

# FOUNDATIONS FOR GROWTH

## Infrastructure Investment in Emerging Markets



Russell Jones and Camille Viros

**LlewellynConsulting**  
*Independent Economics*



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# FOREWORD



Globalisation is now well understood as the transformative economic force of our age. So, too, are many of its consequences: the emergence of vast numbers of people around the world from poverty; urbanisation, industrialisation and the growth of a new emerging-market middle class; and rapidly rising demand for energy, food and industrial raw materials. Perhaps the consequence that is least understood and most deserving of attention is the need these developments create for new infrastructure - roads, ports, communications, power and water - to handle increasing trade flows and to cater to citizens' rising expectations.

As this white paper commissioned by the Trafigura Group demonstrates, infrastructure development is a vital factor for economic and social progress, with far-reaching effects on the growth potential of the global economy and on individual countries' welfare. As it also shows, the world currently faces a massive deficit of infrastructure investment, especially in the emerging economies of Africa, Latin America and large parts of Asia.

The authors calculate that developing countries need to double existing annual spending on infrastructure to 6-8% of GDP by 2020 to keep pace with expected demand. The question arises as to how this massive investment is to be funded and executed.

Historically, the public sector has taken the lead in infrastructure development in both industrialised and emerging countries. It has become clear in recent years, however, that governments are no longer able to play such a dominant role. In part this is because public sector finances are everywhere under pressure, but it also reflects a realisation that governments are not always the optimal agents for efficient delivery of significant infrastructure projects. The search is on, therefore, for alternative solutions.

That is the background against which Trafigura asked Llewellyn Consulting to conduct this research. Our core business is trading vital commodities such as oil products, metals and minerals, but increasingly we are also investors in infrastructure – from oil storage farms and metal warehouses to ports, railways and barge systems. Infrastructure investments are central to delivering the logistical and trading services we provide.

Where a bottleneck impedes supply, we will invest to remove it, in the process connecting new suppliers to global markets. Our Puma Energy affiliate runs a network of midstream and downstream fuel supply assets in fast-growing markets around the world. Our Impala and DT Group subsidiaries are building storage terminals, transport links and port facilities in Latin America, Asia and Africa.

We are thus as interested as anyone in demonstrating the benefits of infrastructure investment to the wider economy – and the opportunity costs of failing to invest in such assets. Increasingly, we are partnering with governments, bringing deep financial resources and practical expertise to help them address their infrastructure needs.

It is our hope that this white paper will contribute to an informed debate about the important role of infrastructure in fostering development, and will encourage the search for innovative public-private partnerships in this area. Since the emerging-market growth that is fuelling demand is unlikely to abate in the foreseeable future, solutions will be at a premium in coming years. In this spirit I commend this report for its valuable insights, and trust you will find it both informative and thought-provoking.

**Claude Dauphin**, *Executive Chairman, Trafigura*

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# *AUTHORS' NOTE*

Infrastructure investment is a hugely important topic for the global economy, and especially the developing world. From an economic perspective, there are two overriding points to emphasise. First, done well, infrastructure investment is unambiguously a 'good thing'. Second, there is a dearth of it: and this is particularly the case in the poorer nations.

This study seeks to demonstrate how well-executed infrastructure spending can exert a powerful influence, on both aggregate demand and aggregate supply, and in the process promote economic development and help to ameliorate extreme poverty. This is especially the case with projects that span national borders, and thereby encourage international and inter-regional trade.

The study also documents that the world is suffering from an enormous shortfall of appropriate and efficiently-run infrastructure assets. And this shortfall is likely only to increase, given rapid population growth, increasing urbanisation, and the burgeoning exigencies of climate change. This widening deficit extends to all the major infrastructure categories – energy, water and sanitation, telecommunications, and transport – and it is in the most under-developed areas of the world, many of which are in Africa, that the greatest transformation is required.

Unfortunately, working out how to meet these burgeoning requirements is by no means straightforward, whether for economists or policymakers, involving as it does vexed and complex matters of how, and by whom, the associated projects are to be planned, financed, sequenced, overseen, and managed.

The third and final section of the study confronts these difficult issues, and suggests some practical solutions. One conclusion in particular shines through: if the developing world's cavernous infrastructure gap is to be 'bridged', then the public and private sectors and international institutions will necessarily have to come together to pool their resources, their experience, and their expertise, in a mutually beneficial and reinforcing manner.

Furthermore, as part of this pooling process, it would be wise to tap into the know-how of a multinational corporate sector that has long demonstrated capability in this area, and which has over recent years become increasingly aware of global citizenship responsibilities that extend some way beyond those owed to its immediate shareholders.

To bring out the main issues clearly, it is necessary to 'fly over the subject at the right height'. This we hope we have done, even if in so doing we have had to truncate the paper in various areas, each of which could have been a subject of study in its own right.

The principal authors are Russell Jones and Camille Viros. Edited, and approved for publication, by John Llewellyn and Preston Llewellyn.



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# TABLE OF CONTENTS

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EXECUTIVE SUMMARY	6
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---

THE ECONOMIC CASE	
— INFRASTRUCTURE: A FORCE FOR GOOD	9
A Multi-faceted Role in Development	10
The Effects on Output, Jobs, and Inequality	11
Quality as Important as Quantity	15
Developing a Successful Infrastructure Programme is Hard	15

---

GLOBAL AND REGIONAL REQUIREMENTS	
— COLOSSAL NEEDS, ESPECIALLY IN AFRICA	17
Drivers of Future Infrastructure Needs	18
Global Infrastructure Needs	20
Regional Infrastructure Needs	23
<i>BOX 1 — Some Examples of Countries with Good Infrastructure</i>	30
<i>BOX 2 — Some Examples of Countries with Poor Infrastructure</i>	32
<i>BOX 3 — China: The New World's Leader in Infrastructure Investment</i>	34

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DELIVERING CHANGE	
— PUBLIC-PRIVATE PARTNERSHIPS TO THE FORE	37
Spreading the Financial Net	38
The Mechanisms of Infrastructure Finance	40
The Future Role of Institutional Investors	45
The Barriers to EM Infrastructure Investment	47
<i>BOX 4 — Impala: The Magdalena River, Colombia</i>	52
<i>BOX 5 — Maersk: Santos Container Terminal, Brazil</i>	54
<i>BOX 6 — Rio Tinto: Simandou, Republic of Guinea</i>	56

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CONCLUSIONS	58
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REFERENCES	60
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TRAFIGURA: ADVANCING TRADE	62
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# *EXECUTIVE SUMMARY*

## **THE ECONOMIC CASE**

- The full importance of infrastructure investment is only now starting to be properly recognised. For infrastructure plays a fundamental role in developed and developing countries alike in economic growth. Infrastructure investment is important on a number of levels. It is a vital facilitator of, and often an active catalyst for, economic and social progress, with the ability to transform a country's welfare and development.
- The overwhelming evidence from quantitative analyses is that infrastructure investment can exert a powerful positive influence on both aggregate demand and aggregate supply, and thereby help developing economies spring the so-called 'Middle-Income Trap'.
- Benefits to economic growth and development can be broader and more enduring than just short-term demand management and additions to an economy's capital stock. For example:
  - Good infrastructure can reduce the costs of production, enhance competition, expand trade, encourage economies of scale and the division of labour, foster the diffusion of new technologies, encourage better organisational practices, and provide access to raw materials and other resources.
- Evaluating its precise impact is complicated: influences vary from country to country and sector to sector.
- The development of energy, water, transportation, and telecom assets can all exert significant positive effects. Energy infrastructure has the most powerful impact on the output and productivity of all these sub-categories.
- Quantity is only part of the story – much hangs on efficiency of implementation and institutional arrangements. Unfortunately, emerging market (EM) infrastructure strategies have, so far at least, proved rare. They have lacked coherence, and there has been a tendency to focus on new, large-scale, prestige energy and transport projects which, while doubtless impressive to behold, have frequently been beset by corruption and have provided limited employment benefits.
- Operation and maintenance also play a key role in successful infrastructure programmes by extending the lifespan of the existing capital stock and thereby reducing the need for new gross investment.

## **GLOBAL AND REGIONAL REQUIREMENTS**

- Emerging countries' infrastructure requirements are colossal; meeting them is crucial to their future development.
- Infrastructure requirements will be driven by demography, urbanisation, trade, and climate change.
  - The world's population is likely to rise from around 7 billion today to some 9.6 billion by 2050, and most of this growth will occur in the developing regions.
  - Today half of the world population lives in cities: by 2050 more than two-thirds of all people will be urbanised.
  - So-called 'South-South' trade has been increasing rapidly, outpacing 'North-South' trade since 2007.
  - Since 1990 global CO<sub>2</sub> emissions have risen by more than 50%, with the developing countries accounting for most of this increase.
- Globally, infrastructure outlays equivalent to some 3.5% of global GDP per year are required to 2030.
- In developing countries, the requirement is even greater: a doubling of existing outlays to 6-8% of GDP per year. Half of the shortfall is in the electricity sector; the remainder is split between transport, water, and telecoms.
  - Nearly 70% of the population in developing countries has no access to electricity.
  - Road connectivity remains low, particularly in rural areas.
  - Nearly 800 million people are without access to an adequate, safe water source.
  - In the telecoms sector, mobile phone penetration is a bright spot, but Africa remains a conspicuous laggard.
- Africa has the poorest infrastructure in the world, with power and water supply the two main challenges. It lags well behind all other regions in all infrastructure sections, and the gap continues to widen.
- Latin America's access to basic infrastructure is good, but transport linkages remain a big problem not only within countries but also, just as importantly, between countries. And in the energy sector the region continues to consume far more than it produces.
- Asia has seen significant progress in infrastructure access, but it is struggling to keep pace with its rapid growth. However, the picture varies considerably from country to country, and there is a marked contrast between the southern (lagging) and the eastern (leading) regions. Access to electricity remains the major issue.

## ACHIEVING A STEP CHANGE

- A combination of inefficiencies and constraints on the public finances are conspiring to limit the public sector's role in the sponsorship and delivery of infrastructure assets in most developing countries.
- Resources have habitually been misallocated across sectors, across regions, and over time in the face of malign political interference and inadequate governance.
- A particular problem for resource-exporting countries is that they have systemically failed to sustain counter-cyclical fiscal policy in the face of large swings in commodity prices.
- Moreover, since the global financial crisis the conventional banking sector has been constrained by tighter regulation, including more demanding capital ratios, and a general move to a more conservative approach to lending.
- All this has left a financing 'hole' which can be filled only by other elements of the private sector.
- Companies have long been involved in the physical delivery of infrastructure assets as contractors to governments, or to support their own businesses. But a broader application by the private sector, of both financial sector resources and practical expertise, is needed if emerging market infrastructure is to develop adequately.
- Such resources and expertise are available in many cases, but harnessing them such that they work to the benefits of both parties – government and the private sector – requires innovative approaches both to financing and to project management.
- In emerging-markets infrastructure project finance and delivery are especially complex and challenging. Serious barriers to EM infrastructure investment include:
  - Political and sovereign risks;
  - The limited number, and sporadic nature, of suitable projects – in particular too many 'greenfield' schemes;
  - Inadequate government guarantees to mitigate private sector risks;
  - Regulatory instability;
  - Lack of appropriate financing vehicles;
  - Investor 'short-termism'; and
  - Lack of adequate transparency and data across the sector as a whole.
- Nevertheless, there clearly are opportunities for:
  - The institutional investment sector, both in the developed and the developing world;
  - Sovereign wealth funds;
  - Multilateral development banks; and
  - The multinational corporate sector.



Shipping vessel unloading, Durban, South Africa



Bridge construction, Panama





# INFRASTRUCTURE: A FORCE FOR GOOD

A country's infrastructure development is important on a number of levels. It is a vital facilitator of, and often an active catalyst for, economic and social progress, with the ability to transform a country's welfare and development.

- Infrastructure investment can exert a powerful influence on both aggregate demand and aggregate supply, and help developing economies spring the so-called 'Middle-Income Trap'
- Benefits to economic growth and development can be broader and more enduring than just short-term demand management and additions to an economy's capital stock
- Evaluating its precise impact is complicated: influences vary from country to country and sector to sector
- The development of energy, water, transportation, and telecom assets can all exert significant positive effects
- Quantity is only part of the story – much hangs on efficiency of implementation and institutional arrangements
- Operation and maintenance also play a key role in successful infrastructure programmes

*Infrastructure is vital for economic success ...*

*... influencing both demand and supply*

## A MULTI-FACETED ROLE IN DEVELOPMENT

It is widely held that a country's infrastructure is central to the functioning of its economy and to the welfare and development of its population.

A broad definition of infrastructure includes both physical (tangible) and non-physical (non-tangible) assets. It can be thought of as the economic arteries and veins that enable people, capital, commodities, manufactures, water, energy, information, and more to move efficiently both within, and into and out of, a country. It therefore includes the assets that underpin the economy's networks for transport; energy generation, distribution and storage; communications; waste management; and water distribution and treatment. Arguably, the most important elements extend to major roads, railways, airports, seaports; power stations and power lines; the telephone system and internet; household and business water supply, sewerage and waste disposal; flood defences; and intellectual capital. Most economists would also include 'social infrastructure' on the list, namely housing; hospitals; schools; universities; the legal system; government research institutions, and more.

From an institutional investor's point of view, there is little doubt that 'social infrastructure' should indeed be included in the definition. For such investors, it is the associated long-dated cash flows associated with the underlying assets that matter most, and 'social infrastructure' is just as capable as any other form of infrastructure of delivering these.

Although, as will become clear later in this report, private sector entities can be involved at every level of infrastructure provision, Government much of the time plays a central role in both planning and financially sponsoring infrastructure projects, as well as in defining the regulatory regime within which they operate and develop. This reflects the fact that infrastructure investment is on a number of levels of national importance. In particular, it is not just an end in itself but a vital facilitator of, if not an active catalyst for, economic and social progress.

Investment and, within that, infrastructure spending can be a crucial element of macroeconomic stabilisation policy, especially given its short-term 'multiplier' effects on aggregate demand. As the post-global financial crisis period has underlined, these can be considerable. And it also adds to an economy's immediate productive capacity.

Multiplier values tend to be larger when the nature of the investment is such that much of the value is added locally, rather than imported; and when the economy has appropriate spare capacity. The quality, nature, and timing of the investment all typically influence the overall multiplier.

Thus the full range of influences on the value of the short term multiplier is wide. The multiplier will tend to be larger:

- For public investment than for other fiscal policy measures;
- When the stance of monetary policy is easy;
- When the private sector is unable or unwilling to borrow;
- If unemployment is high; and
- If the economy is working below full capacity.

Empirical estimates made before the 2008 crisis place most infrastructure multipliers in a broad range from 0.5 to around 1.5. Interestingly, however, more recent, post-crisis, estimates have found values as high as 2.0 or more (See IMF, 2010. Effects of Fiscal Stimulus in Structural Models. IMF Working Paper 10 (73).

In all likelihood, however, such studies underestimate the ultimate, long-run effects of infrastructure spending: while they capture the expenditure effects of infrastructure investment (and hence are sometimes called "short-term multipliers"), they rarely capture important longer-term impacts on productive potential and productivity. These can be considerably greater, but are notoriously difficult to quantify with precision.

Interestingly and importantly, however, empirical evidence and analysis suggests that infrastructure investment can have broader, more enduring, consequences for growth and development, over and above those arising from short-term demand management and simple additions to an economy's capital stock. Infrastructure investment can also be considered to be an element of structural policy in that, when undertaken efficiently,

it enhances the productivity of human and physical capital.<sup>1</sup> It does this by:

- Reducing the costs of production and enhancing competition in markets;
- Expanding trade, and encouraging economies of scale and the division of labour;
- Producing a more efficient allocation of activity across regions;
- Fostering the diffusion of new technologies;
- Encouraging better organisational practices in business and beyond; and
- Providing access to new raw material and other resources.

Appropriately delivered infrastructure can also help in a number of other areas, including reducing poverty and inequality, addressing the burgeoning challenges of climate change, and encouraging the 'greening' of an economy.

The corollary, of course, is that poor or inadequate infrastructure can constrain a country's economic development, by encouraging congestion, restricting trade and innovation, increasing transport costs, undermining the reliability of power supplies and telecommunications, polluting water, and leaving workers unhealthy and poorly educated, if not impoverished and cut off from mainstream society. <sup>1</sup>

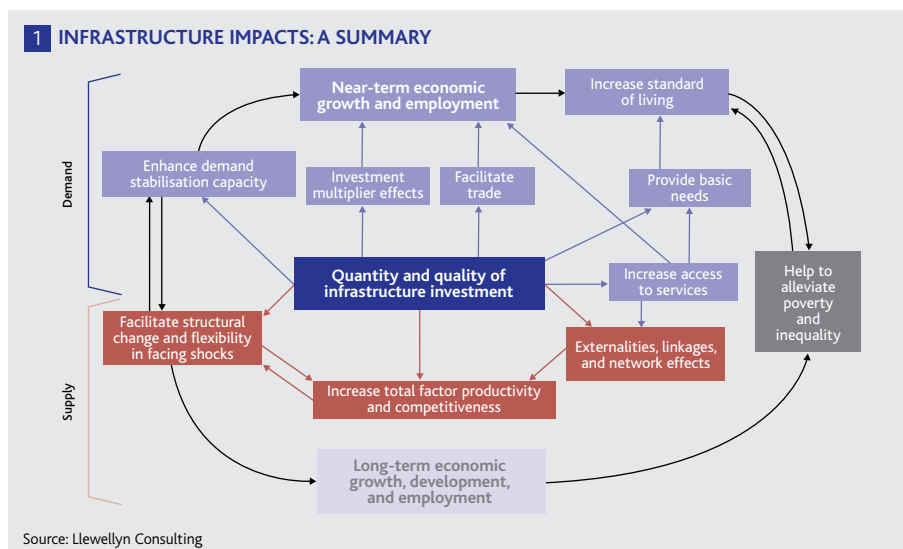
## THE EFFECTS ON OUTPUT, JOBS, AND INEQUALITY

Quantifying the impact of infrastructure on an economy with any degree of precision can be problematic. There are many technical and data-related pitfalls to overcome. These include:

- Choosing the most appropriate econometric modelling technique;
- Deciding on which 'explanatory' variable(s) to use: i.e. whether to use the level of GDP or the growth rate, output per head, or some other measure of productivity;
- Whether to measure infrastructure in physical or monetary terms;
- The frequent absence of data with statistical properties that are constant over time, known as data stationarity;<sup>2</sup>
- Questions of direction of causality – richer countries can, for example, usually afford better infrastructure than can the poor; and
- A general lack of data on stocks and valuations of certain types of infrastructure in many countries, especially those at less advanced stages of development.

