



Private Infrastructure Finance and Investment in Europe

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Abstract

This study discusses the structure and development of private infrastructure finance in Europe in a global context. It examines the contribution of private capital to the financing of infrastructure investment needs. A 'big picture' is created by putting the various financing instruments and investment vehicles into a simple frame, i.e. percentages of GDP.

There is scope for the development of alternative financing arrangements (such as public-private partnerships) and investment vehicles (such as project bonds and suitable investment funds). However, the traditional ways of corporate (and public) capital expenditure as well bank lending, need to keep working in Europe. Institutional investors can play a bigger role as a source of finance but expectations should be realistic. There are a number of barriers in place, regulatory and otherwise, that need to be worked on.

JEL classification: E22, G23

1. Introduction

This study discusses the structure and development of private infrastructure finance in Europe in a global context, i.e. the supply of private capital to the financing of infrastructure needs. The paper also discusses the potential of institutional investors and barriers to higher private infrastructure investments in Europe, and gives a number of policy recommendations.

Infrastructure 'gaps' as such are evident to everybody. There is continuous reference to infrastructure investment needs in the billions and trillions of Dollars or Euros. However, it is often less clear where such figures are coming from and what they actually mean.

The situation is not much better on the supply side. Given the constraints on public budgets, the private sector is asked to play a bigger role. And yet, surprisingly little seems to be known about the structure and development of private finance in infrastructure. The information is typically piecemeal, with partial representations of the situation.

This paper examines the contribution of the various financing instruments and investment vehicles within a simple frame, i.e. percentages of GDP. It appears necessary to get a better understanding of the orders of magnitude in this field, before aiming at precision that may be spurious.

The analysis focuses on four areas:

- the volumes of demand and supply of private infrastructure capital
- the concepts and definitions of 'infrastructure'
- the potential contribution of institutional investors
- the barriers to higher private infrastructure investments.

In this analysis, a global approach is taken, with a particular focus on Europe and the European Union. Infrastructure finance has had international dimension from the outset, when railways around the world were financed by private investors from Europe. In recent times, European infrastructure assets have been in demand with overseas investors, also from emerging markets.

However, there are major challenges, especially for Europe, post financial crisis and with the current economic and political uncertainties. Banks are facing new constraints on long-term lending. Institutional investors are being urged to provide more capital for infrastructure projects but are themselves subject to (new) accounting and solvency regulation that may hinder investment in less liquid assets. In addition, there are other hindrances on the supply and demand side of private capital, and in the intermediation process, including capital markets.

The paper is structured in the following way. Section 2 gives a review of historical infrastructure spending in Europe and the world. Various projections for future infrastructure investment requirements are presented in Section 3. In Section 4, the supply of private infrastructure capital is analysed in the different financing arrangements and instruments, investment vehicles.

Section 5 looks at the current and potential role of institutional investors in infrastructure finance. The pieces fall into place in Section 6, where key figures of supply and demand are compared as percentages of GDP. Section 7 discusses actual and potential hurdles for higher private sector engagement, including regulatory barriers. This is followed by conclusions and recommendations for policy makers.

2. Historical perspective on infrastructure investment

We take historical spending on European infrastructure as a starting point. Rather surprisingly, there has been little research about the development and composition of past infrastructure investment, especially private investment.

Public investment has been on a falling trend in Europe since the 1970s from about 5% to about 2.5% of GDP in the 2000s (Välilä et al. 2005). Alegre et al. (2008) found that roughly one third of government gross capital formation in the old member states is investment in *economic* infrastructure (80% of which is transport). Adding health and education, the share goes up to about one half. Public infrastructure investment at a level of 1 1/4% of GDP is similar to the USA but about half in comparison to Japan.

To what extent can private money compensate for the secular decline in public infrastructure spending?

Wagenvoort et al. (2010) built a framework for such analysis within the European Union, using different sets of government and private finance statistics.¹ Over the years 2006-2009, total (public and private) investment in infrastructure was 3.7% of GDP in 15 old member states (OMS) and 5.3% in 10 new member states (NMS). Infrastructure investment amounted to around € 400bn in the mid-2000s. It fell back after 2007, although government spending rose above € 150bn, but not sufficiently to compensate the decline of private finance.²

In terms of sectors, 'transport' (including telecom and storage) took the lion share of 2.1% and 2.9% in the two areas of the EU. Utilities (0.6% and 1.4%) include energy, water, sewage and waste management. Social infrastructure (health, social services and education) added another 1% in both sub-regions. Total infrastructure spending varies little across the OMS, with larger EU countries slightly below average. However, the sector composition differs considerably across countries.

Government finance and private finance

In this recent period, the private sector contribution was almost twice as high as the governments' in the OMS (2.55% vs. 1.35% of GDP as an average over the years 2006-2009); in the NMS, it was close to half. The high share of the private sector within total

¹ They use Eurostat statistics of (government and total) gross fixed capital formation of a range of sectors, a measure that includes some non-infrastructure spending. Therefore, these figures can be regarded as an 'upper bound' of 'true' infrastructure investment.

² These calculations are for the EU minus seven countries (B, BUL, DK, LV, NL, ROM, SK) over the years 2004-09.

spending in all sectors (except education) is remarkable in this analysis. In contrast, the Group of Thirty (2013), drafted by McKinsey, finds that, over the long term, the government drives 55% of infrastructure investment in Germany, 54% in France, 59% in the USA and 77% in Japan.³

Within private capital spending on infrastructure, project finance contributes 0.33% of EU GDP, i.e. € 39bn (using 2009 GDP). A share of 0.19% of GDP is attributed to the financing of public-private partnerships (PPP) and 0.14% to non-PPP project finance. This implies a volume of about € 22bn and € 17bn per annum, respectively. The bulk of private investment, however, is made by the corporate sector (2.22%), which is defined as a residual that will require further scrutiny, given its size.⁴

In terms of the capital structure of project finance, loan financing dominates (80%), while 6% is bond-financed and 14% of project finance is equity financed. Social infrastructure tends to be more highly geared than economic infrastructure.

Global context

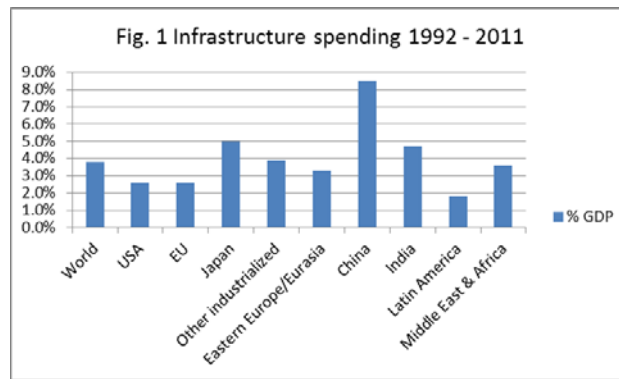
It is useful to put these European findings into a longer-term and world-wide context. Using different data sources, McKinsey (2013) concentrates on seven sectors of *economic* infrastructure.⁵ According to this report, 3.8% of world GDP has been spent on infrastructure over the last 20 years, i.e. an annual amount of around US\$ 2400bn (applied to 2010 GDP) (Fig. 1).

Infrastructure investment was comparatively high in emerging markets (except Latin America) but also in Japan. The USA and the EU both spent 2.6% of GDP, Eastern Europe / Eurasia 3.3%. Infrastructure spending has been trending down in the developed world from 3.6% of GDP in 1980 to 2.8% in 2008 but has been rising in emerging economies from 3.5% to 5.7% (McKinsey 2010).

³ Definitions: "Public investment includes investment in highways and streets, transportation, power, sewer systems, water systems, education, and health care structures. Private investment includes private investment in non-residential structures in power, communication, and other (about 30% of total, including religious, educational, vocational, lodging, railroads, farm, and amusement and recreational structures, net purchases of used structures, and brokers' commissions on the sale of structures, roads, and highways)."

⁴ It is important to note that in this analysis, private finance is defined as a residual of total infrastructure investment (minus government finance (Eurostat figures)), corporate finance as a residual within private finance (minus project finance (Dealogic figures)), and, finally, non-PPP as a residual within project finance (minus PPP (EPEC figures)).

⁵ McKinsey merge data from different sources: International Transport Forum (ITF) for transport, IHS Global Insight (IHS) for energy and telecom, and Global Water Intelligence (GWI) for water. They include capital expenditure in the power and telecom sectors that would not normally be considered infrastructure (such computers or back-office activities). Power also includes energy production.



Source: McKinsey (2013)

For the EU, this implies an annual amount of about US\$ 400bn in 2010. Transport (dominated by roads, ahead of ports, airports and rail) has a share of about 38%, telecom 19%, power 23% and water 20%. The EU figure of 2.6% is similar to the 2.7% figure for economic infrastructure found over the shorter period by Wagenvoort et al. (2010).

Conclusion

Longer-term *economic* infrastructure spending has been calculated at about 3.8% of GDP globally, and 2.6% for Western Europe. *Social* infrastructure adds another 1% of GDP in Europe. Overall, this would imply an annual benchmark figure of about € 450bn of total infrastructure spending in Europe (€ 330bn in economic and € 130bn in social infrastructure, in 2011 prices). Public-private partnerships contribute about 5% to total infrastructure finance, equivalent to over 10% of EU governments' spending.

Caveats apply. Different studies have different scopes, time horizons, methodologies and infrastructure concepts. Definitions of infrastructure vary (see Box 1). Data available are typically neither 'clean' nor consistent across sources (see Box 2).

Box 1: Definitions of infrastructure

One of the main issues in this discussion is the definition of 'infrastructure'. Most people feel they know what infrastructure is, and would perhaps agree on a general definition of infrastructure along the lines of the *American Heritage® Dictionary of the English Language*:

"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."

However, very different concepts are used in the political, economic and financial world. 'Infrastructure' can be defined along the lines of:

- physical characteristics (roads, bridges, pipelines, cables etc.)
- industrial sectors (including *economic* infrastructure sectors such as transport, energy, water and waste; sometimes also *social* infrastructure such as education, health, security buildings)
- economic characteristics (such as large, capital-intense monopolies, high barriers to entry, economies of scale, inelastic demand for services etc.)
- investment characteristics (such as attractive returns; low sensitivity to swings in the economy and markets; low correlation of returns with other asset classes; long term, stable and predictable cash flows; good inflation hedge; low default rates)
- regulatory regime, contractual approach (regulated asset base, concession, licensed); specific contractual arrangements (project finance, PPP)
- combinations and variations of the above.

In practice, the (implicit and explicit) definitions of infrastructure vary widely. Empirical studies in economics typically select certain sectors and sub-sectors in the national account statistics. The financial industry tries to frame infrastructure investments as a 'new asset class' with common investment characteristics, despite a high degree of heterogeneity (Inderst 2010). Finally, some investors are primarily interested in specific contractual and regulatory aspects of infrastructure.

Whatever definitional approach, elements can always be found that don't really fit in. Needless to say, the list of grey and controversial areas is long. Some examples:

- Where does public infrastructure end and private infrastructure start?
- Do (all) utility companies count as infrastructure?
- The inclusion of energy *production*, as opposed to distribution and networks.
- What about conglomerates and vertically integrated companies?
- What percentages of revenue (or assets) make a company or SPV an infrastructure entity: 50%, 60%, 80% or 100%?
- Is renewable energy 'infrastructure'? (Inderst et al. 2012)
- Assets exposed to strong competition, with high demand risk, e.g. in transport
- How to deal with telecommunication?
- Social infrastructure: are care homes, kindergartens, student homes, stadiums, prisons, entertainment facilities etc., all considered?
- Companies connected to infrastructure sectors, such as construction, financial, legal consultants, and other service providers.

