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ABSTRACT/RÉSUMÉ

Pension Fund Investment in Infrastructure

As the need for investment in infrastructure continues to grow, private sector financing for infrastructure projects has developed around the world. Given the long-term growth and (potentially) low correlation aspects of infrastructure investments, pension funds have also shown interest in increasing their exposure to this area, along with their move into alternative assets. Such investments cover a wide spectrum of projects – from economic infrastructure such as transport, to social projects such as hospitals – and involve different forms of financing (primary vs. secondary, debt vs. equity, private vs. listed, direct vs. indirect). Data explaining the size, risk, return and correlations of this diverse asset class is therefore limited, which may be making pension fund investors cautious. Given investing in such assets also involves new types of investment vehicles and risk for pension funds to manage – such as exposure to leverage, legal and ownership issues, environmental risks as well as regulatory and political challenges – such caution may well be justified. However, if governments wish to help infrastructure developers tap into potentially important sources of financing such as pension funds, certain steps can be taken.

This paper is designed as an overview piece, discussing if pension funds should invest in infrastructure on a theoretical basis, whether they do in practice, and, if not, how (and if) regulators can encourage and assist them to do so.

JEL codes: G15 G18 G23 G28 J26
Keywords: alternative assets, asset allocation, barriers, diversification, listed securities, infrastructure, pension, private finance, regulatory constraints, risk, return,

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Investissements des fonds de pension dans les infrastructures

Les besoins en investissements dans les infrastructures continuant de croître, le financement de projets d'infrastructures par le secteur privé s'est développé dans le monde entier. Étant donné la croissance à long terme des investissements dans les infrastructures et la corrélation (potentiellement) faible de leurs rendements, les fonds de pension ont envisagé d'accroître leurs engagements dans ce domaine, parallèlement au développement de leurs placements alternatifs. Ces investissements portent sur une large gamme de projets – allant de projets d'infrastructure économique comme les transports à des projets sociaux comme la construction d'hôpitaux – et impliquent diverses formes de financement (primaire ou secondaire, dette ou fonds propres, titres cotés ou non, direct ou indirect). Les données relatives à la taille, au risque, au rendement et aux corrélations de cette catégorie d'actifs très diversifiée sont par conséquent limitées, ce qui peut inciter les investisseurs des fonds de pension à une certaine prudence. Étant donné que les investissements dans ces actifs impliquent également des instruments et des risques d'un nouveau type qu'auraient à gérer les fonds de pension (emprunts, problèmes juridiques et de propriété, risques environnementaux et problèmes réglementaires et politiques) cette prudence se justifie sans doute. Cela dit, si les pouvoirs publics souhaitent aider les responsables du développement d'infrastructures à avoir recours à des sources de financement potentiellement importantes comme les fonds de pension, certaines mesures peuvent être prises.

Le présent document vise à donner un aperçu de la situation et examine la question de savoir si les fonds de pension doivent investir dans les infrastructures en théorie, s'ils le font en pratique et, dans le cas contraire, si et comment les responsables de la réglementation peuvent les encourager et les aider à le faire.

Classification JEL : G15 G18 G23 G28 J26
Mots clés : actifs alternatifs, allocation des actifs, obstacles, diversification, titres cotés en bourse, infrastructures, pensions, financement privé, contraintes réglementaires, risque, rendement.

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PENSION FUND INVESTMENT IN INFRASTRUCTURE

By Georg Inderst[1]

I. Introduction

Pension funds are increasingly moving into new asset classes in a search for yield. Infrastructure is one type of investment being frequently discussed, given its potential to match long-term pension assets and provide diversification.

Previously pension fund exposure to infrastructure has been via listed companies (such as utilities), or via real estate portfolios. However, some larger funds globally are beginning to invest via private-equity funds, or, occasionally, even directly. Australian, Canadian and Dutch pension funds may be considered as leaders in this field.

However, barriers to such investment still exist – not least from the political risks involved with such long-term investments – and the experience of pension funds around the world with such assets has not always been positive. Such challenges only multiply if investment in projects in developing countries is considered.

OECD guidelines and experience in international investment and related sectors may provide assistance to regulators and other government authorities considering encouraging or assisting pension funds looking to invest in this new asset class.

This paper is designed as an overview piece, discussing if pension funds should invest in infrastructure on a theoretical basis, whether they do in practice, and, if not, how (and if) regulators can encourage and assist them to do so.

II. The asset allocation context

Investing in infrastructure has become a new topic for pension funds in recent years. Institutional investors are trying to spread their investments across a much wider spectrum of investments than in the past. They are looking for new sources of return and better diversification of investment risk. In this process, they are searching beyond the traditional asset classes of equities, bonds, cash and real estate.

In the 1990s, strong stock markets were supportive of the development of funded pensions, and the allocations to equities were increased by pension funds in many countries. However, the burst of the TMT-bubble in the early 2000s and the subsequent recession led to substantial funding and solvency problems for pension funds. Both sides of the balance sheet were affected. Not only did asset prices fall but also

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pension liabilities rose at the same time, because of lower interest rates, improving longevity, and other reasons.

This led to a major rethink of the asset allocation of pension funds. They realized that they were often not well protected against market volatility, inflation and interest rate risks. At the same time, investment experts reduced the long-term return forecasts for mainstream equities and government bonds. As a result, many pension funds started to look for new investment opportunities.

They enlarged their investment universe to include corporate and high yield bonds, and invested more money internationally, including in emerging markets. In addition, the investment industry started to offer new or "alternative" asset classes for pension funds. They include hedge funds, commodities, private equity, currency and tactical asset allocation overlays, commercial loans, infrastructure investments, forestry products, microfinance and other niche areas.

The idea of investing in infrastructure seems to strike a chord with many pension plan directors and members. Infrastructure feels more "tangible" and "real" than a lot of other complex products and derivative strategies presented to pension funds these days, where they find it difficult to detect the underlying value. In addition, infrastructure is made for the long term, and there seems to be a natural fit with the long-term liabilities of many pension plans. For some people there is also a connotation to sustainable or socially responsible investing, which is an increasingly popular route chosen in particular by public and industry-wide pension plans.

Dedicated infrastructure funds were first set up in the mid-1990s in Australia, and the local Superannuation plans in the USA were early investors in them. Some bigger Canadian plans also pioneered this field. Australian financial institutions started to promote such funds more widely to pension funds and other investors earlier this decade. Since 2005, several (mostly big) European und US pension plans have made their first concrete steps while many more seem to be contemplating them.

Over the last 2 - 3 years, not only have financial products for pension funds mushroomed but related marketing and research reports, and media interest in general has followed.[2] Unfortunately, there is considerable confusion in this area, in particular with regard to the definition of infrastructure assets, the investment options available, the actual investments of pension funds, the expected and realized returns, the diversification benefits and the specific risks.

It is symptomatic of the confusion that infrastructure investments of pension funds come under different labels, e.g., under private equity, listed equity, real estate, alternatives, real assets or just "other assets".

Background: private finance of infrastructure

In a historic perspective, private financing of infrastructure is not new. In recent times, however, there have been significant new developments. In post-war Europe in particular, most of the infrastructure was owned and controlled by state institutions. Since the 1980s, the trend has reversed as many pieces of infrastructure have been (partly or fully) privatised in the face of stretched public finances. Estimates for privatized assets run over US$ 1tr for the OECD countries.[3] At the same time, several industries were (more or less) deregulated. In this first wave, many investors benefited from investing in shares and bonds of, e.g., privatized utility companies.

[2] Even a new specialist Journal, "Institutional Investing in Infrastructure", Institutional Real Estate Inc., was launched in Spring 2008.

[3] OECD (2008a)

A key driver behind these trends is the need to improve the (often declining) public infrastructure or build new projects in the first place. Full privatisation is not always needed, or possible, or politically wanted. Therefore, governments increasingly propose new forms of "public private partnerships", e.g. by subcontracting public services to private companies. The state changes its role from owner and provider of public services to purchaser and regulator of them. The private sector comes in as financier and manager of infrastructure, obviously expecting an attractive return.

Different countries have taken different routes at different speed. Australia has been gaining substantial experience in terms of private investing in infrastructure over more than 10 years. In Europe, the UK's "Private Finance Initiative" (PFI) and Public Private Partnerships (PPP) shows a list of over 900 projects for £ 53bn signed from the mid-1990's to the end of 2007, with a capital value of £ 60bn. "Overall, PFI/PPP has accounted for about 10-15% of public sector capital investment since 1996."[4]

The PPP market in Europe outside UK has also been developing in the 2000s. The value of 193 signed projects totalled € 32bn from 2001 to 2007. The pipeline is still growing. A further € 68bn of projects is currently being procured, with Italy being the most active. Many in the infrastructure industry see the USA as "the next gold rush". The involvement of private investors in infrastructure is rising fast in Asia and in many emerging markets.

What about the future? The requirement for better infrastructure seems obvious everywhere in the world. Infrastructure investment will need a huge amount of capital in the coming decades, whether public or private. Estimates made by supranational institutions for global infrastructure needs run into the dozens of trillions.

Through to 2030, according to the OECD, the annual infrastructure requirements for electricity transmission and distribution, road and rail transport, telecommunication and water is likely to average 3.5% of world GDP, i.e. about US$ 2tr pa.[5] This amounts to a sum of over US$ 50tr until 2030. The figures get even higher if other infrastructure sectors are added.

The infrastructure needs are especially high in developing countries.[6] The Economist magazine reports that "over half of the world's infrastructure investment is now taking place in emerging economies."[7] The US$ 1.2tr pa spent is equivalent of 6% of their combined GDPs.

Definition of infrastructure assets

The definition of infrastructure investment seems intuitive. The OECD uses a simple and general definition for infrastructure as the system of public works in a country, state or region, including roads, utility lines and public buildings. A standard dictionary's definition is:

> "The basic facilities, services, and installations needed for the functioning of a community or society, such as transportation and communications systems, water and power lines, and public institutions including schools, post offices, and prisons." (American Heritage Dictionary).

Infrastructure assets are traditionally defined by their physical characteristics. One can split them into two main categories, and a range of sectors within those:

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[4] IFSL (2008)

[5] OECD (2007a)

[6] See, e.g., ADB (2006) for East Asia.

[7] Economist (2008)

Economic infrastructure

- transport (e.g. toll roads, airports, seaport, tunnels, bridges, metro, rail systems)
- utilities (e.g. water supply, sewage system, energy distribution networks, power plants, pipelines, gas storage)
- communication (e.g. TV/ telephone transmitters, towers, satellites, cable networks)
- renewable energy

Social infrastructure

- education facilities
- health (hospitals and health care centres)
- security (e.g. prisons, police, military stations)
- others (e.g. parks).

There is a lot of variety within infrastructure if it is defined by its physical nature, and people disagree what exactly should or should not count as infrastructure asset. For example, do utility companies count as infrastructure? When their activities span production, distribution and networks, where is the dividing line? More generally, where does public infrastructure end and private infrastructure start?

Financial industry analysts therefore tend to take a different route. They see certain commonalties, or common economic and financial characteristics of infrastructure. In particular, they emphasize the existence of limited competition, resulting from different sources.

