.). OMERS dedicates approximately \$5.6 billion to infrastructure and is looking to have between \$8 to \$10 billion under management for infrastructure activity within the next few years. The company participates only in direct deals and has never invested in an infrastructure fund. OMERS has invested in energy companies (Bruce Power), ports, and tunnels, as well as social infrastructure (healthcare, schools, and government buildings). In 2005 OMERS had infrastructure returns of 23%.

Ontario Teachers Pension Plan (OTPP) has invested in infrastructure since 1997. While initially OTPP invested in infrastructure via funds, specifically the Macquarie Infrastructure Group fund of which it is a 10% investor, the pension plan now participates in direct and co-investment

²² Macquarie Research, *Infrastructure*, May 2, 2007.

²³ *Investing in Infrastructure*, op. cit., p. 18.

deals. OTPP looks to invest between 12% and 15% of its portfolio in infrastructure activity over the next five years. The fund has 15 dedicated individuals focused on infrastructure and has established key partnership relationships. The fund has invested in Birmingham Airport, InterGen Power Generation, and Scotia Gas Networks. Other Canadian pension plans that invest in infrastructure include Caisse de dépôt et placement du Québec and Canadian Pension Plan Investment Board.

Similarly in Europe, ABP, the Dutch pension plan, is an active investor in infrastructure. With €210 billion of net assets, ABP allocates 2% of its portfolio to infrastructure. ABP started investing via the Macquarie funds and does not participate in any direct investments within the space.

Within the U.S., a few pension plans have invested in select infrastructure funds. The Illinois State Board of Investment (ISBI) has allocated 5% (\$600 million) of its overall portfolio to infrastructure. Currently ISBI is only making investments via funds and sits on the advisory board of Macquarie Infrastructure Partners.

Table VII. Infrastructure Allocations & Returns for Pension Plans			
Pension Plan	Infrastructure Allocation	Portfolio Allocation Now / Future	2006 Returns
ABP	€4.2 billion	2.0% / 3.0%	20.0%
Caisse de Depot	C\$5.0 billion	4% / Unknown	13.5%
HESTA	A\$700 million	6% / 10%	10.3%
OMERS (Borealis)	C\$5.6 billion	11.5 % / 15.0%	14.0%
Ontario Teachers	C\$7.5 billion	7.1% / 12% to 15%	Unknown

BENCHMARKS

Investors are impeded in their analyses of the infrastructure sector due to a lack of available benchmarks. There are no existing benchmarks which properly address unlisted infrastructure activity. Investment managers typically state a targeted return range for funds as a result of this benchmark deficiency.

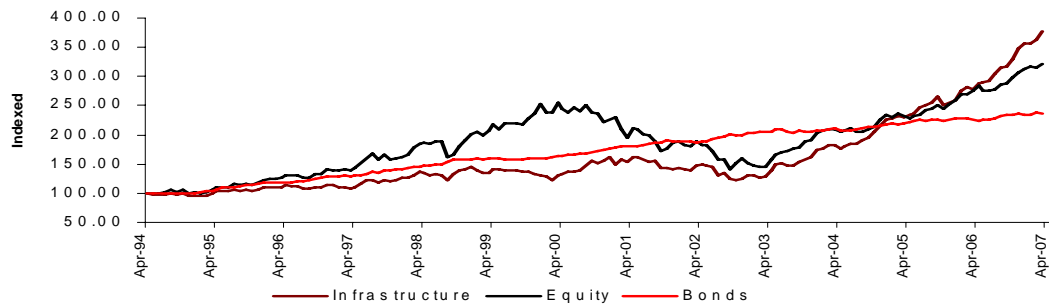
The Macquarie Group with the FTSE introduced the Macquarie Global Infrastructure Index (MGII) in 2005 to measure **public infrastructure activity**. The index uses a broad definition of infrastructure which includes those companies that provide or are involved in providing services that are essential for the growth and development of the community. The MGII comprises a broader range of infrastructure stocks than is currently available in existing indices. It observes the growth of both infrastructure (economic, social, and commercial (defined by Macquarie as satellites, fiber networks, mobiles) and utilities (electric, gas, water)). MGII comprises stocks in FTSE Global All-Cap Index that have operations in the infrastructure and utilities domain. It is further broken down into sub-indices on the basis of regions (Europe (41%), the U.S. (41%), Japan (8%), Asia Pacific ex-Japan (5%), Australasia (3%), and Other (2%)) and sectors (water, transport services, pipelines, multi-utilities, gas distribution, electricity, and telecommunications hardware). As of March 2007, MGII had 236 constituents in the broader index with a combined market capitalization of US\$1,758 billion.²⁴ **This index is being highlighted for illustrative**

