

Michael, Bryane

Preprint

The Upcoming Four Trillion Dollar Infrastructure Gold Rush

Suggested Citation: Michael, Bryane (2013) : The Upcoming Four Trillion Dollar Infrastructure Gold Rush, ZBW - Deutsche Zentralbibliothek für Wirtschaftswissenschaften, Leibniz-Informationszentrum Wirtschaft, Kiel und Hamburg

This Version is available at:

<https://hdl.handle.net/10419/108997>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

The Upcoming Four Trillion Dollar Infrastructure Gold Rush

Bryane Michael, Institute for Emerging Market Studies

Introduction	2
Emerging Markets' Need for Big Four Infrastructure Investment	2
Effective Demand for Infrastructure (How Much Will They Pay?)	5
Cashing in on the Infrastructure Gold-Rush	9
Investing in the global firms	9
Investing in emerging market firms	12
Growing Emerging Markets for Infrastructure	13
Sign, Implement and Use the WTO Agreement on Government Procurement (GPA)	14
Provide capital to fledgling design companies in emerging markets	15
Invest in former public goods like water and transport	17
From Artistic to Practical Master Planning	19
Using design firm development to deepen equity markets	21
Conclusions	22
Appendix I: How Did We Arrive at Our Estimates?	23

Abstract

The largest 25 emerging markets (by population size) will need to make about four trillion dollars worth of investments by 2020. What does this mean for investors looking to cash in on the boom in government (and hopefully private) spending on infrastructure? Which markets will generate the most revenues for large international and domestic engineering and construction companies? How can investors profit from this \$4 trillion “gold rush”? In this brief, we identify the global “design firms” and local construction and engineering companies based in emerging markets which will benefit most. We also provide five recommendations for improving the rate of return these companies can earn from this infrastructure boom. Such recommendations include lobbying for the full implementation of the WTO Agreement on Public Procurement (particularly in emerging markets), directly investment at emerging market infrastructure companies, securitizing and investing in water and transport companies, increasing the scope of services provided during master-planning projects and selling equity in infrastructure more widely in developing markets.

Disclaimer: We make specific recommendations for traded companies in this brief. We have not received any kind of payment from these companies – nor may our recommendations be appropriate for a particular investor’s portfolio. Please consult your locally licensed and registered investment advisor to discuss our recommendations.

The Upcoming Four Trillion Dollar Infrastructure Gold Rush

Bryane Michael, Institute for Emerging Market Studies

Introduction

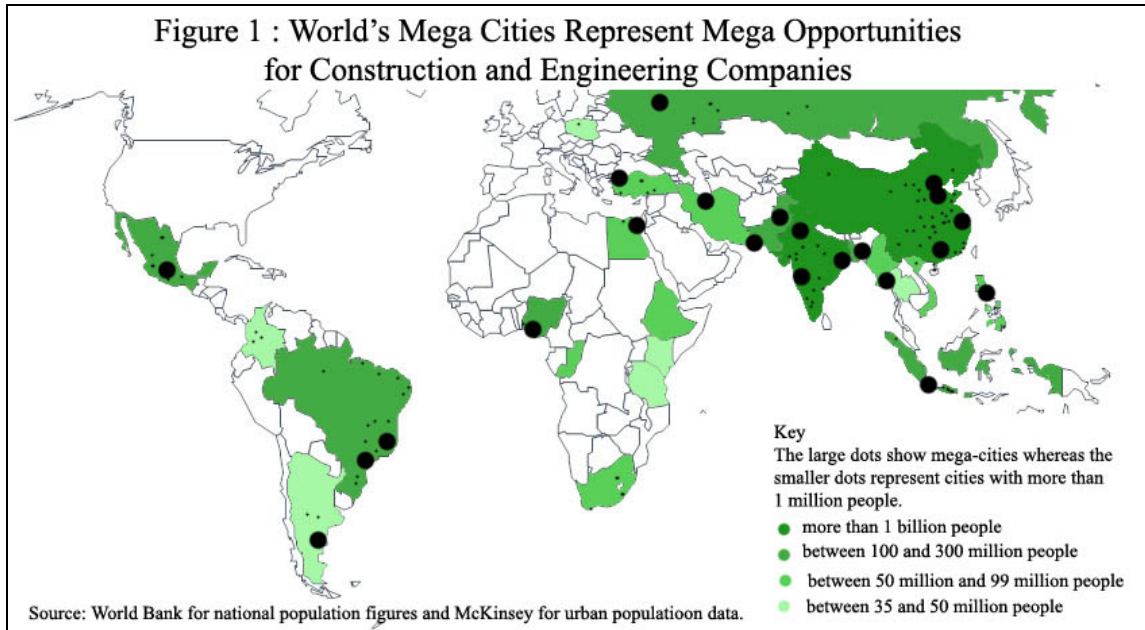
The most populous emerging markets will need to spend roughly \$4 trillion by 2020 on infrastructure. The extra 350 million people born into emerging markets in the next decade will require infrastructure like water, energy, communication and transport in order to work. Since the 1970s, investment bankers and cabinet-level political leaders have seen sewage, bridges, roads and coal-burning energy plants as boring and dirty at the best -- and politically explosive at the worst. Much better to work on “global knowledge products” (whatever those are) rather than a rail line which will displace thousands of families. Yet, the infrastructure boom in fast growing emerging markets like Indonesia, Turkey and China has made infrastructure fashionable again. Who needs infrastructural investment? In what areas? How can investors benefit from the upcoming infrastructure “gold rush”?

In this brief, we argue that investors (both at the retail level and in large construction and engineering companies) will need to spend significant sums of money to develop this \$4 trillion market. Construction companies – and the investors that fund them – will need to work with governments to develop infrastructure project ideas, arrange for funding and of course build the projects. In the first section, we look at major markets which will (or at least should) experience an infrastructure spending gold rush in the next decade. We find that many of the usual suspects (like China and India) represent large profit opportunities. However, other countries like Iran, Philippines and the Ukraine represent important, overlooked opportunities. Spending in areas like water and transport represents large potential growth areas. The second section looks at governments’ capacity to pay. We assess how much funding governments will be able to provide – and how much residual demand remains for enterprising “design firms” to tap using private funding. The third section presents the engineering and construction companies most able to take advantage of large-scale increases in infrastructure spending in the emerging markets we analyse. Many of these companies are listed on public stock exchanges – thus pose potentially lucrative investments for both corporate and retail investors (like you). The fourth section provides lessons and recommendations for companies looking to grow their revenues in this expanding area of activity.

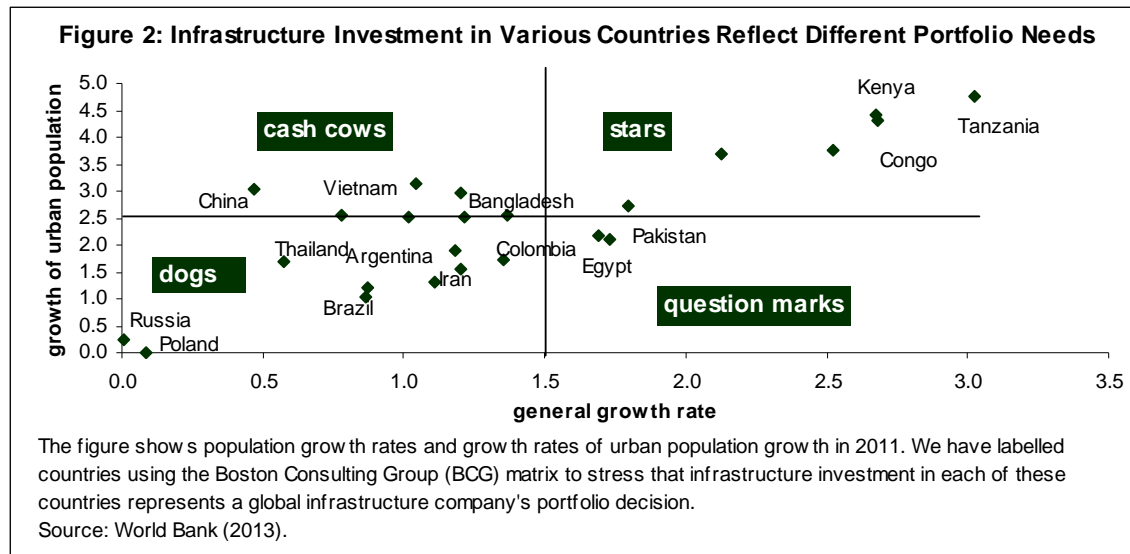
Emerging Markets’ Need for Big Four Infrastructure Investment

Emerging markets require infrastructure based on the size of their populations. Bigger and denser countries require more transport, energy, communications and water than smaller countries. Figure 1 shows the top 25 most populous emerging markets and the urban concentrations requiring infrastructure investment. Let us put the infrastructure challenge into perspective. The Indonesian government must build a city the size of Rome every year to accommodate the roughly 2.5 million extra people born there. Mexican authorities must build a new Kuala Lumpur every year to accommodate the extra 1.3 million people born each year. Let us not forget China, a country whose

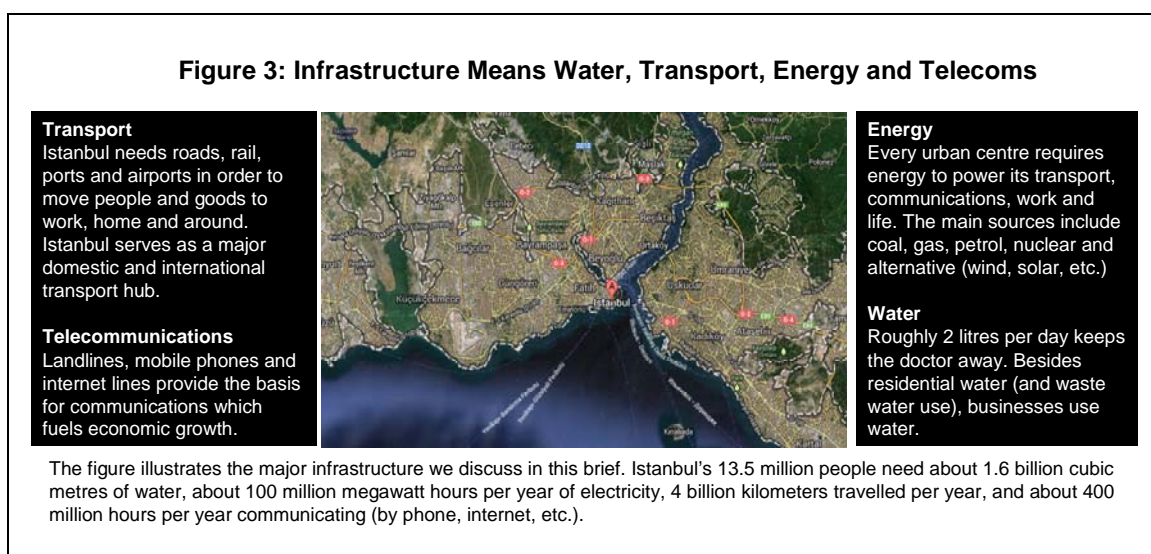
government must raise a city the size of Bangkok from its vacant plains each and every year. India must create a new Mumbai each year. Most of us have seen whole new parts of cities added very quickly (like the Bilkent area outside of Ankara or the new city of New Songdo in South Korea created from scratch). We have seen Dubai and Doha grow to the horizons. Yet, we do not stop to think about the revenues generated by the construction and engineering companies actually building those new urban centres.