3. Future infrastructure investment needs and financing gaps

Infrastructure should be more and better, that is widely agreed. However, infrastructure *investment needs* are not easily quantifiable. There are two basic approaches: top-down and bottom-up. The first is based on the development of macro-statistics such as GDP, capital stock and investment. The second is based on 'micro-economic' information, such as regional and sectoral case studies, planning documents from local entities or experts' assessments.

Important questions come up in this exercise. Do figures extend to new infrastructure, renewal, upgrading and/or maintenance? Which sectors are considered or left out? What is the time horizon? Going further, one can ask: Are any (social, environmental) quality standards set? Are (potential) efficiency gains taken into account? Unfortunately, research in questions is still at an early stage.

3.1 Global estimates

Most estimates are based on a small number of original studies that try to quantify infrastructure investment needs. In one of the first (top-down) international, multi-sectoral studies on the subject, the World Bank's Fay and Yepes (2003) estimated a very large difference in the infrastructure investment needs between high income (1.2% of GDP) and developing countries (5.5%) over the years 2000-2010.

The main reference points to date are the OECD reports 'Infrastructure to 2030' (OECD 2006, 2007), using a sectoral, bottom-up method.⁶ They analysed infrastructure investment demands in five sectors: telecommunications, electricity (transmission and distribution), surface transport (road and rail) and water. Investment needs between 2000 and 2030 were estimated at US\$ 53tn (around US\$ 1.8tn per year), equivalent to about 2.5% of world GDP on average (at 2005 prices). Inclusion of energy generation (US\$ 12tn) and other energy-related infrastructure (US\$ 6tn) would increase the total to USD 71tn, or about 3.5% of world GDP.

OECD (2012a) broadened the spectrum further by assessing the infrastructure or related investment requirements for airports, ports, rail corridors as well as oil & gas transport and distribution until 2030. The estimate is for a further US\$ 11tn between 2009 and 2030, or about US\$ 0.5tn pa (at 2008 prices).

Putting things together, the OECD estimates of total infrastructure spending requirements until 2030 add up to roughly US\$ 82tn, i.e. an annual amount of nearly US\$ 3tn or just over

⁶ The projections for each sector have been developed on the basis of different approaches, different methodologies and different data sets.

4% world GDP. Such analysis is about orders of magnitude, not exact forecasts, and figures may not translate into effective demand.⁷

All four major sectors require significant junks of investment, with a very substantial necessity for investments in water. Energy production takes half of energy investments, an area not always considered strictly as infrastructure. Transport demand is fairly evenly spread across sub-sectors. (Table 1)

<i>Table 1: Global infrastructure investment needs to 2030</i>		<i>in % world GDP</i>	
Water			1.3%
Telecom			0.5%
Transport			0.8%
	Road	0.3%	
	Rail	0.3%	
	Airports	0.2%	
	Ports	0.1%	
Energy			1.5%
	Electricity transmission & distribution	0.2%	
	Electricity generation	0.7%	
	Other energy	0.4%	
	Oil & gas - transmission & distribution	0.2%	
Total			4.1%

Source: OECD (2006, 2007, 2012), WEF (2012)

McKinsey (2013) compares three different approaches to size future infrastructure investment needs between 2013 and 2030. The projections are based on:

1. Historical spending (assuming a constant percentage of GDP over time)
2. Ratio of infrastructure stock to GDP (assumed constant at 70% over time)⁸
3. Estimates of needs by multilateral institutions (i.e. OECD for transport and telecom, IEA for energy, GWI for water).

The estimates of total investment needs span between US\$ 57-62tn, i.e. 3.5%-4.1% of world GDP. Annual infrastructure spending would need to rise from the current US\$ 2.6tn to US\$ 3.0-3.5tn in 2020 and to US\$ 4.1-4.8tn in 2030. Such figures are considered 'baseline amounts'. The 'true scale' of the infrastructure investment challenge could be considerably higher for a number of reasons, including a backlog in renewal, geographic economic imbalances, human development needs, and climate change adaptation and mitigation.

Other studies take a narrower or broader perspective on infrastructure investment requirements, e.g. IEA (2012) for the energy sector, the Group of Thirty (2013) for a more broadly defined 'long-term investment' that includes infrastructure.

⁷ The authors give a number of caveats, including different approaches, methodologies and data sets that are applied across sectors. Time periods and base years are not identical across the studies. Infrastructure needs may not translate into effective demand. No policy changes are assumed.

⁸ In most major countries, the value of infrastructure stock is seen around 70% of GDP. Notable exceptions are 'over-investing' Japan (179%) and 'under-investing' Brazil (16%). In this approach, 40% of investment is for renewal, the rest for expansion and improvement.

3.2 Europe

The European Commission (2011) found ‘preliminary estimates’ for infrastructure investment needs up to 2020 in the range of € 1.5-2tn, or an annual amount of € 150-200bn on average (Table 2). Energy is seen as the largest sector ahead of transport and communication.⁹ More recently, the European Commission (2013a) put “overall investment needs for transport, energy and telecom infrastructure networks of EU importance amount to EUR 1 trillion for the period up to 2020.”¹⁰

Table 2: EU and UK infrastructure investment needs to 2020

	<i>EU</i>	<i>UK</i>
	E bn	£ bn
transport	500	120
energy	1100	264
telecom	268	5
water	n/a	45
<i>total</i>	<i>1500-2000</i>	<i>500</i>
annual average	150-200	50

Source: EC (2011) for the EU, Helm et. al. (2009) for the UK

The EC estimates do not cover the whole range of infrastructure. Water & sewage, waste management are not included, nor is social infrastructure or power generation. Nonetheless, the EC figures (of around 1 ½% of GDP) look comparatively low as both national and international studies would seem to suggest significantly higher figures the EU.¹¹

Taking the UK as an example, Helm et al. (2009) calculate a figure of £ 500bn or £ 50bn per annum over ten years (Table 2). In this sectoral, bottom-up report, energy will require over half of the investments while water would need only about 10%.

Most of the global studies are not very specific on the EU or other world regions. However, one can break down rough benchmark figures for the European Union. Table 3 exemplifies four main scenarios.¹²

⁹ “From now until 2020, €500 billion is estimated to be needed for the implementation of the Trans-European Transport Network (TEN-T) programme. In the energy sector, public and private entities in the Member States will need to spend around €400 billion on distribution networks and smart grids, another €200 billion on transmission networks and storage as well as €500 billion to upgrade and build new generation capacity between now and 2020. Last, but not least, between €38-58 billion and €181-268 billion capital investment are required to achieve the Commission's broadband targets.” (p.3)

¹⁰ “Connecting Europe Facility: About E 500 bn in transport, E 200 bn in energy and E 270 bn for fast broadband infrastructures.” (p. 5)

¹¹ For the USA, a region of a comparable size, ASCE (2013) estimates total infrastructure investment needs of US\$ 2.7tn until 2020 and US\$ 10tn until 2040, i.e. an annual US\$ 350bn. Roughly two thirds of that is surface transport. The other sectors included are: airports, ports and inland waterways, water and wastewater, and electricity.

¹² This is by assuming a 2% long-term growth rate for the EU, i.e. lower than the global growth rate of 3.3% in McKinsey (2013).

Table 3: Scenarios for EU Infrastructure investment needs (2013 - 2030)

Scenario:	historical	plus:	future scenarios	
<i>in E bn</i>	<i>economic</i>	<i>1% social</i>		
% GDP	2.6%	3.6%	4.0%	4.5%
total over 18 years	8400	11600	12900	14600
annual average	470	650	720	810
<i>Source: OECD (2006, 2007, 2012), WEF (2012), McKinsey (2013), own calculations</i>				

As an example, the most conservative figure (historical), with a constant share of (economic) infrastructure spending of 2.6% of GDP, would result in an average annual volume of about € 470bn and a total investment amount of € 8.4tn until 2030. This corresponds to roughly 20% of the global amount of US\$ 57bn. Adding another 1% of GDP for social infrastructure would imply annual investment requirements of well over € 600bn for Europe. On the most ambitious scenario (4.5% of GDP) the figure would go up to € 800bn (all in 2011 prices).

Of course, the specific infrastructure demands differ across countries and regions in size, sectoral composition and type (e.g. maintenance or new). The OECD (2006) mentions that investment needs in the telecom and especially in the electricity sector in the OECD countries are below average.¹³

An earlier report by Booz Allen Hamilton (2007) broke down infrastructure needs between 2005 and 2030 into regions and sectors (not including telecom and social infrastructure)¹⁴. According to this analysis, the highest investment requirements are for water, also in Europe, where it takes about half of the total. Europe's needs are seen higher than the global average for road & rail, and well below average in the power sector.

3.3 Infrastructure financing gaps

'Infrastructure gaps' are much discussed in the public. In this paper, the focus is on the financial aspect of it. An *infrastructure financing gap* can be defined as the difference between investment needs and resources, or the funds needed and available. If infrastructure investment needs are difficult to estimate, infrastructure financing gaps are even more so.

To date, hardly any attempts have been made to date at a proper quantification. The WEF (2012) estimates a global infrastructure gap of about US\$ 1tn per annum (1.25% of GDP). This is the difference between investment needs of US\$ 3.55tn and actual spending of US\$ 2.5tn.¹⁵

¹³ OECD countries account for more than half of the investments in global telecom, over 40% in the electricity sector, roughly two thirds in the rail & road sectors. The weight of OECD countries in world GDP is about two thirds. (As for water, OECD (2006) only covers the OECD countries plus China, India, Russia and Brazil.)

¹⁴ The report draws from a variety of sources with different methodologies: Global Infrastructure Partners, World Energy Outlook, OECD, Boeing, Drewry Shipping Consultants, U.S. Department of Transportation.

¹⁵ WEF (2012), in collaboration with PwC, slightly varies and extends the 'conservative' OECD estimates, by adding the changes required to electricity grids to accommodate new renewable energy

A rather different ‘*green infrastructure investment gap*’ definition is used by WEF (2013). Additional investment needed to meet the climate challenge - for clean energy infrastructure, sustainable transport, energy efficiency and forestry - is about US\$ 700bn per year.¹⁶

For the USA, ASCE (2013) conclude funding gap of about US\$ 150bn per annum, this compared to the expected level of funding of about US\$ 200bn. No comprehensive set of figures is known for Europe. This would be an important area for the development of statistical and research tools within Europe.

Conclusion

There are few original estimates of future infrastructure investment demands available to date, and Europe is no exception. These are typically ‘baseline figures’ to keep pace with anticipated economic growth rather than any ‘social optimum’. Projections differ depending on factors such as:

- forecasting methodology (bottom-up vs. top-down)
- specific assumptions (e.g. GDP growth, capital stock assumptions)
- infrastructure sectors and sub-sectors included and excluded
- type of investment considered (new, maintenance, etc.)
- coverage of countries, especially in less developed countries
- base year and time horizon
- data availability.

They are, of course, highly difficult and uncertain, and subject to qualifications and criticism (e.g. Gramlich 1994, Dethier and Moore 2012, Sawant 2010). Investment needs go up when factors such as climate change and human development are brought into the framework but there is currently little theoretical underpinning of such calculations.

Nonetheless, some benchmark figures should be crystallized. Global projections for economic infrastructure investment requirements range from a ‘conservative’ annual 2.5% of GDP to an ‘ambitious’ 4.5% and beyond. Core estimates appear to be around 3.5% to 3.8%, or roughly between US\$ 3.2tn to US\$ 3.4tn per annum.