²⁴ Macquarie Research, Infrastructure, May 2, 2007.

purposes only due to the limited availability of data in the market pertaining to infrastructure.

Over the last six years, the MGII has grown from US \$466 billion to approximately US \$1,758 billion, as of March 2007. Infrastructure generated an average annual return of 7.81% (log normal real returns) from 1994 to 2007, compared with 4.04% for bonds and 6.64% for global equities.

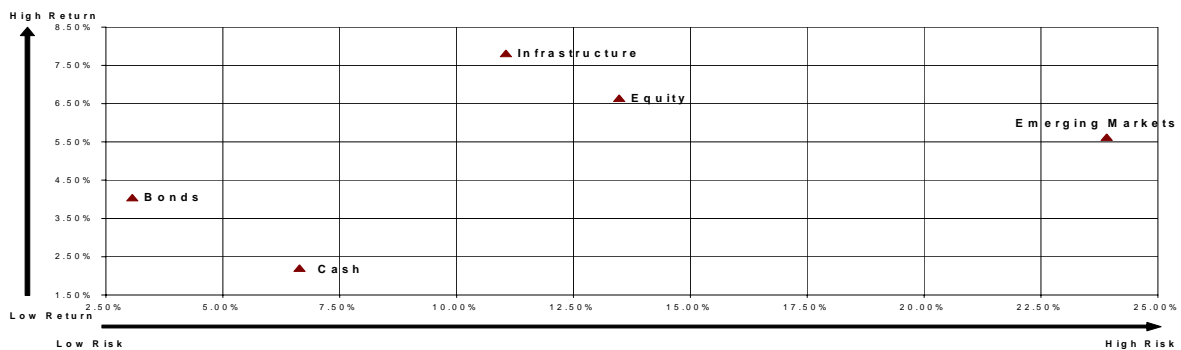
Infrastructure Versus Bonds and Equities (Total Return \$U.S.)



Source: Evalueserve Analysis, April 2007. Figures derived from respective indices, nominal returns; total return data rebased as of April 1994.

The risk-return profiles of different asset classes over a period of 13 years from 1994 to 2007 are presented below. The performance of infrastructure was compared with four other asset classes - emerging markets, equities, bonds, and cash. It can be observed that infrastructure has performed better than all other asset classes.

Risk Return Profile of Five Asset Classes



Source: Evalueserve Analysis, April 2007 and Macquarie Research, Infrastructure, May 2, 2007. Methodology used was the following: (1) The performance (risk-return profile) of infrastructure and other asset classes was examined over a 13-year, period from 1994 to 2007. (2) Risk is measured by standard deviation. (3) Since no single index covers this entire period for infrastructure, two indices, were combined for the purpose of the analysis. (4) The study was restricted to 13 years because of the lack of an available representative infrastructure index prior to 1994.

The analysis suggests that there is a low correlation between infrastructure and other asset classes. Infrastructure as an asset class is hybrid in nature and thus provides the benefits of

moderate to high returns with low to moderate volatility. The distinctive characteristics of infrastructure such as inelastic demand, high barriers to entry, inflation-linked cash flow, and high degree of regulation, make this asset class react differently to changing market scenarios than other asset classes. Therefore, the inclusion of infrastructure as a distinct asset class within a portfolio is expected to provide diversification benefits.