Some urban centres present better opportunities than others for investors looking to capitalise on the upcoming infrastructure boom. Figure 2 shows the growth rates of populations in the fastest growing countries – and the speed of urbanisation. The Sub-Saharan countries of Kenya, Congo and Tanzania have grown the fastest – both inside their cities and outside. Regardless of whether these governments can pay for infrastructure, these countries have the fast growing infrastructure needs. The Asian countries of China, Vietnam and Bangladesh have rapid rates of urbanisation – making investments in dense cities most profitable. The slow growing economies in Eastern Europe and Latin America represent less stellar opportunities. Infrastructure investment would likely consist of modernising existing infrastructure rather than constructing whole new cities. The question mark countries in the Middle East have fast over-all growth – but slow growth inside their cities. As mostly agrarian (subsistence) economies, their infrastructure needs remain far from certain. Companies looking to invest in each of these markets will mostly likely take a portfolio-based view of such investment.



What do we mean by infrastructure? Figure 3 shows an example of infrastructure used in the Turkish metropolitan centre of Istanbul. City planners in Istanbul need to spend roughly **\$30 billion per year** to keep up the metropolitan area's roads, airport, ports and rail access. In addition they need to plan for the city's growth – by developing new capacity as the population grows. City planners must do the same with water (sewage and fresh water), energy (generated through a number of ways including coal, gas, petrol, nuclear and alternative), telecommunications (landlines, mobile phones and internet connections) as well as transport (roads, rail, ports and airports). Each new child raised in former Constantinople will require water, energy, communications and transport to function as a productive member of society and the global economy.



The twenty-five most populous emerging markets will need about \$4 trillion in infrastructure investment in the upcoming decade. Figure 4 shows the overall infrastructure requirements for these economies. Emerging markets will need to invest least in water (fresh and sewage) as previous governments have done a relatively good job of providing such infrastructure. Water services need modernising in many emerging market countries. However, for most emerging markets, providing water still remains a relatively low cost proposition. Investments in power will come to about \$630 billion – representing mostly new power generation. We assume that emerging markets will continue to use the least cost methods available. The information technology (IT) revolution will increase electricity consumption for most of the developing world. However, efficiencies in the production and transmission of such electricity have led to overall decreasing costs over time.

Figure 4: Total infrastructure investment needed in the 25 most populous countries

Areas	Items	Needed (Wanted) Investment
Power	Coal, gas, petrol, nuclear and alternative energy	\$628.5 billion
Water	Fresh water and sewage	\$415 billion
Telecoms	Landline, mobile phone and mostly internet connectivity	\$1.6 trillion
Transport	Roads, rail, airport and seaports	\$1.4 trillion
Total		\$4 trillion

Source: authors. See appendix for description of methodology. We do not provide country specific estimates in order to avoid providing a false sense of accuracy in any country-level estimates. See appendix for other studies' estimates as well.

Telecommunications and transport represent the bulk of infrastructure investment needs in emerging markets. Emerging markets have a long way to go toward fully capitalising on the internet revolution. Most emerging markets of all income levels still require significant levels of internet backbone, household and commercial wiring as well as server investment. Much of such investment will help fund entertainment rather than genuinely economically productive activity. However, our job revolves around estimating demand – not passing judgment on such demand. Finally, transport represents about \$1.4 trillion in needed investment by about 2020. Growing populations will need to travel farther to go to work (sometimes even internationally) growing volumes of international trade will necessitate more advanced supply chains.

Effective Demand for Infrastructure (How Much Will They Pay?)

Public procurements in emerging markets – if they come in at anywhere near the lowest end of the OECD Members – will come to about \$4 trillion by 2020. What would such investment actually buy? Figure 5 shows what these abstract figures mean in concrete terms. The roughly \$1.8 trillion China will spend on infrastructure will build infrastructure equivalent to the gross metropolitan product of Tokyo. A country's GDP, tax collection capabilities and procurement contracting possibilities naturally limit its

ability to expand its infrastructure. Such limited capabilities – unsurprisingly – affect Tanzania, Congo, Ethiopia and Kenya. Without a budget constraint, their infrastructure spending would approach Turkish or Argentine levels. As such, these countries will need to find ways of crowding in private investment.

Figure 5: What Will \$4 trillion Buy Emerging Markets By 2020?



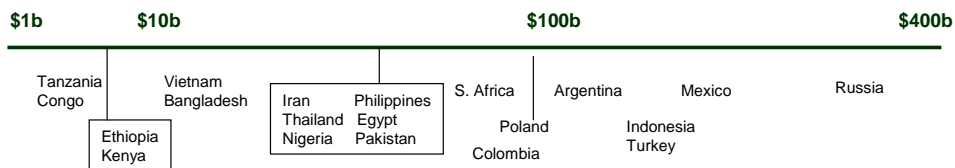
China will get one Tokyo for the \$1.8 trillion it will spend by 2020.



Brazil will get to build another San Paulo for the \$480b it will spend

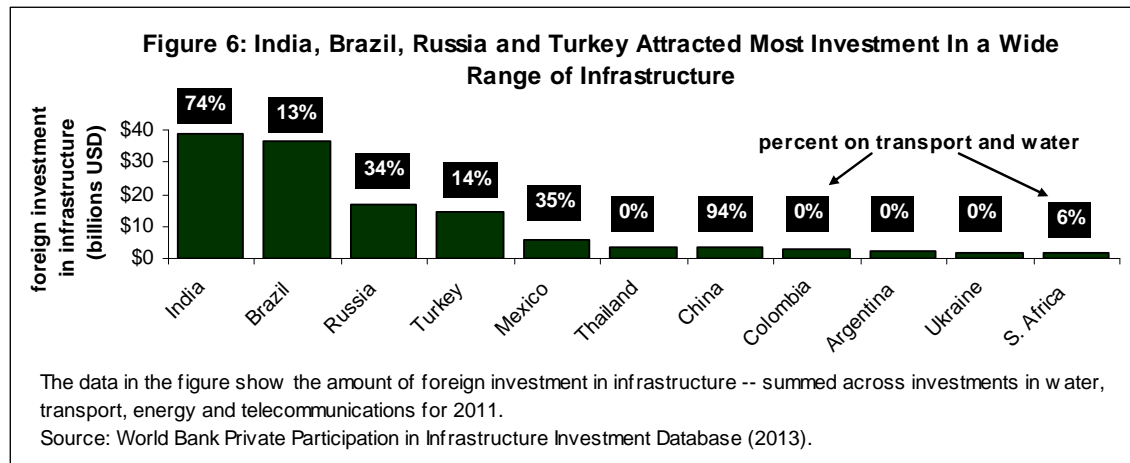


India will add a Mexico City to the map \$425b



The data in the figure show the estimated total procurement of infrastructure-related goods, services and works between 2014 and 2020. We describe the methodology used to derive these estimates in the appendix to this brief.

Past private investment in infrastructure tells us something about the extent to which country will allow private investment in infrastructure in the future. Countries like Colombia and the Ukraine require very significant amounts of infrastructure investment. However, they have maintained policies which prevent such investment. Differences between countries like Turkey and the Ukraine illustrate the impact that policy can make on engineering and construction company prospects of winning contracts in these kinds of countries. Turkey has almost double of the Ukraine's population. Yet, as shown in Figure 6, Turkey has more than seven times the private investment in infrastructure than the Ukraine. Media reports claim that China represents the largest opportunity for construction and engineering firms. Yet, looking at the data, Brazil represented a far larger opportunity for these companies than China (in terms of volume of private investment).



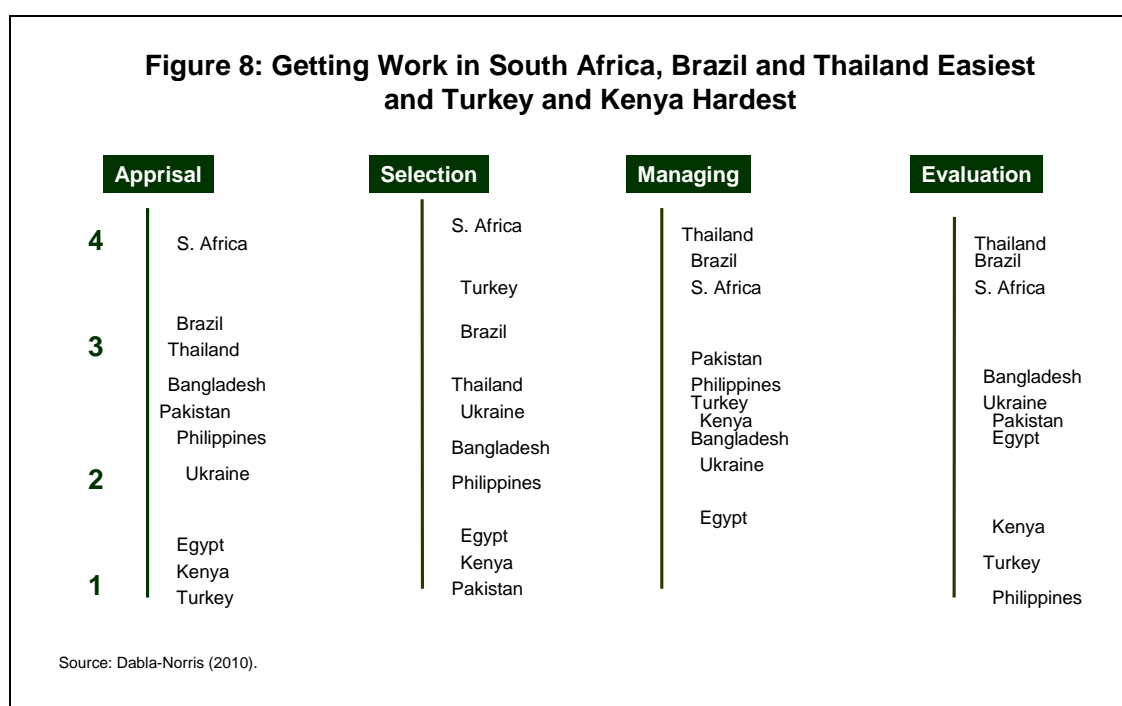
Which governments will be able to pay construction and engineering companies in the upcoming decade? Figure 7 shows – given their current state of public finances – the countries most likely to buy infrastructure in the future. China in particular pays little on its relatively small level of debt and maintains a high sovereign debt rating. The Chinese government – even without crowding in private investment – will be able to contract for significant amounts of infrastructure-related goods, services and works. For countries like Turkey though, the prospects of obtaining government contracts for infrastructure look far less promising. Turkey has a moderate debt level (about 35% of GDP) – though with a widening budget deficit and relatively high interest rates on government debt. At the other extreme, India already has a high debt level (compared to GDP) – and continuing budget deficits promise to expand such debt levels further. With relatively high interest rates on government debt, we can not see where the Indian federal government would find resources to expand investment in infrastructure.