As a result, economists have often had little option but to focus their attention on the influence of public sector capital, or certain relatively data-rich sub-categories as proxies for overall infrastructure. But this can generate misleading results. Public sector capital is often very broadly defined, extending to areas such as police or fire stations and public housing, office and warehouse stocks, which are of negligible long-term importance to growth; while private sector infrastructure investment has accounted for an increasingly significant proportion of the total over recent decades and its share is only likely to continue to expand.

*Measuring infrastructure's impact is difficult*





## *Assessments of its effects vary considerably*

### *Narrower definitions score highest*

### *Some sectors are more productive than others*

Both anecdotal evidence and a range of econometric analyses strongly support the notion of a significant positive relationship between infrastructure investment and economic growth. It has also been widely touted as a key catalyst in enabling developing countries to spring the so-called 'Middle Income Trap'. Many hitherto rapidly-growing economies have tended to stagnate at middle-income levels – 'middle income' being defined by the IMF as per capita income between \$2,000 and \$15,000 in 2005 purchasing power parity (PPP) dollars. <sup>2</sup>

Of the 52 middle income countries in 2010, perhaps 35 (nearly 70%) of them were in the 'Middle Income Trap'. But middle-income status does not automatically result in economic slowdown: Japan, Hong Kong, Singapore, South Korea, and Taiwan have made it through to high-income status. The implementation of good structural policies is vital in springing the trap. And efficient infrastructure development is a key aspect of this process.

However, specific estimates of infrastructure's constructive influence are no doubt affected by: the quantitative method adopted; the breadth of the definition of infrastructure used; the sub-categories of infrastructure spending focussed on; and the level of development of the countries under consideration.

There is also considerable evidence of non-linearity in the relationships explored. For example, the more developed the economy, the greater is the existing stock of infrastructure and the lower the payoff from additional infrastructure outlays. That said, the more developed the economy, the more that infrastructure investment can pay off by reducing factors such as 'bottlenecks', diseconomies of scale, and technological lags: but at the same time these factors can complicate the conduct of any assessment.

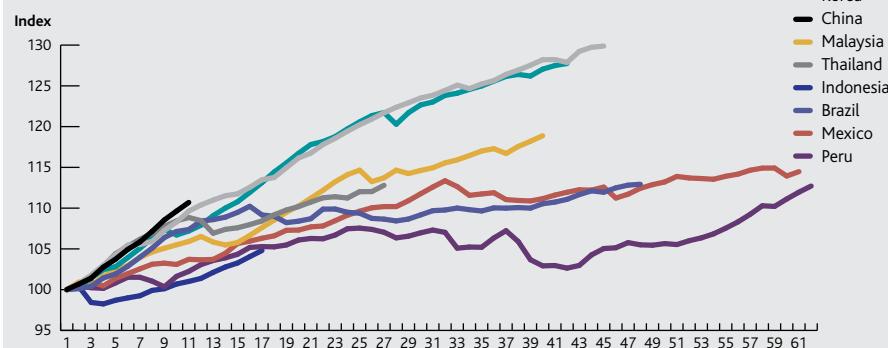
Further difficulties in quantitative assessments include the extent of the exploration of associated regional and country-wide network externalities; and the time period within which they are examined. Some infrastructure-related effects can take decades to become fully manifest: *ceteris paribus*, the longer the period of study, typically the more positive the outcome.

Overall, the narrower the definition of infrastructure that is used – that is to say the more the focus is on immediately productive 'conveyance assets' rather than broader characterisations of the capital stock – the larger the effects seem to be. Furthermore, some specific infrastructure sector pay-offs appear particularly impressive.

In a meta-analysis of comparable studies of the influence of public capital, Bom and Ligthart (2009) conclude that the aggregate effects on output are relatively modest. Their results suggest that the average output elasticity of public capital is only 0.08 – i.e. a 1% increase in the stock of public capital leads to an increase in GDP of 0.08%.<sup>3</sup>

However, this overarching average figure masks much larger impacts for certain sub-sectors of public capital formation, and in particular those falling into narrower and 'harder' definitions of infrastructure investment, such as road and rail networks and port facilities. For studies focussing on these areas of spending more specifically, the elasticity of growth can be some 2½ times the overall average for total public capital.

#### 2 PAST GROWTH TRAJECTORIES



Source: IMF Asia and Pacific Regional Outlook 2013

Note: GDP per capita is in 2005 PPP adjusted terms. The slope of each series reflects the growth rate. Period 1 is defined as the year when GDP per capita for the country considered reached US\$ 3,000 in PPP terms.

Similarly impressive results have also been recorded where the elasticity of GDP per worker with respect to more restrictive definitions of infrastructure is concerned, while further studies have found that differences in the overall efficiency of infrastructure resources can explain anything between 25% and 40% of the growth differential between slow- and fast- growing economies.<sup>4</sup>

Sectoral assessments of the importance of infrastructure have typically concentrated on four areas: energy; water and sanitation; telecommunications; and transport.

### Energy

The importance of power generation, transmission and distribution to human development has long been documented in any number of case studies and cross-country econometric studies. The overwhelming conclusion is that, because of its particularly large-scale network effects, energy sector infrastructure has the most powerful impact on output and productivity of all the sub-categories examined.

This should not be surprising, given that energy is such a key input into the operation and development of other infrastructure sub-sectors. For example, water is often distributed by electric pumps. Supranational energy products seem to exert especially significant effects at all stages of development.

### Water and sanitation

This is the least examined infrastructure sub-sector. Yet clean water and adequate sanitation are essential for irrigation, food security, and limiting the spread of water-borne diseases. They play a crucial role in the health of a population, which in turn greatly affects labour productivity. However, the link with economic growth is more indirect and extended than for other sectors. Among the few studies published, the evidence on the effects of water and sanitation on developing-economy growth is rather mixed.

### Telecommunications

A plethora of data has led to the impact of telecommunications infrastructure on growth in developing economies being especially well-documented. Most studies find impressive effects on both the level and growth rate of real GDP and on labour productivity. However, the precise payoffs vary considerably across regions and countries, and are often determined by the level and the effectiveness of regulation of the sector.

This is particularly the case with fixed and mobile telephony and internet-related investments, where the faster the access to high speed internet, the stronger the ultimate effects on overall output. Yet many developing countries fail to manage this well.

### Transport

For developed countries, the estimated growth effects of transport investments are modest, in large part because transport stocks are typically already mature. The major impact at more advanced stages of development stems from improved quality, addressing specific bottlenecks, or capturing new network or supranational effects not internalised in the original project design.

In the developing world, the results of econometric studies are rather different. Roads and railways have long proved important in the reduction of regional development disparities, both within and between countries, while port quality has proved central to trade facilitation. Supranational transport projects seem to exert especially-significant positive effects, as indeed do multi-modal transport schemes that combine port plus road or port plus railway initiatives. It is doubtful, however, that most of the econometric techniques employed fully capture the related long-term network externalities of transport infrastructure.

Numerous studies have been conducted on the short-term impact of infrastructure on job creation in the developing world. They suggest that the effects will depend, inter alia, on: the particular infrastructure sub-sector under review; the type of technology employed on a project; 'leakages', such as the share of equipment and materials imported from abroad;

*Energy typically scores highly*

*Water is clearly vital but under-researched*

*Telecoms exert an impressive influence*

*The entire impact of transport is rarely captured*

*The influence on employment is inconsistent*

*Multi-sectoral schemes  
provide the most jobs*

*Infrastructure can  
transform the poor's  
prospects*

*But only if it is  
appropriately focussed*

the split of skilled versus unskilled workers employed, and their respective real wage levels.

Overall, the evidence suggests that energy generation and transport investments, while undoubtedly central to long-term competitiveness, productivity, and economic growth, tend to generate relatively few additional jobs in the short-term.

The World Bank estimates that infrastructure investment packages that combine sectors can generate, on average, between 4,000 and 50,000 annualised direct and indirect short-term jobs (depending on sectors and wages) for each billion US dollars spent. However, an investment of \$100 million in a coal-fired power plant generates under 100 direct and indirect short-term jobs for countries that have to import the necessary technology. By contrast, an investment of the same amount in the network expansion of water supply generates about 10,000 direct and indirect short-term jobs.<sup>5</sup>

Notwithstanding the uneven impact on short-term job creation, empirical studies suggest that infrastructure can exert a significant positive effect on the income and welfare of the poor. For example, Gini coefficients<sup>6</sup> and income shares have over an extended period been significantly negatively correlated with indices of both infrastructure stock and quality.

What is more, these conclusions hold when infrastructure is disaggregated. Similarly encouraging results have been obtained for infrastructure stocks in telecommunications, power and transport, and especially for road and rail transport, for example.

Of course, correlation does not prove causality: but there are sound reasons for expecting the causality to run from infrastructure investment to lower inequality, rather than the other way around. By reducing production and transport costs, infrastructure can help to connect the impoverished, indeed entire underdeveloped areas, to core economic activities, in the process enhancing longer-term job opportunities and income prospects, and raising the value of individuals' assets, such as their agricultural output.

Moreover, the process goes beyond potential earning power and wealth. By facilitating better health and education, improved infrastructure can also help to enhance the quantity and quality of human capital. Improved infant and maternal mortality rates have been shown to exert powerful effects over time on the available workforce. Meanwhile, improved electricity supply allows more time for study and access to computers, thereby raising educational levels and encouraging the honing of specific skills.<sup>7</sup>

All this said, infrastructure development does not always help the poor. Outcomes are dependent on the structure and efficiency of programmes. Unfortunately, emerging-market governments, on occasion with the explicit endorsement of the multilateral development banks (MDBs), have all too often focussed unduly on new large-scale 'prestige' energy and transport projects which, while no doubt impressive to behold on completion, provide limited employment benefits.

Moreover, historically large 'prestige' projects have frequently been associated with questionable economics (e.g. poor cost-benefit analyses), corruption, and cost over-runs that 'crowd out' other projects and impose an onerous burden on taxpayers. They can also impose heavy disruptive burdens on local communities and the environment during the construction phase, if not beyond.

Equally, infrastructure investment choices have often been driven by short-termism. In order to exploit immediate political gains, (i.e. in advance of important elections or when a particular regime is at risk), governments have chosen to invest in projects which encourage a burst of employment for a few months, but have limited follow-through, or for that matter little or no potential to deliver productivity growth and total economic return.

Meanwhile, decentralised, diversified, micro solutions to infrastructure shortfalls, that can be especially job-rich in areas such as rural agriculture, agricultural processing, and tourism, and which can strengthen institutional capacity and climate resilience, often tend to get overlooked or crowded out because of a lack of finance.

## QUALITY AS IMPORTANT AS QUANTITY

In reviewing these considerations, it is clear that simply seeking to raise infrastructure investment levels by some notional target figure, or boosting infrastructure investment as a share of GDP, without attention to the underlying fundamentals of efficient allocation and utilisation of resources, risks not producing the hoped-for impact on growth and job creation. Investing in infrastructure can be excessively costly, and even wasteful, if resources are channelled towards projects that do not add value to the economy.

Similarly, notwithstanding the findings of various sectoral studies, maximising the impact of infrastructure investment on development cannot just be a case of focussing on the sub-categories that on average appear to have generated the largest pay-offs across a selection of economies. At different stages of development, different kinds of infrastructure need to be prioritised in order to sustain growth and productivity and facilitate catch-up with the more advanced economies. Equally, however, at different levels of development, the growth and productivity pay-offs of different sectors of infrastructure investment can vary greatly across regions and countries.

Clearly, therefore, infrastructure effectiveness is influenced by a range of exogenous considerations. The evidence is that differences in institutional quality exert a significant impact on the growth and productivity dividends of sectoral investment decisions. Identifying an economy's major supply-side bottlenecks needs to play a central role in the allocation of scarce resources to infrastructure. When done well, comparatively small improvements in infrastructure networks can deliver relatively large growth dividends.

## DEVELOPING A SUCCESSFUL INFRASTRUCTURE PROGRAMME IS HARD

The implication of the issues considered above is that, in addition to taking into account issues of short-term macroeconomic resource utilisation and the financial resources available, the optimum approach to framing a comprehensive infrastructure policy in a developing economy is to aggregate detailed sectoral and micro supply-side diagnostics – the result of detailed project cost-benefit analysis – into a coherent national infrastructure programme. Good planning and prioritisation of investments and sound project selection and implementation will significantly enhance the magnitude and durability of growth and job benefits, and raise the return on scarce resources.

Unfortunately, the evidence is that few, if any countries – even in the developed world – do this anything like as well as they might, although some appear to do so within individual sectors.

Just investing in new infrastructure is not enough; countries need to operate and maintain their infrastructure efficiently in order to maximise the longer-term benefits from the investment. Indeed, there is considerable evidence that infrastructure gaps can often be more effectively plugged via better maintenance and efficiency improvements to the existing stock of assets than the construction of new assets. It is also clear that better management of the demand for specific infrastructure projects or sub-categories through improved pricing can both enhance the efficiency of existing assets and bolster utilities' financial capacity for effective operation and maintenance.

Poor maintenance has two over-riding consequences.

- First, it reduces the lifespan of the existing stock of infrastructure. Indeed, the present-value cost of rehabilitating infrastructure can be up to an order of magnitude greater than the cost of regular maintenance of the same assets.
- Second, it implies higher operating costs and diminished returns on private capital using poorly-performing infrastructure services. In the long term, the potential exists for a negative impact of infrastructure on growth if assets are not operated and maintained well and resources are not allocated efficiently.

*Efficient emerging market infrastructure strategies are rare*

*They require detailed cost-benefit analysis ...*

*... and appropriate 'after care'*

- 1 Egert, B., Kozluk, T. and Sutherland, D., 2009 and Calderón, C. and Servén, L., 2004.
- 2 To facilitate time-series analysis, the data must be 'stationary'. This means that its statistical properties such as the mean, variance, and autocorrelation are all constant over time.
- 3 Bom, P.R.D. and Lighthart, J.E., 2008.
- 4 Straub, S., 2011; Calderón, C., Moral-Benito, E. and Servén, L., 2011; and Estache, A. and Garsous, G., 2012.
- 5 World Bank, 2014a.
- 6 Gini coefficient measures the extent to which the distribution of income or consumption expenditure among individuals or households within an economy deviates from a perfectly equal distribution. A Gini coefficient of 0 represents perfect equality, while an index of 100 implies perfect inequality.
- 7 Calderón, C. and Servén, L., 2004.



Campanda Dam Project, Angola



# COLOSSAL NEEDS, ESPECIALLY IN AFRICA

The emerging countries' infrastructure requirements are colossal. Meeting them is crucial to their future development.

- Infrastructure requirements will be driven by demography, urbanisation, trade, and climate change
- Globally, infrastructure outlays equivalent to some 3.5ppts of GDP per year are required to 2030
- In developing countries, the requirement is even greater: a doubling of existing outlays to 6-8% of GDP per year
- Half of the shortfall is in the electricity sector; the remainder split between transport, water, and telecoms
- Africa has the poorest infrastructure in the world, with power and water supply the two main challenges
- Latin America's access to basic infrastructure is good, but transport connectivity remains a big problem
- Asia has seen significant progress in infrastructure access, but it is struggling to keep pace with its rapid growth

*Infrastructure needs  
reflect a number  
of drivers*

## DRIVERS OF FUTURE INFRASTRUCTURE NEEDS

Global infrastructure requirements will be determined by a number of key fundamental considerations. These are particularly important in the developing world. The most important are:

### Population growth

According to the World Bank, world population is projected to rise from around 7 billion today to some 9.6 billion by 2050. Most of this growth will occur in the developing regions, where the number of people is expected to increase from around 6 billion to 8.2 billion. Africa will likely account for more than half of this growth, mainly because of its high fertility levels and declining mortality rates.<sup>1</sup>

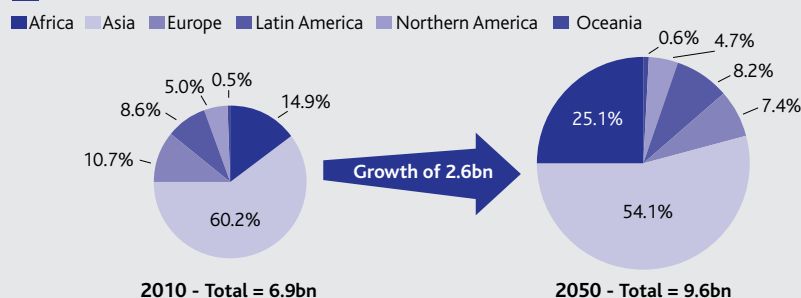
As a result, the developing regions are likely to account for over 85% of the world's population by 2050 <sup>3</sup>. Such rapid population growth will generate significant new infrastructure needs across all sectors, while putting huge pressure on existing infrastructure assets.

### Rapid urbanisation

In the period to 2050, virtually all the world's population growth is expected to be in urban areas, with cities in the developing regions growing particularly fast. While today about half the world's population is urbanised (52%), it is expected that by 2050, 67% of the global population will be city-based.<sup>2</sup> Among the less developed regions, with 79% of the population already living in cities, it is in Latin America that the urbanisation rate is likely to be the highest. Asia is expected to reach a 50% urbanisation rate in 2020, and Africa a similar rate in 2035 <sup>4</sup>.

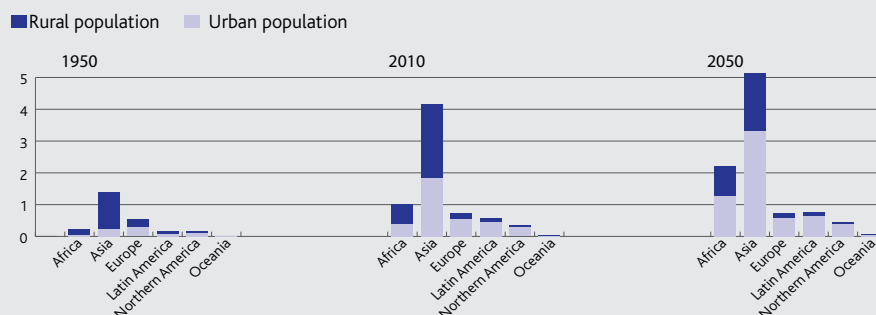
With rapid urbanisation comes a plethora of public and private infrastructure requirements, ranging from new and better transport networks to larger water supply and treatment plants and new schools, hospitals and upgraded telecommunications systems.