For the European Union, the historical figure of 2.6% of GDP implies annual investment amounts of nearly € 500bn for economic infrastructure until 2030. Adding another 1% for social infrastructure would imply annual investment requirement of well over € 600bn

In terms of infrastructure sectors, there are some substantial differences across studies. This is partly determined by the in/exclusion of whole sectors (like water, waste management,

(wind and solar power) supplies. Thereby, the estimate for infrastructure expenditure over the period 2010-2030 goes up to ‘at least 4.5% of GDP (or about US\$ 3,55bn in 2011 prices)’ (here figures are based on a global GDP at PPP of US\$ 79tn). Compared to the global construction spending on infrastructure (including power generation) of US\$ 2.6tn (IHS figures), this would leave an annual infrastructure investment gap of about US\$ 1tn.

¹⁶ WEF (2013) finds that ‘business-as-usual-spending’ of US\$ 5 trillion in global infrastructure investment is required per year to 2030. This large figure includes sectors beyond traditional infrastructure, in particular transport vehicles, buildings & industry, and agriculture & forestry. “This investment must be greened to secure future growth”, with an incremental US\$ 700bn pa.

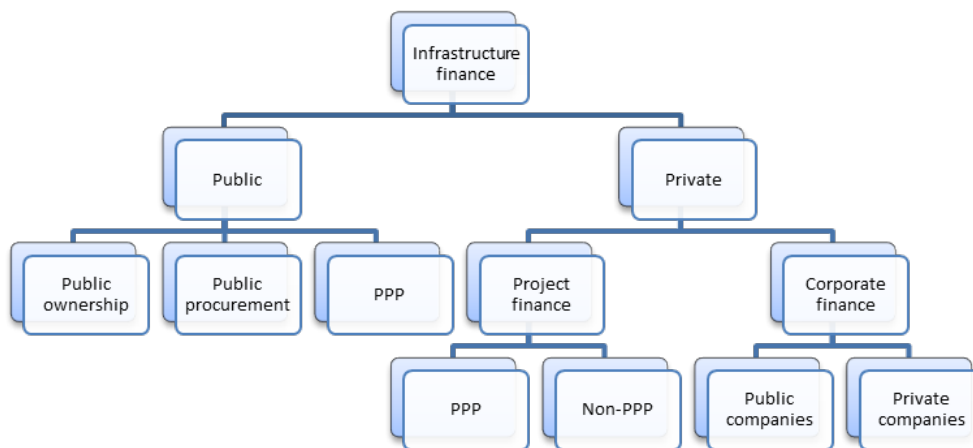
telecom, health or education), but also by the treatment of important sub-sectors such as energy production.

4. Supply of private infrastructure capital

Now we turn to the supply of infrastructure capital. This report will not discuss the *public* provision of capital by central, regional, local and other government institutions. However, the public sector plays key roles in the *private* provision of capital, e.g. by setting infrastructure policies, in the privatization of assets, as regulator of certain industries, as authority in concession regimes, in procurement policies, as partner in PPPs, etc.¹⁷

Private capital is provided in two main forms: *corporate finance* (operating or service companies operating in infrastructure sectors) and *project finance*, a contractual financing arrangement that is particularly important in infrastructure¹⁸ (Fig. 2) (see, e.g., Weber and Alfen 2010)

Fig. 2 Infrastructure Finance



Source; Author

The World Bank estimated the value of (public and private, listed and unlisted) infrastructure asset to be US\$ 17tn in 2005 (UBS 2006). RREEF (2010) found a value of approximately

¹⁷ Public sector finance, in a broader sense, does not only include central government but also lower regional and municipal levels that can be more important in some countries. Furthermore, there is a financing role for international, national and regional development banks and international financial institutions (such as the KfW, EIB, EBRD in Europe).

¹⁸ Project finance is the financing of long-term infrastructure, industrial, extractive, environmental and other projects / public services (including social, sports and entertainment PPPs) based upon a limited recourse financial structure where project debt and equity used to finance the project are paid back from the cash flow generated by the project (typically, a special purpose entity (SPE) or vehicle (SPV)).

US\$ 20.5tn in 2006, of which Europe had a share of 31% (Western European US\$ 5.6tn and Eastern European US\$ 0.8tn).¹⁹

It is useful to give an overview of the most common financing instruments and investment vehicles in infrastructure. They are typically categorized in the market along the lines of (Table 4):

- Financing instruments: equity, debt (loans and bonds), mezzanine
- Investment vehicles: publicly traded (listed) vs. privately traded (unlisted)
- Investment routes: direct vs. indirect investing (via funds).

		direct	indirect
equity	public	listed infrastructure & utility stocks	listed infrastructure equity funds; index funds; EFTs
	private	direct equity investment in infrastructure company / project	unlisted infrastructure funds
debt	bonds	corporate bonds of infrastructure companies; project bonds; PPP/PFI bonds; US municipal	infrastructure bond funds
	loans	direct loans to companies / projects / asset backed financing	infrastructure loan / debt funds

Source; Author

There are also mixed instruments (such as mezzanine capital, i.e. sub-ordinated debt of preferred equity) and hybrid vehicles (such as balanced funds) as well as variations within the categories. In addition, *derived* products such as infrastructure indices, exchange-traded funds (ETF), options etc. exist.

Further common categorizations of infrastructure investments are by

- project stages (greenfield, brownfield, primary, secondary)
- geographic (global, regional, emerging markets, country)
- revenue source (or ultimate 'funding'): user (e.g. toll road) or availability-based (i.e. government and tax payers, e.g. PPP hospital)
- investment style (e.g. core or opportunistic; growth or income style).

There are pros and cons for different financing instruments and investment vehicles, also depending on the perspective of the main parties involved: constructors, operators, investors, financiers, intermediaries, governments etc. (see, e.g., WEF 2010, Inderst 2009). For example, an investment in a share or bond of a company involved in infrastructure may not necessarily be directed to specific infrastructure projects. Infrastructure funds can take a long time to get invested in underlying projects, and be subject to agency issues. Private investments may be less exposed to the vagaries but bear illiquidity, valuation and concentration risks in investor portfolios.

¹⁹ Although not directly comparable, this would be a size similar to the European equity market (about €8tn) and the bond market (€11.3tn), and higher than the investible real estate market (€3.6tn).

No simple measure of private capital investment into infrastructure exists. The charts and figures given in the discussions are typically just partial representations, e.g. infrastructure funds, project finance loans, PPP projects, and similar. There are several issues with the information available (see Box 2).

Box 2: Data

Data availability is a major limiting factor. There is no single or clean source of data although there are a variety of sources with very different scopes and methodologies. Infrastructure statistics need to be interpreted very carefully.

1. Public statistics

'Infrastructure' is rarely a statistical category. Researchers use investment (i.e. gross fixed capital formation) in a range of sectors considered as 'infrastructure' in an ad hoc selection. Drawing the lines of infrastructure in public statistics is a tricky task (Alegre et al. 2008).

2. Financial transactions statistics

Databases of financial deals are a common source of information e.g. for project finance and PPPs. However, not all project finance is infrastructure and vice versa. Second, a number of caveats apply about the categorizations, the included sectors and projects, the completeness and quality of data in general. Finally, commercial databases may be fee-based and not be particularly transparent.

3. Investment funds and managers

The investment community uses data of infrastructure assets-under-management managers and funds. A range of very different definitions of infrastructure assets are used. Here, too, there are a number of caveats with databases.

Coverage is a particularly virulent problem. On one side, there are substantial gaps, e.g. by not counting traditional listed stocks or bonds of utility companies. On the other hand, there are substantial overlaps. For example, when a pension funds invests through a delegated manager, there may be double-counting since both entities are 'institutional investors'.

4. Investor assets

Another source of information is asset allocation and performance data of asset owners (institutional and retail investors). There are sampling issues at work. There is still no all-encompassing, systematic data base available although a number of organizations do collect data in certain areas.

One major problem is that Infrastructure as a separate category is a relatively new phenomenon. Infrastructure is often subsumed under other asset classes such as equities, bonds, private equity, real estate, alternative or real/inflation-linked assets.

We now look at the main building blocks of data available, keeping the above categorizations in mind. The main sources of information for equity finance are listed equities (chapter 4.1) and infrastructure funds (which are mostly private-equity but there are also listed funds)

(4.2). This followed by various bond instruments (4.3), a growing number of infrastructure debt funds on the market (4.2).

Project finance deals (4.4) are a main source of information for direct investments in infrastructure, where project finance loans dominate over equity and project bonds (4.6). PPPs are an important form of project finance, used more in some countries and sectors than in others (4.5). Finally, rating agencies collect a data on the large universe of rated infrastructure and project finance debt (4.7).

A special focus in this paper is the supply of capital by institutional investors (ch 5), where data are presented for pension funds (5.1) and other investors (5.2).

4.1 Listed infrastructure equity

Corporate equity is a major source of private finance for infrastructure. Companies *listed* on public exchanges are the most sizeable owners of infrastructure assets and providers of infrastructure services. This includes companies that act as operators, contractors, developers of projects, or more diversified conglomerates acting in infrastructure sectors. In addition, *private equity* has been on the rise in recent years, also in the infrastructure sectors.

Utilities have been an important element of stock markets for some time. The privatizations of electricity, gas, water, telecom, and other utility companies added substantially to their weight in investor universes. Many countries also privatized transport assets, primarily airports, ports, toll roads, bridges and tunnels.²⁰

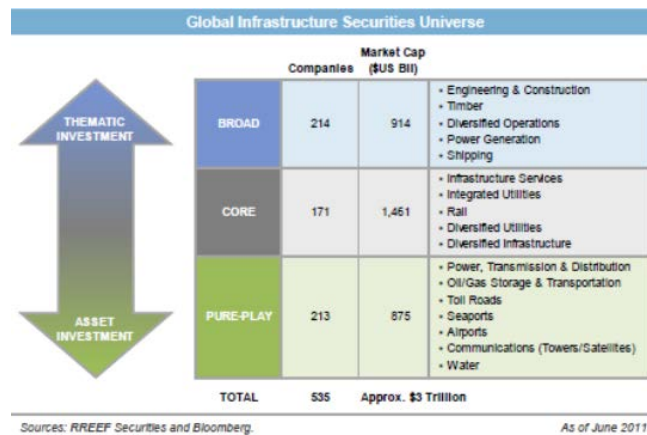
Infrastructure stocks form a subset of global stock markets. RREEF (2011b) find 535 infrastructure stocks with a market capitalization of US\$ 3.25tn worldwide. This is roughly 6% of the estimated global stock market capitalization in 2011, a percentage similar to the one found by S&P (2007).

However, the dispute is on about how far the term ‘infrastructure’ can be stretched. Fig. 3 shows an example of how such an ‘infrastructure investment universe’ is created. In addition to 213 ‘pure-play’ infrastructure companies (US\$ 875bn), ‘core’ infrastructure includes diversified and integrated companies while ‘broad’ goes as far as power generation, shipping and timber.²¹

²⁰ There are estimates of assets privatizations of US\$ 2.35tn worldwide since 1988, about 44% (US\$ 1tn) in the EU (RREEF 2011a). Utilities accounted for US\$ 26.8bn between 2000 and 2010 in the EU, telecoms US\$ 18.3bn, transport US\$ 14.8bn.

²¹ Some researchers span the universe even further. Rothballer and Kaserer (2012) identified listed companies worldwide that own or have a concession for physical (economic) infrastructure assets and generate *more than 50% of revenues* from those. On that count, the number of such companies shot up from 216 to 1458 between 1980 and 2010. Less than a quarter of firms are European, where the electricity sector dominates, followed by telecom stocks and other utilities.

Fig. 3: Global Infrastructure Securities Universe



Source: RREEF (2011b)

Capital raising by infrastructure firms has been rather volatile in recent years, especially in Europe, with a reported average of about US\$ 36bn globally, and US\$ 10bn in Europe, between 2006-2011. Energy has been raising most capital by some margin. IPOs dropped off after the financial crisis when restructuring and raising additional capital dominated.