Figure 7: Ability to Pay for Infrastructure in the Upcoming Decade

Country	Interest rates (10 year)	S&P Rating	Surplus (% GDP)	Debt (% GDP)	Demand for infrastructure*
Russia	7.3%	BBB	0%	8%	Good
China	3.6%	AA-	-2%	23%	Good
Colombia	6.8%	BBB	-1%	32%	Good
Indonesia	7.2%	BB+	-2%	23%	Good
Brazil	11%	BBB	3%	65%	Average
Turkey	8.3%	BB+	-3%	36%	Average
Mexico	5.5%	BBB	-3%	43%	Average
Thailand	3.7%	BBB+	-3.4%	44%	Average
Philippines	4.2%	BBB-	-2%	40%	Average
Nigeria	13.6%	BB-	-3%	18%	Average
Vietnam	9%	BB-	-4%	37%	Average
South Africa	7.5%	BBB	-5%	40%	Poor
Pakistan	12%	B-	-6%	50%	Poor
India	7.5%	BBB-	-6%	68%	Poor
Kenya	12.2%	B+	-5%	47%	Poor

* Economists differentiate between demand (in which customers can pay) from wants (where customers may desire something but they want not or can not pay for it). We have previously shown that government need \$4 trillion in infrastructure. Many won't be able to pay for it. We have omitted countries without functioning public debt or securities markets (Iran, Ukraine, Tanzania, Egypt, Indonesia, Bangladesh, Congo, Ethiopia and Myanmar).

Ability to contract for public procurement represents as important a consideration as the ability to pay. In some countries, large engineering companies can contract relatively easily for infrastructure procurements (like in South Africa). In other countries (like Egypt, Kenya and Turkey) firms have far more difficulty. Figure 8 shows the ratings of a number of countries in terms of appraisal, selection, management and evaluation of the tender process for infrastructure projects. Complex procurement procedures have led to sub-optimal levels of infrastructure in the markets that need it the most -- even in reasonably well-off economies like Brazil, Thailand and Turkey.

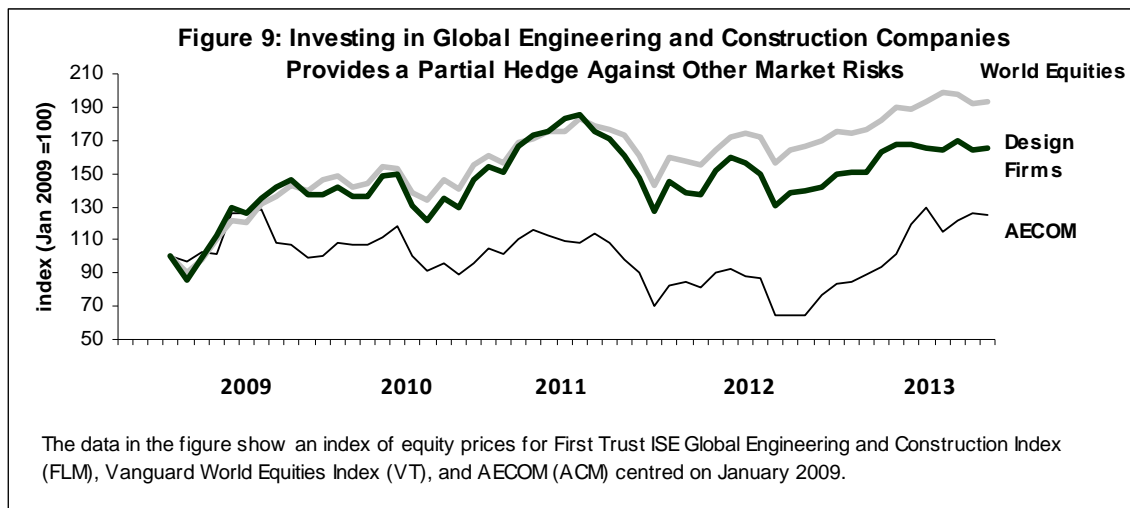


So, how much money will governments and private sector investors make available to fund these \$4 trillion demands? As we discuss later in this brief, investors may supply any amount up to this limit. Government funding – through taxes – helps spread the risk to the private sector of engaging in such investments. However, as we have shown, many governments will find tax-and-spend financing expensive (given the borrowing and contracting costs we have illustrated above).

Cashing In On the Infrastructure Gold-Rush

Investing in the global firms

Investors will want to invest in this \$4 trillion opportunity by buying shares in the global “design firm” giants. Figure 9 shows the returns of the global construction and engineering companies, compares with the global market portfolio and the largest company in the class. Global engineering and construction companies have generally performed in line with the market – beating the market slightly during the recession and under-performing during the recovery. Unsurprisingly, a diversified portfolio of construction and engineering companies has performed better than the largest company in the group – AECOM. Investors looking to take advantage of the upcoming investment boom in infrastructure should seek to invest in a diversified range of these companies – in the US as well as in emerging markets.



The top 10 global “design firms” earned about \$20 billion in 2012. As we describe in Figure 10, no infrastructure industry exists *per se*. Problems defining such an industry make research about the sector particularly difficult. The various activities which go into designing, building and maintaining cities go by a wide range of names and economic classifications. You have probably heard of many of these companies – yet not heard about the industry in which they work. Despite their importance, these companies actually earn relatively little revenue. The top companies – mostly from the petrol sector – on the Fortune Global 100 earned revenues over \$100 billion per year. In contrast, the largest of the global design firms booked a meagre \$7.3 billion in 2012.









Figure 10: What is a Design Firm?

Who builds the world's cities? We actually can not say for sure. Design firms do the lay-out, architecture, and design of buildings and even entire cities. Some famous names include AECOM and Arup. Contractors do the actual construction. Some famous names include Bechtel and Skanska. Most of these companies represent portfolios of projects rather than companies as we think about them in the usual sense. Nike makes shoes and clothing. IBM makes computers. Yet, AECOM can give advice on economic development policies, the design of an airport, or help arrange for builders to come and put a skyscraper together. The largest company AECOM weighs in at number 1907 on the Forbes 2000 – with a market capitalisation of only \$3.2 billion. On the other hand, China State Construction International weighs in at \$5.8 trillion.

Despite the importance of the infrastructure industry, the financial press rarely discusses these behemoths. You won't find these design companies in a list of industrial sectors in the *Wall Street Journal*. You also won't find them in one area of the Standard Industrial Classification (SIC) list. A company might be an engineering company (like Cardno), a engineering-consulting company (like Tetra Tech) or a construction and civil engineering company (like Flatiron Construction). China State Construction represents a construction company (and a potential contractor if the firm decides to operate in earnest abroad). A *Factiva* search presents "construction" as an economic sector – yet omits the companies that do all the intellectual part of the work. A good step toward seizing this upcoming \$4 trillion booty may consist of naming this industry!

Investments in the global design firms may represent an important way to access cheaply and effectively the upcoming boom in infrastructure investment. Figure 11 provides a *vade mecum* for the would-be retail or wholesale investor in global infrastructure. Of the \$20 billion these companies earned in 2012, roughly 40% of these funds came internationally (outside of their own country). For about half of these countries, international revenues means revenues earned outside of the USA. While some of these revenues came from other developed markets, an increasing share comes from the emerging markets we describe in this brief. For example, AECOM booked roughly \$3.5 billion out of its total \$7.3 billion in turn-over in 2012 internationally (outside the USA).