### 3 GLOBAL POPULATION IN 2010 AND 2050



Source: UN World Population Prospects: the 2012 Revision

### 4 URBAN AND RURAL POPULATION IN 1950, 2010 AND 2050 (BILLION)



Source: UN World Urbanization Prospects: the 2011 Revision



### Global trade growth

Developing countries have become the dominant drivers of world trade. Since 1990, developing-country exports have grown much faster than those of the developed countries, so that the former now account for about half of the total <sup>5</sup>. Trade between developing countries – so-called ‘South-South’ trade – has also been on a marked upward trend, outpacing North-South trade since 2007. Only the least-developed countries have failed to exhibit these patterns.

To support rapid trade growth, particularly in developing regions, infrastructure spending, in particular on ports, other transport hubs, and associated logistical networks, has to keep pace: otherwise, bottlenecks will multiply and costs spiral higher.

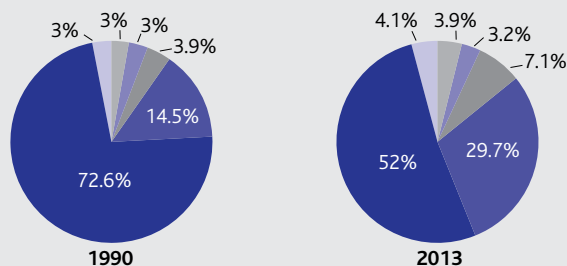
### The need for sustainability

Since 1990 world CO<sub>2</sub> emissions have risen by more than 50%, with developing countries accounting for most of the increase <sup>6</sup>. And as long as developing countries continue to grow quickly and use fossil fuels heavily, their CO<sub>2</sub> emissions are likely to continue to rise rapidly. Ensuring the environmental sustainability of economic growth is one of the eight UN Millennium Development Goals. Appropriate infrastructure development could play a central role in meeting these sustainability challenges.

Air quality has become a subject of particular concern, especially in the faster-growing cities of the developing world. Particulate-matter concentrations in China, India, and Indonesia, for example, are currently around three times the OECD average, and six times the levels recommended by the World Health Organisation <sup>7</sup>. Furthermore, on the basis of existing policies, air quality in most developing regions will deteriorate further over the period to 2030. Over time, the need for improved air quality will probably exert a particularly conspicuous influence on the nature, and quantity, of infrastructure put in place.

**5 WORLD MERCHANDISE EXPORTS BY REGION IN 1990 AND 2013 (EXPORTS VALUE, USD)**

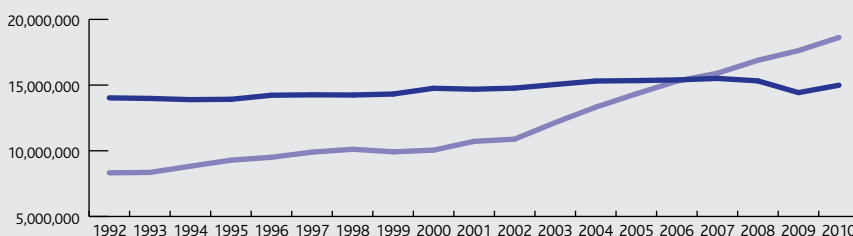
Advanced economies Others Latin America Africa Middle East Asia ex-Japan



Source: World Trade Organisation

**6 CO<sub>2</sub> EMISSIONS, HIGH-INCOME AND DEVELOPING COUNTRIES (KT)**

High-income countries Developing countries



Source: World Bank

Access to basic infrastructure is an issue globally

The need to adapt to climate change

Developing countries need not only to mitigate future climate change by targeting more sustainable growth, they also need to expend additional resources in adapting to it. Climate change is already exerting a profound and disruptive influence on the world's poorest countries. Changes in rainfall patterns, for example, are leading to more frequent and severe flooding in parts of Asia, and to more severe drought conditions across Africa.

As well as being the most seriously affected by such considerations, developing countries are also less equipped to cope with them. Being able to adapt to the consequences of climate change is therefore a priority for these countries. And appropriate infrastructure investment will help to achieve this.

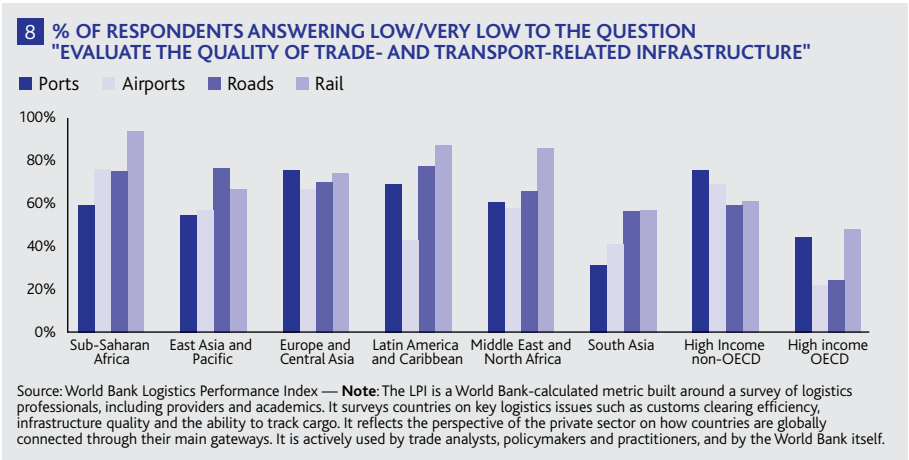
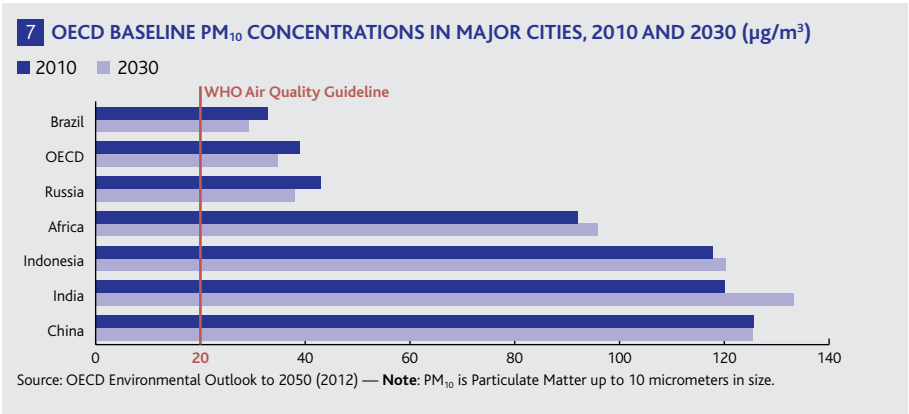
Low quality of today's infrastructure

Over recent decades, developing countries have systematically under-invested in repair and maintenance, leading to inadequate and poorly-performing existing infrastructure assets [8]. This has been due both to financial constraints and a persistent bias towards the construction of new infrastructure projects rather than to the preservation and upkeep of existing assets – often for myopic political reasons.

A major recalibration of outlays is therefore needed, to focus on improving the quality and productivity of existing assets. Such a reorientation of approach could lead to potentially substantial long-term savings for governments.

GLOBAL INFRASTRUCTURE NEEDS

Although access to basic infrastructure in developing countries has improved markedly over the past several decades, there is little doubt that it remains a burning issue. In the least developed countries, for example, nearly 70% of the population has no access at all to electricity. Access to safe water has improved – from 1990 to 2008, 2 billion people were connected – but nearly 800 million are still without access to an adequate water source.



## 9 HOUSEHOLD ACCESS TO INFRASTRUCTURE IN DEVELOPING COUNTRIES

REGION	Access to electricity (% pop, 2011) <sup>1</sup>	Access to water (% pop, 2012)	Access to sanitation (% pop, 2012)	Paved roads (% total roads, 2011) <sup>2</sup>	Mobile subscription (per 100 people, 2012)
South Asia	73	91	40	45	69
East Asia and Pacific	92	91	67	48	89
Latin America and Caribbean	95	94	81	26	108
Sub-Saharan Africa	35	64	30	16	59
Europe and Central Asia	N.A.	95	94	78	109
Middle East and North Africa	94	90	88	77	95
<b>AFRICA</b>					
Angola	38	54	60	10	47
Benin	28	76	14	10	84
Congo, Rep.	38	75	15	7	99
Cote d'Ivoire	59	80	22	8	91
Ghana	72	87	14	13	101
Kenya	19	62	30	14	71
Mozambique	20	49	21	21	36
South Africa	85	95	74	17	131
<b>LATIN AMERICA AND CARIBBEAN</b>					
Brazil	99	98	81	14	125
Mexico	N.A.	95	85	38	83
Argentina	97	99	97	32	152
Chile	99	99	99	24	138
Panama	88	94	73	42	178
Uruguay	99	100	96	10	147
Peru	90	87	73	13	98
Colombia	97	91	80	N.A.	103
<b>SOUTH ASIA</b>					
Afghanistan	30	64	29	36	60
Bangladesh	60	85	57	10	63
India	75	93	36	54	70
Maldives	N.A.	99	99	100	166
Nepal	76	88	37	54	60
Pakistan	69	91	48	73	67
Sri Lanka	85	94	92	81	92
<b>EAST ASIA AND PACIFIC</b>					
China	100	92	65	64	81
Indonesia	73	85	59	57	114
Malaysia	100	100	96	81	141
Philippines	70	92	74	N.A.	107
Thailand	99	96	93	N.A.	127
Vietnam	96	95	75	48	148

Source: World Bank

Notes: (1) and (2) are for latest year available

*Infrastructure spending  
needs are colossal...*

*... especially in developing  
regions*

The sanitation situation is worse, with 2.5 billion people lacking access to adequate facilities. Road connectivity also remains low, particularly in rural areas. The one beacon of light is in the communication sector, as in many developing countries mobile phone penetration has taken off. Africa, however, remains a conspicuous laggard <sup>9</sup>.

Many studies have tried to estimate total future global infrastructure needs. However, this is not a simple task, especially given the patchy quality of reliable data and the number of considerations that have to be factored in to calculations. That said:

- McKinsey, using a top-down approach, estimates that around \$57 trillion of infrastructure outlays will be needed to 2030. This represents around 3.5% of global GDP per year <sup>10,3</sup>

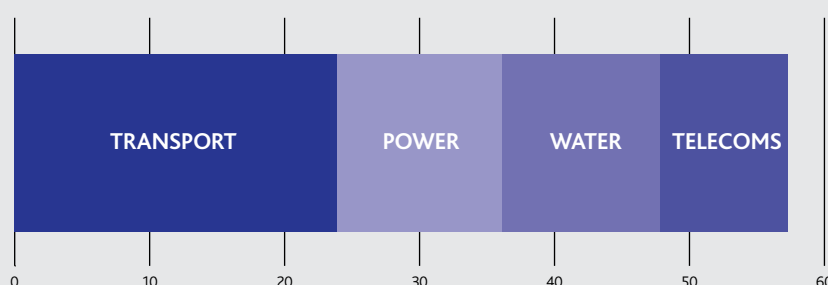
- The OECD, using a more bottom-up approach, has come up with a similar figure.<sup>4</sup> These numbers are undeniably huge, and much higher than contemporary infrastructure supply, creating an 'infrastructure gap' estimated to be in the region of about \$1 trillion per year.

Looking at developing regions in particular, it is projected that infrastructure investment spending will need to double, from the prevailing \$0.8-0.9 trillion per year (3% of their GDP) to some \$1.8-2.3 trillion per year by 2020 (6-8% of their GDP) <sup>11,5</sup>

Moreover, these estimates could well be conservative, being based on steady-state assumptions. They assume a 4% annual GDP growth rate until 2020 – a higher GDP growth rate would increase the estimated requirements – and they include \$200-300 billion annual investment to make infrastructure investments more sustainable. However, the figures do not extend to maintenance requirements. Including these could double the spending required.

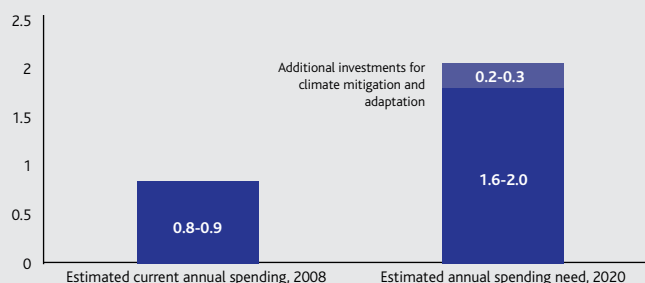
As regards the breakdown of these estimated needs by sector and region, it appears that about half of the investment requirements will be in the electricity sector, with the remainder divided relatively equally between transport, water, and telecoms. Furthermore, about 85% of the infrastructure investment needs are expected to emanate

**10 GLOBAL INFRASTRUCTURE NEEDS, 2013-30, \$TN, CONSTANT 2010 PRICES**



Source: McKinsey (2013a)

**11 INFRASTRUCTURE NEEDS IN DEVELOPING COUNTRIES (\$TN)**



Source: Bhattacharya, A., Romani, M., and Stern, N. (2012)

from low- and lower-middle income countries, with East Asia accounting for the largest part <sup>12</sup>.

## REGIONAL INFRASTRUCTURE NEEDS

### Africa

Africa<sup>6</sup> has the sparsest and least developed infrastructure networks in the world. Indeed, it lags well behind all other regions in all infrastructure sectors, and the gap continues to widen. The differences are particularly large for electricity access (only 35% of the population have access to electricity), paved-road density (only around 15% of African roads are paved), and access to water and sanitation (only 64% and 30% of the population respectively are appropriately serviced).

The quality of the existing infrastructure is also very poor. Although it has improved in most African countries over the past decade, it is still seriously inadequate, and hampering future growth and development <sup>13</sup>.<sup>7</sup> Most of the African countries are at the bottom of the World Economic Forum Competitiveness ranking, with South Africa being one of the only exceptions (see: **BOX 1** page 30, Some examples of countries with good infrastructure and **BOX 2** page 32, Some examples of countries with poor infrastructure). According to the African Development Bank, the low quality of infrastructure constrains economic growth by around 2 ppts every year, and reduces business productivity by as much as 40%.<sup>8</sup> In addition to building new infrastructure in Africa, there is a pressing need to rehabilitate and maintain existing assets.

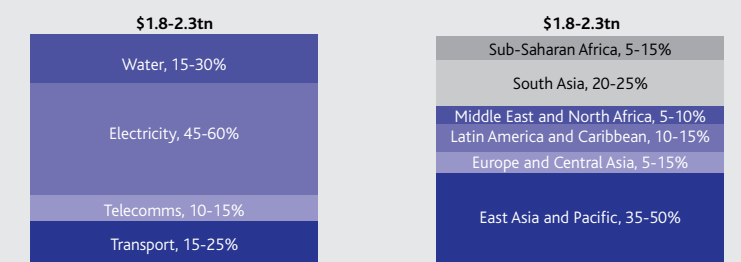
Africa's infrastructure spending needs are no doubt colossal. Estimates by the African Development Bank suggest that they will exceed \$90 billion per year over the coming decade equivalent to around 15% of the region's GDP.<sup>9</sup> About two-thirds of this sum will be required for new developments, and the remaining one-third for the maintenance of existing infrastructure. The breakdown by sector is as follows:

- About 40% is for the power sector;

*Africa's infrastructure is extremely poor*

*Spending needs greatly exceed current outlays*

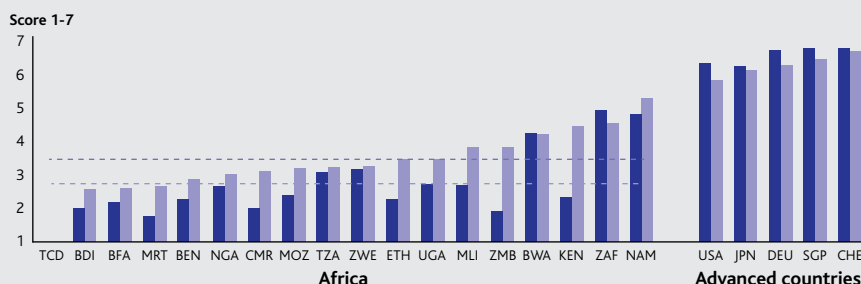
### 12 INFRASTRUCTURE NEEDS IN DEVELOPING COUNTRIES, BY SECTOR AND BY REGION



Source: Bhattacharya, A., Romani, M., and Stern, N. (2012)

### 13 QUALITY OF INFRASTRUCTURE IN AFRICA

■ 2006-07 ■ 2013-14 --- Average quality infrastructure 2006-07 --- Average quality infrastructure 2013-14



Source: WEF Global Competitiveness Report 2013-14

*Africa faces many  
obstacles to the  
development of its  
infrastructure*

- Slightly more than 20% is needed to achieve the Millennium Development Goal for water supply and sanitation; and
- A further 20% is necessary in the transport sector to foster regional, national, rural, and urban linkages, and to maintain existing assets.

These spending requirements are much higher than the sums currently spent on African infrastructure – indeed they are about double the total of current outlays. Hence, there is a substantial funding gap. Even after taking into account some potential efficiency gains – estimated at around \$17 billion per year – the shortfall still exceeds \$30 billion per year.

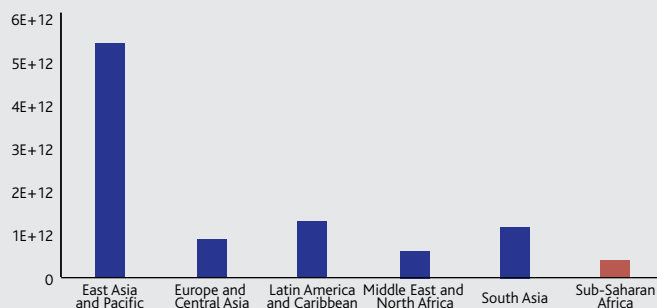
There are great variations among African countries. While the region's more fragile states would need to spend about 25% of their GDP to meet their infrastructure requirements, resource-rich countries such as Nigeria and Zambia have a much smaller funding gap, equating to expenditures of around 4% of their GDP.