Capital expenditure of infrastructure companies is of major significance. Citi (2011) calculated an average annual capex of utility companies in the EU over the last decade of € 35bn, and around € 60bn in the late 2000s (i.e. about 0.5% of GDP). Future spending would need to go up to € 80bn (half for replacement & renewal, half to meet environmental targets). However, there have been setbacks in this decade. Reasons include the Euro crisis, the recessionary environment and shifts in government policies and regulations in a number of countries, especially in the energy sector (e.g. feed-in-tariffs, subsidies, nuclear, shale gas).

Listed Infrastructure indices and funds.

With the emergence of the infrastructure investment theme in the mid-2000s, the major index providers have all started to offer specialist infrastructure indices. Today, global infrastructure stock market indices contain up to 350 infrastructure companies with a market capitalization currently up to US\$ 2.5tn.

There are differences between indices in terms of the size and number of stocks included, the countries and regions covered, and the particular index methodology.

The main issue concerns the sectors and sub-sectors chosen for such indices. Some indices contain over 80% utility stocks.²² The indices also vary strongly in terms of strongly weightings, with Europe having a share of about 40-55%.

Conclusion

Corporate equity is an important vehicle of private infrastructure finance. The number of infrastructure companies has grown since the 1980s. About 5-6% of world stock markets are

²² For example, about half of the US\$ 2.5tn market cap MSCI ACWI Infrastructure Index are telecom stocks. Sometimes also diversified companies and listed infrastructure funds are included while social infrastructure is practically not present.

estimated to be utilities and (economic) infrastructure companies in a very wide definition, with a market capitalization of over US\$ 3tn. Europe's share in market capitalization typically ranges between 40-55%. Utilities, especially energy and telecoms, typically dominate the listed infrastructure indices.

Of course, the market valuation of infrastructure companies, or their equity / bond issuance, is no direct proxies for the financing of infrastructure projects. However, capital expenditure of listed companies is a key source of private infrastructure finance. The investment behaviour of such firms would deserve higher attention and scrutiny also in the context of the overall infrastructure investment discussion, as does the contribution of SMEs in the different sectors and countries.

4.2 Infrastructure funds

Much of the focus of the infrastructure debate has been on *private* infrastructure, especially *infrastructure equity funds*. In addition, *direct* investments by institutional investors have become popular with some insurance companies and larger pension funds, e.g. especially in Canada, the Netherlands and Nordic countries.

Preqin report fundraising volumes in infrastructure *funds*²³ of US\$ 214bn over the years 2004-2012. Annual figures have been rather volatile, with highs in 2007 (US\$ 45bn) and lows in 2009 (US\$ 9bn). The 2012 level of US\$ 24bn is similar to 2011 (US\$ 23bn) (Fig. 4). A further US\$ 93bn of capital is currently being sought on the road by 146 new funds.

Fig. 4: Annual Infrastructure Fundraising



The vast majority of infrastructure funds are equity funds. Only 39 debt funds were closed between 1998-2012 with a total volume of US\$ 18.8bn, i.e. less than 10% of total fundraising.

²³ Preqin figures are taken from the latest available Preqin Infrastructure Spotlight reports. Infrastructure funds are defined as “funds that are pursuing opportunities for investments as equity partners in large scale projects” in economic and social infrastructure. Economic infrastructure includes clean technology, distribution/storage facilities, environmental services, telecommunications, satellite networks; transportation - aviation/aerospace, bridges, parking lots, railways, roads, sea ports, tunnels, utilities - energy, natural resources, renewable energy, water, waste management. Social infrastructure includes defence/national security, education facilities, healthcare/medical facilities, judicial buildings, prisons, senior homes.

However, the interest in debt has been rising in recent times: 8 debt funds were closed in 2012 with a volume of US\$ 2.7bn. 14 more funds are currently on the road, seeking a further US\$ 8.3bn. European debt markets are the main focus of 70% of the latter.

In terms of *transactions*, Preqin registered over 2000 separate deals made by unlisted infrastructure fund managers between 2004 and 2012. Over the last 3 years, there were between 250-300 deals pa, with a typical annual average volume of US\$ 400m, resulting in annual deal volume of roughly US\$ 100-120bn.

European infrastructure assets accounted for close to half of the deals in 2011 and 2012, and about 45% of all deals in the data bank. In terms of sectors, Preqin report a relatively even spread across transport, renewables, utilities and social, with smaller shares of telecom and waste. Only about one third are greenfield deals, close to half are secondary, and the rest are brownfield deals.

From a different perspective, Towers Watson (2012) analyses 53 infrastructure *fund managers* with total infrastructure assets under management of US\$ 266bn. The top 20 managers have US\$ 221bn. 62% or US\$136bn is owned by pension funds, 8% by SWFs, 8% by insurance companies, and 1% by endowments/foundations.

In terms of regions, close to half of infrastructure assets with alternative asset managers are headquartered in Europe. Infrastructure asset management is comparatively concentrated. The top manager (Macquarie) is reported to have a market share of 40%, the top 5 managers control two thirds of assets.

Listed infrastructure equity *funds* were particular popular in Australia before the financial crisis, often containing highly leveraged unlisted infrastructure assets (the 'old' Australian model). These days, Preqin count about 50 listed infrastructure funds with very different mixtures of listed and unlisted companies in different regions.

Conclusion

Infrastructure funds currently raise about US\$ 20bn per annum globally, around 90% of which is equity. In recent years, some 250-300 deals have been registered per year by these funds. Half of the global deal volume of US\$ 100-120bn involves European assets.

The interest is growing in infrastructure debt funds although volumes are still low. They currently have a strong focus on Europe, potentially contributing some US\$ 2bn to infrastructure debt finance there.

4.3 Corporate bonds, municipal bonds, infrastructure bonds

Corporate bonds are an important financing instrument for infrastructure companies on capital markets, especially large utilities. However, hardly any infrastructure bond index is known (an exception is the Canadian corporate bond sub-index 'DEX Universe Infrastructure Bond Index').

Given the traditional reliance of bank debt, the European corporate bond market is less developed than the US market, and also much smaller than the European equity market.

Western Asset Management (2012) identified 85 core infrastructure issuers in Europe with a market value of approximately £ 190bn of debt outstanding (60% in Euros, 40% in Sterling), and an index weight of 3% within the Barclays European Aggregate Bond Index,²⁴ Such a universe is still small compared to EU GDP (1.5%).

In the USA, (tax-exempt) *municipal bonds* are a major contributor to infrastructure finance. Annual issuance is in around US\$ 400bn, the total market volume is over US\$ 3.5tn.

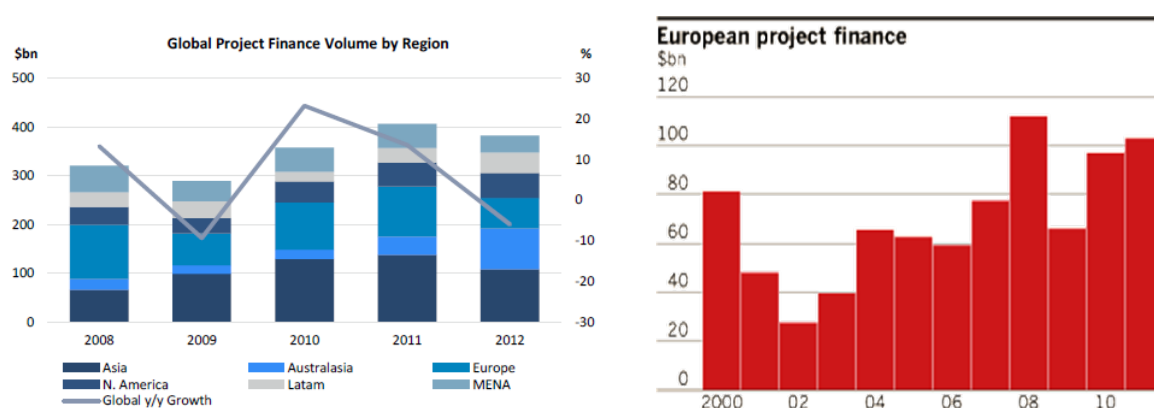
'Infrastructure bonds' are being heavily discussed in many developing countries. Sawant (2010) analysed 60 infrastructure bonds from 15 emerging markets. Chile created infrastructure bonds in 1998, i.e. effectively corporate bonds to finance infrastructure projects of public interest under certain concessions and regulations. A number of other countries have also issued infrastructure bonds (e.g. Peru, South Africa) or 'structure bonds' (Mexico) that are popular with domestic institutional investors (Stewart and Yermo 2012).

4.4 Project finance

Project finance has traditionally been used for both private and public infrastructure. Project finance and PPP statistics are popular for representations of private finance developments in infrastructure. However, it should be noted that project finance reaches beyond infrastructure, and infrastructure goes much further than private finance.

According to Dealogic (2013a), the overall global project finance volume was US\$ 382bn in 2012, down from the record US\$ 407bn in 2011. The number of projects was also down from 976 to 901. Volumes moved in the range of US\$ 350-400 in recent years (Fig. 5).

Fig. 5: Global and European Project Finance Volumes



Source: Dealogic (2013a)

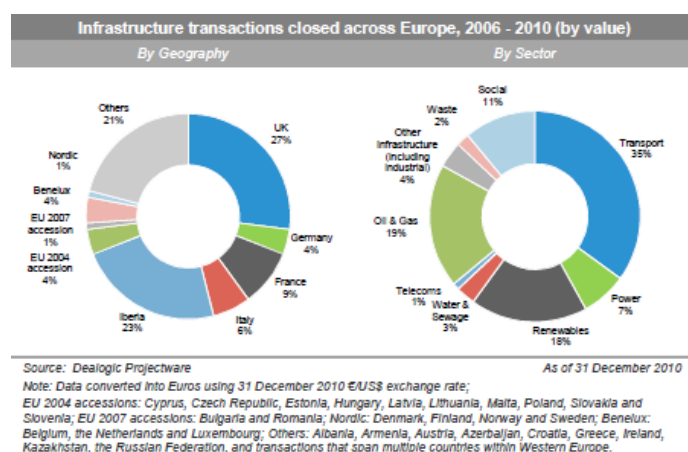
However, the regional shares tend to fluctuate considerably over the years, especially in Europe. The European project finance volumes were in the range of US\$ 60-110 since the

²⁴ "Our definition includes rail, roads, ports, airports, distribution and transmission utilities (i.e., water, sewerage, gas, electric and oil pipelines), social housing, PFI/PPP concessions, government accommodation (such as military housing), and telecommunications networks. We exclude power generation, integrated utilities, renewable energy, telecommunication operators and stadiums."

late-2000s, with 2009 and 2012 being weak years (Fig. 5). The 2012 volume of US\$ 63.5bn was strongly down from US\$ 103bn in 2011.²⁵

Within the EU, the UK (US\$ 17.2bn) and France (US\$ 13.2bn) recorded the highest volumes in 2012. In 2011, the leading European countries were Spain (US\$ 18.4bn), France (US\$ 18.2bn), UK (US\$ 14.9bn) and Italy (US\$ 8bn). The UK and Iberian markets were the largest within the EU over the years 2006-2010 (Fig. 6).