Figure 11: A Primer on the Top 10 Global Design Firms

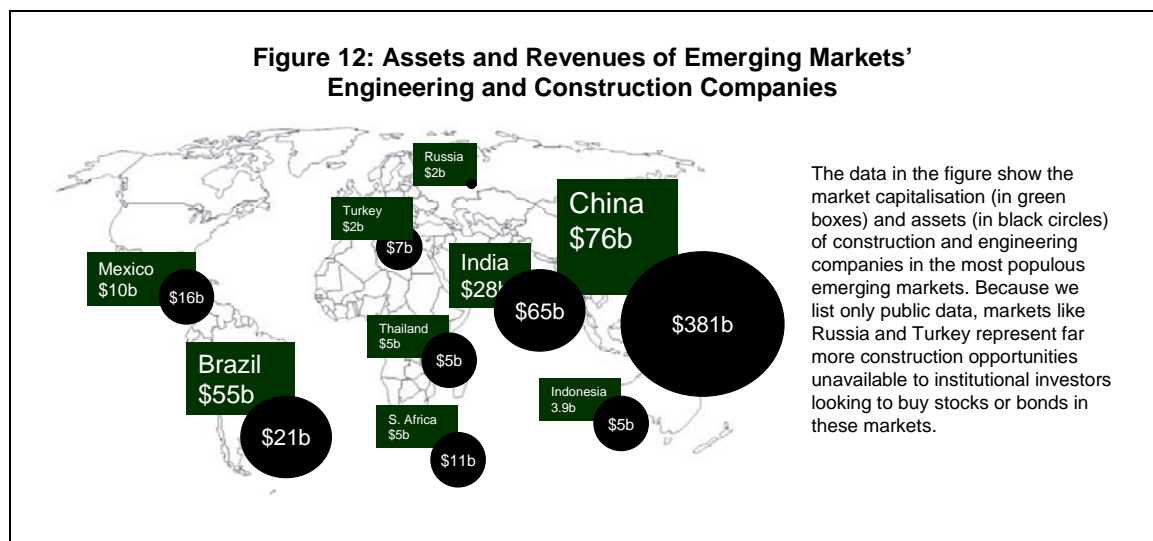
	AECOM Technology		URS Corporation
<p>Assets: \$5.7b Revenues: \$7.2b Location: US Core competency: Offices in Our EMs: 15 The premier engineering and consulting company. Take a trip to any foreign country and see their sign featured on the building site.</p>	<p>Profit: \$57m Employees: 46,800 Ticker: ACM General building</p>	<p>Assets: \$7b Revenues: \$5.8b Location: US Core competency: Offices in Our EMs: 10 From bridges to space centres, URS pulls in about 20% of its revenue outside the US.</p>	<p>Profit: \$400m Employees: 56,000 Ticker: URS Transport</p>
	Jacobs Engineering		WorleyParsons
<p>Assets: \$6.8b Revenues: \$5.2b Location: US Core competency: Offices in Our EMs: 10 Airports, railroads and ports – about 40% of its revenue comes from abroad.</p>	<p>Profit: \$ - Employees: 60,000 Ticker: JEC Energy</p>	<p>Assets: - Revenues: \$4.5b Location: AU Core competency: Offices in Our EMs: 6 Like many of the other engineering companies, they do everything. From master planning a Ghanaian city to Canadian port development.</p>	<p>Profit: \$350m Employees: 40,000 Ticker: WOR Energy</p>
	Fluor Corp.		AMEC Plc
<p>Assets: \$- Revenues: \$4b Location: US Core competency: Offices in Our EMs: 7 Texas based energy company – with numerous “most admired” awards.</p>	<p>Profit: \$ 450m Employees: 41,000 Ticker: FLR Energy</p>	<p>Assets: - Revenues: \$3.9b Location: UK Core competency: Offices in Our EMs: 2 A British energy company – roughly the British version of Fluor, with a green energy bias.</p>	<p>Profit: - Employees: 29,000 Ticker: AMEC Petrol</p>
	CH2M Hill		Fugro
<p>Assets: \$ 2.7b Revenues: \$3.9b Location: US Core competency: Offices in Our EMs: 14 Another portfolio company – with a penchant for US Government procurement.</p>	<p>Profit: \$ 450m Employees: 30,000 Ticker: not listed Transport</p>	<p>Assets: \$ 3.9b Revenues: \$3.6b Location: NL Core competency: Offices in Our EMs: - A full-on oil company, involved in exploration and production.</p>	<p>Profit: \$ 290m Employees: 13,900 Ticker: FUR</p>
	SNC-Lavalin		Arcadis
<p>Assets: - Revenues: \$3.4b Location: CA Core competency: Offices in Our EMs: - Canada’s answer to the design firm – showing that smaller economies can copy the tried-and-true model internationally.</p>	<p>Profit: \$ 390m Employees: 29,000 Ticker: SNC</p>	<p>Assets: - Revenues: \$2.8b Location: NL Core competency: Offices in Our EMs: 9 A UK firm, focused on surveying and construction.</p>	<p>Profit: \$ 80m Employees: - Ticker: ARCAD</p>

Source: ENR.com and company annual reports. Core competency comes from the sector where the company earned the mode (highest amount) of revenue.

These design firms provide numerous lessons for would-be competitors from developing markets like Russia. First, as portfolio companies, they bring together a range of skills. AECOM staff can do a cost-benefit analysis of a tunnel or advise on its building. They do not specialise in building bridges, roads, or even cities. They specialise in “design” – meaning they can design infrastructure from bespoke rails to entire megalopoli. Second, these companies can provide the necessary scale for the infrastructure investments of the next decade. The top 10 global design firms amass assets roughly equal to India’s entire publicly-listed engineering and construction industry. The total assets these companies command eclipse those of listed and public firms in 90% of the emerging markets we review in this brief. Third, they show that city building comprises far more than construction. The largest construction companies – called “contractor firms” by specialists – hail from China. These include China State Construction & Engineering, China Railway Construction and China Railway Engineering.

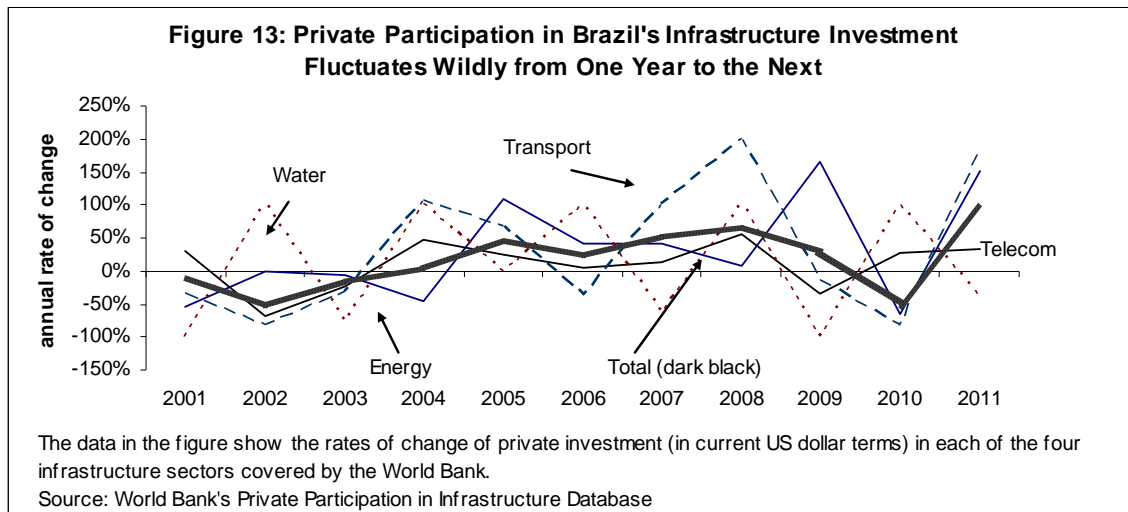
Investing in emerging market firms

Many investors from emerging markets can not (or want not) to invest in the global design firms. Yet, by market capitalisation and assets, many engineering and construction companies in emerging markets provide locally-grown alternatives to the global design firms. Figure 12 shows the size of engineering and construction sectors in the emerging markets we study in this brief. In many countries – like the Ukraine or Bangladesh – these companies either remain too small or too private to provide statistics needed for our comparisons. Yet, in some cases – particularly China, India and Brazil – their construction and engineering companies rival those in many Western European countries.



The volatility of infrastructure funding represents one of the largest obstacles to the development of a home-grown design sector in emerging markets. Figure 13 provides an example of the volatility of such investment from Brazil. Year-on-year changes in investment in each of the four major infrastructure sectors we analyse in this brief can easily change 100% from one year to the next. Changes in overall investment – summing over these four components – has varied significantly over the decade. Overall

infrastructure decreased until about 2004 and then rose afterward (with a bump in 2010). Volatility in Brazil's private infrastructure investment represents the norm among emerging markets rather than the exception.



Cashing in on the emerging markets infrastructure “gold rush” requires significant as well as sustained investment in the years ahead. The global design firms have engaged in a significant amount of work in these emerging markets. However, they have not been able to bring the kinds of investment needed to build entire cities from scratch. They remain bidders in large-scale procurements. What can these firms – and their counterparts in the emerging markets – do to make (rather than take) infrastructure markets?

Growing Emerging Markets for Infrastructure

Emerging market governments alone can not – and will not – tax and procure \$4 trillion in infrastructure. What can design firms and investors alike do in order to crowd in infrastructure? Firms and investors can directly lobby – both their own governments and the foreign governments – to adopt the WTO’s Agreement on Government Procurement. They can provide capital to the smaller design firms in developing countries. They can buy 322, 580 shares of ACM (that represents AECOM’s ticker) with their \$10 million funding budget. Better still, they ask for about 25 million shares of JPIN:IN (Jaypee Infratech’s ticker symbol). They (you) can encourage water and transport companies – the most difficult part of this market to reach – to issue shares and sell their debt more widely. Finally, all kinds of non-construction types can profit from the upcoming infrastructure gold rush. Lawyers can help write the regulations which govern the ways that new rail-lines work. Auditors can assess risks of a communications break down. Even marketing firms and NGOs can grab a piece of the pie by offering marketing and surveying services. All these service providers can issue shares in their own markets – and in foreign market. The securitisation of these professions in emerging markets will help capitalise this \$4 trillion boom.

Sign, Implement and Use the WTO Agreement on Government Procurement (GPA)

The WTO Agreement on Government Procurement represents one of the most important agreements that you have probably never heard of. The Agreement requires governments to publicise information about their public procurement laws, regulations and invitations for the tender of goods, services and works. In theory, every time the governments of the largest economies want to procure a large bridge, port, or even city, they should let companies in the other large economies know. These economies include the members of the OECD and some others like Hong Kong, Iceland, Israel, Korea, Taiwan and conspicuously Armenia).

Many of the governments who could benefit most from liberalisation in procuring infrastructure-related goods, services and works have only started to open up. Figure 14 shows the status of several observer governments to the WTO Committee on Government Procurement. Only China and the Ukraine have declared their interest in acceding to the Agreement. What about the other countries? Protected infrastructure markets hurt engineering and construction companies who can not compete abroad. Governments like India and Indonesia also suffer – as they pay far more for far less infrastructure.

Business persons in these countries – as well as the countries doing business with them – should write to the relevant WTO representative agency in order to encourage them to accede to the Agreement.