To be able to meet its infrastructure requirements, Africa needs to overcome numerous obstacles. These include:

- A 'difficult' topography: the continent is vast; is often inhospitable, if not hostile, to human development; has a relatively large number of landlocked countries; and has high hydrological variability;
- The overall population density is low (which makes infrastructure maintenance particularly difficult), as are urbanisation rates; and economies are small, even when countries are geographically expansive;
- The prices of infrastructure services are higher than in other developing regions, mainly because of the small scale and dispersion of production, the inefficient management of resources, a lack of competition in service provision, and inadequate price regulation; and
- Notwithstanding recent reforms, Africa's institutional architecture for the planning, preparation and delivery of infrastructure is still inadequate.

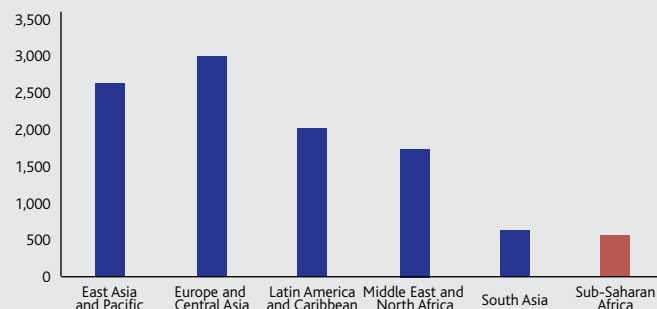
Looking now at Africa's specific needs by sector, the provision of power represents

**14** ELECTRIC POWER PRODUCTION IN 2011 (KWH)



Source: World Bank

**15** ELECTRIC POWER CONSUMPTION IN 2011 (KWH PER CAPITA)



Source: World Bank

the continent's largest infrastructure challenge. Indeed, Africa's power infrastructure delivers only a small fraction of that delivered in other developing regions <sup>14</sup> – the 48 countries of Sub-Saharan Africa (with a combined population of 936 million) generate less electricity than France (with a population of 65 million).

Electricity consumption is also very low, and lags well behind other developing countries <sup>15</sup>. Power shortages and outages are commonplace and often extended (whether because of natural causes such as drought, intermittent oil price shocks, conflicts, or structural issues), leading sometimes to disastrous economic losses. African firms report losing 5% of their sales because of frequent power outages. For the large informal sector the equivalent figure is estimated to be as high as 20%.

Water, being essential not just to sustain economic growth, but also to underpin human and social development, means achieving water security is also key for Africa. While access to water has improved and is getting closer to the 75% Millennium Development Goal (MDG) target <sup>16</sup>, 340 million people still have no functional link to a safe water source.

There is undoubtedly huge potential to improve water infrastructure in Africa, given that the continent has abundant water resources. The problem is that the water resources are unevenly distributed and currently underutilised because of a lack of appropriate storage and irrigation facilities.

In the transport sector too, investment needs remain considerable. Transport infrastructure is critical if Africa's linkages to the global economy are to be improved and economic integration within the continent is to be encouraged.

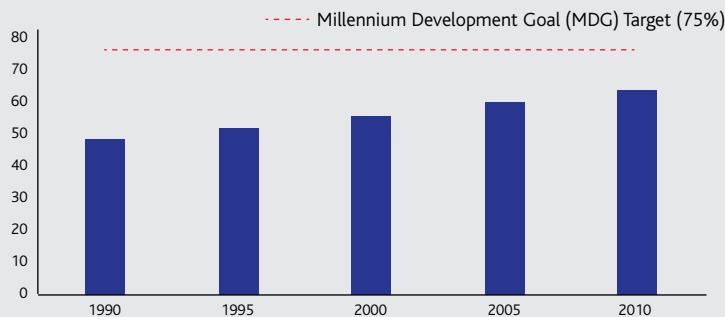
The challenges faced by Africa's transport networks are many and various. Road density is sparse (only one-third of Africans living in rural areas are within 2 kilometres of an

*Power is Africa's largest infrastructure challenge*

*... followed by water and transport*

*Transport investment needs also remain considerable*

**16 ACCESS TO AN IMPROVED WATER SOURCE (% POPULATION), AFRICA**



Source: World Bank

**17 LOGISTICS PERFORMANCE INDEX: QUALITY OF TRADE- AND TRANSPORT-RELATED INFRASTRUCTURE (1=LOW TO 5=HIGH), 2012<sup>1,2</sup>**

REGION	LPI	BOTTOM 10 COUNTRIES	LPI
Sub-Saharan Africa	2.3	Congo, Rep.	1.27
South Asia	2.38	Djibouti	1.51
Middle East & North Africa	2.4	Burundi	1.68
Latin America & Caribbean	2.52	Libya	1.75
East Asia and Pacific	2.58	Haiti	1.78
Europe and Central Asia	2.64	Eritrea	1.83
High income – non-OECD	3.18	Nepal	1.87
High income – OECD	3.5	Rwanda	1.88
		Gambia	1.9
		Iraq	1.92

Source: World Bank Logistics Performance Index

Notes: (1) The Logistics Performance Index (World Bank) score reflects perceptions of a country's logistics based on quality of trade- and transport-related infrastructure

(2) African countries are highlighted (6 out of the 10 worst performing countries)



*Information and communication needs are mixed*

*Latin America's infrastructure is relatively good*

*But few countries have top quality infrastructure*

all-season road, compared with two-thirds of the population in other developing regions); linkages between transport modes are ineffective; ports are poorly equipped and invariably overloaded; rail networks are ageing, disconnected, and inefficient; and the quality of transport assets in general is poor, as is amply demonstrated by the World Bank Logistics Performance Index <sup>17,11</sup>

In the information and communication technology sector, the picture is mixed. While the number of mobile phone subscriptions has risen almost six-fold, from 11 million in 2000 to 61 million in 2013, other ICT sectors have experienced much less impressive growth or virtually no growth at all.

The failure of broadband internet and fixed-line telephone services to expand, however, is less of a concern than appears at first sight <sup>18</sup>. Rather, it suggests that Africa has bypassed the fixed-line telephone phase and moved directly to mobile technology.

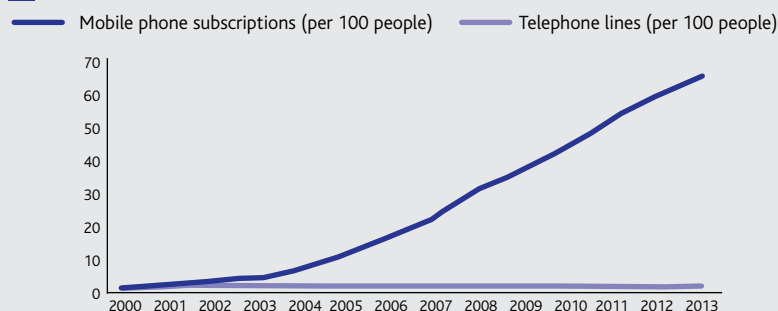
### Latin America

Latin America's access to basic infrastructure is relatively good. It can boast the highest penetration rates in almost every infrastructure category throughout the developing world. The vast majority of the population has access to electricity and decent water (around 95% of the population). Sanitation is less impressive, but LATAM still ranks highly relative to other developing regions (about 80% of the population has access to decent sanitation). Transport connectivity, however, is poor.

Although the quality of Latin America's infrastructure has improved over the past decade, few countries have truly high quality infrastructure. Panama, Chile, Mexico, and Guatemala have the best overall infrastructure networks, while Paraguay and Venezuela are very much at the other end of the scale <sup>19,12</sup> (For more details on some of these countries' infrastructure, see: **BOX 1** page 30, Some examples of countries with good infrastructure and **BOX 2** page 32, Some examples of countries with poor infrastructure).

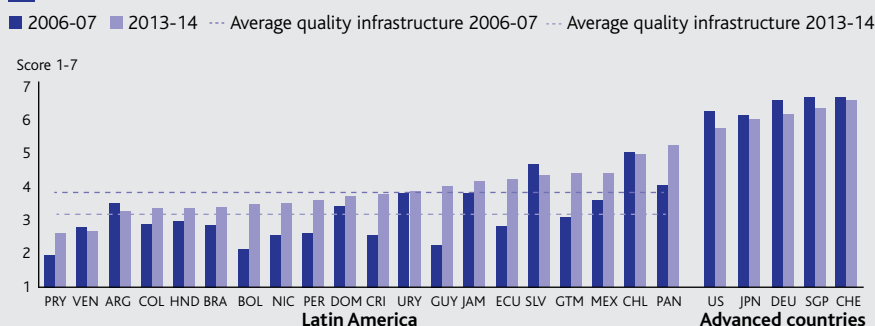
All in all, estimates suggest that about 5% of the region's GDP would need to be spent annually to meet its infrastructure needs.<sup>13</sup> However, infrastructure development

### 18 MOBILE PHONE SUBSCRIPTIONS AND TELEPHONE LINES (PER 100 PEOPLE) IN AFRICA



Source: World Bank

### 19 QUALITY OF INFRASTRUCTURE IN LATIN AMERICA



Source: WEF Global Competitiveness Report 2013-14

in Latin America faces a number of particular challenges. These include:

- Very rapid urbanisation;
- Severe disparities in access to infrastructure between the rural and urban populations [20](#), [21](#);
- Frequent natural disasters, which put existing infrastructure at risk and render potential new developments more challenging, both financially and logistically;
- Lack of reliability in public institutions, resulting in low quality infrastructure and poor investment decisions; and
- Significant barriers to entry to international firms.

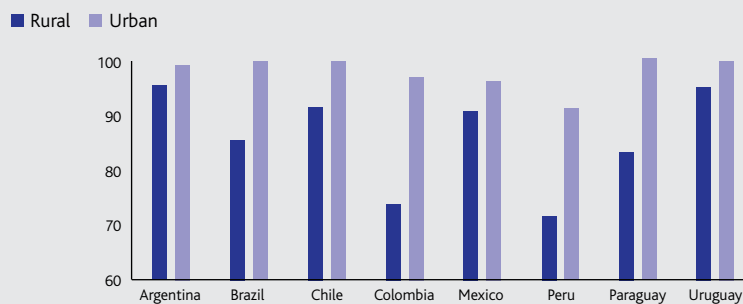
Latin America's main infrastructure challenge is in the transport sector. Road connectivity is a major weakness, with only one-quarter of the region's roads paved [22](#). Quality is also an issue.

However, some recent infrastructure programmes are expected to help redress the balance. For example, in Brazil's Logistics Investment Program, \$66 billion is earmarked for railways and roads, \$30 billion for ports, and \$18 billion for airports. Similarly in

*More investment is needed ...*

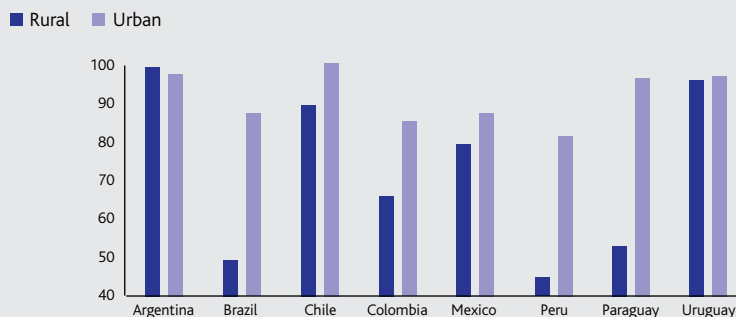
*... particularly in transport linkages*

**20 ACCESS TO AN IMPROVED WATER SOURCE IN LATIN AMERICA (% POPULATION), 2012**



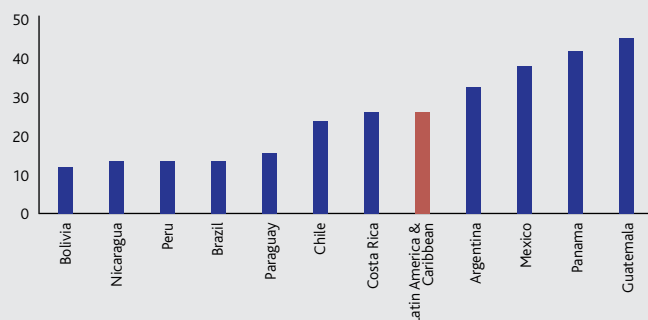
Source: World Bank

**21 ACCESS TO IMPROVED SANITATION FACILITIES IN LATIN AMERICA (% POPULATION), 2012**



Source: World Bank

**22 PAVED ROADS (% TOTAL ROADS), LATIN AMERICA, 2011**



Source: World Bank

*The region also faces an energy shortage*

*South Asia's infrastructure is similar to Africa's*

*Shortcomings in transport are hindering trade*

Mexico, a plan has recently been announced to spend nearly \$100 billion on transport and communications over the next 5 years.

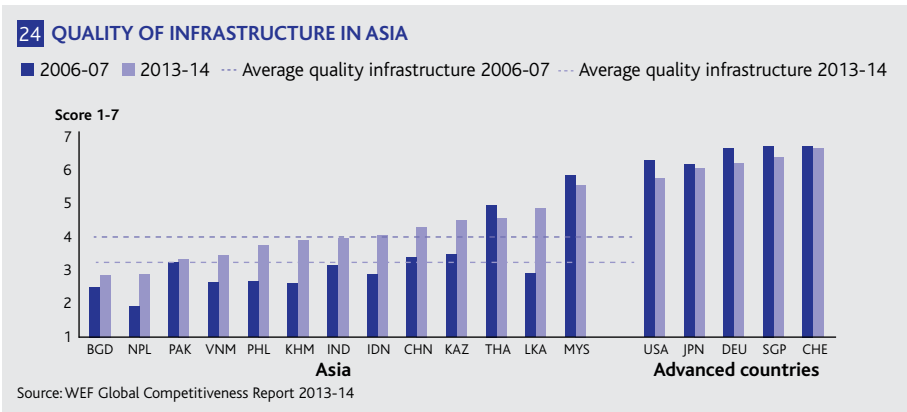
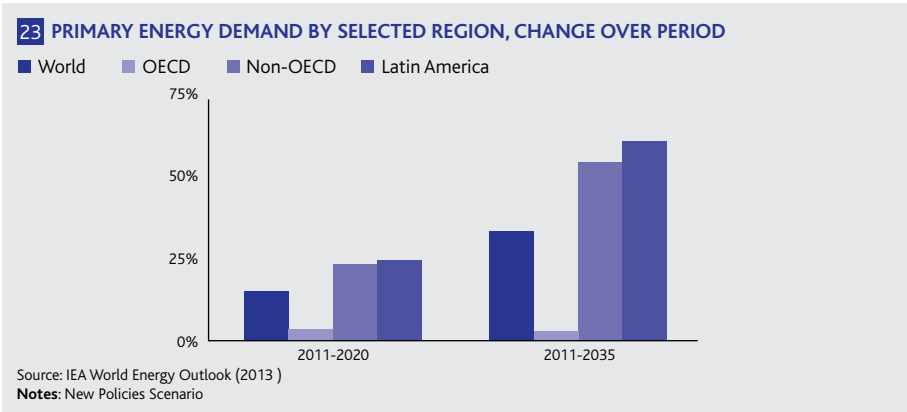
Latin America also faces a serious infrastructure shortage in the energy sector. The region consumes far more energy than it produces, and the gap is set to widen considerably as primary energy demand expands rapidly. According to the International Energy Agency, the region's primary energy demand is likely to grow by around 60% by 2035. OECD demand, by contrast, is expected to grow by only 3% by 2035 <sup>23</sup>. The region's energy infrastructure will have to be transformed if this demand is to be satisfied.

Asia

In Asia, the infrastructure picture varies considerably, and there is a particularly sharp contrast between the southern and eastern regions.<sup>14</sup> Although South Asia's overall growth has been comparable to that in East Asia over the past two decades, the quality of its basic infrastructure network lags far behind. Indeed, access rates are comparable to those in Sub-Saharan Africa. The only exception is access to water, where South Asia enjoys rates comparable to both East Asia and Latin America (Table 1). Access to electricity remains the main issue, however, while shortcomings in the transport network hinder regional and international trade.

This is not to deny that the quality of South-Asian infrastructure has improved markedly since 2007. But large variations exist between countries. Sri Lanka for example has some good-quality infrastructure, but the standard is still very low in Bangladesh, Nepal, and Myanmar in particular (see: <sup>24</sup> and **BOX 2** page 32, Some examples of countries with poor infrastructure).

To be able to meet its development goals, South Asia needs to scale up its infrastructure investments significantly. The south Asian economy has experienced rapid growth over recent years (6.7% annually from 2000-12), but infrastructure provision has not kept up, leading to a growing infrastructure gap. A recent report by the World Bank estimated that addressing South Asia's infrastructure shortfall would require investment of between



\$1.4 trillion and \$2 trillion over the next 10 years (i.e. between 6.6% and 9.9% of GDP annually).<sup>15</sup> However, major challenges are still hampering infrastructure development in the region, including:

- Large concentrations of poverty, particularly in landlocked regions;
- High population density: the region is already home to five cities with a population of over 12 million (Mumbai, Delhi, Kolkata, Dhaka, and Karachi);
- High levels of climate variability and number of natural disasters;
- Conflicts and civil strife, which remain widespread, despite all countries now having elected governments; and
- Lack of economic integration: the region is the world's least integrated (intra-regional trade in South Asia accounts for less than 5% of global trade).

In East Asia, on the other hand, the picture is brighter. Infrastructure access is much better than in South Asia. The region has seen significant progress over the past two decades, owing mainly to large scale infrastructure development programmes.