- Economic: natural monopolies (e.g. energy distribution networks), public goods (e.g. broadcasting)
- Regulation: controlled charges and fee increases (e.g. toll roads), regulated utilities
- Concessions from public authorities: long-dating contracts (e.g. hospitals).

Infrastructure assets typically show one or more of the following stylized economic characteristics, including

- high barriers to entry
- economies of scale (e.g. high fixed, low variable costs)
- inelastic demand for services (giving pricing power)
- low operating cost and high target operating margins
- long duration (e.g. concessions of 25 years, leases up to 99 years).

From this, the investment industry deduces a number of favourable investment characteristics of infrastructure assets:

- stable and predictable cash flows
- long term income streams
- often inflation-linked (helping with liability-matching)
- in some countries, tax-effective
- returns insensitive to the fluctuations in business, interest rates, stock markets
- relatively low default rates
- low correlations with other assets classes (offering diversification potential)
- socially responsible investing (SRI) (providing public goods essential to society)[8].

A caveat is necessary at this stage. The definition of infrastructure investment by its financial rather than physical characteristics creates new controversies. For example, what does the cash flow from a toll bridge have in common with the one from a school building project? Is the risk of an airport comparable to the risk of a gas distribution network? It is therefore important to look deeper into the investment process and vehicles.

Ways of investing in infrastructure

How can pension plans invest in infrastructure? Traditionally, pension funds bought and sold shares or bonds of listed companies operating in the sector. They may also have owned property in the sector. These days, there are a number of different ways to get exposure to infrastructure, and it is important to stress some distinctions.

Primary vs. secondary market

Primary market refers to financing the start-up phase of an infrastructure project, e.g. building a school. It involves procuring, then building and delivering the asset. Secondary relates to the operational phase of an infrastructure asset, e.g. a toll bridge in operation. For example, a financial investor buys the shares of the project special purpose vehicle (SPV).

The primary market is typically higher risk and requires higher return expectations than the secondary. In the former, investors' main interest is in the growth potential of the project. However, a high initial capital investment is required and the cash flow in the first years is likely to be negative. This should be followed by high payouts in later years. This J-curve-like profile of cash flows is known from private equity investments. In the secondary market, investors' main interest is in high and stable dividends. This resembles the regular income streams from real estate or bonds. In the traditional investment style classifications, secondary market investments would suit income-style investors while primary would suit growth-style investors.

[8] See, e.g. Underhill (2007). Furthermore, he argues that "sustainable infrastructure investment programmes offer substantial, tangible benefits to the labour movement". However, Torrance (2006) does not find SRI to be a major factor in pension funds' interest in infrastructure (yet?).

Equity vs. debt finance

Infrastructure projects are financed through a combination of debt and equity. Investors might seek some sort of equity participation or be interested in buying infrastructure bonds issued by infrastructure companies. On the debt side, bank loans tend to dominate but bigger companies often issue infrastructure bonds (e.g., PFI bonds in the UK). Infrastructure projects are often highly leveraged, i.e. the equity portion is small.

Listed vs. unlisted companies

Infrastructure companies can be listed on the stock exchange or unlisted. Investment in unlisted companies works like a private equity investment.

Direct vs. indirect investment

For listed infrastructure companies, equity can be bought easily and directly on the stock exchange. For unlisted companies, direct investment is more complicated. Some bigger pension plans have started to invest directly in unlisted infrastructure companies, normally in partnership with other investors, including specialist funds. The more common route for pension funds is to invest indirectly, e.g. through a specialist private-equity type of fund.

General partner vs. limited partners

Most private equity-type funds take the form of Limited Partnerships. They are managed by a General Partner (GP) that is often part of bigger financial groups. The investors in such funds are referred to as Limited Partners (LP). LPs take a more passive investor role in the fund. Pension funds typically participate as LPs.

Listed vs. unlisted infrastructure funds

Infrastructure funds may also be listed on the stock exchange (such as closed end funds or investment trusts) or unlisted. There are a number of implications, such as different regulation, governance, investment constraints, reporting requirements, access to the funds, etc.

Domestic vs. international

Some infrastructure funds are purely domestic for reasons of investor preferences or regulatory and tax constraints. Other funds have a global or regional focus (e.g. European, Asian). There are already examples of infrastructure funds for single developing countries (e.g. India), regions (e.g. Africa), or global emerging markets.

Single-sector vs. multi-sector

Infrastructure investment vehicles may be single-sector (e.g. airport, transport, utilities) or multi-sector, seeking broader diversification across sectors.

Not all investment options are always available to pension funds in all countries. Nor may they be necessarily suitable. The selection of the investment route and vehicle depend on a number of factors, including the liability profile, the overall investment strategy and asset allocation, regulatory constraints, specific risk budgets and preferences, governance and management resources, etc.

The main focus of this paper is on pension funds investments in private equity-style funds and on direct infrastructure investments. Nonetheless, it is important to keep a broader perspective, and make comparisons with the traditional investment rout via listed securities of infrastructure companies.

Many pension plans are used only to traditional portfolios but there are crucial differences with private equity-type funds, most importantly:

- time horizon of private equity investments (e.g. 5 years)
- investment stages (capital allocated, committed, drawn-down, invested, distributed)
- different valuation methodologies (not market priced, less frequent)
- return measurement (internal rate of return, vintage year returns instead of time-weighted, annual returns)
- J-curve effect (negative cash flows in the early years)
- institutional set-up (GP and LPs) and compensation structure.

Is infrastructure a separate asset class?

The investment banks and managers involved in infrastructure almost *unisono* claim that infrastructure should be treated as a separate asset class. However, not everybody is convinced that infrastructure is necessarily an asset class fundamentally distinct from others.

The first argument in favour follows from the traditional "physical" definition of infrastructure. However, some observers feel that infrastructure is just a particular sector in the economy. Consequently, the traditional approach of subsuming infrastructure companies under the usual stock market sectors (e.g. utilities, transport, energy shares) would still be valid. Idem for infrastructure bonds within corporate bonds. As for the new-wave infrastructure funds, they are effectively buy-out or venture capital funds in the sector, and would fit into the private equity class.

The second argument in favour of infrastructure as a separate asset class is based on common economic and financial characteristics as presented above. One can stress the stylized differences to other asset classes, in particular to private equity (e.g. longer time horizon, higher and more stable yields) and real estate (investment in companies rather than physical property; limited competition; bigger minimum investment size of $ 100m or so).

However, the supposed commonalties and differences may just be sheer idealizations of a very diverse reality. These claims are still awaiting thorough scientific scrutiny. Even if infrastructure is considered a separate asset class, it is certainly a very heterogeneous one. The differences within infrastructure (e.g. primary vs. secondary) often feel bigger than the differences with other asset classes.

A third line of argument separates infrastructure out by its quantitative risk-return characteristics. A line that could be taken would be to show that the correlations of asset returns of subsectors within infrastructure are higher than the correlations with other asset classes. Some correlation statistics have been produced in recent years but a comprehensive study is still lacking.

What do pension funds think? For many, the question has not yet arisen. Listed infrastructure is typically still subsumed in the traditional equity and bond categories. Similarly, infrastructure property would normally show up in the real estate category.

For the new dedicated, alternative infrastructure investments, different routes are being taken. According to one research institute, 47% of active investors now have a separate allocation specifically to infrastructure, while 43% include it in their private equity portfolio and 10% in their real assets allocation.[9] The majority of the separate allocations go into unlisted funds rather than direct investments.

Size of infrastructure market

There are many estimates for the market potential of private infrastructure finance produced by the financial industry. Ernst &Young, a consultancy firm, estimate that global private investment in infrastructure could exceed 1 trillion dollars annually.[10] This would be of comparable size to the global real estate investment.

What is the size of the infrastructure market? RREEF, an investment manager, estimates the current value of European economic infrastructure to be €4 - €5 trillion. This compares to European stocks of € 8tr, bonds € 11tr and commercial property € 5tr.[11] The European social infrastructure market is calculated to be € 420bn. There is substantial potential for private investments in Asia and emerging markets.[12] Estimates for the global market size span over $ 10 – 20tr.[13] Clearly, this is not all open to private capital, and not in the short term.

Another approach is to quantify the size of the listed infrastructure market. Listed infrastructure companies have been well known to analysts for many years and they are contained in well-established stock market indices. S&P, the index provider, estimates the market capitalization of global listed infrastructure companies at about US$ 2.1tr in 2007.[14] Based on their indices, this makes about 6% of the size of the global equity market of about US$ 44tr. The total value of the global infrastructure asset market is estimated at US$ 2.8tr.

Several index providers have linked up with the investment industry to provide specialist listed infrastructure indices in recent years. In 2005, Macquarie Bank and the index provider FTSE launched a new Global Infrastructure Index series, providing data back to the year 2000. It is based on 238 stocks in 48 markets with a market capitalization over US$ 1.6tr.[15] The volume had grown threefold since 2000, through both new issues and higher valuations. However, the index is heavily biased towards utilities (over 80%) (see figure 1).

In 2006, the index provider S&P launched the Global Infrastructure Index. At the end of 2007, it included 75 liquid and investable companies in 22 countries with a combined market capitalization of US$

[9] Preqin (2008)

[10] Ernst &Young (2007). Their calculation assumes that 10%-15% of public infrastructure spending could come from private source.

[11] RREEF (2006b)

[12] For an investor perspective on Asia, India and China, see RREEF (2007b), (2007), (2008).

[13] Quadrant (2008)

[14] S&P (2007)

[15] FTSE (2007)

1.2tr. The breakdown by sectors is 39% transportation, 40% utilities and 21% energy. In terms of countries, the USA has the biggest share of 24% (this compares to 40% in the FTSE index).

UBS, the investment bank, started a Global Infrastructure and Utilities Index in 2006 (calculated by S&P), separating utilities and infrastructure (in a more narrow sense)[16]. Of the 273 companies, utilities dominate while infrastructure only account for about 8.5% of the total market capitalization of US$1.7tr. Within infrastructure only (ex utilities), toll roads (46%), communications (37%) and airports (10%) are large. In terms of regions, Europe is ahead at 64%, followed by North America at 22% and Asia Pacific at 15% (August 2008 figures). To remove the skew towards utilities, UBS introduced a Global 50/50 Infrastructure & Utilities Series in 2008 that equally weights the two subsectors.

S&P also launched an Emerging Markets Infrastructure Index in 2007, made up of 30 large stocks in 20 countries (including South Africa and Egypt) with a market capitalization of US$ 103bn. It is dominated by companies in China, Russia and Brazil. Macquarie started their own Emerging Markets Infrastructure and Development Index in 2008 that covers 50 stocks in 15 countries with a total value of US$ 570bn.

More index providers have recently launched infrastructure indices.[17] Typically, these services also provide sub-indices covering different regions, countries, sectors, company sizes etc. Further developments include the calculation of single country indices such as the FTSE IDFC India Infrastructure Index, a Global Infrastructure Shariah Index by S&P, and the launch of exchange-traded funds (ETF) based on infrastructure indices.