Figure 14: Governments Negotiating Membership and Contacts

Country	Procurement transparency score**	Observer Date	Representative Agency
Argentina	99	24 February 1997	Ministry of Economy
China*	91	21 February 2002	Ministry of Commerce
India	76	10 February 2010	Ministry of Commerce and Industry
Indonesia	90	31 October 2012	None provided
Russia	87	29 May 2013	Ministry of Foreign Affairs
Turkey	94	4 June 1996	Ministry of Economy
Ukraine*	78	25 February 2009	None provided
Vietnam	72	5 December 2012	Industry and Trade Info. Center

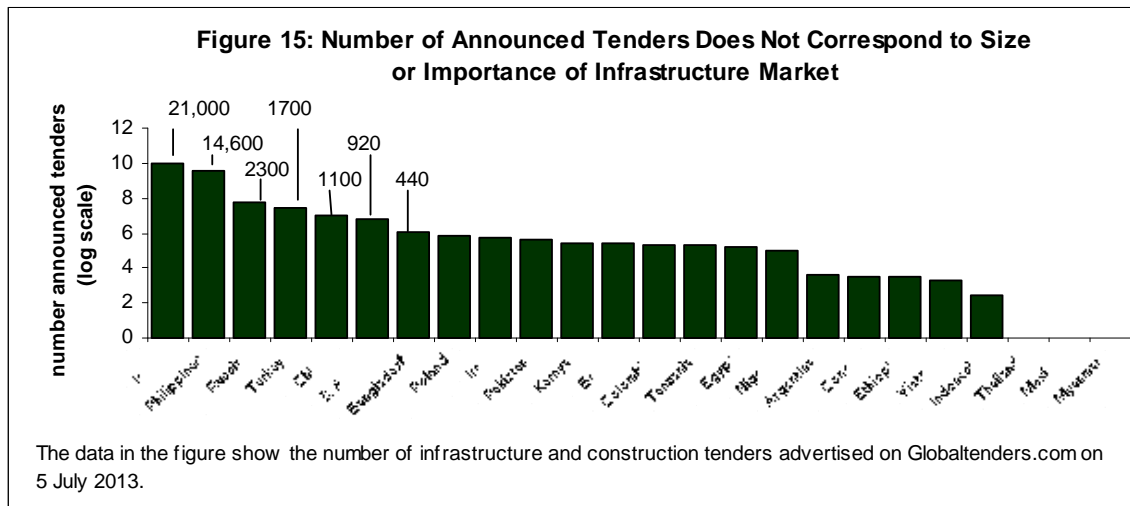
* In process of accession.

** Shows transparency scores from Global Integrity – a Washington-based NGO – in 2011 or latest year available. The score has a maximum of 100.

We provide Internet links for business persons interested in encouraging these governments to accede to the Agreement.

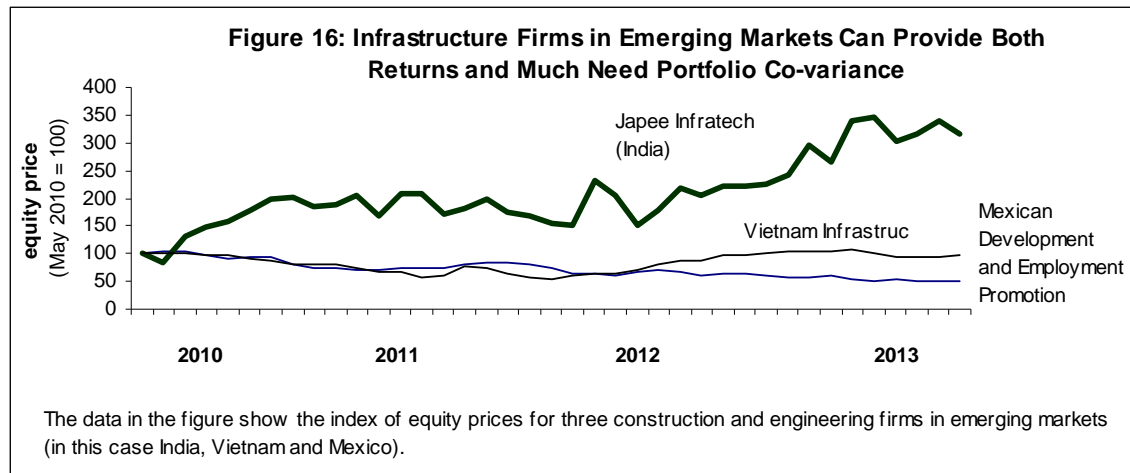
Implementing the Agreement on Public Procurement represents a far more important step than signing the Agreement. Figure 15 shows the number of infrastructure and construction tenders published on a popular website. Large economies like Brazil and Mexico have few tenders listed on these sites – with much of such work reserved for local firms and large companies which know how to navigate through local government bureaucracies. Even for large economies like Turkey or South Africa, the number of tenders easily accessible to up-and-coming builders looking to cross borders remains

extremely small. In theory, most governments announce public procurements on their procurement agency's website. These statistics show that such information does not filter out widely (if at all).



Provide capital to fledgling design companies in emerging markets

Construction and engineering companies in emerging markets certainly do not lack opportunities for potential work. Why does so much work go to global design firms? Why do potentially profitable infrastructure projects go un-built? Many investors simply do not know about these infrastructure firms – and the kinds of returns they can generate from them. Figure 16 shows an index of equity prices of three infrastructure-related shares which we have chosen at random. Readers should keep three features about these companies' equity in mind. First, if they had invested in companies like Japee Infratech – they would have tripled their money in a bit over 3 years. Second, these shares offer something for every investor. Investors in the Mexican Development and Employment Promotion company would have experienced very steady returns over the period (albeit losing a bit of money). Third, when all three shares combine into one single portfolio, their overall risk falls and returns increase significantly. Imagine holding equal shares of the Vietnam infrastructure and the Mexican infrastructure stocks. You would have broken even with very little variance in prices of your shares. When you combine these two with an equal weighting of the Indian stock, you would have profited, without much of the price variance experienced by Japee alone.



Which emerging market infrastructure-related companies can investors put capital into? Figure 17 shows the names of many of the largest of these companies – by market capitalisation and by assets. Many of these largest companies represent relatively small concerns, compared to the global design firms. However, with assets of over \$5 billion, the largest Brazilian infrastructure companies could compete with their global rivals. With a market capitalisation of \$1.6b, Indonesian companies like Inovisi Infracom could also compete with their global design firm rivals. Why don't more investors choose these companies? Unfortunately, these companies lack the good fortune to grow in countries which have encouraged foreign openness to their goods and services (see our recommendation about the WTO Agreement above).

Figure 17: Larger Infrastructure Companies in/from Harder to Reach Markets

Name	Assets	Name	Market Cap
Indonesia			
Pembangunan Perumahan	\$790m	Inovisi Infracom TBK	\$1.6b
Adhi Karya Persero TBK	\$696m	Jaya Konstruksi Manggala PR	\$475m
Thailand			
Italian-Thai Development PCL	\$1.7b	Italian-Thai Development	\$619m
Ch Karnchang PCL	\$120m	Ch Karnchang PCL	\$412m
Vietnam			
Ho Chi Minh City Infracor	\$244m	Vietnam Const & Import	\$131m
Development Invest Const	\$234m	Quoc Cuong Gia Lai Jsc	\$84m
Brazil			
Construtora Mendes Jr Engr	\$5.5b	Rossi Residencial SA	\$1.3b
Gafisa SA	\$5.7b	Gafisa SA	\$1.1b

* We provide different companies as the top companies by market capitalisation may not have the largest amount of assets in their country and category (and visa versa).

Source: Computstat (2013).

For investors willing to invest indirectly through a collective investment scheme, they can also tap a wide range of infrastructure companies. Four large global infrastructure exchange-traded funds (or ETFs) supposedly dominate the market for indirect investment in these companies. Yet, iShares Global Infrastructure (IGF) invests less than 10% of its capital in emerging market infrastructure companies. The iShares S&P Emerging

Markets Infrastructure Index Fund (EMIF) has over 50% of its capital invested in China (28%) and Brazil (32%). The FTSE/Macquarie Global Infrastructure 100 invests entirely in upper-income economies (with more than half of the ETF's capital in the US). Only PowerShares Emerging Markets Infrastructure Portfolio (PXR) provides a broad range of investment in emerging market infrastructure companies (and we provide its holdings in the Appendix). Investors should allocate more capital to emerging market infrastructure companies. **Mutual fund and portfolio managers should provide a broader range of emerging market companies for investors to tap.** In practice, that may mean shoving a bunch of Ukrainian and Bangladeshi infrastructure shares into mutual funds that Wall Street brokers flog to institutions.

Invest in former public goods like water and transport

Water and transport represent public goods. Attempts to privatize water in emerging markets have generally led to civil rest (think Bolivia). The efficient and low cost railways of Western Europe show that investors can only recoup their investments indirectly. However, investing in water and transport may still represent viable alternatives for investors. Much recent research shows that the question is not whether to privatise or not. Instead, governments and investors should focus on right-privatising (or privatising the optimal amount of water and transport service, given the country's level of development).

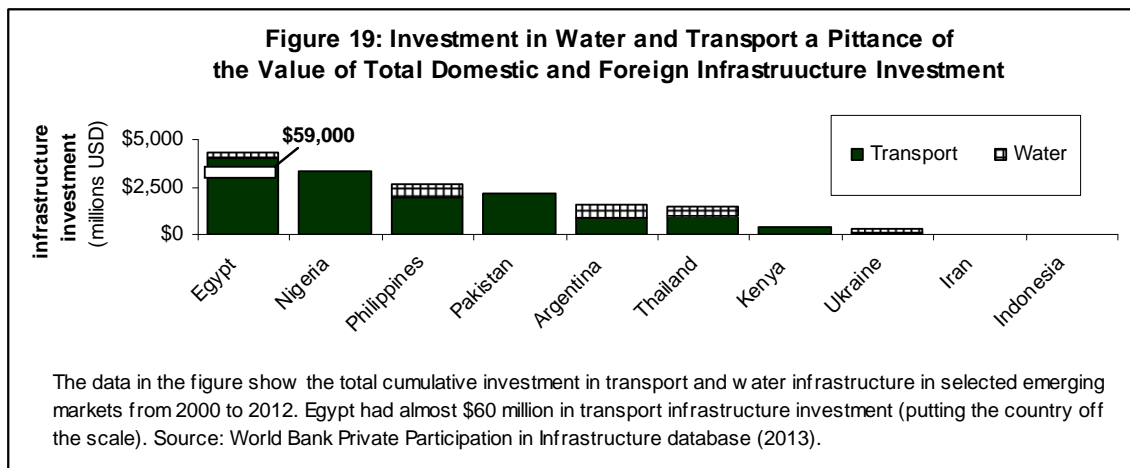
How can investors take advantage of new opportunities to participate in emerging markets for supposedly public goods like water and transport? Figure 18 shows several of the publicly traded companies which invest in water and transport infrastructure in emerging markets. We show the maximum share price as a percent of the minimum share price in 2012 to show that these companies' equity prices do not remain very stable (and thus boring). Many of these shares (like any shares in general) would have produced extremely good returns if the investor timed their purchases and sales very well. These shares also provide investors with both exposure to these developing infrastructure markets as well as volatility which they can use to off-set risks in other parts of their portfolios.