The two fastest-growing economies in the region – China and Vietnam – are investing about 10% of their GDP annually in infrastructure (see: **BOX 3** page 34, China: The new world's leader in infrastructure investment). Laos, Cambodia, Thailand, Vietnam, Myanmar, and China are all focusing their infrastructure plans on the greater integration of their transport and energy markets, and expect a significant positive contribution to growth in due course as a result. The Indonesian government has also outlined its intention to upgrade its roads, ports, water facilities, and power plants, and changes in the regulatory environment have been introduced with a view to encouraging greater private investment involvement. Infrastructure investment has ostensibly been a national priority since 2004, and a target for outlays of this nature equivalent to some 5-6% of GDP has been set. However, for now, congestion remains a fact of life and progress is often difficult to discern.<sup>16</sup>

Notwithstanding the importance that is being attached to infrastructure, however, the quantum of investment outlays is still struggling to keep pace with the region's fast growth and rising incomes. Around 170 million people still lack access to electricity; access to sanitation is unimpressive when compared to income levels; in cities, about 28% of people lack access to water, sanitation, or durable housing; and less than half of the roads are paved.

More infrastructure investment is therefore needed to meet East Asia's growing infrastructure requirements.

*Infrastructure access in East Asia is improving ...*

*... but struggles to keep up with the region's growth*

1 UN World Population Prospects: the 2012 Revision.

2 UN World Urbanization Prospects: the 2011 Revision.

3 McKinsey, 2013a.

4 OECD, 2006.

5 Bhattacharya, A., Romani, M. and Stern, N., 2012.

6 By Africa, we mean Sub-Saharan Africa.

7 World Economic Forum Global Competitiveness Report 2013-14.

8 International Bank for Reconstruction and Development and the World Bank, 2009.

9 International Bank for Reconstruction and Development and the World Bank, 2009.

10 International Bank for Reconstruction and Development and the World Bank, 2009.

11 The Logistics Performance Index score by the World Bank reflects perceptions of a country's logistics based on quality of trade- and transport-related infrastructure.

12 World Economic Forum Global Competitiveness Report 2013-14.

13 ECLAC, 2011.

14 Taking the World Bank's definitions of Asia's regions, South Asia consists of: Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka. East Asia and Pacific consists of American Samoa, Cambodia, China, Fiji, Indonesia, Kiribati, South Korea, Laos, Malaysia, Marshall Islands, Micronesia, Mongolia, Myanmar, Palau, Papua New Guinea, Philippines, Samoa, Solomon Islands, Thailand, Timor-Leste, Tonga, Tuvalu, Vanuatu, and Vietnam.

15 Andres, L., Biller, D., and Herrera, M., 2013.

16 International Finance Corporation, 2012.

## BOX 1

# SOME EXAMPLES OF COUNTRIES WITH GOOD INFRASTRUCTURE<sup>1</sup>



## SINGAPORE

With its world-class infrastructure, Singapore has been a model for the past several decades. While Singapore inherited a superior infrastructure network from the colonial era, after its independence the government continued to invest in infrastructure to improve it further, and today Singapore benefits from some of the best infrastructure in the world, in terms of availability, quality, reliability, and safety. For example, capitalising on its strategic location between India and China, Singapore's port is the world's second-busiest container port (after Shanghai).

In 2014, Singapore ranked 2nd of 148 countries in the Global Competitiveness Index by the WEF, and was the only economy to be in the top three countries in seven of the twelve pillars of the survey.<sup>2</sup>



## SOUTH KOREA

South Korea's economic success owes in great part to infrastructure investments, with South Korea having made infrastructure one of its priorities since the 1960s, through a succession of five-year economic development plans between 1962 and 1996. The private sector has also been largely involved, through PPPs.

Road construction in particular was the foundation of the nation's economic recovery in the 1960s, as it contributed to balanced regional linkages and development, and improved living standards. The opening in 1970 of the 416-kilometre Gyeongbu expressway between Seoul and Busan is considered the country's most important infrastructure achievement.<sup>3</sup> While road construction slowed in the 1980s, it started to increase again quickly in the 1990s. More recently, the government has committed to spending more on expanding the highways, as the number of vehicles in use continues to rise. While South Korea's power generation is continually growing (it is the world's fifth biggest nuclear energy producer), it has committed to decrease its reliance on nuclear power following Japan's Fukushima disaster and several domestic safety scandals.<sup>4</sup>



## PANAMA

Panama benefits from one of the best port and airport networks in the world, and its infrastructure is ranked 37<sup>th</sup> globally in the latest WEF Competitiveness Report. This year (2014) marked the centennial celebration of the opening of the Panama Canal, which still makes Central America a great facilitator of international trade.<sup>5</sup>

Panama has also made considerable progress in developing new infrastructure, and Panama's government have been investing heavily in new infrastructure projects, most notably the expansion of the Panama Canal, which is on track to be completed by 2015, and is expected to increase both container vessel capacity and maritime traffic. Other public projects include the expansion of the Tocumen International Airport and the Panama Metro Line.



## CHILE

Chile has one of the best infrastructure networks in Latin America. The need to increase investment in infrastructure was recognised in the early 1990s, following a decade of rapid economic growth. To boost infrastructure investment, private investment has been encouraged by the Chilean government, particularly in the transport sector, through concession schemes.<sup>6</sup> As a result of these concessions, a total of \$11.5 billion was spent on public infrastructure between 1997 and 2011, with the construction of 3,000 kilometres of highways, ten new airports, and the modernisation of port terminals, making Chilean ports among the most efficient in South America.<sup>7</sup>

Nevertheless, a combination of a slowdown in investment and growing wealth among the population has led to some infrastructure bottlenecks and, while Chile still leads South America in terms of infrastructure, the gap is narrowing with a number of countries, including Brazil and Peru. To overcome this, the government has unveiled a large-scale program of new infrastructure concessions.



## SOUTH AFRICA

South Africa is by far the best performer in Africa in terms of competitiveness (WEF<sup>8</sup>) and logistics (World Bank<sup>9</sup>). The transport sector in particular performs well: the air and rail networks are the largest on the continent – the rail network is the 14<sup>th</sup> longest in the world, and accounts for 80% of Africa's total. However, the lack of investment and proper maintenance has led to an ageing network. South African roads tell a similar story: a long network, and generally in a good state, but with a backlog of maintenance and rehabilitation. South African ports are the main trade transit points for southern Africa, with Durban Africa's busiest port. However, some constraints (e.g. high tariffs) have pushed a number of importers and exporters to choose other African ports.

South Africa's energy sector is where some major bottlenecks remain. The country's power sector reached a low point in 2008, with power shortages and tariff increases. Since then, energy capacity has become a priority for the government.<sup>10</sup>

- 1 These five countries have been selected on the basis of the ranking of countries in the WEF Global Competitiveness Report 2013-14, and are among the top performing developing countries.
- 2 The 12 pillars of the survey are: Institutions; Infrastructure; Macroeconomic environment; Health and primary education; Higher education and training; Goods market efficiency; Labour market efficiency; Financial market development; Technological readiness; Market size; Business sophistication; and Innovation.
- 3 Seo, J.Y., 2013. Roads: The Arteries of Korea's Development. The Korea Herald, 20 May.
- 4 Cho, M., 2014. South Korea Approves \$7 billion Reactor Plans in Boost for Nuclear Power. Reuters, 29 January.
- 5 Corrigan, T., 2014. If You Build It: Latin America's Infrastructure Deficit. Huffington Post, 4 February.
- 6 Gomez-Lobo, A. and Hinojosa, S., 2000.
- 7 Azzopardi, T., 2013. Road Work Ahead. Business Chile, 22 April.
- 8 WEF Global Competitiveness Report 2013-14.
- 9 World Bank Logistics Performance Index.
- 10 PricewaterhouseCoopers, 2013.

## BOX 2

# SOME EXAMPLES OF COUNTRIES WITH POOR INFRASTRUCTURE<sup>1</sup>



## MAURITANIA

Mauritania's infrastructure is poor compared with Africa's average. Road network density is very low, and does not connect production areas to consumption centres. And the country's 'difficult' geography makes road maintenance especially difficult. Electricity supply is of poor quality and faces frequent service interruptions. The economy as a whole is severely undermined by the country's weak infrastructure. It leads to high costs of production, thereby restricting the competitiveness of the economy. Furthermore, despite Mauritania's favourable geographic situation and access to the sea, its poor transport network results in low levels of trade with its neighbouring countries, rendering Mauritania unable to fulfil its potential for regional integration.

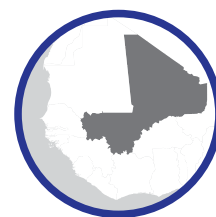
Infrastructure development has become a priority for Mauritania's government, which seeks to couple the implementation of key projects in all infrastructure sectors with sector reforms, including the legal and institutional framework and the promotion of private sector participation in the management and supply of infrastructure under PPPs.<sup>2</sup>



## MYANMAR

Myanmar is one of the poorest countries in East Asia, and has very low-grade infrastructure. Its transport sector is greatly underdeveloped: road density is low; the rail network is in poor condition (although it expanded by almost 80% between 1998 and 2010);<sup>3</sup> and as much as 70% of the population – some 40 million people – have no access to electricity.

However, Myanmar's government is trying to turn matters around, for example by giving priority to infrastructure projects that improve land connectivity and boost economic integration, and by committing to improve the quality of railroad sections connecting important economic centres.<sup>4</sup> In January 2014, the World Bank Group announced a \$2 billion multi-year development program, with half of the funds aimed at expanding power supplies.<sup>5</sup> Furthermore, its favourable geographic location and long coastline offers potential for Myanmar to become an important trade hub.



## MALI

Geographic conditions are particularly difficult, Mali being large, semi-arid, with low population density, and with no access to the sea. Moreover, the stark contrast between the arid north and the much richer south makes infrastructure development particularly difficult. The allocation of the country's infrastructure reflects these geographic characteristics, with the density of transport, power, and ICT infrastructure greater in the south than in the north. Mali's road density is among the lowest in Africa: half of the country being arid or desert and thereby not accessible by road. But even in other parts of the country, road density lags well behind other African countries.

Some progress has been made recently. Mali's authorities have made improvements by focussing infrastructure development on integrating the country with regional networks and export points. However, many challenges remain, the greatest being in the power sector: energy production costs are among the highest in the region, leading to only 17% of the population having access to electricity. Water and sanitation also remain a major problem area.<sup>6</sup>





## MOZAMBIQUE

Mozambique's economy is highly dependent on natural resources (mainly coal and ores), and its geographic position makes it a key entry and exit point for the flow of goods to and from landlocked neighbouring countries. However, rising coal production and growing trade volumes are putting considerable pressure on existing infrastructure, which is still in poor condition, even though its civil war ended fully two decades ago.

Several transport projects have been launched, primarily to serve the natural resources industry. These include the building of new railways and the expansion of port capacity. Notwithstanding recent upgrades, however, current rail and port capacities are still not enough to meet the increasing demand that is coming from rising coal production and growing neighbouring-country trade. Private mining companies are now stepping in to fund a number of rail projects.<sup>7</sup>



## VENEZUELA

Notwithstanding its large oil reserves (the largest in the world), Venezuela has not been able to put efficient infrastructure investment in place. Venezuela's infrastructure lags well behind that of other Latin American countries. Under the Chavez administration, nationalisation was seen as a solution to the private sector's 'pitfalls', and transport infrastructure moved from local to federal control. Since then, the country's transport infrastructure has deteriorated: collapsed bridges, cracked airport runways, and 'mega-holes' in highways have become common. Even the Caracas metro, a supposed flagship for efficient infrastructure, suffers from poor service and maintenance. Venezuela's power generation also faces frequent service interruption, due to its old infrastructure and poor maintenance.<sup>8</sup>

To improve Venezuela's infrastructure, private sector involvement is crucial. To attract private investment, Venezuela's government needs to establish conditions for reliable partnerships between the private and public sectors. China has emerged as a strategic source of financing, recently committing to lending \$5 billion for infrastructure and oil-project development.<sup>9</sup>

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- 1 These five countries have been selected on the basis of the ranking of countries in the WEF Global Competitiveness Report 2013-14, and are among the worst performing developing countries.
  - 2 African Development Bank Group, 2010.
  - 3 KPMG, 2013.
  - 4 KPMG, 2013.
  - 5 World Bank, 2014b. Emerging Myanmar Aims to Catch Up to its Neighbors. Feature Story, 26 January.
  - 6 Briceno-Garmendia, C.M., 2011.
  - 7 PricewaterhouseCoopers, 2013.
  - 8 The Economist, 2011. Venezuela's Infrastructure: Falling Apart. 5 October.
  - 9 Pitt, P.D., 2014. Venezuela Gets More than \$7 billion from China and Russia. Bloomberg, 7 March.

## BOX 3

# CHINA: THE NEW WORLD'S LEADER IN INFRASTRUCTURE INVESTMENT

Infrastructure development has been one of China's top economic policy priorities over the past several decades, and it has now surpassed the US and the European Union to become the world's largest investor in infrastructure.

Over the period 1992 to 2011, China spent an average of 8.5% of its GDP on infrastructure each year.<sup>1</sup> These outlays, which are enormous, have led to a huge improvement in overall access to basic infrastructure. For example, between 1995 and 2012 the proportion of the population connected to a safe water source increased from 74% to 92%, and the number of paved roads rose from 44% of the total in 2003 to 64% in 2011.<sup>2</sup>

In recent years, the Chinese government has continued to spend massively on infrastructure, using such investment as a primary element of counter-cyclical policy, not least in the context of the recent global financial crisis. Furthermore, in order to continue stimulating growth, China plans continued heavy investment, and across all the major infrastructure sectors.

One of the country's priorities is to encourage better trade linkages and regional integration, especially between city clusters, by building efficient domestic transport networks. Several keynote projects target this objective. For example, in 2012, one of the longest high-speed rail lines in the world was opened, between Beijing and Guangzhou. Other projects include new rail connections with Western China and neighbouring countries, and the expansion of the rural road network.

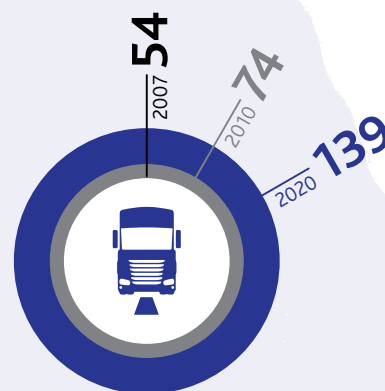
1 McKinsey, 2013b.

2 World Bank.

## PAST AND FUTURE INFRASTRUCTURE INVESTMENT PLANS IN CHINA



NUMBER OF AIRPORTS



LENGTH OF EXPRESSWAYS,  
THOUSAND KM

Source: McKinsey (2013b) Note: (1) Twenty-foot-equivalent unit, a standard measure of cargo capacity equal to 20 feet x 8 feet x 8 feet

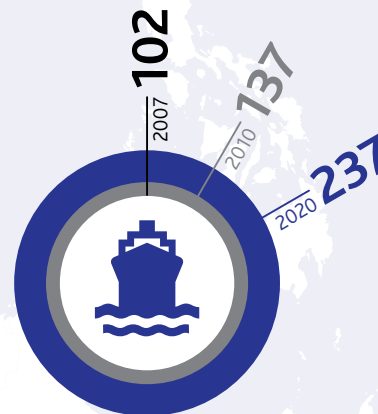
## CHINA'S HIGH-SPEED RAILWAY NETWORK PLAN



Source: Chinese Ministry of Railways (rail over 250 km/h)



LENGTH OF RAILWAYS,  
THOUSAND KM



CAPACITY OF CONTAINER  
TERMINALS, MILLION TEU (1)



Impala warehouse, Ndola, Zambia



# PUBLIC-PRIVATE PARTNERSHIPS TO THE FORE

Greater private sector involvement is vital if emerging market infrastructure is to develop adequately.

- The public sector's role in the sponsorship and delivery of infrastructure assets is in decline around the world
- Financial constraints and inefficiencies have conspired to encourage greater demand for private participation
- The private sector can offer vast financial resources and much-needed practical expertise
- But emerging-market infrastructure project finance and delivery are especially complex and challenging
- Overcoming the significant obstacles to greater private sector involvement requires a range of policy initiatives
- Only if these are delivered will the full potential of institutional investors and multinational firms be realised



*Private sector involvement has been rising ...*

*... as public sector constraints have tightened ...*

## SPREADING THE FINANCIAL NET

### Public sector dominance in decline

Infrastructure provision globally, for most of the 19<sup>th</sup> and 20<sup>th</sup> centuries, was dominated by the public sector. This was due in large part to a combination of the existence of natural monopolies; governmental desire to control strategic assets such as telecommunications networks; and a lack of private sector financial resources. Infrastructure networks had to be built from scratch, and required huge, and frequently highly risky, investments, especially in their early stages. Even when private funding and involvement started to become more common, governments remained the dominant planners and sponsors of infrastructure and proved determined to exert tight regulatory control over the assets put in place.

Over the past three decades, however, the role of the state in the finance, development, ownership, and management of infrastructure provision has been in conspicuous decline, both in the advanced economies and beyond. This reflects efforts to moderate the financial burden of capital investment on public sector balance sheets, and concerns about the historical inefficiency of public infrastructure provision, an important side effect of which has been the spread of privatisation programmes.

Today, to ease the financial and other costs associated with government infrastructure sponsorship and delivery, yet also address the enduring market failures and potential negative externalities associated with greater private sector involvement, it is widely held that a balance should be struck between public and private infrastructure provision. Only in this way, it is asserted, can the efficient delivery, management, and maintenance of infrastructure assets be guaranteed.

### Financial constraints

Emerging-market public finances deteriorated significantly in the wake of the Global Financial Crisis, as real GDP growth slowed sharply and various discretionary fiscal policy stimuli were employed. However, the aggregate budgetary deterioration proved to be rather less than that witnessed in the OECD and, as demonstrated in [25](#) and [26](#), there has been some improvement in both budget balances and debt burdens over recent years. Moreover, with demographic (ageing) issues less of an issue in the developing world than in the OECD, these more positive public finance trends are expected to continue.

Nevertheless, given the widespread need to improve social safety nets, and increasingly intense competition for public sector funds as these countries progress, deficits and debt remain active constraints on government spending and infrastructure outlays in the developing world. This is particularly the case in the Middle East and North Africa, and in parts of Latin America. Fiscal policy decisions in Developing Asia and Europe stand to be somewhat less inhibited.