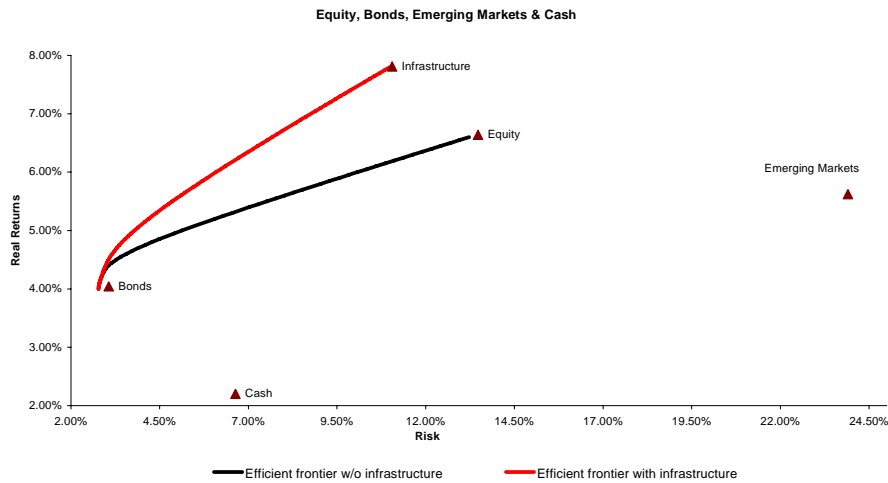
Thirteen Year Correlation with Infrastructure

	Infrastructure	Equity	Emerging Mkts	Utilities	Cash	Bonds
Infrastructure	1.00					
Equity	0.58	1.00				
Emerging Mkts	0.45	0.74	1.00			
Utilities	0.67	0.40	0.35	1.00		
Cash	0.35	0.16	0.09	0.22	1.00	
Bonds	0.14	(0.10)	(0.18)	0.09	0.10	1.00

Source: Evalueserve Analysis, April 2007

The analysis shows that the efficient frontiers have shifted to the left when infrastructure is added to the portfolio. With the same level of risk, the portfolio including infrastructure offers higher returns vis-à-vis a portfolio without infrastructure. This shift to the left is explained by the fact that infrastructure, with its low covariance with other asset classes, improves the efficiency within the portfolio and offers diversification benefits. These factors reduce volatility in the portfolio returns (i.e., reduce risk at each level of return).

Efficient frontiers with emerging markets, cash, equities and bonds (13 years)



Source: Evalueserve Analysis, April 2007

IV. Routes to Market

As investors assess the types of infrastructure assets that are available in addition to geographic preferences, they also have a choice as to which routes to market they can utilize to participate in infrastructure investments. Infrastructure can be accessed through listed securities that are traded in public markets, closed or open-ended funds (limited partnerships), as well as via direct investments in specific infrastructure assets and businesses. Each vehicle has its advantages and disadvantages.

Listed Securities. Listed infrastructure securities encompass mature assets such as toll roads, airports, utilities, and communications. The value of publicly traded infrastructure companies is over \$3 trillion.²⁵ Listed securities provide easy access to the infrastructure market and enable investors to build global portfolios for diversification. Strong infrastructure management expertise is not needed to invest in these securities. Liquidity of the securities is high as there is a strong supply and demand for the securities. Investors can easily alter their investment strategy by selling securities in the market. However, listed securities introduce volatility and increased correlation between infrastructure and other asset classes. Also, there is a challenge in determining appropriate benchmarks.

Closed or Open-Ended Funds (Limited Partnerships). There are a growing number of funds that investors can participate in as new funds are raising between \$38 to \$51 billion dollars in 2006/2007.²⁶ Each fund has a different infrastructure strategy (brownfield and/or greenfield projects, geographies, etc.) and may not be diversified within sub sectors, however investors can obtain diversification by hiring numerous managers. These funds are large (over \$1 billion in assets) and often structure complex deals with intricate debt and equity structures. Closed-ended funds have specified maturity dates whereas open-ended funds have an indefinite term. Closed-end funds are common in the market place with private equity-like structures and fee schedules. Open-ended funds have slightly lower fee structures and provide a longer duration. Management selection is very important with funds as demonstrated skilled expertise and strong partnership relationships are needed to alleviate execution risk. Infrastructure assets are illiquid and exit strategies may not be clearly outlined. Investors can also have a co-investment relationship with the funds whereby they invest a larger sum of money for specific transactions. This is a viable way for investors who are new to infrastructure to learn more about investment strategies. In addition, investors typically pay lower fees in co-investment deals. In general, infrastructure funds have private equity-like fees. Assets can be taken public or sold to other strategic buyers or management teams. With numerous funds in the market, fund management teams are pressured to identify new assets, however, competitive landscapes, longer due diligence periods, and deal supply issues may affect deal closing timeframes.