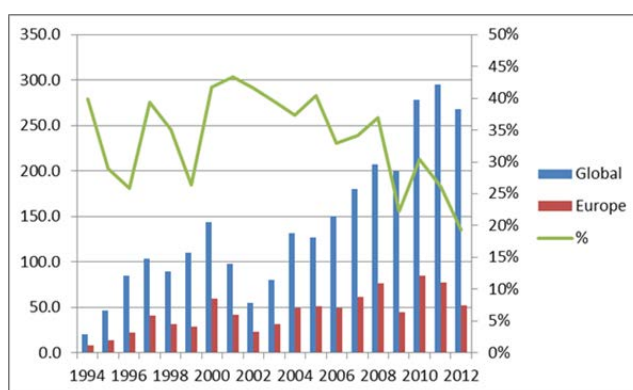
Fig. 6: European infrastructure transactions



Source: RREEF (2011a)

Taking a longer-term perspective, project finance has been rising in several waves since the early 1990s (Fig. 7). The total global volume of project finance debt between 1994 and 2012 was US\$ 2667bn (Blanc-Brude and Ismail 2013). Europe had a share of nearly one third over the 18 years with a volume of US\$ 847bn. However, that share has fallen since the financial crisis.

Fig. 7: Global project debt by region, US\$ bn, 1994-2012

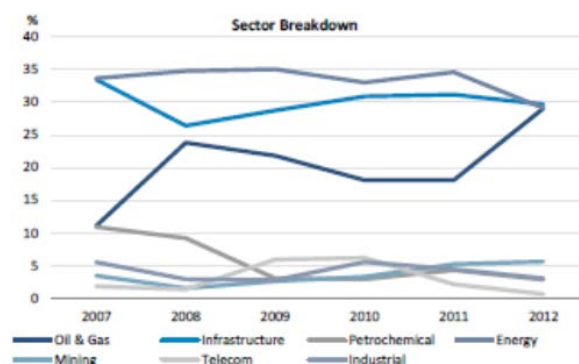


Source: Dealogic, Blanc-Brude and Ismail (2013)

²⁵ US\$ 55bn in Western Europe and US\$ 8bn in Eastern Europe in 2012, down from US\$ 75bn and US\$ 28bn in 2011. The number of deals was 187 in Western Europe and 17 in Eastern Europe in 2012, down from 247 and 36 in 2011, respectively.

In terms of sectors, attention needs to be paid to the labels. Dealogic narrowly defined 'infrastructure' sector covers only transport and social infrastructure projects. 'Infrastructure'²⁶, energy & power²⁷ and oil & gas²⁸ are by far the biggest three sectors, with global volumes of US\$ 114bn, US\$111bn and US\$ 111bn respectively in 2012. Smaller sectors include telecom²⁹, water & sewage³⁰, chemical & petro-chemical³¹, mining³² and industrial³³ (Fig. 8). Within Europe, transport (35%), social infrastructure (11%) and renewables (18%) had relatively large shares in international comparison (RREEF 2011a).

Fig. 8: Project Finance Sectors



Source: Dealogic (2013a)

Projects are said to be eligible if there is “involvement of infrastructure specific sectors, both economic and social” (Dealogic 2013b). It is obvious that the universe is stretched very widely: industrial, mining and chemical are normally not considered to be infrastructure sectors. The same is true for certain types of assets, e.g. hotels and casinos, oil refineries. Power generation and renewables are disputed areas.

In terms of the financing instruments, the dominant share is loan financing. The global volume of loans was US\$ 289bn in 2012, down from US\$ 327bn in 2011. On the other hand, project bonds recovered somewhat from the lows post financial crisis. The volumes went up from US\$ 15.6bn to US\$ 24.9bn over the year. Equity financing was US\$ 67.9bn in 2012 (US\$ 63.7bn in 2011).

For the EU, the share of equity has fluctuated around 20% while the project bond market has almost disappeared post 2008 (Fig. 9).

²⁶ “Airport, Bridge, Tunnels, Canals, Ports, Railroads, Urban railway/ LRT/ MRT/ Light rail. Casinos, Defense, Education, Government buildings, Hotels, Hospital / Healthcare, Police, Prison, Sports and leisure facilities. Other infrastructure projects; Residential property/ Service stations/ Car parks are excluded (unless PPP/PFI project).” (Dealogic (2013b).

²⁷ “Wind farm, Solar power plants, Geothermal, CCGT, IPP, Coal-fired, Gas-fired, Oil-fired, Biomass, Hydropower, Nuclear, Repowering, Tidal.”

²⁸ “Gas field development, Gas pipeline, Gas distribution networks, Oilfield development, Oil pipeline, Oil refinery, LNG and LPG plants, FPSO, Gas storage, Oil storage, Re-gasification.”

²⁹ “Cable, Fiber Optic, Transmission/ Receiving towers, Base stations, Fixed-line, Satellite.”

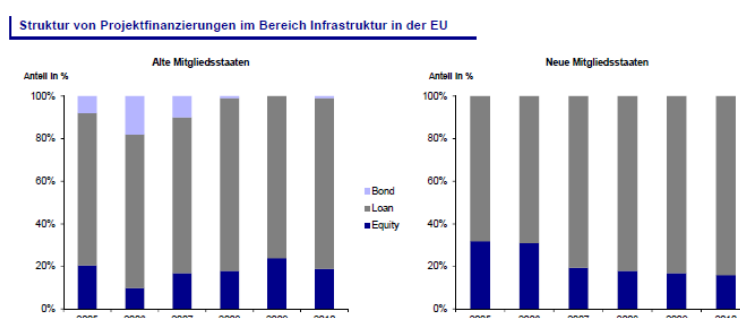
³⁰ “Water distribution, Desalination, Water treatment, Sewerage.”

³¹ “Biodiesel plants, Chemical plants, Petroleum plants, Petrochemical plants.”

³² “Precious metals extraction, Facilities and operations for mining, smelting and processing of precious metals.”

³³ “Pulp & paper mills, Metal processing plants, Smelting, Steel mills, Cement plants, Industrial zone developments (as long as PPP nature).”

Fig.9: Financing instruments in Europe



Source: Kleine et al. (2012)

As an alternative data source, Thomson Reuters (2013) concentrates on project finance loans. The European loan volume in 2012 was US\$ 46.3bn, down from US\$ 72.2bn in 2011. There is no explicit definition of 'infrastructure' but, here too, power, transport and oil& gas are the largest sectors by far.

Conclusion

Global project finance volumes have been fluctuating around US\$ 350-400bn in recent years, i.e. a share of global GDP of roughly 0.5%. European volumes – about one third in the long term – are rather volatile; they were in the region of US\$ 60-110bn over the last few years, i.e. a share of about 0.3% - 0.5% of GDP.³⁴

The most important sectors are power (including renewables), oil & gas and transport. There is no precise infrastructure definition used in project finance data, as they include a sizeable amount of sectors and assets that are not considered 'infrastructure' in an economic or financial definition.

4.5 Public–Private Partnerships

Public–private partnerships (PPP) have become increasingly relevant for public infrastructure investment, as an alternative to spending by the governments or (privatized) infrastructure companies.³⁵

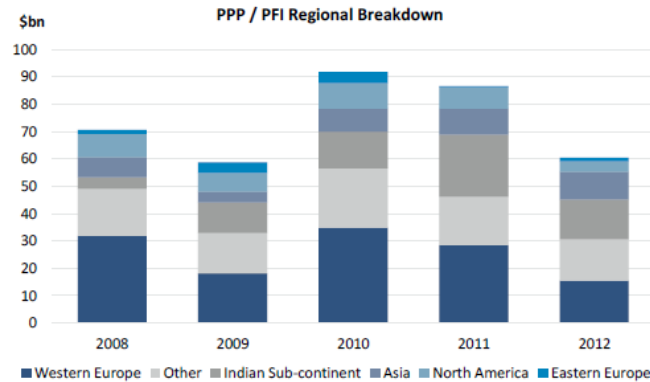
Global PPP volumes were in the region of US \$ 60-100bn in total in recent years. According to Dealogic (2013a), the 2012 total volume was US\$ 57bn, down substantially from US\$ 95.4bn in 2011. Thereby, the share of PPP fell to 15% of project finance, the lowest since 2001 (10%). Traditionally, that share had ranged between 20-25%. The number of PPP deals was 214 in 2011 and 191 in 2012.

³⁴ Wagenvoort et. al. (2010) have project finance in the EU at 0.33% of GDP for the years 2006-2009, i.e. US\$ 54bn (using 2009 GDP).

³⁵ PPPs are a form of project finance that involves a contract between a public sector authority and a private party to provide a public project or service. Depending on the constituency, such schemes are sometimes referred to as PPP, P3 or PFI. Typically, a public sector consortium forms a SPV to develop, build, maintain and operate the asset for the contracted period. The risk-sharing depends on the specific contract.

Western European PPP deals were in the range US\$ 15-30bn in recent years (Fig. 10). The 2012 total volume dropped to US\$ 15.5bn (share of 27.5% of global) from US\$ 28.5bn in 2011.

Fig. 10: PPP by region



Source: Dealogic (2013a)

Dealogic's 'infrastructure' (i.e. transport, social, leisure & property) leads all other sectors with a global volume of US\$ 47.5bn and a share of 83% in 2012. Energy & power fell to a level of US\$ 5.1bn, a share of 9%. Most PPP can be considered as infrastructure, in contrast to non-PPP project finance.

EPEC (2013) reports PPP figures for the European markets in the region of € 12bn-30bn (Fig. 11). The best years were 2005 to 2008. The volume was very weak in 2012: € 11.7bn, down from € 17.9bn in 2011. The number of deals was also down from 84 to 66. France led the other European markets in 2011, and so did the UK in 2012.

Fig. 11 European PPP



Source: EPEC (2013)

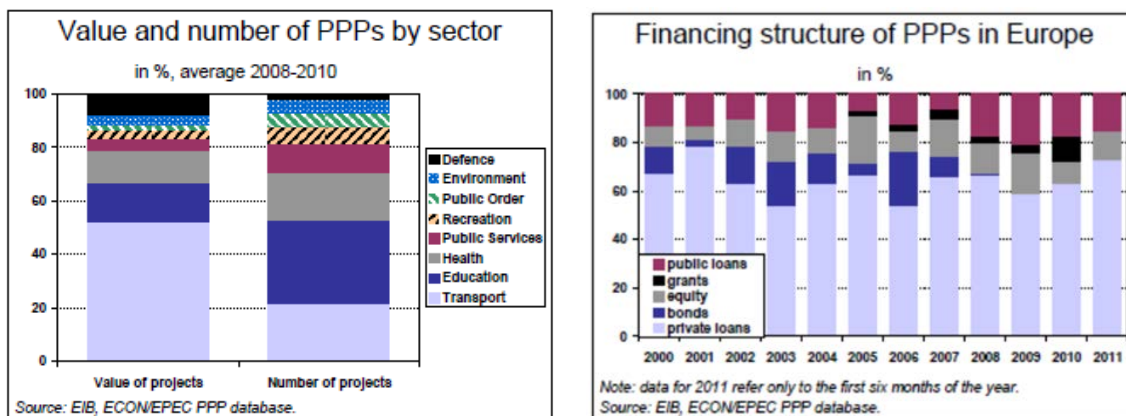
Taking a longer term perspective, the total volume of PPP deals over the period 1990-2012 was € 308bn (Kappeler 2011, EPEC 2012, 2013). Close to half of the volume was in the UK, followed by Spain and France (Table 5).

	1990-2012	%	2011		2012	
Total EU	308	100%	17.9	100%	11.7	100%
<i>E bn</i>						
UK	141	46%	3.2	18%	5.7	49%
Spain	34	11%	0.3	2%	0.2	2%
France	32	10%	11.0	61%	3.9	33%
Portugal	21	7%	0	0%	0.1	1%
Greece	14	5%	0	0%	0	0%
Germany	11	4%	1.3	7%	0.2	2%
Italy	11	3%	0.9	5%	0.2	2%
Belgium	6	2%	0.7	4%	0.2	2%
Netherlands	7	2%	0	0%	0.9	8%
Other EU	32	10%	0.5	3%	0.3	3%

Source: Kappeler (2011), EPEC (2012, 2013)

In terms of sectors, transport took about half the volume over the period 2008-2010, and around 60% in 2011 and 2012. The number of deals was highest in social infrastructure, especially education, although with a much smaller average size (Fig. 12). Energy and other utilities hardly play a role in EU PPP, but 'environment', including waste management, does.