Figure 18: Returns to Investments in Unsexy Infrastructure

Company	Ticker	Max return 2012*	Recent News
Water			
Tetra Tech	TTEK	29%	Recently \$500m in US government contracts in rule of law in developing countries – showing that the idea of “core competences” does not function very strongly in this sector.
Pentair	PNR	50%	Completely unremarkable – and that’s how it should be. Pentair’s news consists only of water trade shows and executive moves.
Veolia Environ.	VE	47%	A recent contract to provide services to Marafiq (a leading Saudi Arabia water services operator) shows the aggressive stance this company has taken in emerging markets,
Transport			
Atkins	ATK.L	62%	Next to AECOM and possible Arup, Atkins represents one of the most visible names on construction sites across the emerging world – and construction sites near London!
STV Group	STVG.L	87%	Mostly in UK news, this company earned \$263 million in revenue last year.
Michael Baker	BKR	44%	A \$2.5 billion beach front property development contract in Oman reason enough to open a Middle East office... and that’s probably just the beginning.

* Maximum return refers to the 2012 52-week high equity price divided by the 2012 lowest price.

These companies represent a drop in the proverbial bucket. Most of the emerging markets we study have very little (if any) private resources invested in their water and transport sectors. The largest economies like China, Russia, India, Brazil, Mexico and so forth have private participation in these supposedly public goods. Yet, Figure 19 shows the woeful under-investment in these sectors in the countries which need such investment the most. Total investment in these countries since 2000 has totalled \$16.4 billion – roughly three times the size of Ireland’s water sector related investments alone. Such investments will not come anywhere near enough to providing for the needs of future Ukrainian, Indonesian and Kenyan workers.



Private sector funding can fill most – if not all – of this gap. Consider the largest water and waste infrastructure providers account for about \$1 billion in revenues. MWH Global obtains roughly 80% of its revenue from water and waste. The company earned about \$590 million internationally in 2012. Brown and Caldwell (a US-only water provider) earned \$282 million in revenue in 2012. The revenues alone of these two companies account for total private investment in the water sector in Thailand for the previous decade. **Incorporating local water providers as (at least partially) publicly held corporations could provide capital (and revenue generating possibilities) in emerging markets.**

From Artistic to Practical Master Planning

Many urban master-plans remain pieces of art rather than implement-able projects. Figure 20 shows one of the many examples of beautiful master plans designed for large urban areas. These plans provide for green areas, environmentally friendly mixed-use (working and living) areas, and easy access to transport. Type the city of your choice and the words “master plan” into Google, and you will certainly find your plan. These master plans look like cities from *Lord of the Rings* because the design firms who create such master plans have no responsibility for implementing them. In fact, no government agency or contractor has the legal or administrative obligation to implement these master plans. Interestingly, no statistical analyses yet exist assessing the number of these plans which have been implemented.

Figure 20: Jakarta the Garden City Master Plan



If the design firms put together the projects which make up these master plans, the revenues will spread far beyond the AECOMs and their local cousins. Figure 21 shows some of the professions which must participate in implementing multi-project infrastructure-related master plans. Draughtsman (the men and women who draw the pretty pictures) represent an important part of the master plan. So do the research companies which ask current residents if they want a new train station or a park. However, these master plans almost always fail to include the lawyers who must revise

local planning ordinances, the public finance experts who must advise the city government how to budget for recurrent capital expenditures and so forth.

Figure 21: Not Only Design Companies Who Will Benefit from the \$4 Trillion Bonanza

Phase of implementation	Companies involved	Description
Design	Design firms, auditors	From zoning to designing buildings and common amenities (like stadiums, rail stations and so forth), design represents the area most focused on by municipal authorities.
Finance	Banks and finance companies and auditors	Local governments have few authorities to crowd-in private sector finance of infrastructure. National authorities naturally fear local authority to engage in borrowing and some kinds of securitisation.
Procurement	Materials providers	Usually matched with the design phase, governments have a solid sense of goods, services and works procurement.
Ordinance drafting	Law firms	Usually completely lacking in any large scale infrastructure and master planning exercise.
Consultation	Marketing companies	Such consultation usually too scary for local governments, who try to engage the public poorly.
Quality Control	Consulting companies and auditors	How well have rails and roads been built? Do ports and train stations generate the revenue previously anticipated? Quality control can help fix design problems before they sap resources from the broader infrastructure development programme.

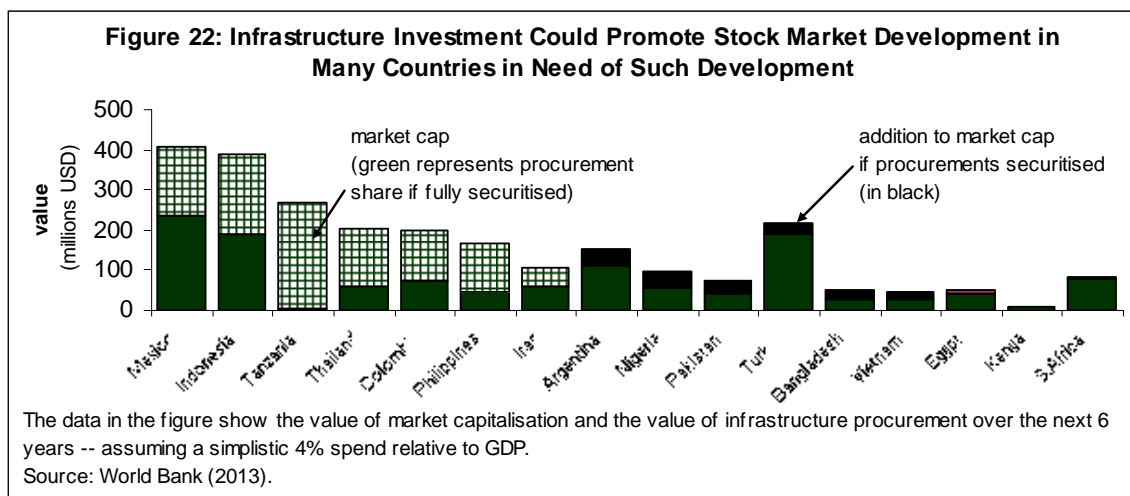
Audit represents a core activity in such master planning. Few policymakers and even business people understand the role audit can play at each step of the infrastructure master planning process. Auditors assess risks related to the plan, assess the extent to which the plan matches local and national development goals, and so forth. Such audit also ensures that bankers chose the best methods of long-term finance and that legal counsel drafts appropriate regulations. An audit firm has helped pay for this study (and the main author is an internal auditor). Such wide-spread participation by auditors in this work shows the importance of audit in urban design and infrastructure planning.

Professional service firms can prepare for this wave of infrastructure in a number of ways. Lawyers and marketing firms can help sensitize taxpayers in many of these low-taxing paying countries (particularly India and Russia) about the importance of paying taxes and monitoring procurement-related public expenditure. Most readers would laugh when reading this recommendation. However, such trends have underpinned large increases in spending in Brazil, South Africa, Mexico, and Turkey. These professional service firms can also let the design firms and construction companies know about their services far more aggressively. When you approach many URS project managers and tell them they should consider an analysis of local regulations or model economic impacts, many still stare with incredulity. Few tender proposals consider the range of services we describe in Figure 21 which would help ensure the long-term sustainability of many of these infrastructure procurements.

Using design firm development to deepen equity markets

In OECD countries, tying long-term infrastructure development to stock markets seems extremely dubious. However, present crisis notwithstanding, the overall trend shows that equity market development correlates with infrastructure development. In the US, the first publicly traded corporations emerged to fund large infrastructure like a bridge over Boston's Charles River. Building large motorways in Moscow, Cairo, Kiev, and Mexico City can ease infrastructure burdens. More importantly, the projects set up as corporations to collect the money for these projects can offer savers a \$50 million vehicle for saving and drawing a pension in their old age. Such securities (either stocks or debt issued by these projects) then goes into other portfolios, serves as bank collateral, and serves as a key in what economists call the "money multiplier."

In all the emerging markets we study for this brief, the private securitisation of even a modicum of infrastructure investment would expand equity markets significantly. Figure 22 shows the effect of such securitisation (namely breaking up infrastructure projects into companies and selling their shares to the general and investing public). In Mexico, such infrastructure investment would represent about half the value of the Mexican Bolsa (stock market). In Argentina and Turkey, such investments would increase the size of each country's traded securities by about 10%. Relatively small increases in the size of the Egyptian or Kenyan equities markets likely reflect investors' inability to absorb investments in very large projects. Gross national product in these countries would need to grow before large scale securitisation would increase the size of these stock markets.



Participants in all stages of an infrastructure project should consider using securitisation as they build emerging markets' \$4 trillion dollars worth of projects.

Governments can tender projects already incorporated as corporations (and tender shares along with project specifications). Design firms can sell off projects as special purpose vehicles (though the name has nasty connotations in post-Lehman financial markets). Emerging market firms can issue their own shares more widely on the world's exchanges – as a way of pooling the risks inherent in the shares of any one project. The

construction and engineering “designer firms” of emerging markets can serve as surrogate portfolios. They can assemble the shares of 200 or more projects in various emerging markets corporatised projects. Such a financing method would make companies like Indonesia’s Wijaya Karya Persero or the Mexican Grupo Carso far less risky, bigger and more financially.

Conclusions

Emerging market governments will need to invest about \$4 trillion in order to meet residential and commercial demand for infrastructure. In this brief, we looked at needed water (including waste water), telecom, transport and energy infrastructure in the most populous emerging markets. We could not tell the reader where planners and constructors should place each bridge or wireless antenna. However, we could exploit patterns in overall spending in advanced OECD markets to predict how much infrastructure investment emerging market governments need to make. Using the law of large numbers, country specific idiosyncrasies down into broad patterns showing additional infrastructure spending needed by these emerging markets.

We argue that investors in both OECD and emerging markets could invest far more in infrastructure companies. We identify some of the major infrastructure companies for retail and investment firm customers looking to take advantage of this upcoming boom in infrastructure. Investors putting money in the global “design firms” can obtain broad coverage of this trend. Yet, lesser known companies in emerging markets need the capital and can possibly use it far more profitably. An investment in a Thai, Russian, Mexican or other construction and engineering company we identify in this brief may help investors take advantage of the upcoming emerging market infrastructure “gold rush.”

We also identify ways that governments and companies can make the most out of these infrastructure-related needs. The WTO Agreement on Government Procurement can open up markets to a range of lower cost and higher quality foreign design and construction firms. The Agreement can also encourage emerging market firms to increase their assets and revenue abroad – thereby entering the league of design firms reserved for OECD member firms. Many infrastructure firms – in both OECD and emerging markets – remain in private hands. By listing, they can obtain more capital and increase their exposure in emerging markets. Finally, other professions can also “get in” on the infrastructure boom. Lawyers, auditors, and even marketing firms will see a fair amount of residual demand generated from large infrastructure projects. They should seek work in this area.