The growth of infrastructure funds

The size of the unlisted infrastructure market is more difficult to measure. In 2006, the credit rating agency S&P reported that "it is estimated that $ 100-150bn of fund money has been raised globally and is waiting to be placed in suitable assets in the infrastructure sector".[18] S&P also saw a rise in infrastructure deals and a strong increase in private equity firms' activity in the sector.

In a new Infrastructure Review, Preqin, a private equity research company, reports a massive increase in fund-raising for infrastructure funds in recent years. A total of US$ 34.9bn was raised by 18 funds in 2007, up from $6.6bn raised by 11 funds in 2005. Another $13.2bn was added by 6 funds early in 2008. By mid-2008, the trend was still unbroken. "There are currently 71 funds on the road seeking an aggregate $90.8 billion – a dramatic increase on 2005 when there were four funds seeking $ 1.8 billion."[19] (see figure 2)

Infrastructure finance has also been driven by the mergers and acquisitions (M&A) boom of recent years. According to Thomson Financial, the value of infrastructure-related deals exceeded $300bn globally both in 2006 and 2007. Infrastructure funds have also become bigger, as have private equity funds and M&A deals in general. According to Preqin, the average size of infrastructure funds has increased massively from US$ 159m in 2003 to US$3.3bn in 2008.

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[16] UBS (2006a), (2006b)

[17] Dow Jones and Brookfield, e.g., started in 2008 with a global index comprising 94 stocks in 22 countries and a value of about US$ 300bn.

[18] S&P (2006)

[19] Preqin (2008). The Chairman of the Global Infrastructure Council talks of a "tsunami of 77 new infrastructure funds launched in the past 18 months", aiming to raise capital commitments over US$ 126bn. (Underhill (2007))

The investors surveyed by Preqin, are 48% based in Europe, 19% in Asia and 33% in North America (one third of them in Canada). The share of the USA appears small compared to private equity in general, were the USA is the dominant market. This is explained be the relative late entry of private finance in infrastructure there.

In terms of capital sought, Preqin find 15 North-American funds targeting aggregate commitments of $ 34bn, equating to 37% over the overall target volume. 23 European funds are targeting $ 33bn and 33 funds in Asia and the rest of the world target $ 24bn (as of mid 2008). There are "numerous" emerging market-focused funds but they are their fund-raising targets are smaller than those focused on the more established markets.

The majority of investments in infrastructure funds to date seem to have gone into transport (airports, ports, toll roads) but investors are trying to diversify into other sectors, such as communication infrastructure, waste, renewable energy and social infrastructure.

III. Pension funds investments

According to the OECD calculations, the funded pensions market (both occupational and work-related) has a size of US$ 24.6tr worldwide. Of this, US$ 16.2tr is held by pension funds.[20] On a simple calculation, an allocation of 3% of pension fund assets would make roughly US$ 500bn available for infrastructure investments.

How much money have pension funds invested in infrastructure? Again, one should distinguish investments in listed and unlisted infrastructure equity.

Listed infrastructure

There are no hard data available. However, one can make a simple approximation.

Following earlier calculations, infrastructure stocks (including utilities) account for around 5% of the stock market. Watson Wyatt estimates that 56.4% of global pension assets were invested in equity in 2007.[21] This gives a total equity investment by pension funds of over US$ 8tr.

Assuming that pension funds have, overall, no sector bias for or against infrastructure stocks, a proportion of 5% implies they are invested with US$ 400bn in listed infrastructure stocks. However, if only 15% of those are infrastructure in a narrow sense (ex utilities), as indicated by the indices, than the approximation figure comes down to US$ 60bn.

Unlisted infrastructure

It is becoming accepted practice to name infrastructure as an alternative asset classes. In the alternative space, this typically means investment in infrastructure funds and direct investments in (unlisted) infrastructure companies.

There is hardly any independent and reliable data available on the investment of pension funds in infrastructure as alternative asset class. Data providers normally still classify infrastructure under the "other" or "alternative" asset classes, without breaking that up further. They may also fall into the private equity or real estate categories.

[20] OECD (2007c)

[21] Watson Wyatt (2008b)

Watson Wyatt, a consultancy, undertakes an annual survey of managers of alternative asset classes, where infrastructure was included for the first time in 2008.[22] 17 managers had US$ 45.8bn pension fund assets under management. This is about 5% of alternative investments. 53% of that was in invested in Europe, 21% in North America, 22% in Asia Pacific and 4% elsewhere. In comparison to other alternative asset classes, North America comes out much lower while Europe and Asia Pacific comes out much higher.

According to this survey, the Australian Macquarie Group is by far the biggest manager, managing assets of over US$ 20bn for pension funds, and a market share of 44%.[23] Macquarie is a pioneer and leader in the "Australian finance model". [24]

> "Organizing infrastructure acquisition, funding and management, the Macquarie Bank Group has grown to include 900 professionals working solely in the infrastructure sector, managing approximately US $45 billion in infrastructure equity invested in more than 100 assets across 25 countries."[25]

What is the percentage of pension funds assets allocated to infrastructure? In Australia, the Superannuation funds have been a key driving force behind the private capital flow into infrastructure. An average of approximately 5% of their assets is invested there, with some funds being in the double digits.[26]

Globally, following the Watson Wyatt survey, the figure of US$ 45.8bn given by fund managers would make about 0.28% of the US$ 16.2tr global pension funds assets.[27]

Outside Australia, the weightings of unlisted infrastructure appear much lower. In the client survey of the consultant firm Mercer, only 0.7% of UK pension plans are shown to invest in infrastructure. The average allocation to infrastructure by those plans is 2.3% on an unweighted basis and 0.8% on a weighted basis.[28] For Continental Europe, only 1.1% of pension plans are said to be invested in infrastructure, with an average allocation of 2.0% to the asset class by those funds invested.

Overall, the allocation of pension funds to new-style infrastructure funds has been growing in the last 3 years although from an almost nil base (outside Australia). Asset allocation weightings are still low on average, but there are a number of prominent examples of single big pension funds that have made substantial allocations (but not necessarily yet commitments or investments!).

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[22] Watson Wyatt (2008a)

[23] There are 2 more Australian managers in the top 10, Colonial First State and AMP Capital. The others are RREEF (Deutsche Bank), Goldman Sachs, Alinda Capital Partners and Morgan Stanley (main domicile USA), 3i Group and Henderson (UK), Fortis Investments (Belgium).

[24] "The pioneer of the specialist fund model was Macquarie Group, although several local rivals including Babcock & Brown and Allco Finance joined in with gusto. The model involved buying infrastructure assets … and bundling them into listed satellites and taking fees." (Article "Infrastructure funds lose out in a scramble to divest their assets", Financial Times, 25.08.2008).

[25] Torrance (2008)

[26] Access Economics (2005)

[27] It is not untypical for surveys to overestimate pension fund investments in alternative assets. They often include other institutional investors and financial services companies, or use a generous definition of "pension fund investments".

[28] Mercer (2008)

Examples of pension fund investments

In Canada, the Ontario Municipal Employees Retirement System (OMERS) has several billions Can$ invested in infrastructure through its subsidiary Borealis Infrastructure, set up in 1998. The Ontario Teachers Pension Plan (OTPP) is another example.

The big US pension fund, CalPERS, adopted a new investment policy in 2008 with a target 3% allocation of assets, or US$ 7.2bn in infrastructure. The target returns is a net 5% above inflation over 5 years. Other US pension funds with infrastructure allocations or intentions include CalSTERS, the Washington State Pension Plan, Alaska Permanent Fund Corporation, Oregon PERD, the World Bank.

The major Dutch pension fund APG has a target of 2% for infrastructure in its Strategic Investment Plan 2007-2009. Given the size of the fund of € 300bn, this amounts to a volume of about € 6bn. Currently, the actual investment level is still well below that target. Other big pension investors in Continental Europe include the Danish ATP and PKA, Dutch PGGM, Finnish VER. In the UK, a number of big pension funds have announced going into infrastructure in recent years: USS, BT, RailPen. In addition, several local authority schemes have already started the process, e.g. LPFA. A number of smaller and medium-sized pension funds, private and public, are currently joining in.

The majority of pension fund investments are through infrastructure funds. However, some bigger Canadian and Dutch pension plans have started to invest directly. They are often co-investors with specialist funds, and thereby hope to build up the internal expertise in-house over time.

Several countries have established public pension reserve plans to fund the state pension promises. Some reserve funds have made a start in the infrastructure space, e.g., the Swedish buffer fund AP3, the Canadian Pension Plan (CPP). In 2008, the Irish National Pension Reserve Fund (NPRF) announced the desire to invest Euro 200m, i.e. 1% of its assets, in domestic public sector infrastructure projects. The overall target allocation to infrastructure for 2009 is 2%. The French FFR has also added infrastructure to its strategic asset allocation.

There are particular governance and investment issues to consider for them.[29] There is potential pressure, or desire, to invest in domestic infrastructure in order to help the development of the national or regional infrastructure, the local capital markets and the economic development in general.

Sovereign wealth funds (SWF) offer another potential major source of infrastructure funding. There has been an increase in investments of private equity and hedge funds by SWRs in recent times. So far, however, direct involvement in global infrastructure seems to have been small. [30] Nonetheless, there has been controversy about the possibility of "political investing" in some places already.

IV. Risk-return profile and benchmarks

What returns can pension fund expect from infrastructure investments? There are many figures flowing around in the financial and pensions industry but it is less clear what their substance is. History can offer little guidance. Surprisingly, there is still hardly any academic research on the subject.

What is the theoretical risk-reward profile? Early marketing brochures used charts showing "equity-type returns with bond-type risk" to describe the profile of infrastructure investment. Even if such a combination existed on the market, it would be unlikely to persevere for a very long time.

[29] See Yermo (2008) for an overview.

[30] McKinsey (2008)

Pension funds are presented all sorts of graphics with stylized risk-return profiles: sometimes showing infrastructure with risk and return both higher than equities, sometimes both lower, and sometimes at higher returns and lower risk. Other charts plot different dots on the chart for early-stage and mature assets, or many more dots for different sectors (see figure 3 for an example).

A theoretical analysis could start with the Capital-Asset-Pricing-Model and establish risk premia for infrastructure assets. For primary infrastructure investments, e.g. they could include a credit premium, an illiquidity premium, a small cap premium, and perhaps others. This would speak for a return and risk expectation somewhere between public and private equity. On the other side, mature infrastructure services with high and stable dividends may have a risk-return profile closer to utility stocks with a low stock market beta, or corporate bonds.

In a nutshell, more work will need to be done in this field. The definition and heterogeneity of infrastructure asset is a crucial element in the analysis, and the specific mix of risk premia varies a lot across infrastructure investment vehicles.

For pension funds, these questions are not academic. How should they benchmark infrastructure investments? What could be considered success or failure? How should infrastructure be modelled in asset-liability-studies? How should they integrate it in their strategic asset allocation and risk budgeting exercises?