Fig. 12: European PPP



Source: Kappeler (2011)

Fig.12 demonstrates the dominance of private loan financing in European PPP. Bond financing (mostly UK PFI bonds) has almost disappeared since the financial crisis while public loans, e.g. by governments and financing institutions play an increasing role post 2008. The EIB increased their involvement to 17% and 18% of PPP deals in 2009 and 2010 (Kappeler 2011).

Conclusion

Globally, PPP contributed an investment volume of about US\$ 60-100bn, i.e. a fifth to a quarter of project finance volumes, fluctuating at around 0.1% of global GDP. In the EU, PPP

plays a comparatively important role, with volumes ranging between US\$ 15-40bn, i.e. 0.1-0.2% of GDP. However, activity has halved since the 'good years' 2005-2008.

The UK has in the past produced nearly half of EU PPP volumes. Transport is by far the strongest sector in terms of volume while the highest number of (smaller) deals is in social infrastructure. Private loans are the historically the predominant PPP financing tool in Europe but during the crisis, public loans and multi-lateral institutions played a countercyclical role.

4.6 Project bonds

Project bonds are debt instruments issued by project finance companies for investment by institutional investors and other financial institutions. They are often tradable on secondary markets but can also be private placements.

Project bonds constitute about 10% of global project debt in the long term (1994-2012). However, the share was much lower in recent years (between 3% and 8% since 2007). The volume was US\$ 23bn in 2012, up from US\$ 14bn in 2011 (Blanc-Brude and Ismail 2013). As an example, Canada is a countries with a well-established project bond market, and a history of insurance companies being long-term investors in them (Inderst and Della Croce 2013).

Europe's project bond market is rather small and underdeveloped. There was an exception in the UK, where PFI bonds were common before the financial crisis, typically 'wrapped' or guaranteed by a 'monoline' insurance company (EPEC 2012). Institutional investors reportedly bought approximately £15 billion of bonds issued by PPP project companies in the UK between 1997 and 2008.

The Europe 2020 Project Bond Initiative by the EU and the EIB aims to kick-start an ailing capital market (European Commission 2011, Rosales and Vassallo 2012). EU forecasts are in the range of € 1-5bn initially and € 10-20bn by 2020. A pilot scheme of € 230m should stimulate infrastructure investments of € 4.4bn (using a multiplier of 19). A commitment of € 10-20bn by 2020 could help create a project bond market of € 110-200bn (Bassanini et al. 2011). This would equate to about 1 to 1 ½% of EU GDP.

4.7 Rated infrastructure and project finance debt

Rating agencies are another source of information in infrastructure finance. Naturally, they concentrate on the sub-set of *rated* loans and bonds.

Moody's (2012b) analysed the credit performance of over 1000 *corporate infrastructure and project finance entities* as well as over 2100 *US municipal issuers* between 1983 and mid-2012. The definition of infrastructure is "broad" to cover "large, capital-intensive, critical

assets that underpin economic activity". They include social infrastructure but exclude telecom and oil & gas exploration and production.³⁶

In terms of the numbers of issuers, these statistics are primarily driven by US municipal bonds: 95% of issuers are North American. Utilities constitute 86% of all debts, transportation 13%. Within utilities, water has the largest share.

In terms of volumes, US\$ 2.4tn was issued by corporate infrastructure and project finance entities (unfortunately, figures are not separated), and US\$ 0.8tn by US municipal issuers. In the first group, with a share of 43%, Europe is slightly ahead of the USA (38%), equivalent to a volume of about US\$ 1tn. The average size of issuance is much smaller in the USA than outside.

In an earlier report, Moody's (2009) analysed 600 rated *project finance debts* between 1992 and 2008, when the total volume grew to US\$ 120bn. North America has a share of 53% of the latter, the UK 18% (US\$ 22bn) and the rest of EMEA 8% (US\$ 10bn). Project finance is not limited to infrastructure but also includes industrial, natural resources and public services.

Moody's (2012a) analysed about half of the 6941 *project finance loans* in the Thomson Reuters database, with a volume of US\$ 1995bn, over the period 1983-2010. About one third of them are classified as 'infrastructure' (in a very narrow sense of transport and social assets / services procured by project finance only).³⁷ In addition, 35% are in the power sector, 11% in oil & gas and 9% in telecom. 23% of projects are counted as PPP/PFI. Europe's share is relatively high: 35.6% of the number of loans in the full ThomsonReuters dataset is located in Western Europe, 4.8% in Eastern Europe.

Conclusion

About US\$ 2.4tn of infrastructure debt of both corporate and project finance entities has been rated by Moody's globally since 1983. The figure for Europe is US\$ 1tn, giving an annual average of over US\$ 30bn, i.e. about 0.2% of GDP. Of course, not all infrastructure debt is rated.

5. Institutional investment in infrastructure

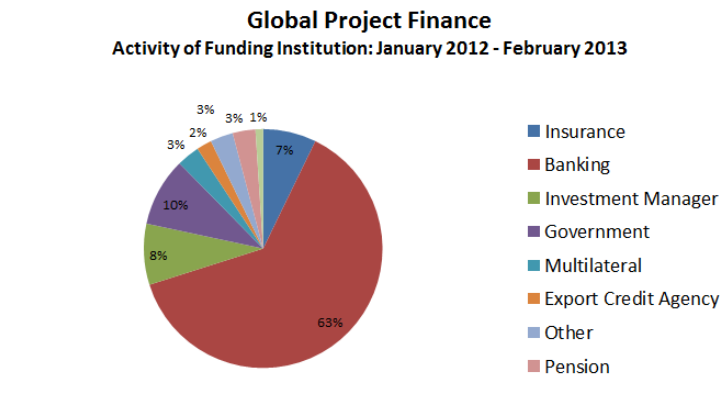
Institutional investment in infrastructure has become a much discussed topic in recent years, also in terms of public policy. Governments and other institutions call for a heavier engagement of pension funds, insurance companies etc. in infrastructure projects, and 'long-term investing' more generally (European Commission 2013a).

³⁶ "Typical infrastructure debt helps finance power and transport systems including electric generation, electric and natural gas transmission and distribution networks, long-haul energy pipelines (projects and operating companies), water and wastewater companies, integrated utilities, roads, bridges, ports, airports, and other fundamental facilities serving a country, city or other particular area (such as stadiums, military installations and hospitals). (...) Telecommunications, mining or oil and gas exploration and production companies are typically not viewed as infrastructure."

³⁷ The definitional inconsistencies in relation to the term infrastructure, particularly in the context of project finance, are exemplified by the fact that Moody's use two different definitions of 'infrastructure' in this paper: a wider definition in the general discussion and a narrower one (transport and social) for the data work (p. 4).

As an indication, according to S&P, institutional investors sourced about 18% of (only) global *project finance* over the recent 14 months, this compared to nearly two thirds by banks and 10% by governments. Smaller contributions came from multilateral institutions and other agencies (Fig. 13).

Fig. 13. Global Project Finance by Funding Institutions



Source: S&P

In this discussion, it is often overlooked Institutional investors have been investors in infrastructure for a long time, e.g. as shareholders of infrastructure companies listed on public stock exchanges, in IPOs of privatized utility companies, as buyers of corporate bonds of infrastructure companies, or municipal bonds.

Institutional investors have in recent years been experiencing low asset returns, high market volatility and often rising liabilities connected to low interest rates and improved longevity. At the same time, investors are seeking to diversify portfolios better than in the past and looking for alternative sources of return and income.

Infrastructure investments potentially offer some useful characteristics for pension funds and insurance companies that have to match long-term, annuity-type liabilities. They include long-term, predictable income streams, low correlations to other asset classes, relatively favourable default and recovery rates of project finance (compared to corporate debt). However, new accounting rules and prudential regulations are perceived hindrances to long-term investing in less liquid asset classes.

More recently, the focus has been on institutional investing in dedicated private investment vehicles such as:

- closed-end funds, often private equity-style (popular in Europe and the USA)
- open-ended funds (the 'new Australian model')
- direct investments in (private) infrastructure projects and companies (the 'Canadian model')
- co-investment in different forms (alongside other institutional or other investors, in investor 'clubs', 'alliances', 'platforms' such as the UK PIP).

The main preference of most institutional investors is for lower risk, operating infrastructure assets with predictable, often inflation-linked, cash flows ('coupon clipping'). Some pension

funds, especially very large and well-funded ones, are also able to take on construction risks, or should consider so (Blanc-Brude and Ismail 2013).

Expectations have been raised that institutional investors could not only keep rising their equity investments in infrastructure but also get more heavily involved on the debt side. The interest in debt fund has been rising, and nowadays there are first examples of some direct loans investing by insurance companies and larger pensions funds.

Surveys for institutional investment in infrastructure need to be interpreted with care. First, 'institutional investors' include not only end-investors, or asset owners, but also other financial institutions (such banks, asset managers and investment companies) that may (fully or partially) act as 'intermediaries'. This can lead to double-counting.

Second, there is a sampling bias in such surveys. The 'true' overall asset allocation of institutional investors is likely to be smaller because many investors do not invest in infrastructure funds at all and/or are not covered in such sampling universes. Third, asset allocation figures tend to be 'size-biased' because smaller pension funds tend to have smaller allocations to infrastructure than larger funds, if any.

5.1 Pension funds

Australian and large Canadian pension funds have been pioneers in this field since the 1990s and early 2000s. In Europe, some larger pension funds started dedicated infrastructure investments in the mid-2000s, and the number of investors has been rising since.

There are no precise figures available on pension funds' investments in infrastructure. To start with the leading countries, in Australia, the average asset allocation to infrastructure is estimated at 5-6% of asset, equivalent to A\$ 70-85bn. In Canada, there is an average asset allocation figure for pension funds of roughly 5%.

Preqin have over 600 pension plans in their database (about 225 public plans, 255 private plans and 75 superannuation schemes). Aggregate assets are US\$ 8.4tn. The average asset allocation to infrastructure is 3.3%, the target allocation 5%.

39% of pension plans are based in Europe but only two of the top 10 pension plans in terms of infrastructure assets are European: ABP (NL) with commitments of US\$ 6bn and ATP (DK) with US\$ 2.6bn (the top 3 plans are all Canadian).

The OECD Large Pension Funds Survey 2011 (OECD 2012c) collected data from 52 large pension fund and public pension reserve funds, 28 of which provided infrastructure investment data. Total infrastructure investments were US\$ 42bn. This is equivalent to 2.9% of their assets (US\$ 1.5tn), or 0.5% of the overall assets (US\$ 7.7tn) of the full sample of 52 plans. Towers Watson (2013) report global pensions assets of US\$ 29.8tn, while Towers Watson (2012) find US\$ 136bn of pension fund assets with the top 20 infrastructure managers.

To put the pieces together: pension fund investment in infrastructure has been growing strongly in recent years but is still small compared to overall assets of US\$ 30tn. A benchmark volume figure of US\$ 300 implies a percentage of about 1%.³⁸

5.2 Other institutional investors

Preqin count 173 *insurance companies* with average assets under management of US\$ 83bn. The average asset allocation to infrastructure is 1.9%, the target allocation 2.5% (of the insurers in the universe). This implies insurers' infrastructure investments of currently about US\$ 270bn, an amount similar to that of pension plans globally. 38% of insurance companies are based in Europe.