Appendix I: How Did We Arrive at Our Estimates?

Among the OECD countries, infrastructure needs assessments have become extremely well developed. Figure A shows one example from the US of a cost-benefit analysis of infrastructure investments in water, energy, transport and communications (and several other areas). They conduct a locality-by-locality analysis – focusing on the major risks to infrastructure posed by obsolescence. As the US represents a well-developed infrastructure network, they rightly focus on the costs posed by disruptions to the country's energy, transport, water and telecom infrastructure. Replacing and upgrading of aging infrastructure represents an important part of infrastructure renewal. However, in countries like China which grow extremely rapidly, we need to analyse more than the state of existing infrastructure. We need to assess future requirements – often in areas of infrastructure (like mobile telephony) where infrastructure does not yet exist.

Figure A: Example from the US of an infrastructure funding gap assessment

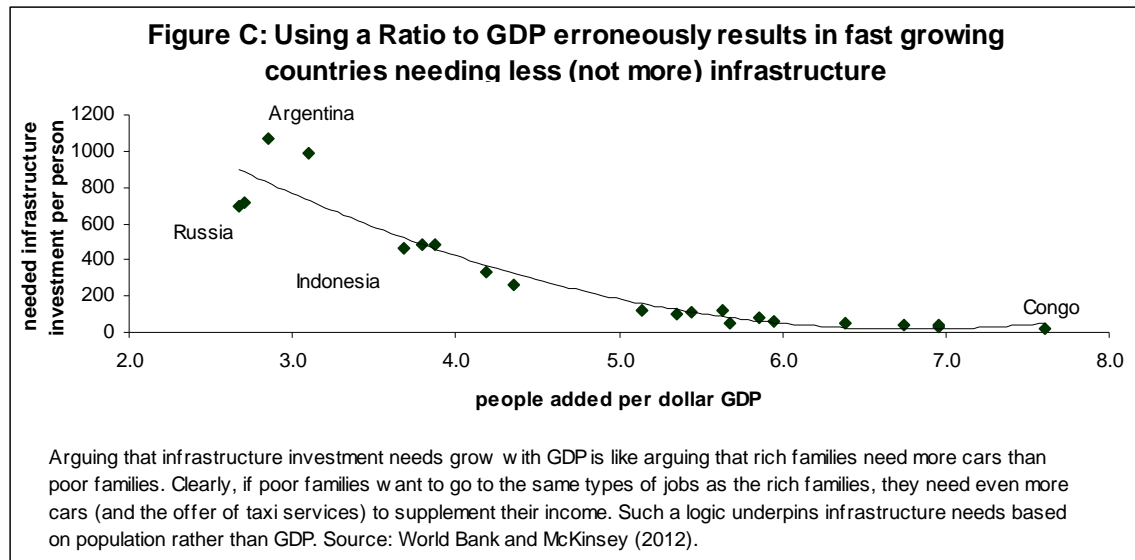


Other reports attempt to assess the state of infrastructure in emerging markets. Figure B shows examples of some of the more prominent studies. We found almost 200 reports assessing aggregate or sector-specific infrastructure needs world-wide. However, we could not use most of them because they consisted of estimates without any explanation of how the authors reached these estimates (mostly from the investment banks). In other cases, they consisted of surveys of executives. Finally, we found references to large studies conducted by companies like Morgan Stanley and Booz-Allen Hamilton. However, these reports had been removed from the internet by the time of our study. As such, we could not evaluate the extent to which these reports provided reliable estimates of infrastructure spending needs.

Figure B: Other infrastructure reports and market sizings

Institution	Description and critique	Link
WEF/KPMG	Use specifically a GDP measure of needed infrastructure and place spending needs at about \$1 trillion.	*
McKinsey Global Institute	Estimate a <u>total</u> needed \$57 trillion in infrastructure – across all markets. Roughly \$2.5 trillion in <u>extra</u> targeted infrastructure needed (far closer to our own estimates).	*
RBS	Estimate a \$20 trillion need for infrastructure across markets in total. They do not explicitly state <u>marginal</u> increased needs – though growth projections look very similar to ours.	*
E&Y	Another GDP-based estimate of <u>total</u> needed infrastructure spending (at about \$57 trillion). Does provide some consideration of population as driver of infrastructure and major urban centres.	*
OECD	Their report <i>Infrastructure to 2030</i> provides the most comprehensive over of infrastructure needs. However, the report only looks at the OECD economies. Using their methodologies to assess infrastructure needs in emerging markets seemed like a logical extension of their analysis.	*

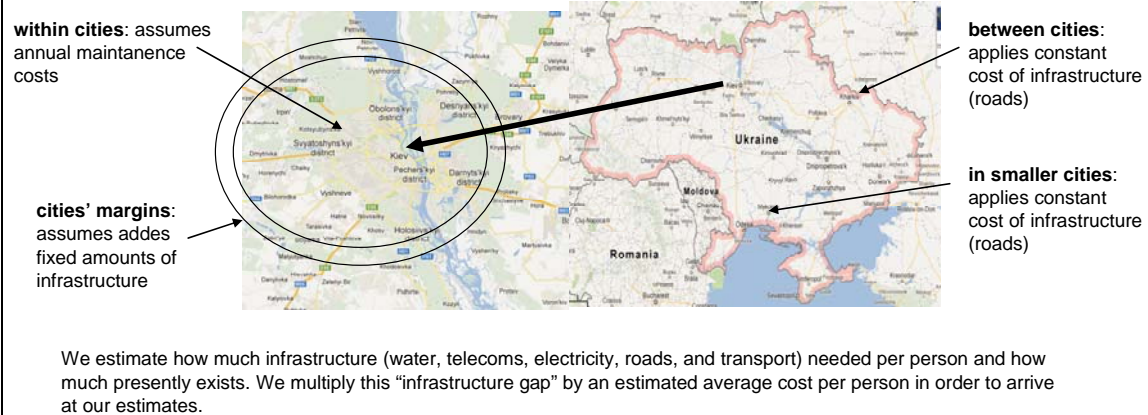
While preparing this report, we analysed a number of other studies and reports. Many use GDP as a rule of thumb for infrastructure spending needs. This approach – epitomized by the relatively well cited McKinsey Global Institute – argues that infrastructure needs corresponds with economic size. Larger economies have more factories, produce more things that need shipping to foreign parts, and so forth. Figure C shows why such an approach generates completely wrong estimates – at least for fast-growing emerging markets. The fastest growing economies – like the Congo or Kenya – need to expand their water, energy, telecom and transport infrastructure far faster than places like Russia. Per dollar of GDP, Kenya adds about 4 more people than Russia. These people do not require less water than Russians. In fact, they require more (because they need to develop an infrastructure which covers a much smaller proportion of their population). Using the McKinsey method, these infrastructure-starving economies require far less investment than economies like Russia and Argentina which have already made significant investments in infrastructure. Using GDP as a proxy for infrastructure needs is just plain wrong.



We follow the disaggregated approach followed by the OECD. In the OECD study, the authors break down infrastructure needs according to population. For water, they estimate the number of people and companies that need fresh water by country. For energy, they break-down energy needs by population (both residential and commercial populations). They calculate how various methods of energy production can meet such demand – such as production from coal, gas, petrol, nuclear and alternative methods. They finally figure out the quantity and methods of supplying extra energy to match demand.

Our infrastructure gap model places the needs of an expanding population at the heart of the analysis. Figure D provides a representation of the way we conducted our analysis. First, we had to calculate the need for water, energy, and transport and telecoms for populations in each emerging market. We know from OECD estimates roughly the value of such water, energy, transport and telecom services required by these populations. We use OECD averages as our baseline because if emerging markets like Kenya or Thailand will want to produce outputs at the same level as the OECD member states (namely as upper income countries), they will need an upper-income country infrastructure. Second, with these needs in hand, we estimate the extent to which existing populations are underserved by existing infrastructure. The World Bank provide data on access to electricity and other statistics which allow us to guess how many people do not have access to infrastructure inside of urban areas and outside of them. We know the cost of maintaining infrastructure in these urban and rural areas (thanks to OECD data). We also know the cost of adding enough capacity to ensure universal coverage in a country's principally urban areas. We refer to these as infra-marginal costs (think of trying to fill the circle surrounding a city in Figure D as such infra-marginal costs).

Figure D: Model of Infrastructure Needs in Emerging Markets



We also include the cost of scaling up infrastructure as populations (particularly urban populations) grow. Think of such costs as expanding the circle shown in Figure D to build around the city as populations expand. In reality, cities become more dense as well as expand outward. However, in order to illustrate our method, the reader can think of extra costs of adding energy, water, telecom and transport services as simply adding rings of such infrastructure around existing population centres. The third step in our analysis then consists of estimating the cost of providing the marginal (or extra) population with more water, energy, telecom and transport services. The fourth step consists of filling in the lattice between cities – figuring out how much it costs to pipe water, energy, telecom services and transport linkages between urban areas. Such an approach can not give precise estimates. However, they probably represent far more reliable estimates than a simplistic measure using GDP as a base to determine infrastructure needs.

How do we estimate the sizes of populations in these countries, the cost of expanding such infrastructure and so forth? Figure E shows the main variables we used in our analysis – and the way we used each variable in our analysis. We had to remain flexible in our analysis, as clearly some costs for transport for example, would be far more or less in places like Africa. We did not want to turn a short brief into a doctoral dissertation delineating each step in our calculation method. As such, we wanted to provide enough information so readers could reproduce our estimates – without overwhelming them in details. For readers interested in reproducing our estimates, we encourage you to match our “orders of magnitude” rather than try to match our exact numbers.