When the global infrastructure boom started, return expectations were often given as 15% plus pa by some providers.[31] In their 2005 analysis of the Australian market, Mercer say that "most managers' products fall into the category of diversified infrastructure funds that have an objective to deliver returns of 9 – 12% net of fees".[32]

RREEF makes the distinction between the total return expectations of mature (10 % – 14% pa) and early-stage assets (18% plus).[33] It should be noted, however, that such expectations are fuelled by leveraging the returns of the underlying portfolio. RREEF put a typical leverage rate of 40–80% for mature and 30–75% for early-stage assets.

The analysts' projections also vary across infrastructure sectors. JP Morgan Asset Management, e.g., expects the lowest expected internal rates of returns for toll roads (8-2%) and PFI/PPP (9–14%), and the highest for airports (15-18%) and broadcast network (15-20%), this against an infrastructure average of 10-15%.[34]

Return expectations have been reduced more recently (even before the credit crunch 2007) from double digits to single digits, as more players crowded into the market and pushed bidding prices up. The "first-mover-advantage", typical for new asset classes, has run out:

> "(…) assets have been mispriced in the past and, despite their low-risk characteristics which would normally mean low returns, infrastructure returns have historically ranged anywhere

[31] Another issue is the definition of "return". Infrastructure fund providers normally think in terms of expected internal rate of returns over a given period, while pension funds are used to think in terms of annual total returns.

[32] Mercer (2005)

[33] RREEF (2007a)

[34] Quadrant (2008)

between 10% and 35%. With demand and knowledge rising however, returns are predicted to stabilise around 5-6% in the long term, and in equilibrium."[35]

How do these return expectations compare to other asset classes? According to a recent survey, return expectations for the asset class infrastructure over 10 years are an annualized 9.5%, putting it in second place behind private equity (11.3%). In comparison, stocks are expected to return 9.0%, bonds 5.1% and cash 3.7%.[36]

What is the expected risk profile of infrastructure? Expectations for volatility are typically set somewhere between equities and bonds. The asset-liability model used by Morgan Stanley Investment Management, e.g., compares five main asset classes.[37] It puts infrastructure (volatility 7.9%, return 9.3%) second only to bonds (4.4%) in terms of expected volatility and second only to private equity (10.0%) in terms of expected return (see table 1).

As an example for pension funds, the Dutch APG, expects a 10% return from infrastructure with a 7% risk. In comparison, the corresponding figures are 6% / 9% for property and 15% / 25% for private equity. CalPERS are looking for an annual return of inflation (CPI) plus 5% - 7%.

There is currently no established benchmark for infrastructure investments. In theory, there are a number of possibilities, including

- Absolute return figure (e.g. 9%)
- Inflation plus margin (e.g. CPI + 4%)
- Bond yield plus margin
- (Inflation-linked) bond index return plus margin
- Blend of equity, real estate, bond and private equity benchmark
- Listed infrastructure index or global equity index or blend of the two
- Peer group of unlisted infrastructure funds.

In practice, there seems to be much variety in the benchmarks set by different pension funds, with the first two seemingly the most important. The choice of an appropriate benchmark depends on a number of factors, relating both to the liability profile of the pension fund and the type of infrastructure investment (e.g. mature, growth or diversified). [38]

[35] Torrance (2007b)

[36] Survey of 100 European pension schemes undertaken by Richard Davies Investor Relations for Financial News, 10.12.2007.

[37] Morgan Stanley (2007)

[38] For a discussion of benchmarks, see, e.g., Colonial First State (2007), RREEF (2007a).

Performance

Performance: listed infrastructure

What do the actual performance figures tell? There was a strong revaluation of the utility and infrastructure sectors on the stock markets in the mid-2000s. Marketing material uses charts showing the outperformance of these sectors against the general stock market. Rather problematically, this is frequently interpreted as a proof of the virtues of infrastructure as an asset class in general.

Some asset managers and consultants make a case in favour of listed infrastructure against unlisted investments.[39] They mention the advantages of higher liquidity, lower transaction and fund management costs, less leverage, market pricing, market size, etc. However, listed infrastructure would be more volatile and more correlated with the stock market.

Newell and Peng have undertaken studies for Australia, the USA and Europe. The main body of their analysis is based on the performance of listed infrastructure companies and funds, using the UBS Global Infrastructure and Utilities Index.

According to their index calculation, global listed infrastructure returned an average annual return of 12.8% in the 10 years to end 2006. [40] This compares favourably with returns of 9.2% for global equities, and 5.2% for bonds. However, infrastructure lags the performance of property that is presented as 16.5% over the period.

Newell and Peng further analyze the risk-adjusted performance of listed infrastructure over the 7 years 2000-2006. Globally, the annualized return is 18.2% with a risk figure of 14.1%, resulting in a Sharpe ratio of 1.07. This compares favourably with stocks that have a 7-year return of 5.8%, volatility of 16.2% and a Sharpe ratio of 0.17. Property again looked good over the period with an annual return of 30.0%, risk of 18.1% and a Sharpe ratio of 1.32. In the same analysis, the European listed infrastructure produces an annualized return of 20.3% with a risk figure of 13.7%, resulting in a Sharpe ratio of 1.26.

Another study of Newell and Peng deals with the USA, where the results are less favourable. Over the seven years to the end of 2006, US infrastructure underperformed (on a risk-adjusted basis) other asset classes in the USA but also infrastructure in other regions. They conclude: "While Europe, Canada, and Australia have a long tradition of privatization of infrastructure assets, the U.S. has only recently become actively involved, particularly with toll road privatization." [41]

Performance: unlisted infrastructure

Unfortunately, performance data are much less available for unlisted infrastructure investments. There are a number of reasons for this:

- The history of most unlisted infrastructure vehicles is quite short.
- Data is often proprietary and not made public.

[39] See, e.g., Timotijevic (2007a). Lazard (2007), e.g., work with a list of 70 preferred listed stocks with a value of US$ 350m that show the typical infrastructure investment characteristics.

[40] Newell/Peng (2008b)

[41] Newell/Peng (2008a)

- The reliability of performance data used in marketing is unclear.
- There is much variety and diversity in unlisted infrastructure funds.
- Funds use different benchmarks.
- There are no agreed performance reporting standards.
- Independent performance measurement services still do not measure infrastructure investments separately, or do not provide data yet.

It appears that the data situation is best for Australia where the experience with unlisted infrastructure investments has been the longest. In one of their papers, Peng and Newell analyze both listed and unlisted infrastructure investments in Australia.[42]

They compare the risk-adjusted performance of 16 listed infrastructure companies (with assets of A$ 55bn), 16 listed infrastructure funds (with assets of A$ 27bn) and 19 unlisted funds (with 144 infrastructure assets of A$ 4.5bn). The average annual return over ten years to Q2 2006 is 22.4% for listed and 14.1% for unlisted infrastructure. Unlisted infrastructure beat bonds (return of 7.2%), stocks (12.9%) and direct property (10.9%) over the period (see table 2).

Volatility of unlisted infrastructure is shown as 5.8% and thereby much lower than for listed infrastructure (16.0%) and stocks (11.0%). Bonds (4.3%) and direct property (1.5%) are less volatile. Putting risk and return figures together, they calculate a risk-adjusted performance figure for unlisted infrastructure, giving a Sharpe-ratio of 1.5. Only direct property comes out higher (primarily because of the extremely low volatility input).

Unfortunately, no such analysis is provided for data outside Australia. There are a number of caveats, some of them given also by the authors. They include the valuation basis, the definition of risk, the indices used, the period analyzed (here before the credit crunch 2007/2008). Volatility measures for unlisted vehicles are not really comparable to those of listed vehicles as different valuation standards are at work.

Figures from the industry

Macquarie Bank used show strong risk/return statistics where unlisted infrastructure in Australia stands out very favourably against other asset classes with a return of 19.2% and risk at 6.5% for the period 1995-2002.[43]. Strong performance claims are also made on a global scale, e.g. in 2006:

> "Macquarie believes it has demonstrated its value by providing investors with an average annual compound return of 19.4% across its managed infrastructure funds over an 11 year period."[44]

This is compared to a return of global equities of 9.7% and Australian listed infrastructure of 25.7%.

In 2005, Mercer published figures for unlisted infrastructure in Australia. They use a simple unweighted average of gross monthly returns provided by a very small number (three) of providers with a

[42] Peng/Newell (2007)

[43] Rakowski (2004)

[44] Macquarie article of 03.03.06, www.macquarie.com

longer history.[45] The average annual return of unlisted infrastructure is 13.3% and annualized volatility 9.1% over the 10-year period 1996-2005. This compares favourably with other asset classes. Australian equities, e.g., show returns of 11.6% and volatility of 11.3%. The authors add a health warning:

> "We urge extreme caution in interpreting these figures because of the appraisal basis of valuations in infrastructure as referred above. Also, investors have increased their investments progressively over the period. As the returns presented above are time-weighted, they do not reflect the actual overall returns achieved by investors on their investments through the period."

Colonial First State Global Asset Management uses a similar approach with data of five unlisted Australian diversified infrastructure funds. They produce average annual return figures for the 10 years to June 2006 of 13.5% at a volatility of about 6%.[46]

Quadrant[47], an advisory firm, lists returns since inception of seven North American pension plans. They range from 5.8% (Canada Pension Fund) to 29.0% (Ontario Municipal Employees).

For most pension funds, it is too early to say. The first performance figures now start to appear in the annual reports of pension plans but they are naturally of limited value. APG, for example, reported infrastructure returns of 41.3% in 2006 and 21.0% in 2007.

How much diversification?

An important reason for investment in alternative asset classes is the benefit of diversification. In simple terms, diversification is achieved by having assets that do not go up and down all at the same time. A measure commonly used is the statistical covariance of returns, or its square, the correlation of returns.

Such correlation analysis is relatively easy for listed infrastructure since the launch of such sector indices in recent years. For example, RREEF show a correlation matrix of global returns over 10 years, where listed infrastructure correlates with equities with a value of 0.59, fixed income of 0.39, public real estate of 0.62, hedge funds of 0.0 to 0.1(depending on index used), private equity -0.1 to 0.3. This confirms that listed infrastructure is affected by the general stock market volatility.[48]

Actual, longer-term correlations statistics for unlisted infrastructure are only available for Australia. Peng and Newell's analysis of data there seems to confirm the diversification opportunity.[49] Unlisted infrastructure shows low correlations with other asset classes using quarterly data): 0.06 with equities, 0.17 with bonds, and 0.26 with direct property. In comparison, listed infrastructure has somewhat higher values for the correlation with equities (0.21 and bonds (0.38) but only 0.03 with direct property. Interestingly, listed and unlisted infrastructure only correlate with a value of 0.36 (see table 3).

Mercer's analysis shows similarly low correlations of < 0.20 of unlisted Australian infrastructure against other asset classes and a value of 0.30 against unlisted property.[50] Colonial First State monthly

[45] Mercer (2005)

[46] Colonial First State (2006)

[47] Quadrant (2008)

[48] RREEF (2007a)

[49] Peng/Newell (2007)

[50] Mercer (2005)

correlations statistics of unlisted infrastructure are a bit higher for equities (0.27) and bonds (0.33), but negative for direct property (-0.20).[51]

It is also interesting to see how correlations change over time. Peng and Newell undertake a dynamic analysis of 5-year rolling correlations. It shows movements of correlations, e.g. of unlisted infrastructure against equities, between 0.30 and -0.15. In a similar analysis, Colonial First State's range is between 0.4 and 0.