#### **25** BROADLY-DEFINED BUDGET BALANCES

GENERAL GOVERNMENT BALANCE (% GDP)	2012	2013	2014 (F)	2015 (F)
Asia	-3.0	-2.6	-2.8	-2.4
Europe	-0.8	-1.6	-1.3	-1.3
LATAM	-2.5	-2.9	-3.2	-2.6
MENA	-9.1	-9.9	-7.6	-7.8
G-20 EM	-2.0	-2.3	-2.4	-2.2
OECD	-6.2	-4.9	-4.3	-3.6

Source: IMF Fiscal Monitor, April 2014



### Efficiencies, feasts, and famines

As summarised above, there is also considerable evidence that the public provision of developing economy infrastructure has proved far from optimal. Resources have habitually been misallocated across sectors, across regions, and across time in the face of malign political interference and inadequate governance, if not brazen corruption and extortion, not least in state-owned enterprises in natural resource sectors.

Planning and day-to-day management have frequently been poor, ministerial responsibility for projects and programmes fragmented and poorly co-ordinated, and parliamentary oversight of projects lacking. Meanwhile, rapid urbanisation and decentralisation have tended to increase the onus of responsibility for infrastructure investment on local and municipal governments that have proved singularly ill-equipped to do the job, especially given that fiscal transfers and overall tax revenues have frequently failed to keep pace with designated outlays.

One particular recurring problem is that resource-exporting countries have systematically failed to sustain a coherent counter-cyclical fiscal policy in the face of what are all too often large swings in commodity prices. Rather, fiscal policy has all too often been pro-cyclical. In commodity price upswings, when government revenues are abundant, spending has tended to outrun management capacity, perhaps dramatically, with the result that corruption and extortion multiplied, investment quality suffered and bottlenecks developed, and the costs for government and contractors alike escalated. Conversely, in commodity price downswings, when revenue growth collapsed, the necessity for sudden and dramatic fiscal consolidation would leave many partially-completed projects in limbo, with devastating consequences for contractors and workers alike.

### The development of private sector involvement

Private-sector firms have long been involved in the physical delivery of infrastructure assets as contractors to governments, or to support their own businesses. But the widespread constraints on public sector balance sheets and the inefficiencies and shortcomings of public investment management have recently resulted in a growing demand from governments for the broader application of private sector financial resources and practical expertise to infrastructure development.

At the same time, private sector entities themselves have demonstrated a burgeoning willingness to extend their involvement beyond their longstanding narrow contractual obligations or commercial interests.

For financial institutions, infrastructure assets appeal on a number of levels: they offer extended-maturity, stable, monopoly or quasi-monopoly, often inflation-protected and low correlation, returns in what has increasingly become, and many expect to remain, a low yield environment. Hence, they can help to fill pension fund deficits and assist greatly in liability management and duration hedging.

*... and resource  
misallocations have  
multiplied ...*

*... not least in commodity-  
exporting nations*

*There is demand for  
greater private sector  
assistance*

#### 26 BROADLY-DEFINED GROSS GOVERNMENT DEBT

GENERAL GOVERNMENT GROSS DEBT (% GDP)	2012	2013	2014 (F)	2015 (F)
Asia	33.9	31	29	27.6
Europe	27	27.7	26.1	26.5
LATAM	52	51.4	52.5	52.6
MENA	70.5	75.1	76.6	77.5
G-20 EM	35.1	33	31.8	31
OECD	108.3	107.1	107.1	106.9

Source: IMF Fiscal Monitor, April 2014

*And the private sector is  
keen to contribute ...*

*... on a number of  
different levels*

*Project risks evolve,  
diminishing in the process*

Privatisations of utilities and other public enterprises have served as an active catalyst for this growing private sector financial involvement in the sector. Utilities in particular exhibit generic qualities, not least of which are that they are usually relatively familiar entities and can offer inflation-linked returns from day one.

Although the process of greater private sector financial involvement in infrastructure began in the advanced economies, institutional investors in OECD countries have long been heavily involved in emerging markets, and are beginning to view emerging-market (EM) infrastructure assets as another potentially attractive string to their necessarily diverse bows. Furthermore, EM institutional investors are now themselves beginning to evolve and mature and represent an additional, potentially large, source of long-term capital for the future.

Public Private Partnerships (PPPs) are an increasingly important conduit through which the growing demand for, and supply of, private sector involvement in infrastructure are being expressed. Again these arrangements initially flourished in the developed world, but are now coming more to the fore in the developing economies.

There is also a growing interest in an expanded and more diverse role in infrastructure on the part of multinational corporates which, often with their own interests very much in mind, have long been at the forefront of resource development in the EM world, and can bring with them particular facets of financial and practical expertise.

## THE MECHANISMS OF INFRASTRUCTURE FINANCE

### Managing evolving project risk

Infrastructure projects typically go through a number of stages. The financial and other risk parameters associated with each stage vary considerably although, particularly in the developing world, macroeconomic and political hazards have tended to be ever-present throughout <sup>27</sup>.

In the first, higher risk, stage of a project, the underlying capital asset for development is selected, planned, and designed. In this phase, the assessment and forecast of expected costs, the identification of the final users of the asset and of the expected returns to the investment are crucial in order to ensure that miscalculations and mistakes do not

### <sup>27</sup> THE STAGES OF INFRASTRUCTURE INVESTMENT

	PREPARATION	CONSTRUCTION	OPERATION
<b>DESCRIPTION</b>	Feasibility studies Modelling cash flow and finance Organise contracts with utilities, operators, and construction firms	Building the project	Separate company takes on operation and maintenance
<b>RISKS</b>	Macroeconomic and political risks • Government finances, • Inflation, • Exchange rate fluctuations, • Corruption, • Regulatory barriers, • Civil unrest, • Nationalisation Technical risks to project viability Environmental and planning risks	Macroeconomic and political risks Construction risks (cost escalation, overrun, and delay)	Macroeconomic and political risks Lack of demand risk Operating risks Policy risks (tariff changes)
<b>CASH FLOW</b>	Developer seeks equity investors and debt providers		Once construction is complete and project operating, it can be refinanced to reflect changing risk profile

Source: Bhattacharya, A., Romani, M. and Stern, N. (2012)

create delays and waste precious financial resources. In addition, private sector contractors need to be selected appropriately in order to share the risks among the partners involved, and to ensure that private and wider social interests do not clash unnecessarily.

In the second phase of construction delivery, besides the ubiquitous threat of macroeconomic and political disruption, contractual default and unforeseen delays are the main sources of uncertainty and potential cost overrun.

The third and final stage concerns the operation of the infrastructure asset. This phase, in which another set of contractors are regularly held responsible for delivering on-time services to users of the asset, is usually the least risky phase, and it is only at this juncture that a project typically becomes profitable. However, financial monitoring is important to assess that the cash flows generated by the asset are in line with the initial assessment.

### Financing vehicles

Although infrastructure projects can be financed with a number of different instruments of varying complexity, they all belong to the two basic categories: debt and equity. Debt finance includes bank loans and bonds issued either by the sponsoring public sector or by the corporate entities involved in the project. Equity finance can take the form of shareholdings of either listed or unlisted holdings in the companies contracted to deliver the designated infrastructure asset or assets.

Debt allows a project to develop before the underlying asset can earn the funds necessary for its ultimate operation, and without its sponsors having to share ownership or control of the business. However, there are constraints on the ability of any entity – public or private – to borrow. In the private sector, firms will need to provide collateral for any loan (often the infrastructure asset itself fulfils this role) and a company may need to be listed in order to be able to issue debt. Debt repayments will also have to be separated from expected future returns on any project.

Equity financing does not have to be repaid and, for a company, initially keeping its debt-to-equity ratio low may prove helpful when or if at some stage a bigger loan is required. However, equity finance is typically more volatile, and requires companies to cede partial ownership. Raising equity also involves legal, accounting, and investment banking fees, which can account for 3% to 5% of the sum raised.<sup>1</sup>

Equity finance tends to dominate in the risky, earlier, stages of a project. The actual preliminary capital sum required may be relatively low (between 2% and 5% of the total financing) but fundraising can be problematic because of the high risk profile at this juncture. The initial equity finance typically is raised by the project sponsor or sponsors which, more often than not, is still the government.<sup>2</sup>

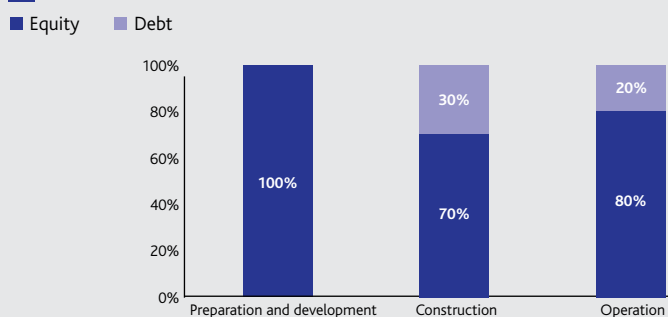
Debt instruments tend to dominate once the project has gone through the planning and procurement phases although, in the later stages, additional resources are frequently raised via investment funds that can specialise in either debt or equity.<sup>28</sup>

*Financing options fall into two broad categories ...*

*... debt and equity...*

*... both of which have their pros and cons*

**28 THE TYPICAL FINANCING STRUCTURE OF AN INFRASTRUCTURE PROJECT**



Source: World Economic Forum (2013b)

*Bank lending plays a key,  
if declining, role ...*

*...especially for  
greenfield' sites*

*Project bonds face  
increasing investor  
demand*

### Debt-based financing

In total, as much as 90% of the asset value of a large infrastructure project may be debt financed.<sup>3</sup>

**'Greenfield' sites.** With infrastructure networks typically much less expansive and mature, greenfield sites are naturally more prominent in the EM world than in the more developed economies. Because of their credit underwriting and supervision skills, single banks, or syndicates of banks, have historically dominated the provision of financing in this area, while institutional investors have tended to balk at the higher-risk characteristics of these projects.

However, reflecting the damaging effects of the global financial crisis on balance sheets and a more onerous regulatory environment characterised by the Basel III accords, the global (especially European) banking sector's ability and willingness to extend long-term loans for so-called 'project finance' has diminished over recent years. Furthermore, where such loans have continued to be made, the conditions attached have become more onerous. Not surprisingly, therefore, the volume of global bank-originated project finance fell away after 2008 and has struggled to recover [29](#).

**'Brownfield' sites.** For brownfield sites, bank project finance has again historically played a dominant role. However, long-term bonds issued by the contracted infrastructure construction company, and frequently underwritten by an investment bank, have proved to be a more readily available alternative financing option than is the case for greenfield sites.

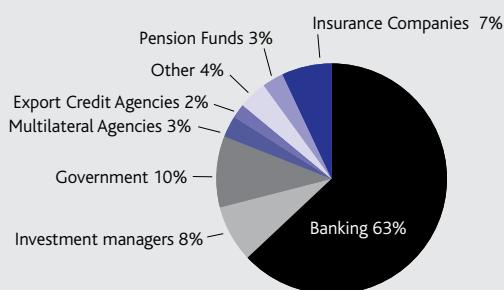
Such debt issues can vary considerably in seniority, and the associated credit-rating may be enhanced by some sort of insurance to guarantee repayment of the bonds. Project-finance bond issuance also declined in the wake of the crisis, not least because of the demise of the 'Monoline insurers' that regularly used to perform this guarantee function. Latterly, however, governments and the multilateral development banks (MDBs) have increasingly stepped in to offer this service, and there have been signs of recovery.

Moreover, institutional investors are apparently becoming more adventurous where infrastructure is concerned. Globally, investment funds specialising in infrastructure debt have risen in prominence, and banks have actively sought to sell bundles of project loans to these entities as part of their deleveraging activities.

The expansion of the EM markets for government infrastructure or corporate project bonds – including, where possible, in connection with greenfield projects – is seen as a major requirement for EMs to attract the necessary additional private sector financing.

Chile has been issuing project bonds since 1998, and they are also issued by South Africa, Panama, and Mexico.

**29** SHARE OF GLOBAL PROJECT FINANCE (%), 2013



Source: S&P (2013)

## Equity-based financing

Equity-based infrastructure financing options fall into four categories:

### **Direct unlisted equity investments**

These do not make use of a fund manager, and require in-house resources and the capability to source assets. There are few such firms in the market – perhaps 20-odd.<sup>4</sup>

### **Unlisted equity funds**

Institutional investors operate as limited partners in projects. Funds are managed by a general partner – often an investment bank or investment manager. Unlisted funds have been the most popular equity vehicle for institutional investors to access core infrastructure assets.

### **Listed infrastructure funds**

These are similar to unlisted funds in that an external manager invests on behalf of investors into infrastructure assets. The fund is listed, but the assets may not be. They are often criticised for their use of complex financial structures, over-paying for assets, and inflated fees.

### **Listed infrastructure indexed funds**

These are found in well-established stock markets; and hence it is possible to track the performance of listed infrastructure firms.

## Public Private Partnerships and their challenges

Notwithstanding a setback in the wake of the global financial crisis, Public Private Partnerships (PPPs) have blossomed over recent decades, and these hybrid structures are now an important conduit for private sector involvement in infrastructure.

Historically, the greater part of the private sector's infrastructure investment tended to be made directly by utility and transport companies. Since the 1990s, however, many countries have sought to broaden private sector involvement, especially in new projects, via PPPs that marry private sector capacity and public resources to deliver publicly-specified infrastructure projects.

In assembling a PPP, the government typically stipulates the quantity and quality of the service it requires from the private partners, which are coalesced into a consortium to do the job. This entity in turn capitalises a Special Purpose Vehicle (SPV) with recourse variously to equity and debt.

The consortium is tasked with the design, construction, financing, operation, and management of the infrastructure asset, as well as the delivery of the resulting service. The group may benefit from some initial public sector equity contribution or guarantees, but it will also subsequently receive either a stream of payments from the government or charges levied on end-users.

Utility and transport projects – roads, railways, airports and seaports – have proved most popular, but PPPs have also been extended to social infrastructure. In the EM world over the past 10 years or so, private capital has contributed some 10-15% of total investment. PPPs were implemented in 134 countries between 2002 and 2011, but outside the OECD countries they are most regularly to be found in the middle-income economies.<sup>5</sup>

*Equity financing options vary considerably*

*Unlisted funds are preferred to listed funds*

*PPPs are increasingly popular ...*

*... and have been utilised in over 130 countries*

*However, PPPs can be complex to set up ...*

*... not least where financing is concerned ...*

*... although, again, project bonds can help*

PPPs often prove complex and challenging in advanced economies, let alone emerging nations. They are therefore certainly no panacea for infrastructure shortfalls.

The intricacies involved include the need to dovetail with development strategy, including national infrastructure and budget plans. The project assets are also typically specific and illiquid, and have little value if the project fails. They require a transparent, competitive, bidding process, and legal and regulatory frameworks that provide adequate protection for all parties. They also need political buy-in and support across different levels of government departments, together with appropriate risk allocation between the public and private sector participants. The reality is that private sector participants still usually shoulder significant risks – and therefore feel obliged to charge high risk premia.

PPPs can be expensive to prepare and require stable long-term finance throughout. Historically, the typical financing arrangements have heavily utilised bonds or senior debt (for large projects) and bank loans (for smaller projects), secured against project cash flows. EM PPPs may require credit rating enhancement to secure investment-grade debt status. PPPs remunerated by private sector tolls involve a higher equity stake and private risk. PPPs remunerated by payments by government involve lower equity stake and private risk. A key constraint in EMs is the lack of experience and skills of governments in structuring deals that can both entice in the private sector and protect taxpayers and consumers.

The role that project bonds can play in infrastructure finance, especially where 'brownfield' sites are concerned, has been outlined above. Project bonds issued by the Special Purpose Vehicle (SPV) associated with a specific PPP certainly offer a number of attractions for both EM infrastructure providers and institutional investors. They are a mechanism to remove some of the financial burden of infrastructure development from the public sector, while the potential impact of a project on a company's balance sheet can be more easily isolated. At the same time, they allow project risks to be identified more clearly, and economic viability to be more easily assessed. They also typically provide a significant yield pickup over sovereign debt.

However, they are not without drawbacks. In particular, issuing project bonds requires that the risks, costs, and expected revenues of the underlying project are well estimated from the very beginning, in order to reduce default risks. (see: [30](#) )

**30 SUCCESSFUL PPPs REQUIRE A COMBINATION OF GOOD ECONOMICS, SUPPORTIVE POLITICS, AND ASTUTE EXECUTION. A NUMBER OF THE KEY ELEMENTS ARE LISTED BELOW.**

**ECONOMICS**

- Ensure sound fundamentals – PPPs cannot create economic miracles
- Structure a partnership that optimises cost, quality, and investor return

**POLITICS**

- Secure political champions
- Build stakeholder support
- Assess and manage social and environmental impact
- Foster a stable and supportive regulatory environment

**EXECUTION**

- Use a disciplined approach – time and complexity are pitfalls
- Secure the right mix of global and local expertise
- Support a transparent, competitive bid process
- Plan for ongoing monitoring and review



## THE FUTURE ROLE OF INSTITUTIONAL INVESTORS

### A largely untapped source of infrastructure funding

Institutional investors offer attractive alternative sources of infrastructure funding, especially as there is considerable scope for their expansion into EMs.

The global non-bank financial sector is extremely large and diverse, extending to pension funds; insurance companies; mutual funds; family offices; sovereign wealth funds (SWFs); and public pension and social security reserve funds (PPRFs). Institutional investors hold almost \$80 trillion in assets in the OECD economies alone <sup>31</sup>.

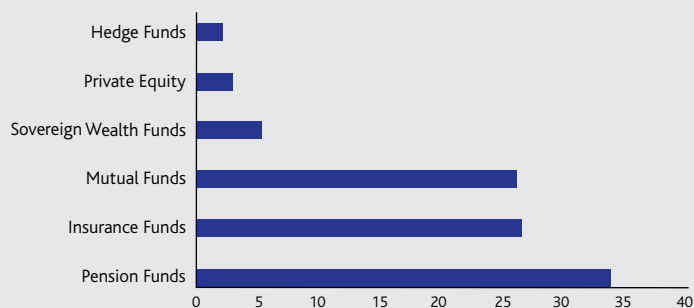
Institutional asset allocation is focussed in particular on the two main asset classes: bonds (both sovereign and corporate) and listed equities. Total allocations to other, 'alternative', assets are relatively modest – typically between 20% and 30% of the total, and rarely in excess of 40%.