Figure E: Variables Used in Our Analysis of Infra-Marginal and Marginal Infrastructure Needs

Variable	Source	How we used this indicator
General variables		
Population	World Bank	Population formed the basis of our analysis. The demand and value from infrastructure come from people – not from GDP.
Percent urbanisation	World Bank	Using these data, we can estimate how quickly cities grow (both because of population growth and because of migration from the rural areas).
Energy		
Access to electricity	World Bank	We must calculate the amount of resources needed to provide electricity to the current population before we could plan for future generations.
Alternative and nuclear energy (% of total energy use)	World Bank	We had to plan for a future in which alternative energy use grows. We assumed that our countries grew use about 5% of total energy from alternative sources.
Average cost of per kilowatt hour	OECD and various	We must estimate the <u>average</u> cost of kilowatt hour as generated over a variety of methods. In practice, several countries subsidise some electricity generation methods – so our estimates will be slightly off.
Transport		
Air transport, freight (million ton-km) and passengers carried	World Bank and airline industry data.	Each airport can generate a certain amount of passengers and cargo. We know the average passenger and cargo for OECD economies. We calculate the gap between emerging markets and OECD countries. We also know how much it costs to transport passengers and cargo per km. Multiplying these costs by the gap (in cargo and passengers) gives a air transport gap.
Rail lines (total route-km), goods transported (million ton-km)	World Bank and rail industry data.	We know the rail line coverage per square kilometre from the OECD countries. We calculated the difference between the amount of rail emerging markets and the amount they “should have.” A simple internet search provides rail costs per km and transport costs.
Container port traffic (TEU: 20 foot equivalent units), Liner shipping connectivity index (maximum value in 2004 = 100) and Quality of port infrastructure, WEF	World Bank and shipping industry data.	We know the amount of port traffic of OECD countries as well as their average connectivity indices and quality of infrastructure. We know from industry data the cost of putting down and running a port (per TEU).
Motor vehicles (per 1,000 people), road (km of road per 100 sq. km of land area), and goods transported (million ton-km)	World Bank and trucking industry data.	We calculate the average vehicle use in the OECD, road penetration and goods transported. Finding the difference with emerging markets poses little problem. We know the cost of laying road and sending goods by truck over 100 kms of good road).
Water		
Annual freshwater withdrawals, industry (% of total freshwater withdrawal), Improved water source (% of population with access), Improved water source, urban (% of urban population with access)	World Bank and water industry sources.	World Bank data provide information about scarcity of water (and waste water) in emerging markets. We know how much water processing plants cost to build, operate and maintain (plus or minus several tens of millions of dollars). Fortunately, water provision is far less complex than energy or telecommunications in recent years. Innovations in water provision promise to change this industry – but we do not incorporate any of the recent innovations into our analysis.

Communications		
Telephone lines (per 100 people) and mobile cellular subscriptions (per 100 people)	World Bank and telecom industry estimates	Interesting, some emerging markets have far more mobile phone penetration than OECD countries. Moreover, many people do not use landlines anymore. As such, this part of our analysis represented the least important part of our work.
Fixed broadband Internet subscribers (per 100 people) and Secure Internet servers (per 1 million people)	World Bank (and industry estimates)	We know how much more connected the OECD is than most emerging markets. Internet connectivity is economic destiny. We know how much it costs to lay fibre-optic line and to wire houses. Calculating the needs of the non-wired in emerging markets represents a relatively easy task.

We used the standard research databases in order to identify the companies who could provide much of this infrastructure. Figure F shows the relatively scarce number of companies we could find in order to predict which companies would/could profit most from the upcoming infrastructure gold rush. We specifically looked at SIC codes 1500 to 1800 and 8100 to 8110 (covering construction, engineering and consulting companies which we hope cover the “design firms” of the emerging markets). Countries like China have even more companies than many developed Western European countries (making their categorisation as an emerging market very suspicious for our purposes). Other countries – like Turkey – have only 5 companies’ information on our databases.

Figure F: Companies We Used in Our Study

Country	Number companies (market cap)	Variability of market cap*	Number companies (assets/revenue)	Variability of assets*
Argentina	5	0.6	4	0.7
Brazil	17	3.5	7	1.2
China	58	1.7	58	2.7
Indonesia	12	1.3	12	0.6
India	102	5.0	98	3.2
Mexico	10	1.3	7	1.2
Nigeria	6	1.5	4	-
Russia	3	1.5	1	-
Thailand	33	1.3	7	1.9
Turkey	5	1.0	5	0.9
Vietnam	132	2.5	26	0.9
South Africa	19	1.7	15	1.4

Only 12 of the 25 countries we studied have publicly traded infrastructure-related companies. The lack of similar companies in places like Pakistan and Nigeria represent an opportunity not only for foreign companies, but domestic as well.

* Each variability indicator represents the standard deviation divided by the mean.

Source: Compustat

As of 2013, investors interested in taking advantage of the “gold rush” could look at four Exchange-Traded Funds (ETFs). All four have had negative yield-to-dates in 2013 -- the iShares S&P Global Infrastructure Index Fund (IGF), the iShares S&P Emerging Markets Infrastructure Index Fund (EMIF), the PowerShares Emerging Markets Infrastructure Portfolio (PXR) and the the SPDR FTSE/Macquarie Global Infrastructure 100 (GII).

However, these provide the retail investor with an exposure to this market – and insight into the potential “design firms” of the future. Figure G shows the holdings of the PowerShares EMI Portfolio. Many of the infrastructure companies in the portfolio come from developed markets. Yet, a number represent construction and engineering companies which whose data we do not have access to. Indirect access through ETFs, mutual funds and other forms of institutional investment may come to represent a key way that investors obtain access to these companies.

Figure G: PowerShares Emerging Markets Infrastructure Portfolio

Country	Ticker	Share	Name
Brazil	VALE	3.00	Vale SA ADR
Brazil	MYPK3	1.29	Iochpe-Maxion SA
Brazil	GGB	1.04	Gerdau SA ADR
Brazil	MAGG3	1.04	Magnesita Refratarios SA
Brazil	MMXM3	0.37	MMX Mineracao e Metalicos SA
Brazil	PMAM3	0.53	Paranapanema SA
Brazil	WEGE3	0.53	WEG SA
Brazil	SID	0.37	Cia Siderurgica Nacional SA ADR
Mexico	ICA	2.25	Empresas ICA SAB de CV
Mexico	PINFRA	1.67	Promotora y Operadora de Infraestructura SAB de CV
Mexico	CX	2.38	Cemex SAB de CV ADR
Mexico	GCARSOA1	0.44	Grupo Carso SAB de CV
China	914	3.13	Anhui Conch Cement Co Ltd
China	358	2.02	Jiangxi Copper Co Ltd
China	390	1.44	China Railway Group Ltd
China	2009	1.38	BBMG Corp
China	1186	1.23	China Railway Construction Corp Ltd
China	347	1.10	Angang Steel Co Ltd
China	3993	0.95	China Molybdenum Co Ltd
China	1072	0.95	Dongfang Electric Corp Ltd
China	1829	0.34	China Machinery Engineering Corp
China	3339	1.08	Lonking Holdings Ltd
China	MIDAS	0.69	Midas Holdings Ltd
China	2626	1.04	Hunan Nonferrous Metal Corp Ltd
China	1800	0.63	China Communications Construction Co Ltd
China	2727	0.81	Shanghai Electric Group Co Ltd
China	3323	0.49	China National Building Material Co Ltd
China	38	0.45	First Tractor Co Ltd
China	1618	0.98	Metallurgical Corp of China Ltd
China	1133	0.37	Harbin Electric Co Ltd

S. Africa	WBO	1.99	Wilson Bayly Holmes-Ovcon Ltd
S. Africa	MUR	1.98	Murray & Roberts Holdings Ltd
S. Africa	PPC	1.48	PPC Ltd
S. Africa	AEG	0.81	Aveng Ltd
S. Africa	ASR	0.81	Assore Ltd
S. Africa	ARI	1.23	African Rainbow Minerals Ltd
Malaysia	DLG	2.61	Dialog Group BHD
Malaysia	IJM	1.56	IJM Corp Bhd
Malaysia	WCTH	0.97	WCT Holdings Bhd
Malaysia	GAM	1.91	Gamuda Bhd
India	LTOD	0.69	Larsen & Toubro Ltd GDR
India	MHID	0.98	Mahindra & Mahindra Ltd GDR
India	SLT	0.22	Sterlite Industries India Ltd ADR
Indonesia	SSIA	1.04	Surya Semesta Internusa Tbk PT
Indonesia	INTP	0.82	Indocement Tunggal Prakarsa Tbk PT
Indonesia	WIKA	0.82	Wijaya Karya Persero Tbk PT
Indonesia	TBIG	0.70	Tower Bersama Infrastructure Tbk PT
Indonesia	UNTR	0.52	United Tractors Tbk PT
Indonesia	ADHI	0.52	Adhi Karya Persero Tbk PT
Indonesia	INCO	0.35	Vale Indonesia Tbk PT
Indonesia	SMCB	0.34	Holcim Indonesia Tbk PT
Indonesia	ANTM	0.29	Aneka Tambang Persero Tbk PT
Indonesia	SMGR	0.92	Semen Indonesia Persero Tbk PT
Russia	MNOD	1.78	MMC Norilsk Nickel OJSC ADR
Russia	LSRG	0.65	LSR Group GDR
Russia	MTL	0.34	Mechel ADR
Russia	NLMK	0.17	Novolipetsk Steel OJSC GDR
Russia	MMK	0.32	Magnitogorsk Iron & Steel Works GDR
Russia	SVST	0.24	Severstal OAO GDR
Other emerging market			
Turkey	TKFEN	1.28	Tekfen Holding AS
Turkey	CIMSA	0.58	Cimsa Cimento Sanayi VE Tica
Philippines	MPI	1.11	Metro Pacific Investments Corp
Chile	BESALCO	0.89	Besalco SA
Chile	SALFACOR	0.83	Salfacorp SA
Malaysia	LMC	0.83	Lafarge Malaysia Bhd
Malaysia	MMHE	0.40	Malaysia Marine and Heavy Engineering Holdings Bhd
Egypt	OCIC	0.63	Orascom Construction Industries

Other Upper-income			
Australia	LEI	0.50	Leighton Holdings Ltd
Switz	ABB	3.20	ABB Ltd
Sweden	ATCOA	2.99	Atlas Copco AB
France	AREVA	0.20	Areva SA
Taiwan	9933	2.48	CTCI Corp
Taiwan	1102	2.38	Asia Cement Corp
Taiwan	2002	1.90	China Steel Corp
Taiwan	2006	1.54	Tung Ho Steel Enterprise Corp
Taiwan	2515	0.76	BES Engineering Corp
Taiwan	2059	1.08	King Slide Works Co Ltd
Taiwan	2504	1.05	Goldsun Development & Construction Co Ltd
France	ALO	1.35	Alstom SA
Chile	CAP	1.30	CAP SA
Singapore	SMM	0.56	SembCorp Marine Ltd
Singapore	HYF	1.14	Hyflux Ltd
S. Africa	RLO	0.96	Reunert Ltd
UK	EVR	0.48	Evrz PLC
Taiwan	1101	3.33	Taiwan Cement Corp
USA	CAT	3.21	Caterpillar Inc
USA	PLL	1.53	Pall Corp

Source: PowerShares (Emerging Markets Infrastructure Portfolio)