In terms of future expected correlations, Morgan Stanley use similar very low levels of correlation of infrastructure other asset classes, ranging between 0.12 against private equity and 0.20 against bonds (see table 1).

There are a number of important issues with using correlation as a measure of diversification, including the exact definition of return data used, the frequency, the stability of correlations over time, and others. For example, the investment industry often uses short-term frequency data (e.g. daily) while pension funds tend to favour longer-term frequency (e.g. quarterly, annual, or longer).

Yet again, statistical analysis involving unlisted assets needs to be read with caution. There is a tendency to underestimate volatility and covariances, and overestimate the diversification potential of direct property, private equity and unlisted infrastructure. In summary, more work needs to be done.

Risks

It is an essential part of the fiduciary duty of those involved in pension fund investing to understand the specific risks of infrastructure assets. Risks go much further than the usual volatility statistics, and certain factors are just genuinely uncertain[52].

At the level of infrastructure projects and companies, key risks include:

- Construction risk (e.g. the project is not completed on time; costs are higher than budgeted)
- Operational risk (e.g. poor management, systems)
- Business risk (e.g. more competitors entering; change in consumer preferences and demand; technological advances)
- Gearing risk (typical leverage of 30-90%, resulting in a high exposure to interest rate risk; refinancing risk with higher inflation and interest rates; downgrade risk)
- Legal and ownership risk (unknown future litigation, planning consents not granted; lease running out)
- Regulatory risk (e.g. fee rises fall behind schedule)
- Environmental risk (unforeseen environmental hazards; action groups)

[51] Colonial First State (2006)

[52] See Stewart (2007) for some similar issues with hedge fund investments by pension funds.

- Political and social risk (opposition from pressure groups; politicians may change their mind; corruption).

There are additional issues at the level of infrastructure funds and vehicles:

Liquidity

Unlike listed investment instruments, it is normally not so easy to reduce or liquidate investments at short notice. The secondary market is still immature in most places. Although the majority of pension funds do not have a high need for immediate liquidity, for some others this may be a crucial consideration.

Pricing

Pension funds are used to daily market price valuations of traded assets but infrastructure is typically valued on an appraisal basis, the frequency being quarterly or longer periods. Some know this already from property investments.

Timing

It is crucial to know at what point of time the pension fund's money is actually being invested. It is often overlooked, that even when pension funds have allocated and committed money to infrastructure, it may not have been drawn down and invested in infrastructure projects. [53] In fact, it seems that much of the new money allocated by pension funds is still not invested and therefore unable to generate the expected value added.

Governance, management, operations

Investing in infrastructure constitutes a major management and governance challenge for pension fund. What type of projects should be considered? What investment approach? What should be outsourced? What specific advisers are needed? Is it understood what fund managers do and what they invest in? Infrastructure is also an operational challenge for pension funds, including accounting, IT, risk management. Who will deal with all the small print in the (voluminous) paperwork?

What are the barriers to pension funds' investment in infrastructure?

Some of the inherent risks and issues with infrastructure investment can put pension funds off making such investments. Other barriers may be imposed from outside, e.g. by regulators. Those in the pensions and investment world mention several key barriers for infrastructure investment:[54]

Novelty

Infrastructure (in the form of unlisted funds and direct investments) is a relatively new asset class and still little known in the pensions world. Most trustees have not gained any experience with infrastructure investments yet, and even for those involved, the experience is mostly shorter than 2 - 3 years.[55] Investing

[53] See Fraser-Sampson (2007). It should also be noted that industry figures (volume, performance, etc.) are often not clear about what stage of the process they refer to.

[54] Torrance (2006) undertook 40 interviews with people involved in pension funds, consultants and infrastructure industry in 2005. See also Inderst (2007), Global Pensions (2008) for a recent discussion of industry experts on pension fund opportunities and barriers for pension funds.

[55] Still in 2005, Torrance (2007a) finds it difficult to find actual pension fund investors in the UK and USA.

in something new always constitutes an unknown fiduciary risk: If something goes wrong, pension fund boards are very exposed.

Lack of knowledge and experience

Many pension plan trustees feel a lack of knowledge not only on their own side but also on the side of managers and advisers (investment consultants, actuaries, lawyers, auditors etc). Most infrastructure funds have been created only since the mid-2000s. Investment consultants have established dedicated resources to infrastructure analysis only recently.

Shortage of data

Despite the flurry of research reports issued by fund managers recently, pension funds still perceive a shortage of objective information and quality data. Independent performance and risk management has not gone very far as yet in regards to the collection, analysis, and publication of data. Academic research is also in its infancy.

Little know investment vehicles

Many pension trustees have no experience with private-equity type of funds, or have reservations about them. Still only a minority of plans is invested in private equity in general and would thereby have learnt the differences to mainstream investments. With infrastructure, the disorientation is even bigger because of the changing mix of equity, private equity, real estate and bond elements involved.

Lack of transparency

Transaction-driven investment firms prefer to sit on their proprietary information while pension fund investors like transparency on investment process and assets. Such issues are already heavily debated in the world of private equity and hedge funds.

Direct investment

Direct investment is not unknown to many pension funds from their property portfolios. However, it works differently for infrastructure because investment is in a company rather than a real estate asset. Also, some pension plans have disinvested from direct property in recent years, instead opting for indirect vehicles.

The pros and cons for direct investments by pension funds are easy to see. Direct investment gives direct ownership and control over the investments, but requires much stronger in-house resources in the process of building, acquiring, managing and disposing assets. Transaction costs and investment sizes are relatively high. Indirect investment allows investment in smaller sizes and a higher degree of diversification. However, there is little control over assets and substantial fees needs to be paid to external specialist firms. Direct investing in infrastructure is not a realistic option for most smaller and medium-sized pension funds.

Short lifespan of investment funds

Paradoxically, pension funds often find the lifespan of the infrastructure vehicle offered too short for their needs. There is a maturity mismatch between the typical length of private equity-type of funds (typically 10 years) with the liabilities of pension plans (often much longer). Trustees do not like the idea of selling assets that they might have bought for a long-term, steady, inflation-linked income stream. Providers prefer to realize investments and set up successor funds.

Culture

Many stakeholders of pension funds generally do not feel comfortable with the transaction business, or "deal-making culture", of investment banks and private equity funds. Most pension funds are traditionally used to the longer-term "asset management" relationship with performance benchmarks and ad-valorem fees.

Fees

How are fees and transaction costs structured? What is the total cost load to the ultimate investor?

One area of contention is the appropriate level of management fee and the structure of incentive fees. Typically, there is a basic management fee of 1% - 2% and a performance fee of 10% - 20%, usually with a hurdle rate of 8% -12%.[56] Some (potential) investors feel that they are charged "private equity-type fees for bond/utility stock-type returns".

Another area of concern for pension funds is the range of fees and costs incurred in the course of transactions of infrastructure projects. This includes acquisition fees, financial adviser and other advisory fees, finance arranger fees, fees for provision of funding, project development fees etc. The complexity of infrastructure deals will be matched by the level of fees charged, and this can substantially affect the net returns to the investor.

In recent years, many pension funds have been asked to raise their attention on transaction fees paid.[57] However, that analysis is still mostly focusing on securities with comparatively low fees in relatively competitive markets, i.e. mainstream equities and bonds. However, trying to chase higher returns, pension funds are, ironically, now paying 50% higher fees on their assets on average than 5 years ago.[58]

Conflicts of interest and other governance issues

Pension fund trustees should be aware of potential or actual conflicts of interest. Investment groups are often involved in different roles (financing, transactions, management). Fees often flow from the infrastructure fund to companies related the manager, e.g. within an investment banking group. This raises the question of how potential conflicts of interests are handled by the infrastructure fund manager. The debate about how to achieve an effective alignment of interests is open.[59]

The "Australian infrastructure model" has raised a number of other corporate governance concerns in relation to the control of the sponsoring group, disclosure, transactions, valuations and auditing.[60]

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[56] Welsh (2007) According to the press, some fee renegotiations are already underway.

[57] E.g. the Myners (2001) report in the UK.

[58] Watson Wyatt (2008c).

[59] Torrance (2007a) discusses the problems in the private governance of the infrastructure investment process, in particular the tensions between providers and investors over different time horizons, transaction and management fees, transparency, manager independence, flexibility in contracting.

[60] For a critical account of Australian listed funds in particular, see RiskMetrics (2008). Torrance (2007a) discusses the problems in the private governance of the infrastructure investment process, in particular the tensions between providers and investors over different time horizons, transaction and management fees, transparency, manager independence, flexibility in contracting.

Regulatory, political and social risks

Infrastructure is not a pure "private" investment. Pension funds are aware that there is a "public" side too it, it is inherently "political".[61] Government involvement can be in various directions. The revenues of infrastructure projects are often protected by government concessions of 25 years or more (e.g. schools and hospitals). Other projects may have charges and fee increases controlled by a public regulator (e.g. toll roads). The public authorities also tend to keep a strong interest in the regulation of formerly nationalized monopolies such as utility distribution networks.

Given the visibility of infrastructure, it is not difficult to see that any such licences and regulations will be more under the scrutiny of the public than, e.g., more privately owned real estate. Different stakeholders have different interests; pressure groups may become vocal; media find easy targets particularly when things are not going well; politicians may take a short-term view driven by election prospects and intervene.

Many in the pensions industry are concerned about negative press in relation to private involvement in infrastructure. There are well-know examples of infrastructure companies that fill the headlines: Eurotunnel, Cross-City-tunnel in Sidney, BAA, and others. There is vocal opposition against PPP/PFI in the UK, using a number of arguments: lack of transparency, increasing costs of PFI projects, a build-up of huge off-balance-sheet liabilities for future taxpayers, excessive returns for the financial industry, etc.[62]

Another concern is corruption of people involved both inside and outside infrastructure companies: managers, regulators, legislators, judiciaries. Pension fund directors worry about the financial consequences in a narrow sense, but also about how to handle the reputational risk.

Emerging markets

Political and social risks are being perceived as being particularly virulent in many developing markets.[63] Business surveys frequently show that political stability is a *sine qua non* for foreign investors. Clarity and continuity in the regulatory and supervisory approach is essential to create comfort with conservative pension boards.[64]

Pension funds have generally reduced their "home bias" in recent years, even in real estate. However, investing in alternative assets in lesser-known constituencies poses a considerable governance challenge on the shoulders of pension trustees. Investors frequently demand a geographic restriction of infrastructure fund investments, e.g., to OECD countries.

Market excesses

Many industry observers believe that infrastructure had been undervalued in the 1990s. However, prices rose strongly in the 2000s. Infrastructure markets appeared to overheat in 2006/2007, where investors often felt a shortage of suitable projects or the overvaluation of assets. In 2006, the rating agency

[61] See Torrance (2006) and (2008) for a discussion of the "financialization of urban infrastructures" and the impact of international firms on the local governance of public infrastructure.