Direct and Syndicated Deals. Investors can purchase infrastructure assets outright via direct deals or syndicated deals with other institutional investors, pension funds, and/or investment funds. Many Canadian and European pension plans are actively participating in direct deals after once utilizing funds/limited partnerships as investment vehicles. Direct investing can mitigate the fees investment funds charge and provide the opportunity of owning or leasing assets such as toll roads and energy companies. Investors need strong management expertise and partnerships to execute these transactions if they do not possess internal groups consisting of bankers, engineers, and industry-specific leaders/operators. The interests of all parties within

²⁵ Global Insight: Standard and Poor's COMPUSTAT North American database; RREEF Research.

²⁶ Macquarie Research, April 2007.

direct investment deals need to be fully aligned. All participants need to work together without egos and ulterior motives in order to achieve success as a group. Frequently, groups of pension plans co-invest in transactions as they have common goals and performance expectations.

For example, in May 2007, Airport Group Investments Ltd. (AGIL), a limited company owned by the Ontario Teachers' Pension Plan (OTPP) and Victorian Funds Management Corp. (VFMC), entered into a conditional agreement to acquire a 48.25% interest in Birmingham International Airport for £420 million (\$918 million Cdn). Birmingham International Airport, the fifth largest airport in the U.K., handles more than nine million passengers a year through two terminals, and acts as a gateway to Europe, North America, India and the Middle East.

V. Opportunities in Infrastructure

TRANSPORTATION

Transportation assets include bridges, toll roads, tunnels, rail, mass transit, airports, and seaports. Transportation assets are large in scale and are very hard to replicate. These assets provide core services in a community and are used by large quantities of people. In the United States, there is a great need for transportation infrastructure improvements as many of these assets are aged and require significant capital expenditures for maintenance. In addition, greenfield projects are needed to address congestion issues and growing populations. Internationally, these projects are developed but there are more greenfield opportunities.

Transportation Assets	
Domestic Need	<p><i>Overall sector need domestically is over \$510 billion according to American Society of Civil Engineers.</i></p> <p><i>Toll roads, bridges and tunnels</i></p> <ul style="list-style-type: none"> • Approximately \$95 billion in annual spending is needed for maintenance of toll roads, bridges, and tunnels. \$125 billion is needed for improvements and expansion. Only \$59.4 billion is spent by government on toll roads, tunnels, and bridges.
	<p><i>Mass transit, Railways, Freight</i></p> <ul style="list-style-type: none"> • Approximately \$175 to \$195 billion is needed over next 20 years to maintain existing infrastructure and expand for freight growth. • \$60 billion over 20 years is needed to expand rail network to develop intercity corridor passenger rail. • Rail capacity suffers from severe delays.
	<p><i>Airports and Aviation Services</i></p> <ul style="list-style-type: none"> • U.S. airport capital development costs from 2005 to 2009 estimated at \$39.5 billion.
	<p><i>Maritime and Seaports</i></p> <ul style="list-style-type: none"> • Limited number of ports due to industry consolidation. • U.S. ports running at 85% of capacity.
Growth Drivers	<p><i>Toll roads, bridges, and tunnels</i></p> <ul style="list-style-type: none"> • Lane miles up 5% since 1980 while vehicle miles traveled up 100%. • Much of the U.S. interstate system is over 50 years old. • Government entities lack capital to fund near-term needs.
	<p><i>Mass transit, Railways, Freight</i></p> <ul style="list-style-type: none"> • Freight transportation traffic expected to grow 55% from 2000 to 2020. • Increase in traffic has resulted in service and capacity constraints on certain rail corridors.
	<p><i>Airports and Aviation Services</i></p> <ul style="list-style-type: none"> • Air travel and traffic are projected to grow at 4.3% annually thru 2015.
	<p><i>Maritime and Seaports</i></p> <ul style="list-style-type: none"> • Cargo volume expected growth of 6.1% with capacity growing at 4.6% over next 10 years.
Ownership	<p>Most transportation assets are currently owned by municipalities or government entities. A few are owned and operated by private entities.</p>