Developed-economy pension, insurance, and mutual funds dominate global institutional investment flows. SWFs, private equity, and hedge funds are much smaller players. To date, allocations to infrastructure, and in particular direct investments in infrastructure, although growing, have been limited – perhaps in the region of 3% of the overall total. And although many institutions have considerable experience in investing in the developing world, their exposures to EM infrastructure are very much in the minority <sup>32</sup>.

*Institutional investors  
have huge resources ...*

*... but little exposure to  
EM infrastructure*

**31 ASSETS UNDER MANAGEMENT (\$TN)**



Source: TheCityUK (2013)

**32 INSTITUTIONAL INVESTOR ALLOCATIONS TO EM INFRASTRUCTURE**

INSTITUTIONAL INVESTOR	ASSETS UNDER MANAGEMENT	EXPOSURE TO EM INFRASTRUCTURE	POTENTIAL EXPOSURE TO EM INFRASTRUCTURE	COMMENTS
OECD	\$79tn plus	<1% in total; Leading investors c10%,	1% of assets = \$750bn	Allocation of AUM to long-term capital = \$6.5tn
Emerging Market	\$4.5tn EM pension fund assets estimated to rise from \$2.5tn to \$17.4tn by 2050	Significantly less than 1%; Chilean pension funds 1.5%	1% of assets = c\$50bn	This target could be higher as many EM institutions can only invest domestically
Sovereign wealth funds	\$4tn	0-5%	c5% of assets = c\$250bn	Some new EM SWFs set up to invest specifically in domestic infrastructure
EM pension reserve and social security funds	\$1tn	Limited – ad hoc examples up to 10%	10% of assets = c\$100bn	High target as these funds are often largest single source of capital

Source: World Bank (2014d)

*EM financial systems  
remain bank-based*

*The investment  
community is set to  
expand*

However, what this also means is that there is enormous potential for diversification. To expect additional flows into EM infrastructure of around \$1 trillion, cumulating over several years, would not be unreasonable, and still larger flows are possible. Though insufficient to fill the huge EM infrastructure gap outlined in Chapter 2, it would certainly amount to an important additional source of capital.

On the other hand, infrastructure's share is growing. And, of course, OECD pension funds and insurers are already major investors in overseas markets and the developing world.

### The fledgling EM institutional sector

EM financial systems are typically much less developed and more conservative than their OECD counterparts. Most are largely commercial bank-based, with many disproportionately dependent on foreign banks, although there are some exceptions, including Brazil and South Africa.

The assets of EM pension funds are usually very small as a proportion of GDP, and they are compelled to invest domestically. On the other hand, this means that again there is plenty of room for this investor community to expand and diversify.

A number of middle-income EMs are currently reforming and developing their pension systems to introduce mandatory funded pillars, the establishment of which should greatly accelerate the growth of assets under management, ultimately to the sorts of large percentages of GDP seen in the OECD. There, figures of 60 or 70% are not uncommon.

So far, the experience of infrastructure investing by EM pension funds is most widespread in Latin America, where such institutions are most mature; but there are also early examples in Asia and Africa, and the demonstration effect is likely to strengthen.

As regards EM insurance systems, their assets under management are also likely only to grow as these economies mature. Total insurance company assets amount to more than 100% of GDP in some of the world's largest countries, and average more than 60% of GDP across the OECD countries.<sup>6</sup> **33**

### **33** CREATING THE CONDITIONS FOR EM INSTITUTIONAL INVESTMENT IN INFRASTRUCTURE

**ARE THERE INSTITUTIONAL INVESTORS (PENSION/ SOCIAL SECURITY FUNDS, INSURERS, SWFS) WITH INVESTMENT FUNDS?**

**YES**

Type, size

**NO**

Create or reform funded pension/social security system

**ARE THERE SUBSTANTIAL LIMITS/CONSTRAINTS?**

**YES**

Review

Quantitative limits?

Asset classes/investment vehicles?

Liquidity?

Investor regulation?

Funding and solvency

Foreign investments?

**ARE THERE INFRASTRUCTURE ASSETS TO INVEST IN?**

**YES**

Private/ privatised?

Public-private/PPP?

**NO**

Develop/review infrastructure policy

**ARE THERE WORKING CAPITAL MARKETS (EQUITIES/BONDS/ DERIVATIVES)?**

**NO**

Develop/reform capital markets

**IS THE BANK INTERMEDIATION WORKING?**

**NO**

Reform banks

Look to development banks

Look to multilateral development agencies

**IS THERE A FAVOURABLE MACRO ENVIRONMENT (POLITICAL, LAW, INSTITUTIONS)?**

**NO**

Reform/improve

Political stability

Rule of law

Regulatory certainty

Institutions

Source: World Bank (2014d)

### Sovereign wealth and public pension reserve funds

Sovereign wealth funds (SWFs) and public pension reserve funds (PPRFs) represent another large and growing pool of savings, especially in the natural-resource-exporting countries. Indeed, in 2011 they accounted for some \$10 trillion in assets. Their asset allocations vary widely, although most experienced entities' investments largely mirror those of large-scale institutional investors in the OECD economies.<sup>7</sup> <sup>34</sup> <sup>35</sup>

SWFs are already major investors in developing economies, and are expressing a rising interest in international infrastructure. A number of EM SWFs have domestic investment mandates, and a survey of 60 SWFs suggests that domestic holdings accounted for some 16% of their total holdings. As of 2012, more than 50% of SWFs held some assets in infrastructure, suggesting that they are developing important appraisal skills.<sup>8</sup>

Joint investment ventures between SWFs, other sources of institutional capital, and MDBs could prove to be a powerful catalyst for infrastructure expansion in the emerging world, although such is the financial firepower of these entities that there would need to be close co-ordination with macro policy regimes and public investment plans to guard against excessive pressure on resources.

PPRFs,<sup>9</sup> for their part, enjoy a relative certainty of asset base and are less inclined to seek short-term returns than are many institutional investors. Some PPRFs have already increased their allocations to non-traditional asset classes, and have begun to invest in infrastructure, mainly through listed and unlisted equity. Perhaps the biggest concern with these institutions is that historically they have proven vulnerable to political pressure.<sup>10</sup>

### THE BARRIERS TO EM INFRASTRUCTURE INVESTMENT

The barriers to EM infrastructure investment should not be underestimated. They are significantly greater than in the OECD economies, and fall into three main categories:

#### Investment opportunities and issues of government support

- High political and sovereign risks, ranging from fiscal and monetary incontinence to war, poor governance, corruption, and expropriation
- The associated difficulties of achieving an investment-grade credit rating for debt finance
- The limited number and sporadic nature of suitable projects – in particular, too many 'greenfield' schemes
- Inadequate government guarantees to mitigate private sector risk and 'crowd in' investment
- Lack of political commitment to particular projects over the long-term
- Regulatory instability and fragmentation of responsibility across government
- Lack of appropriate financing vehicles – e.g. specified infrastructure funds

#### Investor capability

- Lack of expertise in the sector, and dependency on third-party due diligence
- Size of institutional investor funds – smaller funds face particular issues
- Regulatory barriers and investor short-termism

#### Conditions for investment

- Negative perception of the value of infrastructure
- Lack of transparency in the sector and shortage of adequate data

Addressing the barriers to EM infrastructure investment requires a range of mutually-reinforcing policy initiatives. The delivery of greater macroeconomic, fiscal, and political stability would appear to be paramount. However, it would also make sense for individual governments, if not groups of countries, to establish a stable, long-term

*Sovereign wealth funds (SWFs) and public pension reserve funds (PPRFs) are a burgeoning source of funding*

*Barriers to EM investment are numerous*

*Addressing them will require many policy initiatives ...*

**34 SOVEREIGN WEALTH FUNDS AND PUBLIC PENSION RESERVE FUND ASSETS**

COUNTRY	NAME	ASSETS (\$BN)	START DATE	ORIGIN
Norway	Government Pension Fund	664.3	1990	Oil
UAE – Abu Dhabi	Abu Dhabi Investment Authority	627	1976	Oil
China	SAFE Investment Company	567.9	1997	Non-commodity
Saudi Arabia	SAMA Foreign Holdings	532.8	n/a	Oil
China	CIC China Investment Corporation	482	2007	Non-commodity
China-Hong Kong	HKMA Investment Portfolio	298.7	1993	Non-commodity
Kuwait	Kuwait Investment Authority	296	1953	Oil
Singapore	Govt. of Singapore Investment Corp	247.5	1981	Non-commodity
Singapore	Temasek Holdings	157.7	1974	Non-commodity
Russia	National Wealth Fund	149.7	2008	Oil
China	National Social Security Fund	134.5	2000	Non-commodity
Qatar	Qatar Investment Authority	115	2005	Oil
Australia	Australian Future Fund	83	2006	Non-commodity
UAE – Dubai	Investment Corporation of Dubai	70	2006	Oil
UAE – Abu Dhabi	International Petroleum Investment Co	65.3	1984	Oil
Libya	Libyan Investment Authority	65	2006	Oil
Kazakhstan	Kazakstan National Fund	61.8	2000	Oil, gas, metals
Algeria	Revenue Regulation Fund	56.7	2000	Oil
UAE – Abu Dhabi	Mubadala Development Company	53.1	2002	Oil
South Korea	Korea Investment Company	43	2005	Non-commodity
US – Alaska	Alaska Permanent Fund	42.8	1976	Oil
Iran	National Development Fund of Iran	40	2011	Oil & gas
Malaysia	Khazanah Nasional	34	1993	Non-commodity
Azerbaijan	State Oil Fund	32.7	1999	Oil
Brunei	Brunei Investment Agency	30	1983	Oil
France	Strategic Investment Fund	25.5	2008	Non-commodity
US – Texas	Texas Permanent School Fund	25.5	1854	Oil & other
Ireland	National Pensions Reserve Fund	18	2001	Non-commodity
New Zealand	New Zealand Superannuation Fund	16.6	2003	Non-commodity
Canada	Alberta Heritage Fund	16.4	1976	Oil

Source: OECD (2013)

**35 SOVEREIGN WEALTH FUNDS AND EM INFRASTRUCTURE INVESTMENTS**

COUNTRY	FUND	ESTABLISHED	ASSET VALUE (\$BN)	INFRASTRUCTURE FOCUS?	DOMESTIC ALLOCATION (%)
Abu Dhabi	Investment Council	2007	627	Implicit	n.a.
Angola	Fundo Soberano de Angola	2012	5	Implicit	n.a.
Bahrain	Mumtalakat	2006	13.5	Implicit	n.a.
Kazakhstan	Samruk-Kazyna	2008	47.4	Explicit	n.a.
Malaysia	Kazanah	2003	34.4	Explicit	n.a.
Nigeria	Nigeria Infrastructure Fund	2011	1	Explicit	100
Palestine	Palestine Investment Fund	2003	0.9	Explicit	80
South Africa	Public Investment Corporation	1911	114.6	Explicit	n.a.
Taiwan	National Development Plan	1973	16.1	Explicit	n.a.
UAE	Mubadala	2002	641	Explicit	n.a.

Source: World Bank (2014e)

and accessible programme of infrastructure investment, extending to national and regional project pipelines, perhaps under the aegis of a national or regional infrastructure agency or bank.

There must, furthermore, be greater regulatory stability, and efforts warrant being made to put in place guarantees that encourage the appropriate transfer of risk, establish new debt and equity financing vehicles, and develop deeper and more diverse domestic debt capital markets.

However, the responses to these obstacles must necessarily go further. To promote the development of the EM institutional investor community, pension fund governance must be improved, collaborative strategies and resource pooling be encouraged, the interests of institutional investors and the infrastructure industry be brought more conspicuously into line, and prudential and regulatory frameworks adjusted towards long-term investment.

This in turn will require regulatory, supervisory, and tax frameworks that encourage institutional investors to develop the necessary expertise and professionalism; improvements in pension trustee composition and knowledge; bank syndication and consortia; the consolidation of smaller institutional investors; transparency in business models; the adjustment of pension accounting rules to address funding gaps, and the easing of quantitative investment restrictions.

Furthermore, the broader investment environment would benefit from independent and objective data collection and the establishment of common performance measures for the asset class; greater involvement of existing pockets of expertise in universities, research bodies, and MDBs; the creation of an independent association of infrastructure investors; and a platform for dialogue between institutional investors, the financial industry, and governments.

Many of these latter objectives could be pursued by a national or regional infrastructure agency or bank.

### **The role of multilateral development banks**

Multilateral Development Banks can play a pivotal role in the development of EM infrastructure, both by providing direct financing and by putting in place the institutional architecture to mobilise and 'crowd in' private sector funds. The private sector will not invest in the dark. The MDBs can provide the additional light to turn it into an asset class in its own right.

MDBs are in a central position to contribute their own direct funding to infrastructure projects via both equity investments and project loans, often with longer than commercially available maturities and grace periods.

However, they can also attract and enhance private sector financing by catalysing syndications or other co-financing mechanisms (in which they may themselves play a central part); and enhancing investment partners' creditor status through risk guarantees and project insurance against risks such as civil disturbance or non-government payment.

In this way they can enhance confidence and lower risk premia for EM infrastructure projects. Clearly, their contribution can be especially important in frontier markets.

The role of the MDBs can however go far beyond funding and risk sharing. They can help in project preparation, which can be demanding for EM economies where institutional, legal, social, environmental, financial, regulatory, and engineering know-how are in short supply. After all, for complex PPPs, preparation costs can amount to 5-10% of the total project.<sup>11</sup>

The MDBs can also help to develop 'transformational regional projects', rendering them attractive for both private and public sectors. For example, cross-border power networks, fibre-optic links, international road corridors, flood controls that protect downstream areas, and ports designed to service land-locked regions can offer huge benefits to two or more countries, yet they may require very large human resources and financial sums for preparation.

*... many of them  
regulatory in nature ...*

*An infrastructure bank  
could oversee them*

*MDBs can provide direct  
financing ...*

*... credit enhancement  
and insurance ...*

*.. help with project  
preparation ...*

*... and better institutional support*

*Multinational corporates have had their critics ...*

*... but attitudes are changing for the better ...*

*... both in the companies and in governments ...*

*... as expertise and competition is sought out and ...*

MDBs can also help to develop an infrastructure market place – a venue for capital providers to meet project sponsors at a time when EM infrastructure is characterised by limited investment vehicles, a shortage of able local financial intermediaries, market fragmentation, information asymmetries, and high transaction costs – especially in Africa.

MDBs can assist too in the collation and improvement of data on the sector as a whole, so that projects and programmes can be better evaluated and prioritised, and benchmarks developed. Data are currently especially short in areas that include service access, prices and costs, efficiency parameters, and the quality of infrastructure

Finally, the MDBs can help to tackle corruption. Anything between 10% and 30% of an EM infrastructure project's value can be 'lost' in the construction phase.<sup>12</sup>

#### **The role of the multinational corporate sector**

Multinational corporates have long played a central part in the provision of EM infrastructure, especially where the resource sector is concerned. They have acted both as keynote contractors for government-sponsored projects, as well as putting in place their own transport and logistical networks to enable the cost-effective exportation of primary materials. However, their activities have often provoked controversy, the sense being that many of these companies were disproportionately motivated by their own profitability and relatively unconcerned with broader issues of poverty, inequality, overall development, or the environment.

Not all companies, however, can be tarred with this unfortunate brush. Moreover, there is today generally a greater awareness of the multinational corporate sector's wider responsibilities to populations of the developing world, and the longer-term benefits that a wider, more enlightened, view can bring to its own bottom line, both in terms of the future business opportunities this may encourage and their wider reputation as responsible global citizens.

Equally, in EM governments and beyond, there is a sense that the long-standing experience and capabilities of the multinational entities have hitherto not been fully tapped, not least where the provision of much-needed financial and practical on-the-ground expertise are concerned.

Multinational companies are adept at assembling complex project financing structures beyond the ken of most EM governments or corporates. They can usually borrow in domestic or international capital markets at interest rates, and under conditions, that are much less onerous than those imposed upon domestic companies. Indeed, they can often borrow under conditions that are superior to those available to the domestic sovereign.

Multinational companies will also sub-contract elements of the work they are tasked with to domestic entities, in the process providing jobs, income, and training and experience to the local workforce.

More important still, the capital assets they put in place – e.g. roads, railway, and port installations – can subsequently be utilised by a wide range of domestic entities, ranging from other companies to individuals. In this way they can be a source of, and catalyst for, additional competition, helping to dislodge inefficient monopoly or quasi-monopoly infrastructure providers.

Under the appropriate conditions, and in particular with the right financial and other incentives, in addition to being encouraged to deliver more much-needed infrastructure assets that can directly contribute to a nation's wealth and well-being, multinational firms are being viewed as alternative providers of the supervisory roles previously undertaken either by the banks or the now largely defunct 'monoline' insurers.

However, it must be stressed that maximising these broader potential benefits requires co-operation with the government authorities, and a rational and coherent approach to pricing, subsidy and supply strategies, not least to ensure suitable access and affordability for the poor.

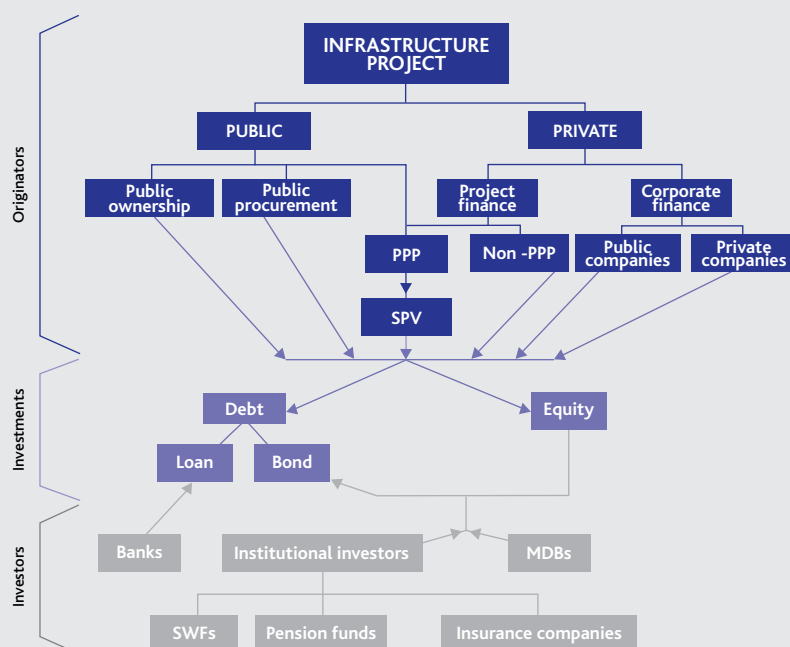


This sort of private sector involvement can also lend itself to the formation of 'expanded PPPs' that could, for example, involve complementary roles for the domestic public sector, multinational corporates, domestic private sector firms, MDBs, SWFs, and institutional investors.