Sovereign wealth funds (SWF) are reported to manage assets of US\$ 5.2tn (TheCityUK 2013b). In addition, US\$ 7.7tn is managed by other sovereign investment vehicles, such as pension reserve funds and developments funds. 56% of SWFs say they do invest in infrastructure. The infrastructure investment volume is estimated at about US\$ 55bn between the years 2005-2012, which would imply only a small asset allocation percentage of 1% or so.

Between 2007 and mid-2012, about US\$ 26bn were invested by SWFs in *foreign* infrastructure assets, with Europe being by far the most popular destination (US\$ 16bn). The picture is mixed in terms of sectors and preferred vehicles. (Barbary 2013)

Preqin also report 114 *foundations and family offices* with average assets under management of US\$ 2.4bn. The average asset allocation to infrastructure is 3.3%, the target allocation 5.4%. This implies infrastructure investments of currently about US\$ 9bn.

Conclusion

Institutional investors have been increasing their asset allocation to specialist infrastructure funds and direct investments especially since the mid-2000s. The focus has so far been on equity with a share of about 90%.

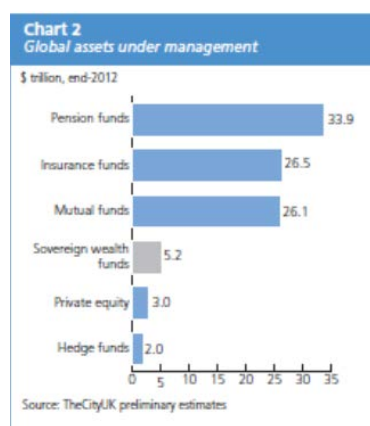
As benchmark figures, estimates of pension plan investments in dedicated infrastructure vehicles are US\$ 300bn, of insurance companies around US\$ 270bn, of SWFs around US\$ 50bn, of foundations and family offices US\$ 10bn globally. This gives a total for institutional investors in a narrow sense (asset owners) of roughly US\$ 600-700bn, or around 1% of institutional assets. (Incidentally, this estimated (cumulative, not annual) value is also about 1% of GDP.)

³⁸ Here, an important reminder is required. These figures for infrastructure allocations do in most cases not include the traditional investments in listed utility, transport and other infrastructure stocks or bonds. For example, if pension funds hold about half of their assets in equities, and infrastructure stocks constitute 5% of world stock markets, the implied asset allocation in them is 2.5% or roughly US\$700bn. Similar calculations can also be made for other institutional investors, and corporate bonds.

5.3 Institutional investor potential

What more could institutional investors contribute? The OECD reports institutional assets of US\$ 75tn at the end of 2010. This includes pension funds (US\$ 20.4tn), insurance companies (US\$ 24.3) and investment companies (US\$ 28.8tn). In a somewhat wider calculation (TheCityUK 2013), global assets under management reach US\$ 97tn at the end of 2012 (Fig. 14). A further US\$ 42tn is estimated to be in private wealth funds (TheCityUK 2012).

Fig. 14: Global Assets under Management



Source: TheCityUK 2013

For the purpose of this exercise, we concentrate on institutional assets with pension funds, insurance companies and SWFs, i.e. about US\$ 65tn. Most of the money in mutual funds is retail money although some countries, like France, have also a sizeable institutional presence there.³⁹

Asset allocation scenarios

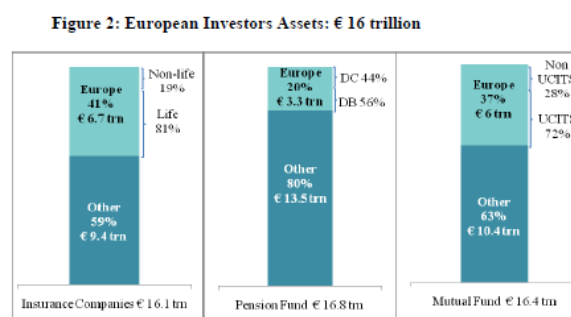
On a simple calculation, and taking a benchmark figure for global institutional assets of US\$ 70tn, a flat allocation of 1% results in US\$ 0.7tn to infrastructure investments. An increase to 3% (or 5%) would imply an allocation about US\$ 2.1tn (or 3.5tn). Spread out over 10 years, this could generate additional infrastructure investments of US\$ 140bn (280bn) annually.

Such overall asset allocation shifts would be quite considerable in the 'alternative asset' space. However, these flows could still add 'only' 0.2-0.4% of GDP per annum, and only up to 10% of the projected infrastructure investment requirements.

The story is not much different in Europe. The European Commission refers to institutional assets in Europe of € 13.8bn (EFAMA 2012). Kleine et al. (2012) find € 5.9bn of assets in pension funds and insurance companies in 6 EU countries (D, A, F, UK, PL, S). Bassanini et al. (2011) calculate a figure of € 16tn (€ 6.7tn with insurance companies, € 3.3tn with pension funds and € 6tn with mutual funds) in 2010 (Fig. 15).

³⁹ Retail investing and mutual funds would deserve a separate discussion as they are subject to different decision processes, regulation and liquidity requirements. Dedicated infrastructure investments are still at very low levels although some instruments and vehicles may well be suitable.

Fig. 15: European Assets under Management



Source: OECD, CEA, Swiss Re, Fitch and CDP' calculations

Source: Bassanini et al. (2011)

Taking a benchmark figure for European institutional assets of € 14bn, a 1% allocation to infrastructure is equivalent to € 140bn of assets. An increase to 3% (or 5%) would imply an allocation about € 420bn (or 700bn). Spread out over 10 years, this could generate additional infrastructure investments of € 28bn (56bn) annually, or 0.2-0.4% of GDP.

Such amounts are perhaps short of the high expectations often raised. Furthermore, investors need their good reasons for such changes, as their primary concern is generally the investment performance in the context of their specific objectives (such as paying pensions and annuities).

Such simple calculations have their limits, of course, and objections can be raised from various sides. One factor is international capital flows. Europe has so far been a favourite destination for many infrastructure funds. Also, there are potential barriers to such asset allocation shifts (see below).

6. Comparing supply and demand

This study undertakes a more systematic analysis by putting demand and supply of (private) infrastructure investment into a single frame (i.e. percentages of GDP). The approach taken may appear crude and simplistic, and is subject to revision and update. Nonetheless, it is important to form a fuller picture of the situation in order to progress.

Box 3 summarizes some 'benchmark' figures to indicate the orders of magnitude in this field. It presents both global and European estimates. One can draw some conclusions from this exercise.

1. Core projections of future infrastructure investment up to 2030 are 3.7% of GDP globally and 2.6% for the EU for economic infrastructure. Social infrastructure adds about 1% in Europe. These figures still imply huge amounts of annual investments, with benchmark

figures for economic infrastructure of US\$ 3300bn globally and nearly € 500bn in the European Union (and over € 650bn when adding social infrastructure).

2. Public infrastructure spending has been on a secular decline in Europe to a level of about 1 1/4% of GDP. Given the fiscal constraints, a continued, if not increasing contribution by the private sector will be required.

3. The main contribution to infrastructure investment comes from the *corporate sector*, especially *listed infrastructure and utility companies*. However, capital raising and IPOs have recently been slow on the stock markets in recent times. Unfortunately, the role of *smaller companies* in this field has hardly been analysed or recognized to date.

4. Dedicated *private infrastructure funds* have been mushrooming since the mid-2000s. The annual fundraising of about US\$ 20bn is still small but is likely to rise further. About half of the annual deal volume of over US\$100bn from such funds goes to Europe, i.e. 0.3% of GDP. They are 90% equity-orientated although a range of debt funds have been launched over the last few years.

5. The role of *project finance* has been growing in two waves since the 1990. The contribution of 0.4% of GDP covers only roughly 10% of total infrastructure investment, the main sectors being energy (including renewables), oil & gas and transport.

6. *Public-private partnerships* are an important financing arrangement especially in social infrastructure and transport, especially in the UK, France and on the Iberian, when *public loans* from government and development banks came to support. Overall, the contribution of 0.1% of GDP is still small and can be expanded.

7. *Project bonds* constituted about 10% of global project debt in the long term but the share was lower in recent years. Europe's project bond market is rather underdeveloped, and came practically to a halt post financial crisis. There are new encouraging developments underway but it will take some time and effort to develop a sizeable project bond market comparable to, e.g., USA and Canada.

8. *Bank loans* are the dominant traditional financing instrument in Europe, and it is difficult to see the future for infrastructure investments without a properly working bank lending market. More institutional investors, especially insurance companies and large pension funds, are now attracted by longer-term *direct loans* in a low interest rate environment, and this market has certainly further potential.

9. *Institutional investors* are these days being called into increasing their contribution. Pension funds and insurance companies have started to allocate capital to specialist infrastructure funds as well as directly to projects over the last 10 years. The current allocation is estimated to be about US\$ 700bn worldwide, i.e. around 1% of assets and also about 1% of GDP (as a cumulative, not annual value). Furthermore, they have been major (indirect) contributors as shareholders or bondholders of infrastructure companies for some time.

10. The perspective here is that the institutional investor could provide some additional contribution to infrastructure finance but expectations need to be realistic. Even a strong shift in the average asset allocation up to 3% or 5% across the board over the next 10 years would imply an annual capital supply of € 30-60bn in Europe, or 0.2%-0.4% of GDP. That is only up to 10% of the projected infrastructure investment requirements.

11. In a nutshell, given the high future infrastructure investment requirement, the public sector can hardly withdraw. On the private side, Europe's traditional forces of bank lending and corporate capital expenditure will need to keep working, and so does the public sector. However, there is much scope for an increased contribution of alternative financing arrangements, especially PPPs, and the development of capital markets and instruments, such as project bonds and suitable funds. Institutional investors can play an increasing role but there are investment barriers that need to be recognized, and worked on.