Transportation Assets (cont'd)			
Asset Cycle	Transportation assets tend to be very mature, however, with respect to toll roads and rail there are many greenfield opportunities.		
Revenues	These assets generate strong, predictable cash flows which are inflation linked. Cash yield.		
Volatility	Low		
Risk Level	Low (toll roads, bridges, tunnels) to medium (airports). Transactions are subject to volume risk, construction risk (greenfield projects), operational, and demand risk (ex: traffic estimates for roads). Political risk may be high for foreign purchasers of certain assets such as ports.		
Returns	Asset	Cash Yield	IRRs
	Toll Road (Operating)	4% - 9%	8% - 12%
	Toll Road (Greenfield)	3% - 5%	12% - 20%
	Rail	8% - 12%	14% - 18%
	Airports/Seaports	5% - 10%	15% - 18%
Liquidity	Exit strategy unknown. Possible sale to strategic buyers.		
Competitive Landscape	<ul style="list-style-type: none"> • Many competitors, lots of capital being raised, few deals. • Recent winning bids over 25% to 40% greater than runner up. • Few airports have been taken private in the U.S. (Midway in process); numerous airports in CAD, Europe, and AUD have gone private. 		
Life Span	30 to 99 year operating leases (concessions).		
Regulatory Environment	<ul style="list-style-type: none"> • Roads are overseen by the Federal Highway Administration (FHWA) for safety and maintenance, and the Federal Transit Administration (FTA) for development of transport regions. • Airports are overseen by the Federal Aviation Administration (FAA) for operations, and the Transportation Security Administration (TSA) for national security issues. • Ports are overseen by the Maritime Administration for safety and maintenance. 		

Opportunities

The transportation sector has a significant amount of investment activity across the United States and the marketplace for transportation assets has been very active recently. These assets may provide solid cash yields and returns. Operating toll roads has a lower risk return profile than building new roads and operating airports. Government entities appear to be open to toll road concession as recent deals with the Chicago Skyway (\$1.83 billion), Indiana Toll Road (\$3.8 billion), and the Texas Corridor (\$2.8 billion) are establishing benchmarks. At least 39 toll roads have been identified by the Federal Highway Administration as potentially available for transactions. However, the pricing on recent transactions has been very high. With the Indiana Tollway, the second highest bidder was \$950 million behind the winning bid.

There are many opportunities within the rail and freight sub sector as well. Internationally, many airports are being sold and built out to create business parks alongside traditional airports. Investors need to recognize the different risk and return profiles associated with the various transportation assets. In addition, while transportation assets are stable and allow for higher degrees of leverage, investors should be cautious of how higher leverage levels translate into higher risk premiums. Case studies for transportation transactions are included in the appendix.

ENERGY & UTILITIES

The energy and utilities sector of infrastructure is also large and active. These assets are owned both by government and private entities. Within the infrastructure definition established in this document, energy and utility companies that are exposed to commodity risks are not included in this analysis. Energy and utility assets include gas pipelines, power distribution and transmission, water and water treatment systems as well as clean energy.