[62] For example, see Halligan (2006), or the article "PFI deals 'not doing a good job', says watchdog" (Financial Times, 2.9.2008).

[63] See, e.g., Dewey Ballantine (2006).

[64] See Eberhard (2007) for a discussion of infrastructure regulation in developing countries.

S&P warned, "the infrastructure sector is in danger of suffering from the dual curse of overvaluation and excessive leverage -the classic symptoms of an asset bubble similar to the dotcom era of the last decade".[65]

All sorts of players had entered the competition for infrastructure assets and companies: (competing and non-competing) corporations, investment banks, private equity and real estate investors, specialist funds and boutiques, insurance companies, pension plans, etc. Interesting alliances are being formed: Banks team up with institutional investors in order to raise capital for the big deals. It remains often less clear to the public who is acting as principal and who as agent.

Credit crunch and financial crisis

The credit crisis starting in 2007 has changed the investment scenario. Because of tighter liquidity and lending conditions, and the global economic slowdown, asset prices adjust downward and this affects private equity, real estate and ultimately infrastructure funds, too. The effect varies across infrastructure sectors and investment vehicles, depending on the level of gearing, the debt profile, the exposure to business cycles and other factors.[66]

In 2008, some big Australian infrastructure funds started to divest assets, in some cases in order to reduce debt levels when interest costs rise and asset prices fall.[67] Another effect of the credit crunch is that the comparatively stable infrastructure sector attracts "the new power brokers" of private equity firms, hedge funds and sovereign funds.[68]

Are there any regulatory constraints to pension funds investing in infrastructure?

Investment regulation for pension funds can affect infrastructure investments of pension funds in various ways, directly or indirectly. In addition, funding and solvency regulations, risk management regulations and others may also have an effect. The regulatory framework for pension plans differs substantially across countries. Consequently, investment regulations need to be seen in the context of the overall legal and regulatory framework of each constituency.

Vives (1999) developed a classification of how investment regulations can affect infrastructure investments by pension funds.[69] He found considerable impact of local investment regulation in Latin America, although there are big differences across the region, and certain things have, of course, changed since. Generally speaking, "it is no wonder that there has been so little participation" of pension funds in infrastructure.

> "Even though pension funds can afford to wait for returns because their liabilities are long term, current regulations lead them to prefer short-term, steady returns."

Adjusting and extending Vives' approach, investment regulations potentially affect infrastructure investment in a number of ways.

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[65] S&P (2006)

[66] See, e.g., Timotijevic (2007b), Freshfields (2008), Leen (2008).

[67] Article "Infrastructure funds lose out in a scramble to divest their assets", Financial Times, 25.08.2008. Question marks over the listed infrastructure models are also being raised, see the article "Australian infrastructure managers feel the heat", Financial Times, 22.09.08.

[68] McKinsey (2007)

[69] Vives (1999)

Constraints on asset classes

- Quantitative constraints on asset classes (maximum or minimum limits)
- Outright exclusion of asset classes, funds or types of securities (e.g., real estate or private equity)
- Constraints on foreign investment (or non-EU, non-OECD) or currency exposure may also come into play

Listing or liquidity

- Exclusion of assets that are not listed and traded on organized security exchanges
- Maximum limits for unlisted investments
- The use of (minimum) liquidity indices

Concentration and diversification

- Investment limits in any single issue or single issuer
- Maximum percentage of ownership, e.g. in shares of any company

Ratings

- A requirement that infrastructure securities are rated, or have minimum rating (e.g. investment grade), or are being issued by a company that is rated

Valuation rules

- Requirement of mark-to-market valuation, effectively excluding privately traded assets.

Switching

- Allowing or disallowing plan members to switch pension administrator or funds, and how

Performance regulation

- Minimum returns (nominal or real, absolute or relative to some benchmark, e.g. an industry peer group)
- Capital guarantees

DC investment options

- Number of investment options open to members of DC or cash-balance plans
- Type of options (e.g. different risk levels)

Competition in pensions industry

- Is there a monopoly of pensions asset management?
- Competition between pension funds, banks, funds managers, insurers?
- Separate regulators and supervisors?

Prudent person principles

- Suitability of investments
- Need of diversification
- Understanding and resources

Risk management regulation

- Mandatory use of particular risk management techniques (e.g. value-at-risk)
- How is riskiness of infrastructure investments prescribed or determined?

Solvency and funding rules

- Regulation of quantitative solvency and funding rules (e.g. "traffic-light")
- Rules for infrastructure investments in scenario analysis and stress testing?

Investment limits

Investment regulations have been relaxed in many countries over the last 10 years or so. [70]Nonetheless, there are still quantitative constraints in place in many countries. The annual OECD Survey of Investment Regulations of Pension Funds gives an overview for OECD member states and selected non OECD countries.[71]

National regulations do normally not (yet?) specify separate rules for infrastructure investments but there are other quantitative investment constraints relevant for infrastructure. These can be general limits to listed equities or bonds, and, most significantly, constraints on private investments and real estate. Countries can be grouped in three categories.

1. No quantitative limits

There is a first group of countries that have no investment constraints on the allocation to particular asset classes. They include countries with a tradition of the 'prudent person' rule such as the USA, UK, the Netherlands, Ireland, New Zealand, as well as countries that have recently introduced new pension fund legislation, e.g. Germany (Pensionsfonds), Belgium (OFP), Luxembourg (ASSEP and SEPCAV).

[70] For example, the European Pensions Directive 2003 sets the 'prudent person' rule as the underlying principle for capital investment.

[71] OECD (2008b)

2. Quantitative constraints

A second group has some sort of limit on private investment funds and/or real estate but do not exclude such investments completely. For example, there is a 10% limit for private equity in Denmark and 30% in Spain. This group still forms the majority of the countries listed by the OECD.

3. Exclusion of asset classes

In group three, there are the countries that fully exclude investments in private investment funds, including Slovakia, Poland, Russia, Korea (corporate pensions), Mexico, Chile, South Africa. Real estate investment faces similar exclusions in most of these countries, although there can be a distinction between listed and direct.

Other limitations potentially also affect infrastructure investments, in particular on foreign assets, ownership concentration limits and limits on single issue or issuer. The countries under the prudent person tend to set only a general diversification requirement, without any quantitative restrictions.[72]

For the other countries, quantitative restrictions are typical. Ownership concentration limits can be particularly binding as investment in infrastructure fund investments often require relatively big capital commitments. This is even more obvious for direct investments. Similarly, for investment limits in a single issue or issuer. Overall limits on foreign investments are still quite common in the OECD and beyond. In addition, some countries specifically prohibit investment in foreign private investment funds, e.g. Brazil, Columbia and South Africa.

V. What can governments and regulators do?

There are economic characteristics connected with infrastructure that potentially justify public intervention: public goods, natural monopolies, externalities, and other "market failures". Infrastructure is also important in terms of social and defence policy. Furthermore, there are architectural, artistic and cultural aspects to it. On the other hand, public provision of infrastructure has its own problems.[73]

Should governments give incentives to institutional investors, and pension funds in particular, to invest in infrastructure? Typical arguments in favour include:

- High social returns on infrastructure investments
- Enhancement of the country's international competitiveness
- Development of local capital markets
- Natural long term match of assets and pension liabilities
- Political considerations (e.g. control of big financial resources by political parties or social partners).

The arguments against run along the lines of

[72] The exception is limits on self-investment in companies somehow related to the pension fund, e.g. 5% - 10% in the Netherlands.

[73] See, e.g., Foldary (2005).

- Mis-allocation of resources
- Eventually lower (private and social) returns as a result of that
- Political interventionism
- Bureaucracy and agency problems
- Corruption risk.

Positive incentives to investors can be in the form of, e.g., tax advantages, special subsidies or guarantees.[74] In his analysis of Latin America, Vives (1999) demands a development of local capital markets and infrastructure securities that are more adequate to pension fund investing. He also favours a gradual move towards a "prudent person" regulatory framework. However, he does not propose special subsidies, guarantees or tax benefits for pension fund infrastructure investments.

Another way is to set positive targets of pension funds investments that should go into national infrastructure. It is clear that there is potentially a higher pressure by politicians and the public on public, mandatory and regional pension funds, including funded national pensions reserve systems or other sovereign funds.[75]

In practice, the bigger issue for pension fund investment in infrastructure is barriers, negative incentives and unmanageable risks. It would be useful to distinguish between those that are in the remit of governments and regulators (e.g. investment restrictions, funding regulation, supervisory approach, political interference) and those that are more in the nature of the asset class (e.g. liquidity, size, novelty) or market-driven (e.g. data, fees, market excesses). Clearly, the distinction is not always clear-cut. For example, the transparency issue as all three ingredients, and so has knowledge and understanding.

Under the prudent person rule, infrastructure is an integral element in the asset-liability and risk management of the pension funds, the same way as other asset classes are. The particular characteristics (e.g. liquidity, private equity-type vehicle) need to be integrated in such exercise. An additional advantage is that investment policy can be more scheme-specific than under broad-brushed restrictions. Over time, one can therefore, expect much variation across countries and plans in terms of the allocations made, the vehicles used, the risk-return contribution expected, and the geographical and sectoral exposure to infrastructure.

The prudent person rule is not easily transferable into different legal and pension cultures. It requires high standards in pensions governance, risk management and supervision. This may give a rationale for specific investment restrictions for infrastructure (and alternative investments in general) by the regulators in some places. However, they should be clearly justified and reviewed on a regular basis.

[74] Ernst &Young (2007) mention that some developing countries, such as India, Brazil, and China, provide infrastructure specific incentives designed to encourage private investments. The US has traditionally encouraged infrastructure financing in the public sector via the favourable tax treatment of municipal bonds.

[75] As an example, in 2005 the Irish NPRF was warned by the IMF of potential conflicts of interest that could arise with investments in domestic private-public partnerships.

VI. OECD advice

The OECD has undertaken a major study examining what governments can do to respond to the complex infrastructure challenge.[76] It finds an important role for private sector finance to satisfy the high needs of future infrastructure investment. This would include "mechanisms for securing long-term financing for infrastructure (e.g. long-term infrastructure funds)". The OECD presents 17 principal policy recommendations, including:

> "2. Encourage investment by pension funds and other large institutional investors."
>
> "6. Examine the legal and regulatory framework conditions with a view to encouraging the emergence of fresh sources of capital and new business models for infrastructure."

Private sector participation in infrastructure

Recognising the critical importance of infrastructure sectors for growth and sustainable development, the OECD Council approved in March 2007 the OECD *Principles for Private Sector Participation in Infrastructure (OECD 2007b)*[77]. The *Principles* offer a practical guidance to help governments and other stakeholders properly assess and manage the implications of involving private actors in the financing, development and management of infrastructure. They provide a coherent catalogue of policy directions for consideration by governments, including appropriate allocation of roles, risks and responsibilities and framework conditions necessary to attract and make the best of private sector participation, while emphasizing the need for adaptation to local circumstances and needs.