Box 3: Demand and supply of infrastructure capital: some benchmark figures							
	<i>per year (except)*</i>	<i>World US\$ bn</i>	<i>% GDP</i>	<i>EU/Europe</i>		<i>region</i>	<i>approx. % of global</i>
<i>US\$/€ = 1.4</i>	<i>2011</i>	<i>70000</i>	<i>100%</i>	<i>€ bn</i>	<i>% GDP</i>		
Infrastructure investment							
<i>Historical</i>	<i>economic</i>	<i>2400</i>	<i>3.8%</i>	<i>330</i>	<i>2.6%</i>	<i>EU</i>	<i>20%</i>
	<i>plus social</i>			<i>450</i>	<i>3.6%</i>	<i>EU</i>	
<i>Future needs</i>	<i>economic</i>	<i>3300</i>	<i>3.7%</i>	<i>500</i>	<i>2.6%</i>	<i>EU</i>	<i>20%</i>
	<i>plus social</i>			<i>600</i>	<i>3.6%</i>	<i>EU</i>	
Supply of capital							
<i>Listed infrastructure & utility stocks</i>	<i>market cap*</i>	<i>3000</i>	<i>4%</i>	<i>1000</i>	<i>8%</i>	<i>Europe</i>	<i>45%</i>
	<i>Utilities capex investment</i>			<i>60</i>	<i>0.5%</i>	<i>EU</i>	
<i>Infrastructure funds</i>	<i>fundraising</i>	<i>20</i>	<i>0.0%</i>	<i>7</i>	<i>0.1%</i>	<i>Europe</i>	<i>50%</i>
	<i>deal volume</i>	<i>100</i>	<i>0.2%</i>	<i>35</i>	<i>0.3%</i>	<i>Europe</i>	<i>50%</i>
<i>Corporate infrastructure bonds</i>	<i>market cap*</i>			<i>220</i>	<i>2%</i>	<i>Europe</i>	
<i>US municipal bonds</i>	<i>annual issuance</i>	<i>400</i>	<i>0.6%</i>				
<i>Project finance</i>	<i>deal volume</i>	<i>375</i>	<i>0.5%</i>	<i>65</i>	<i>0.5%</i>	<i>Europe</i>	<i>25%</i>
	<i>of which PPP deal volume</i>	<i>75</i>	<i>0.1%</i>	<i>15</i>	<i>0.1%</i>	<i>EU</i>	<i>30%</i>
	<i>of which project bonds deal volume</i>	<i>20</i>	<i>0.0%</i>	<i>0</i>	<i>0.0%</i>	<i>Europe</i>	<i>0%</i>
<i>Rated infrastructure debt</i>	<i>average 1983-2012</i>	<i>80</i>	<i>0.1%</i>	<i>24</i>	<i>0.2%</i>	<i>Europe</i>	<i>40%</i>
Institutional investors							
<i>Institutional assets</i>	<i>market value*</i>	<i>70000</i>	<i>100%</i>	<i>14000</i>	<i>110%</i>	<i>Europe</i>	<i>28%</i>
<i>Private infrastructure</i>	<i>1% of assets*</i>	<i>700</i>	<i>1%</i>	<i>140</i>	<i>1.1%</i>	<i>Europe</i>	<i>28%</i>
	<i>Pension funds market value*</i>	<i>300</i>	<i>0.4%</i>				
	<i>Insurance companies market value*</i>	<i>270</i>	<i>0.4%</i>				
	<i>SWFs market value*</i>	<i>50</i>	<i>0.1%</i>				
	<i>Other asset owners market value*</i>	<i>10</i>	<i>0.0%</i>				
Asset allocation scenarios for institutional investors							
<i>Private infrastructure</i>							
	<i>from 1% to 3% over 10 years annual investment</i>	<i>140</i>	<i>0.2%</i>	<i>28</i>	<i>0.2%</i>	<i>Europe</i>	<i>28%</i>
	<i>from 1% to 5% over 10 years annual investment</i>	<i>280</i>	<i>0.4%</i>	<i>56</i>	<i>0.4%</i>	<i>Europe</i>	<i>28%</i>
<i>Source: Author's rough estimates (see main text for sources and comments)</i>							

7. Investment barriers

The environment for infrastructure investment has become more difficult following the global financial crisis, the global economic slowdown and the Euro crisis. Public budgets are likely to remain constrained for some time across most of Europe.

The macro-economic and macro-political environment is also not easy for European private infrastructure finance for a number of reasons. They include the usual cyclical factors such as weaker demand, the impact of public spending cuts, and the lack of investor confidence.

In addition, there are some (old and new) special detrimental factors at work, and that are also (actual and potential) barriers to increased future activity. Of particular importance is the impact of the new prudential, accounting and tax framework in the EU (see, e.g., Bassanini and Reviglio 2011, European Commission 2013a, Societe Generale 2013).

7.1 Bank lending

European capital investment, including infrastructure and project finance, is traditionally very dependent on bank loans. The impact of the recapitalization of banks and stricter regulation (e.g. Basle III) is being widely discussed. In general, European banks reduce risk by reducing long-term lending, foreign exposure and lending to risky businesses, and by off-loading assets from their balance sheets.

The impact on infrastructure finance is

- reduced availability of bank finance for long-term projects (over 7-10 years)
- stricter credit assessments for new ventures
- some examples of sales of loans to institutional investors.

On the positive side, not all European banks have equally withdrawn from long-term lending, while some non-European banks have increased their presence. Also, there is increased activity in co-operation with international financial institutions and institutional investors. Finally, this 'bank disintermediation' process could move Europe towards stronger securitization and capital market markets similar to the USA.

There are hopes that pension funds and insurers could, to a certain extent, replace banks in the direct provision of long-term syndicated loans. In fact, some larger investors have already taken over loans from banks or provided private finance to, e.g., renewable energy projects.

S&P (2013) estimates some US\$ 20bn of 'alternative' project debt finance from the 'shadow banking sector' in 2012 globally, expected to rise to US\$ 25bn in 2013. Societe Generale (2013) expects a market for private bonds and loans developing in Europe, with project finance energy and transport as attractive sectors for investors. It has to be seen how far

these development can reach as such investments require specialist and expensive management expertise.

7.2 Investor regulations

Insurance companies

Insurance companies have already adjusted their asset allocation by reducing exposure to risky assets, especially equities, in the face of IFRS accounting rules and in anticipation of Solvency II (Severinson and Yermo 2012). The new risk-based solvency regulations are seen as an obstacle to infrastructure investments, given the high capital charges for less liquid assets. For example, charges for infrastructure bonds are higher for longer maturities and lower credit ratings.

Many European insurers express interest in increasing their (still low) exposure to infrastructure assets. Their preference is primarily for the 'conservative' end of the infrastructure investment spectrum, e.g. operating assets; bonds with a minimum rating of A-, ideally liquid and included in bond indices. Insurers are less keen on taking on construction and other greenfield risks, except if they come with some sort of credit enhancement mechanism or public guarantee.

There are discussions around a possible 'calibration' of capital requirements for different infrastructure investments (e.g. infrastructure funds, project loans, bonds) (EIOPA 2013).

Pension funds

Pension funds in many European countries have been de-risking their investment strategies. This led to reduced holdings of equities and increased holding of fixed interest. The main reasons are market developments, new accounting rules, new funding and solvency regulations in some countries, and a higher emphasis on asset-liability-matching strategies.

New *account rules* for pension benefits were introduced in the early/mid 2000s (FRS 17 in the UK, IAS 19 in the EU), based on 'fair value principles' ('mark- to-market valuation') (see, e.g., Franzen 2010). The *funding and solvency regimes* vary strongly across countries. Risk-based funding rules were introduced or tightened in recent years, e.g., in Nordic countries ('traffic-light system'), Germany and the Netherlands (FTK). A 'Solvency II' for pension funds is currently in discussion.

Conclusion

The general de-risking trend in institutional investor portfolios has already had a substantial effect on listed infrastructure and utility stocks. According to Towers Watson (2013), the asset allocation of global pension funds to equities was about 60% in 2001 and 2006, and 47% in 2012. This implies roughly a reduction of roughly US\$ 200bn of equity capital over this short period.

At the same time, many institutional investors have increased 'alternative assets' (including infrastructure equity and debt), The impact of the new accounting and solvency rules on less

liquid assets has so far been inconclusive. There are other factors at work such as low interest rates, new asset allocation strategies with a broader diversification than in the past, as well as changes in benefit policies.

Nonetheless, there are concerns that fair value and risk-based regulations for institutional investors could lead to further de-risking and pro-cyclicality, and may also be detrimental to substantially increasing infrastructure and other long-term investment strategies.

7.3 Other barriers

There are also other barriers to higher infrastructure investments expressed by institutional investors based and/or investing in Europe. They can be summed up into three groups.⁴⁰

Supply side

- Political risk
- Changes in energy, transport and other policies
- Regulatory uncertainty (for both infrastructure companies and investors)
- Lack of a consistent project pipeline
- Complicated procurement processes
- Project size

Demand side

- Investor scale
- Internal resources and experience (governance, management, operational)
- Portfolio concentration
- Concerns over construction risks
- Legal and reputation risks

Market structure and intermediation

- Lack of appropriate investment vehicles
- Capital markets, e.g. for project bonds
- Thin secondary markets
- Fee levels of funds
- Alignment / conflicts of interests
- Cyclical overvaluation of assets.

As far as capital market instruments are concerned, bond investing is constrained by the availability of securities in the European corporate bond market. The development of markets for project bonds will take time while the use of asset-backed, covered bonds has been suggested.

More lessons can be learnt also from other regions. In Australia, e.g., pension schemes invest in infrastructure despite having a defined contribution system, and there is an

⁴⁰ See, e.g., European Commission (2013a,b), Inderst (2009), Della Croce (2011), OECD (2013).

intensive dialogue between government and investors (IFWG 2012). Given the preference for brownfield assets, there is also a discussion about 'asset recycling' (sale of operating assets in order to raise funds for new infrastructure) (Inderst and Della Croce 2013).

8. Conclusions and policy recommendations

There is an important discussion about infrastructure needs, financing gaps and the contribution of private finance to infrastructure investments. This study discusses the structure and development of private infrastructure finance in Europe in a global context, i.e. the supply of private capital to the financing of infrastructure needs.

The information is typically scattered, with partial representations of the situation. In this paper, a 'big picture' is formed by examining the contribution of the various financing instruments and investment vehicles within a simple frame, i.e. percentages of GDP. The paper also discusses the potential of institutional investors and barriers to higher private infrastructure investments in Europe, and gives a number of policy recommendations.

There are major definitional issues and conceptual gaps in this field, aggravated by the poor data situation. This creates considerable confusion in the infrastructure debate where many figures used create rather partial pictures. If infrastructure research, as well as policy, expects more credibility, this needs to improve.

Conclusions

Overall, given the high future infrastructure investment requirements, the public sector can hardly withdraw further. The funding costs are at historically very low levels for many European governments.

On the private side, the main contribution to infrastructure investment in Europe is likely to remain with the corporate sector, especially listed infrastructure and utility companies. The role of smaller companies is still very much in the shadow.

There is scope for an increased contribution of alternative financing channels, PPPs. and project finance more generally, have been growing since the 1990s, although their role is limited. There is also the need for further development of capital markets and instruments, especially project bonds.

Institutional investors have been called into playing a bigger role, and there is scope for increased allocations to infrastructure from the current low levels. Specialist infrastructure funds have been growing in recent years, mostly concentrating on equity until recently.

The interest in institutional debt investing has only recently been awakened and can slowly grow further. However, Europe's traditional way of debt financing, i.e. bank lending, will need to keep working in a big way.

One has to be realistic about the institutional investor potential. Even under optimistic asset allocation scenarios, the capability is limited. Furthermore, such scenarios are only possible

with sufficient supply of infrastructure assets and a favourable political-economic environment.

Infrastructure investments could be hindered by (some new) accounting, solvency and funding regulations of pension funds and insurers (e.g. affecting risky and illiquid assets) and new banking regulation (Basel III). This is particularly virulent where the bottlenecks are most narrow, i.e. the construction of new infrastructure. There are also other barriers at work on the supply and demand side, and in the capital intermediation process (i.e. shortage of suitable investment vehicles).

Last but not least, a reminder of an important fact that is often confused in the public debate. Whatever form of (intermediate) financing of infrastructure, it is ultimately not paid by the financiers but by the users or the taxpayers.

Policy recommendations

There are a number of policy implications and recommendations.

- 1) Macro-framework for private infrastructure finance: political and economic stability.
- 2) Clear, long-term infrastructure policies and institutions.
- 3) Certainty and continuity in the legal, regulatory and tax environment (e.g. energy and transport policies, PPP framework).
- 4) Avoid policy inconsistencies (e.g. conflicts between long-term investment targets and investor regulation).
- 5) Sufficient pipeline of suitable infrastructure projects; clear and fast procurement processes.
- 6) Careful consideration and continuous review of public interventions (guarantee and insurance schemes, subsidies and taxation).
- 7) Review of any investment limitations for investors; clarify fiduciary duties of investors in relation to long-term, green and sustainable investments.
- 8) Further development of capital markets, including suitable long-term investment vehicles (e.g. project bonds, investor funds); consideration of capital market liquidity.
- 9) Role for national, regional and international development banks, especially in difficult sectors and segments of infrastructure finance.
- 10) Study experiences of other countries (e.g. Australia, Canada).
- 11) Improved Infrastructure data collection and research.

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