Energy and Utility Assets	
Domestic Need	<p>Overall sector need domestically is over \$1.0 trillion according to American Society of Civil Engineers.</p> <p><i>Gas Pipelines</i></p> <ul style="list-style-type: none"> • \$9 billion of annual investment needed for gas pipeline and storage
	<p><i>Power Distribution and Transmission</i></p> <ul style="list-style-type: none"> • Strong market dynamics • Attractive market for power generating capabilities • Maintenance expenditures down 1%/year since 1992 • Transmission grids in need of severe upgrades
	<p><i>Water and Water Treatment</i></p> <ul style="list-style-type: none"> • \$1 trillion need in sector • \$161 billion of required expenditures for water from 2000 to 2019 • \$19 billion of annual expenditures for repairs and improvements for wastewater
Growth Drivers	<p><i>Gas Pipelines</i></p> <ul style="list-style-type: none"> • Aging structure with 88% of gas pipelines and 52% of compression built before 1970
	<p><i>Power Distribution and Transmission</i></p> <ul style="list-style-type: none"> • Demand expected to rise 19% over next 10 years with committed resources increasing only by 6% • Need for grid reliability • Energy Policy Act of 2005 • Increased consumption growth and increased natural gas usage • New housing development • Predictable growth profile
	<p><i>Water and Water Treatment</i></p> <ul style="list-style-type: none"> • Aging system nearing the end of its service life • Extremely fragmented market with 54,000 systems (31,000 private) in \$100 billion market
Ownership	Both private and public (government ownership)
Asset Cycle	Long lived assets, contracts in 10 to 20 year range
Revenues	Stable, inflation-linked growth
Volatility	Low to medium
Risk Level	Medium (Higher for clean tech initiatives). Regulatory risk, execution risk, volume risk.
Liquidity	Asset sales are prevalent

Energy and Utility Assets (cont'd)			
Returns	Asset	Cash Yield	IRRs
	Regulated Assets	6% - 10%	10% - 15%
Competitive Landscape	<ul style="list-style-type: none"> • Healthy deal flow • Ample number of utilities to explore • A well known set of pipeline players with new entrants • Many small private water operators – consolidation needed 		
Life Span	10 to 25 years		
Regulatory Environment	<ul style="list-style-type: none"> • Strong regulatory environment for utilities. Regulations play role in valuations. • Federal Energy Regulatory Commission monitors energy companies. • State Public Utilities Commission monitors water companies. 		

Source: Returns from JPMorgan Asset Management, Investing in Infrastructure, April 2007.

Opportunities

In general, energy and utility assets are riskier investments than transportation assets. Although energy companies and utilities have been upgraded in the U.S., many still require maintenance. In addition, many greenfield projects are needed across the U.S. There has been a strong market for energy and utility companies abroad. Water and sewer projects are very prevalent in Latin America and Asia. The power market has \$185 billion of governmental assets and approximately \$800 billion of private market assets. The transmission market has approximately \$320 billion of private market assets.

In addition, renewable energy offers many opportunities within the energy sector. In the United States renewable energy use is forecast to grow more than 60% during the next ten years, representing over \$60 billion in new investment. These opportunities are within biomass, geothermal, hydroelectric, solar and wind technologies.

COMMUNICATIONS

Communications assets include broadband wireless networks as well as cable and satellite systems. Although some what regulated, these assets are typically owned by private companies. The communications sector as it pertains to infrastructure has a high risk and reward profile. There is a high degree of technology dependence and the risk of technology obsolescence. Within the communications sector there is a great deal of competition. The public has many choices for communications providers as service providers are delivering different platforms to the public (cable companies providing phone services, broadband and cable programming). The communications sector is not a primary infrastructure sector as the services rendered are not as crucial as bridges, airports and water systems.

Many transactions opportunities within the communications sector are taking place in Asia and Latin America where there is a greater need for a build out of communications networks.

SOCIAL SERVICES

Social infrastructure assets include educational facilities (schools, dormitories) judicial buildings (court houses), military housing and correctional facilities (prisons). Social infrastructure transactions are low risk investments. The underlying assets are primarily owned by the local governments and municipalities. As a result of this, it is difficult to determine the economic need for improving and developing these assets. In the United Kingdom social infrastructure investments are made via Private Finance Initiatives (PFI). In the UK PFI projects represent between 10% and 13% of all UK investments in public infrastructure according to the World Bank. Investors may participate in social infrastructure investments in order to support social causes and to make a direct investment in their local communities.

VI. CONCLUSION

Infrastructure investment is an attractive strategy for institutional investors. As the sector has developed and matured in Australia and the United Kingdom it is establishing a track record in Canada and now in the United States. Infrastructure privatizations are utilized by governments worldwide because of the strong demand for building new infrastructure assets (via greenfield projects) and maintaining existing infrastructures. Within the United States there are an increasing number of infrastructure opportunities as governments begin utilizing public-private partnerships to develop undervalued assets and to build out infrastructure needs. The combination of government funding needs, progressive PPP legislation and recent privatization activities have created a U.S. marketplace.