The framework covers five main sets of challenges:

a) Deciding on the utility and nature of potential private sector involvement;

b) Providing a sound institutional and regulatory environment for infrastructure investment, including facilitating access to capital markets through the phasing out of unnecessary obstacles to capital movements and restrictions on access to local markets;

c) Ensuring public and institutional support for the project and choice of financing;

d) Making the co-operation between the public and private sectors work by promoting transparency and appropriate contractual arrangements;

e) Promoting private partners' responsible business conduct'.

Some examples of practical suggestions for how to overcome such challenges are included in the table below:

[76] See OECD (2007a) for a set of policy recommendations.

[77] For further background information relating to the Principles see www.oecd.org/daf/investment/ppp

OECD Principles Private Sector Participation in Infrastructure	***Issues for Government***
Enhancing the enabling institutional environment ***Principle 6:*** *infrastructure projects should be free from corruption at all levels and in all project phases. Public authorities should take effective measures to ensure public and private sector integrity and accountability and establish procedures to deter, detect and sanction corruption*	• Consider sending strong political signal: adhere to international anti-corruption conventions (OECD and UN Conventions), inducing institutional reforms (procurement, judiciary), set a structure of disincentives and strengthen monitoring and enforcement • Reduce incentives: address corruption explicitly in the PPP framework, disclose information, define performance targets and outputs, introduce opportunities for challenges and reviews, and allow for private sector to benefit from contract (rather than by preventing it). Reduce incidence of transaction, gain from each transaction and increase probability of detection and penalty • Be aware and mitigate potential negative impacts of the fight against corruption: the costs related to proliferation of controls and institutions and the impacts on the poorest. Tackle corruption in an open, inclusive and equitable manner by suggesting alternatives so as to avoid negative consequences of removing illegal connections and closing below standard facilities
Making the public-private cooperation work ***Principle 14:*** *there should be full disclosure of all project-relevant information between public authorities and their private partners, including the state of pre-existing infrastructure, performance standards and penalties in the case of non-compliance. The principle of due diligence must be upheld*	• Concentrate on improving data quality overtime. Involve all stakeholders in data improvement strategy • Develop monitoring mechanisms • Invest time and capacity in the due diligence process • Clarify expectations and constraints
Principle 17: *regulation of infrastructure services needs to be entrusted to specialised public authorities that are competent, well-resourced and shielded from undue influence by the parties to infrastructure contracts*	• There should be a clear separation between the commercial and the regulation functions of the State • The regulatory body needs to be set up prior to the reform, enjoy stability to build-up credibility. Some flexibility is needed to adapt roles and responsibilities to initial conditions while being able to evolve with country development • There is a trade-off between independence and accountability of regulatory bodies. Key elements are predictability, transparency, consistency, capacity. Disclose information on decisions and procedures, submit to judicial reviews, which also help to protect against excessive political influence • Efforts must be made to avoid conflicts between contractual obligations and regulatory requirements • Regulating small providers requires some form of official recognition of their activities (through licensing and sub-contracting arrangements for instance). Simplify opaque layers of regulation, inform on regulatory

	principles and lines of responsibility. Develop better monitoring of sector.
Principle 18: *occasional renegotiations are inevitable in long-term partnerships, but they should be conducted in good faith, in a transparent and non-discriminatory manner*	• The constantly changing environment that developing and emerging countries face (due to external shocks but also to internal factors such as population growth, migration to urban areas, evolution of poverty) calls for flexibility to adapt to new conditions • Some basic principles can help avoid unnecessary renegotiations: - be aware of trade-off between the risk borne by investors and the probability of renegotiations: less renegotiation when award based on higher transfer fee vs. lowest tariff and rate of return vs. price cap; - less renegotiation when a credible regulatory framework is in place (prior to reforms): existence of regulatory body and regulatory framework embedded in law (rather than decree or contract); - less renegotiation when regulation by objectives (on performance indicators) vs. by means (investments) as give flexibility (notably in terms of technology and strategies) to reach the objectives. For similar reasons, avoid multiplicity of criteria (potentially contradictory and leverage for renegotiation) and using criteria likely to be modified soon (tariffs); - avoid making renegotiations too easy and allowing possibility to default cheaply. Use of performance bonds, step-in rights and renegotiation fees can reduce incentive to renegotiate. Include contractual stipulations specifying under what circumstances revisions shall be considered; -develop credible and realistic terms of reference and contract specifications and avoid changes in policy orientation (adding additional provisions- such as delivery to the poor – after award)

In response to the international community's call for strengthened efforts to ensure adequate provision of water and sanitation services, a specific application of the *Principles* to the water and sanitation sector was conducted in 2007 and 2008[78]. Further sectoral applications of the *Principles* are underway on transport[79]and energy."

Pension fund asset management

In terms of pension fund related recommendations, the *OECD Guidelines for Pension Fund Asset Management* (2006) can be read to be broadly supportive of pension fund investment in infrastructure. First these Guidelines support the prudent person standard as the basic principle for pension boards: "such that the investment of pension assets is undertaken with care, the skill of an expert, prudence and due diligence."

[78] OECD (2008. Forthcoming). Optimising private sector participation in water infrastructure. A checklist for public action.

[79] Regional Background Paper for the 2008 Regional Roundtable of the NEPAD/OECD Africa Investment Initiative. How to increase sound private investment in Africa's road infrastructure: building on country successes and OECD policy tools.

Second, the Guidelines caution against the use of investment category limits. Though recognising that some limits may be required (e.g. on unquoted shares, illiquid assets, investments that lack sufficient transparency, or in relation to single issues and issuers), the Annotations to the Guidelines note that: "the general intent of such portfolio limits is to implement the prudent principles of security, profitability and liquidity at the regulatory level, rather than pension fund level, and to effect or make an initial strategic asset allocation decision applicable to all pension funds subject to the legal provision. Portfolio limits may be applied to ensure a minimum degree of diversification and asset-liability matching."

However, the Guidelines do not support the use of minimum investment floors for asset categories, which would prevent the use of some positive incentive mechanisms for infrastructure investment.

In terms of the valuation of pension assets, the Guidelines recommend the use of current market value or fair market methodology. However, "special methods may be needed to value securities in less liquid markets and assets such as real estate." The special methods would, of course, also apply to many infrastructure investments.

Other OECD guidance for pension funds, such as the *Guidelines for Pension Fund Governance* (2005) can also be applied to infrastructure investing – notably the requirement for the governing boards of pension funds to understand the investments they are making or to seek suitably expert advice.

Risk-management of alternative assets

In addition to OECD guidance, the International Organisation of Pension Supervisors (IOPS) has issued a set of *Good Practices in Risk Management of Alternative Investments by Pension Funds (2008).*

The introduction to the IOPS (2008) guideline recognizes some specific characteristics of alternative investments such as "the application of innovative financial products and derivatives, the use of extensive leverage, illiquidity of underlying investments, a greater reliance on the skill of the manager and the absence of a meaningful benchmark". Such investments may be complex, illiquid or opaque.

Pension funds need to address the specific risks, e.g. liquidity, operational, reputation, integrity, counter-party or outsourcing risk, as well as inherent issues such as limited transparency, valuation weaknesses, control issues and conflicts of interest.

As alternative investments often have divergent, asymmetric risk and return profiles, limited transparency and liquidity, IOPS Good Practice No. 1 requires pension funds to "take appropriate account of the specific risk and return characteristics of these investments". Good Practice No. 2 demands adequate diversification and avoidance of undesirable concentrations of risks.

The commentary to Guideline 2 recommends the application of appropriate stress testing procedures, and adds: "Illiquid portfolios can often move in concert in certain stress events. Such common exposures might not be picked up in normal mean-variance analysis."This is a useful recognition of the limitations of traditional quantitative risk management. In theory and practice, correlations of alternative asset classes with each other and with traditional asset classes are far from set and proven. Furthermore, in the new debate in risk management, it is questioned to what extent such correlations would ever be stable and consistent. There are question marks over stress testing procedures imposed on financial institutions, and this has become more widely recognised since the credit crisis 2007/8.

In practice, all this is difficult to achieve, for infrastructure in particular, where the risk-return profile is still controversial. Pension funds and supervisors do not have well-established standards available, and a lot of the risk is not easily quantifiable.

Other important rules and recommendations by international organizations include the European Pension Fund Directive (2003), the IOPS Principles on Pension Supervision (2006), the AIOS Principles of Pension Regulation and Supervision (2003).

VII. Conclusion and Recommendations

As the need for investment in infrastructure continues to grow, private sector financing for infrastructure projects has developed around the world. Given the long-term growth and (potentially) low correlation aspects of infrastructure investments, pension funds have also shown interest in increasing their exposure to this area, along with their move into alternative assets.

Such investments cover a wide spectrum of projects – from economic infrastructure such as transport, to social projects such as hospitals – and involve different forms of financing (primary vs. secondary, debt vs. equity, private vs. listed, direct vs. indirect). Data explaining the size, risk, return and correlations of this diverse asset class is therefore limited, which may be making pension fund investors cautious. Given investing in such assets also involves new types of investment vehicles and risk for pension funds to manage – such as exposure to leverage, legal and ownership issues, environmental risks as well as regulatory and political challenges – such caution may well be justified.

However, if governments wish to help infrastructure developers tap into potentially important sources of financing such as pension funds, certain steps could be taken:

Enhance the investment environment

- Decide on the utility and nature of potential private sector involvement
- Provide a sound institutional and regulatory environment for infrastructure investment, including facilitating access to capital markets through the phasing out of unnecessary obstacles to capital movements and restrictions on access to local markets
- Ensure public and institutional support for the project and choice of financing
- Make the co-operation between the public and private sectors work by promoting transparency and appropriate contractual arrangements
- Promote private partners' responsible business conduct'

Remove regulatory barriers

- Promote the prudent person standard of investment
- Remove unnecessary or overly restrictive quantitative investment limits (asset category ceilings, prohibitions on investing in unlisted, overseas assets etc.)

Others

- Support stronger efforts in independent data collection and objective information provision in the field of infrastructure investment
- Recommend upgrade of national and supra-national statistical data collection with a view to better capture infrastructure (and other alternative asset classes)

- Promote higher transparency standards in private equity vehicles and direct investments

- Recommend the establishment of international guidelines for performance and risk measurement of infrastructure (and other alternative) investments

- Encourage the study of more advanced risk analysis beyond the traditional measures, including the specific risks of infrastructure. Advice against a supervisory approach that creates false certainties in risk management

- Encourage improvements in knowledge and understanding of pension fund stakeholders and supervisors on infrastructure assets.