The American Society of Civil Engineers (ASCE) has estimated a \$1.6 trillion infrastructure investment demand for the next 5 years in order to meet the national need for maintaining aging infrastructures and developing new infrastructures. There are also abundant foreign investment opportunities, especially in developing countries and regions of the world such as Southeast Asia, South America, and the Middle East.

Infrastructure assets have unique characteristics and as a result, we think infrastructure should be a separate asset class or a component of an inflation-linked asset class. The underlying assets provide a hedge to inflation as revenues have built in CPI adjustments. The assets provide essential services to societies and typically have a monopolistic position due to high barriers to entry and inelasticities in price and/or demand. Furthermore, infrastructure is not impacted by global competition (for example, a toll road in Chicago does not compete with a toll road in China).

Infrastructure assets are long lived assets which provide steady and predictable cash flows. They provide a match for long term liabilities within an investment portfolio. Infrastructure assets maintain a low correlation to other asset classes and provide portfolio diversification. They also have limited commodity risks and are insensitive to changes in technology.

While these assets are low risk by nature, infrastructure investments still present a variety of risks. The structure of public-private partnerships may mitigate or transfer some operational risk. However, investors need to be cognizant of outside factors which may strongly influence the risk profile of investments such as regulatory changes, public and political approval as well as union participation where applicable. As of June 2007 members of the Transportation and Infrastructure Committee of the House of Representatives are debating whether “PPPs can supplement—but not provide a substitute for—public investments in transportation improvements.” The committee recommends that “states must ensure that public-private partnerships do not undermine the planning process, which ensures that priority will be given to the public interest, not the desire of profits.” The findings of the committee and any subsequent legislation could have a dramatic impact on infrastructure investments.

In addition, understanding the structure of infrastructure transactions is critical as the use of excessive leverage may transform a low risk asset into a high risk investment. Asset management is important as the partnerships and operational improvements related to transactions have a direct effect on the profitability of investments.

Although there is not an overall benchmark for unlisted infrastructure investments, there are some resources such as the Macquarie Global Infrastructure Index (MGII) which demonstrates

higher returns for infrastructure investments than that of bonds and global equities over the period of 1994 to 2007. As the underlying infrastructure assets have low correlation with other asset classes, the sector provides diversification benefits in an investment portfolio and reduces risk at each level of return.

There are many new managers entering the infrastructure space that have raised close to \$50 billion of capital in 2006-2007 alone. The number of new managers will likely increase as infrastructure investments are better understood and are marketed to more investors such as pension plans. As managers have been swift to assemble funds, they are faced with a limited infrastructure deal flow. Consequently, transaction prices are being bid up quickly and pricing differentials are significant. While it is unclear if current market transactions are outliers rather than new established standards, investors must thoroughly understand the investment strategy of new managers. Infrastructure investments have a longer lead time than traditional investments, even longer than private equity in some instances and investment managers should not rush to engage in transactions. The strategic advantage in infrastructure investing will come from those who are able to originate transactions outside of an auction or request-for-proposal process.

Pension plans are focusing on infrastructure investing due the positive attributes. Infrastructure is playing a more active role in liability driven investing and provides portfolio diversification and stable cash flows. Some Canadian and Australian pension funds are experienced investors in the infrastructure space and American pension plans are cautiously entering the investment sector as they complete their due diligence on infrastructure activities. Some U.S. pensions plans such as the Illinois State Board of Investment have made portfolio allocations to infrastructure. There exists a range of ways to enter the market: funds can access infrastructure through listed securities that are traded in public markets, closed or open-ended funds and co-investment opportunities with funds, as well as via direct investments in specific infrastructure assets and businesses. Investing via funds and co-investment opportunities allows institutional investors to participate in infrastructure transactions while learning more about the emerging asset class. As investors become more sophisticated and are able to acquire experienced infrastructure personnel, they will be better equipped to invest directly.