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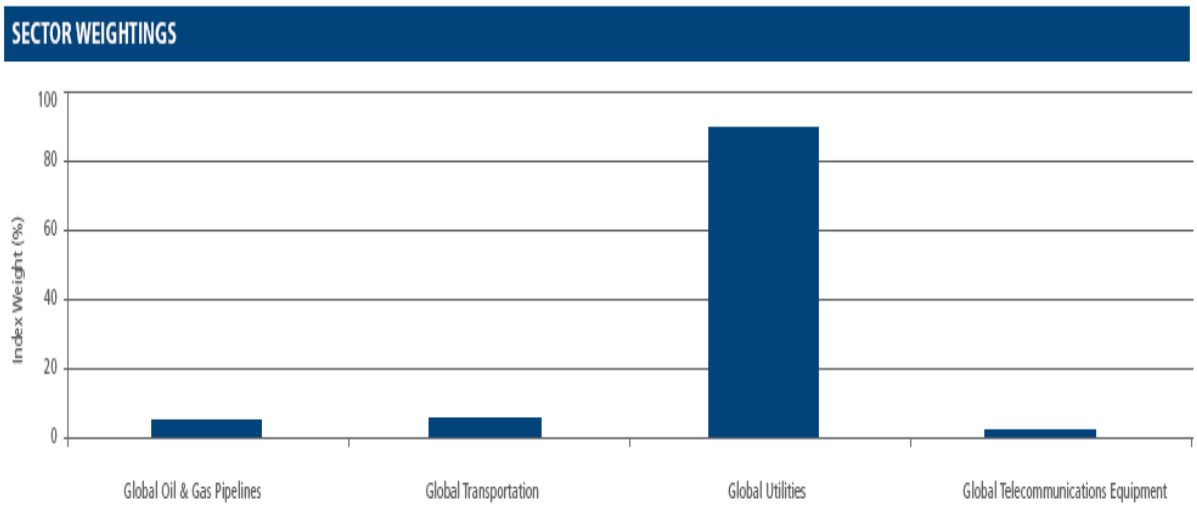
APPENDIX:

Figure 1

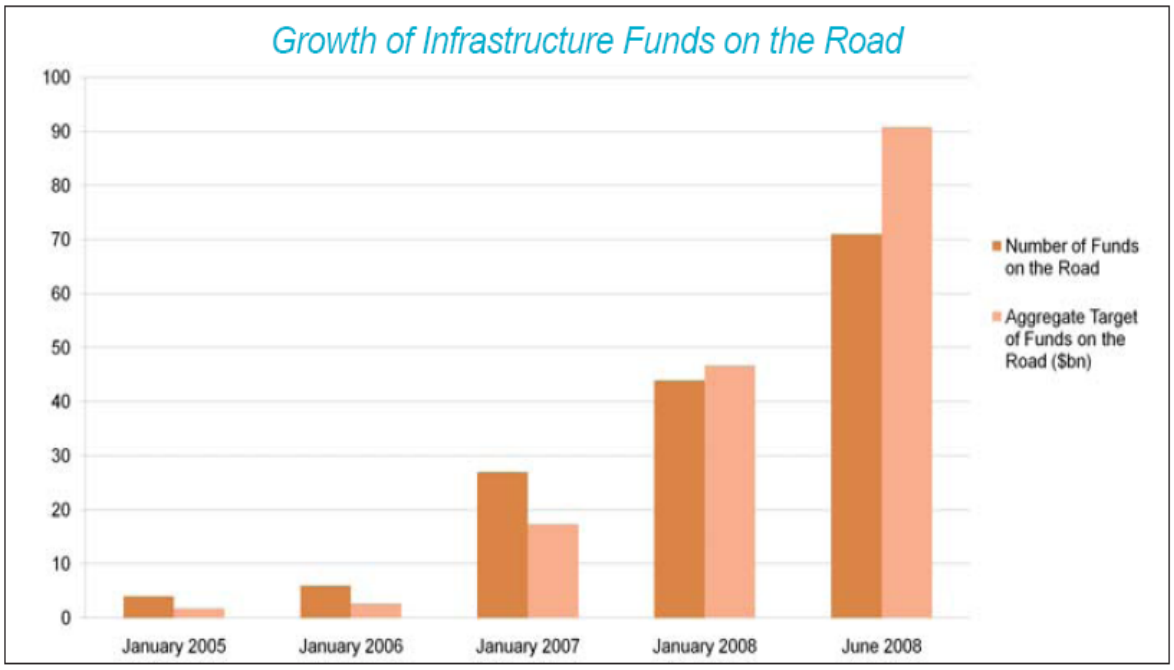
5.1.1 Macquarie Global Infrastructure Index Sector Breakdown



Source: FTSE Group, data as at 28 Feb, 2007

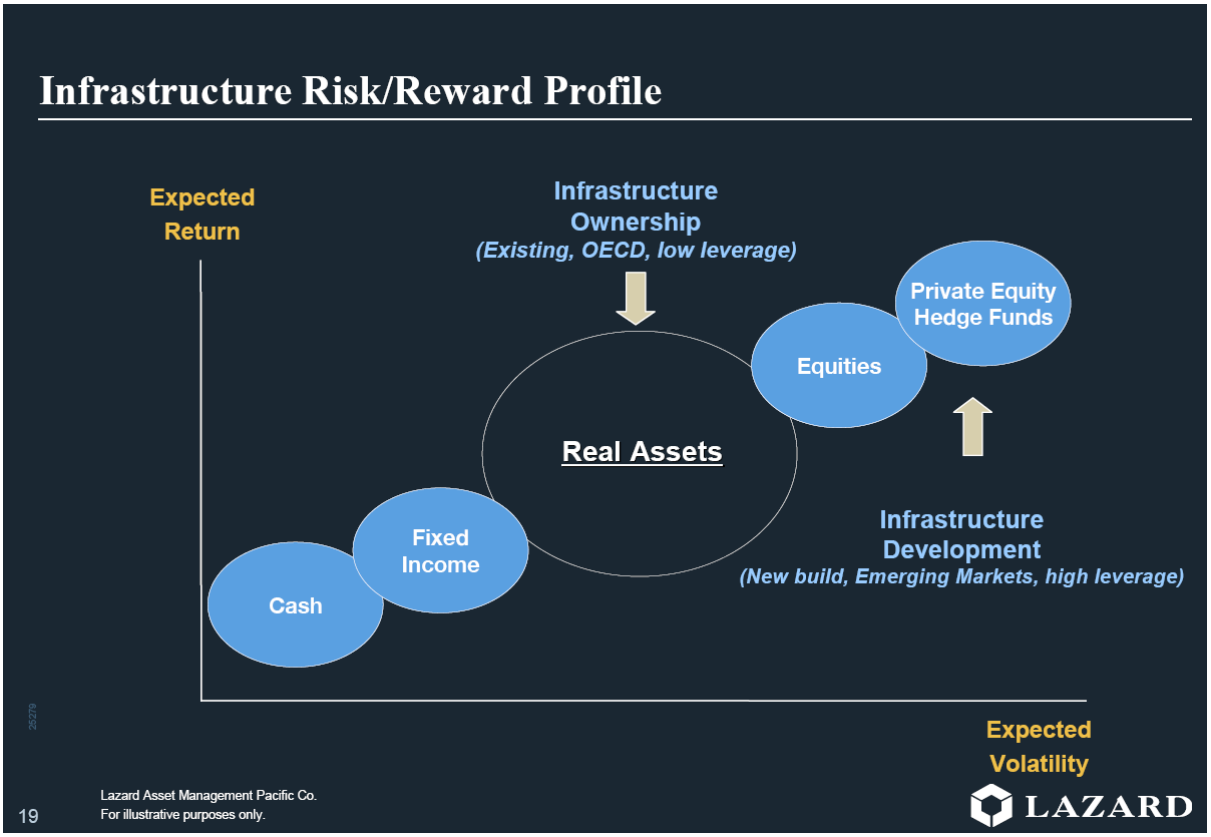
Source: FTSE (2007)

Figure 2



Source: Preqin (2008)

Figure 3



Source: Lazard (2007).

Table 1

Figure 2: Expected Returns and Correlations[1,2]

ASSET RETURNS	EXPECTED RETURN[3]	ANNUALIZED VOLATILITY[4]	WORST 5% RETURNS[5]		
Bonds (5-year duration)	5.2%	4.4%	3.1%		
Equities	8.1%	18.2%	1.1%		
Real estate	7.0%	9.5%	(1.3)%		
Infrastructure	9.3%	7.9%	(1.5)%		
Private equity	10.0%	30.2%	(7.3)%		
CORRELATIONS[6]	**BONDS**	**EQUITIES**	**REAL ESTATE**	**INFRASTRUCTURE**	**PRIVATE EQUITY**
Bonds	100%	11%	40%	20%	6%
Equities		100%	8%	15%	34%
Real estate			100%	21%	5%
Infrastructure				100%	12%
Private equity					100%

Source: Morgan Stanley Asset-Liability model
Data as of May 2007
There can be no assurance that estimated returns or projections can be realized or that actual returns or performance results will not be materially lower than those estimated herein. The expected returns do not reflect the performance of any Morgan Stanley Investment Management investment.

Source: Morgan Stanley (2007)

Table 2

Table 4: Infrastructure Risk-adjusted Performance Analysis: Q3:1995-Q2:2006

Asset class	Average Annual Return	Annual Volatility[a, b]	Sharpe Index	Performance Rank[c]
Composite Infrastructure	22.38%	16.03%	1.05	3
Infrastructure	24.89%	23.42%	0.83	6
Toll Roads	25.65%	24.39%	0.82	7
Airports	8.05%	30.67%	0.08	10
Utilities	21.93%	15.65%	1.05	4
Unlisted Infrastructure	14.11%	5.83%	1.47	2
Direct Property	10.90%	1.46%	3.67	1
LPTs	13.75%	7.92%	1.04	5
Stocks	12.91%	10.97%	0.67	8
Bonds	7.20%	4.28%	0.39	9

Source: Authors' calculations from UBS (2006), PCA/IPD (2006)
Note:
a Annual volatility is the annualised standard deviation of the respective quarterly returns
b Property volatility has not be adjusted for valuation-smoothing
c Performance rank is based on the Sharpe index

Source: Peng/Newell (2007)

Table 3

Table 5: Inter-asset Correlation Matrix: Q3:1995-Q2:2006

	Composite Infrastructure	Infrastructure	Toll Roads	Airports	Utilities	Unlisted Infrastructure	Direct Property	LPTs	Stocks	Bonds
Composite Infrastructure	1.00									
Infrastructure	0.86*	1.00								
Toll Roads	0.85*	0.99*	1.00							
Airports	0.38*	0.40*	0.26	1.00						
Utilities	0.82*	0.42*	0.42*	0.14	1.00					
Unlisted Infrastructure	0.31*	0.36*	0.36*	0.26	0.16	1.00				
Direct Property	-0.08	0.03	-0.01	0.36*	-0.21	0.26	1.00			
LPTs	0.52*	0.40*	0.39*	0.06	0.47*	0.24	0.19	1.00		
Stocks	0.15	0.21	0.14	0.54*	0.01	0.06	0.14	0.17	1.00	
Bonds	0.57*	0.38*	0.38*	-0.03	0.57*	0.17	-0.12	0.49*	-0.21	1.00
Inflation	-0.20	-0.22	-0.21	-0.23	-0.12	-0.27	0.10	-0.13	-0.09	-0.25

*: significant correlation (P<5%)

Source: Peng/Newell (2007)