Some multinationals have already delivered essential projects, the Trafigura Group amongst them. For some examples, see **BOXES 4, 5, and 6** on pages 52-57.

*... as positive  
examples multiply*

### 36 FINANCING INFRASTRUCTURE - THE COMPLETE PICTURE



Source: Llewellyn Consulting

- 1 OECD, 2013.
- 2 Llewellyn Consulting, 2013.
- 3 European Investment Bank, 2013.
- 4 OECD, 2013.
- 5 OECD, 2013.
- 6 World Bank, 2014d.
- 7 World Bank, 2014c.
- 8 European Investment Bank, 2013.
- 9 Public pension reserve funds are publicly run entities that manage assets built up in the process of pre-funding future pension liabilities. The most common form is the partially funded, defined benefit scheme. These are often found in younger countries, where pension schemes are still immature, as in Francophone Africa and some parts of Middle East and East Asia. A second type is the centrally-managed, defined contribution arrangement or provident fund. These are mostly found in the former colonies of Africa and Asia.
- 10 World Bank, 2014c.
- 11 World Bank, 2014c.
- 12 World Bank, 2014c.

## BOX 4

# IMPALA: THE MAGDALENA RIVER, COLOMBIA



## INFRASTRUCTURE AND LOGISTICS IN COLOMBIA

Colombia's economy has grown robustly in recent years; yet at the same time this performance falls short of the potential offered by the abundance of its natural resources.

Economic growth averaged 4% per year between 2009 and 2013 – and it seems possible that it will even grow slightly faster over the coming several years: the economy is very much open both to international trade (free trade agreements are in place with approximately 50 countries) and inflows of foreign capital.

At the same time, however, the growth of the economy is constrained, not least by its poor transport network. For example only 15% of its roads are paved, compared with the OECD average of 75%. Hindered by its challenging topography, the quality of Colombia's transport infrastructure<sup>1</sup> ranked 117 out of 148 countries in the World Economic Forum Global Competitiveness Report 2013-14. More generally, Colombia's overall infrastructure – inclusive of transport, electricity and telephone infrastructure – ranks a slightly higher 92 out of 148. In the latest Logistics Performance Index compiled by the World Bank, Colombia scored 2.64 out of a possible 5.<sup>2</sup>

If Colombia can alleviate some of its most important economic constraints, including importantly transport, it could well become a 'breakout' economy – and indeed has been identified as such, for example by Sharma (2012).<sup>3</sup>

## THE MAGDALENA ARTERY

Colombia's main river – the Magdalena – offers particular opportunities to improve the country's transport network. The Magdalena currently acts as a conduit for a mere 5% of the country's total cargo throughput, but it has the potential to become the nation's primary logistical artery. The government has recently taken a significant step in this direction by approving \$1.2 billion in projects to improve the river's navigation. These initiatives are likely to provide multiple benefits, not least greater distributive efficiency and significantly lower transport costs. For example, to export 1.3 million barrels of crude oil in a month, approximately 2,000 trucks are currently required. By contrast, just six convoys of six barges each can move the same amount by river.

The use of the river for cargo shipments is expected to increase. Production of crude is projected to rise by 30%, from 1m barrels per day in 2013 to around 1.3 million in 2019.<sup>4</sup> But with a pipeline capacity of only 1.05 million barrels per day, alternative transportation options will increasingly be required and river transport is the most obvious alternative.

## IMPALA'S MAGDALENA RIVER PROJECT

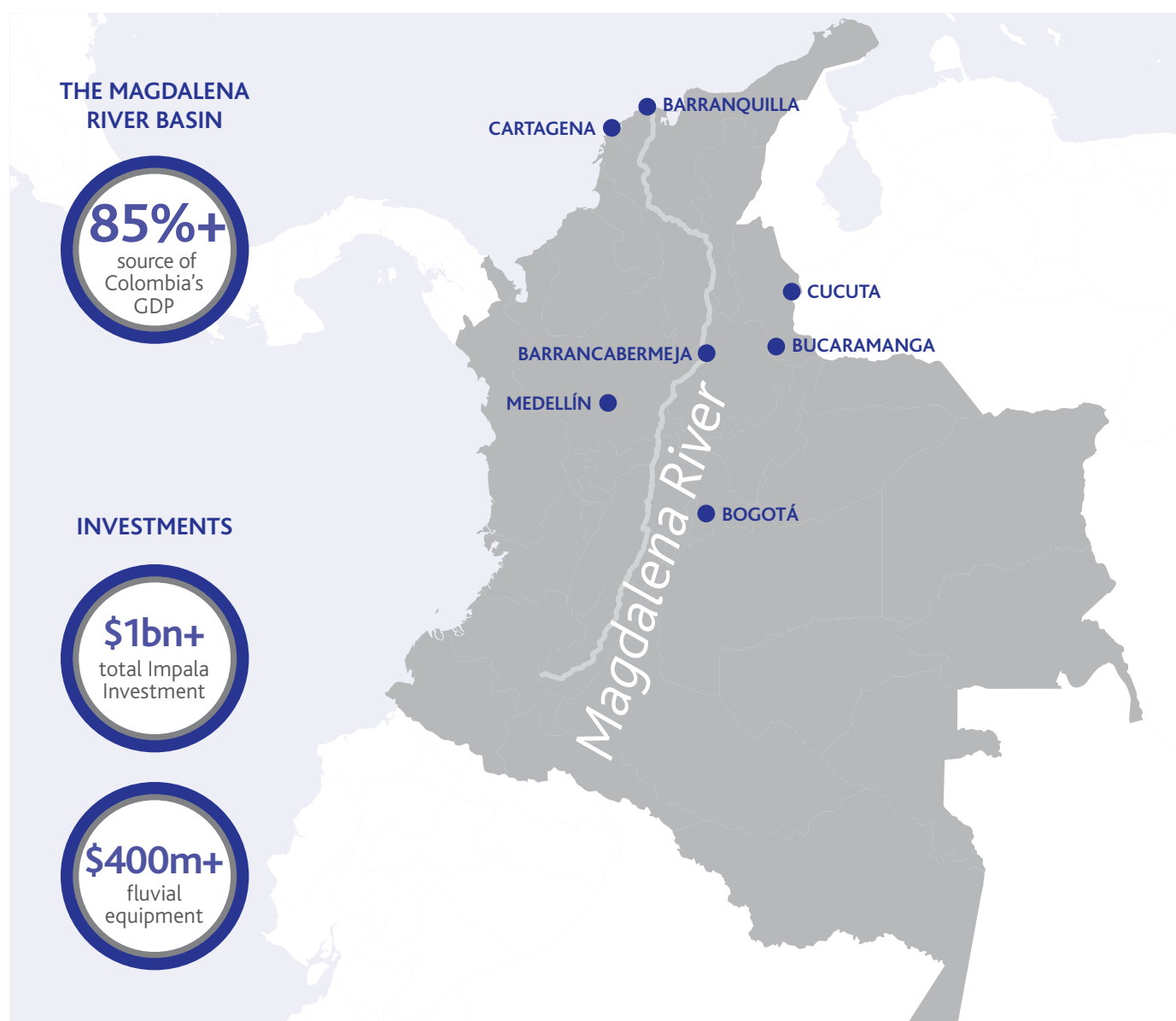
Impala, a Trafigura company, has indicated that it intends to spend nearly \$1 billion – almost as much as the government – to develop transit on the Magdalena River. This multi-modal project involves the creation of new trading hubs; improved road transport links; port developments; and the encouragement of barge transport. Impala says that the project comprises the following investments:

- More than \$400 million in fluvial equipment;
- Construction of a new fluvial terminal at Barrancabermeja;
- Development of a trucking network (trucks, etc); and
- Potential terminal in Barranquilla.

The positive effects of the Magdalena River projects on both domestic and international trade stand to be considerable. The river basin and surrounding areas comprise 726 towns; accommodates 28 million Colombians, or nearly 80% of the population, and it is already the source of over 85% of Colombia's GDP.

It is also expected that there will be important social benefits. For example, the project employs local labour and fosters engagement with local communities; including via specialised training programmes and environmental workshops, and projects specifically designed for artisan miners and fishermen. At least 1,500 new jobs stand to be created directly or indirectly.

- 1 This includes quality of roads, railroads, ports, and airports, and a measure of available airline seats.
- 2 World Economic Forum Global Competitiveness Report 2013-14.
- 3 Sharma, R., 2012. Breakout Nations: In Pursuit of the Next Economic Miracles. Penguin Books.
- 4 Business Monitor – Colombia Oil & Gas Report Q3 2014.



## BOX 5

# MAERSK: SANTOS CONTAINER TERMINAL, BRAZIL



## BRAZILIAN PORT INFRASTRUCTURE

Brazil's rapid growth and development over recent decades has put enormous pressure on the country's infrastructure, not least its seaport capacity. Increased demand for consumer and investment goods, as well as the expansion of its natural resource production, has led to a surge in both imports and exports, and thereby in container traffic. Overall, container-port throughput has more than tripled over the past decade, and many of the country's main ports are now at, or near, capacity. Cargo movements are often delayed, and logistical constraints are adversely affecting productivity and adding to industry's costs.

Developing an efficient and well-functioning supply chain is vital if competitiveness is to be maintained and growth potential maximised. Increasing port capacity and removing related supply bottlenecks is therefore an urgent priority.

There are a number of infrastructure initiatives in planning, or in development. Many involve both public and private sectors. One of the largest projects is the development of the Port of Santos, the country's predominant container hub.

## SANTOS CONTAINER TERMINAL

Maersk, the Danish shipping group, is centrally involved in the construction of a new \$1 billion, state of the art, container terminal in Santos. It is expected that the new container terminal, Brazil Terminal Portuario (BTP), will increase container capacity by up to 40%, and raise berth productivity by more than 10%.

Maersk has stated<sup>1</sup> that the increased trade potential of the terminal is worth up to \$15.3 billion. The company also expects the project to create:

- 3,000 jobs during the construction phase;
- 1,500 jobs during the operation phase, and;
- 9,000 indirect jobs once the terminal is fully up and running.

Nevertheless, to realise and possibly enhance these trade and employment benefits, there is a need to improve the road infrastructure around the port and to address onshore transport bottlenecks. Such need for accompanying infrastructure is not unique to Santos – other port projects require to be multi-modal in scope, encompassing door-to-door logistics. Maersk and other companies are also involved in these types of infrastructure investments.

<sup>1</sup> Maersk in Brazil, 2013. Available at <<http://www.maersk.com/en/the-maersk-group/sustainability/~media/2FEA2632C1A14E71953248D11EF640CC.ashx>>.



## JOB POTENTIAL

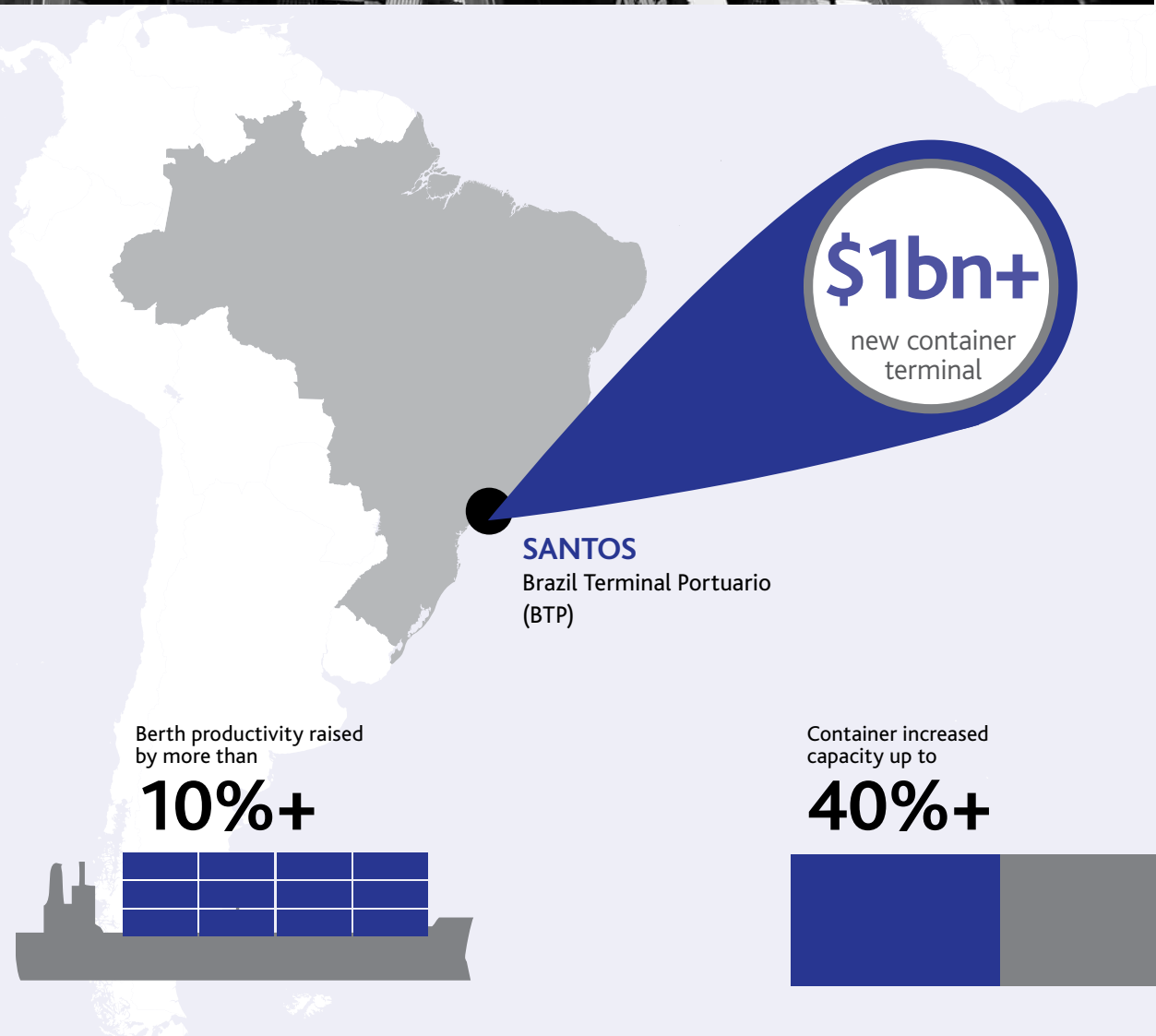
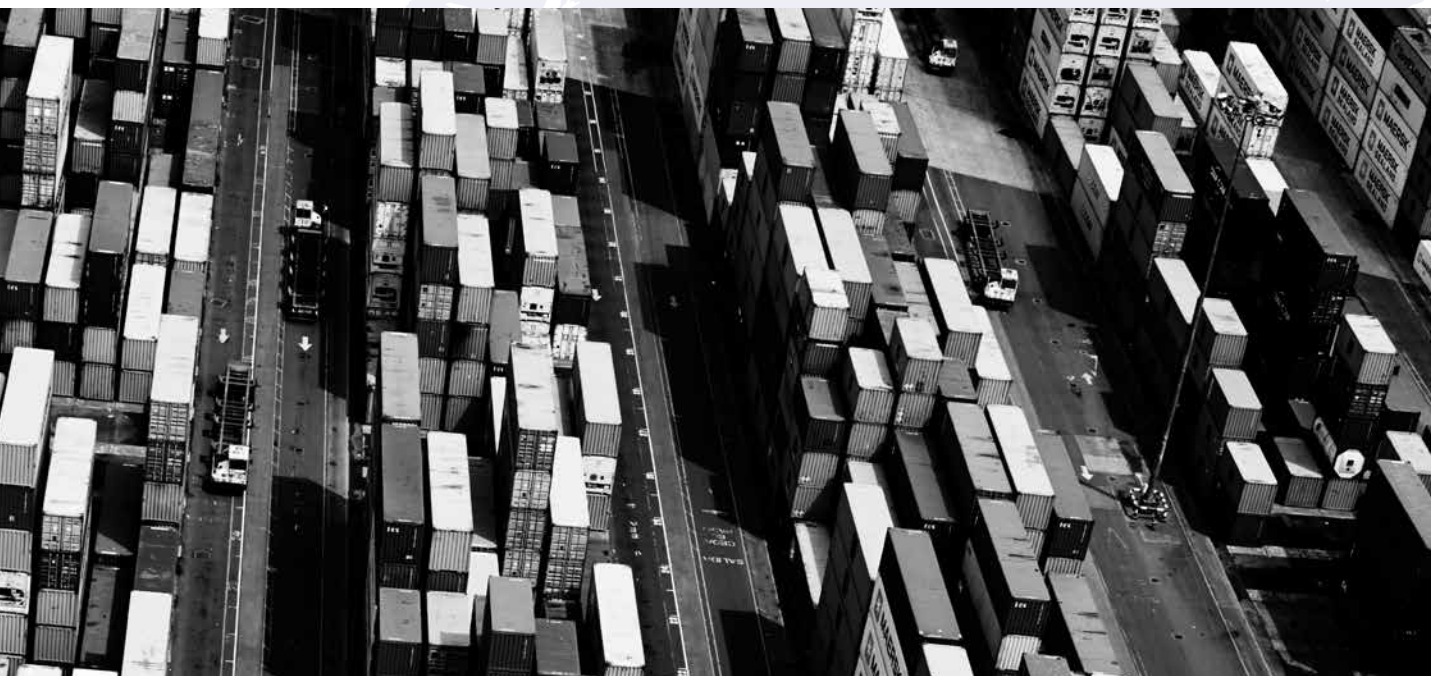


**3,000+**  
during construction phase

**1,500+**  
during operation phase

**9,000+**  
once terminal is up and running







## BOX 6

# *RIO TINTO:* SIMANDOU, REPUBLIC OF GUINEA



## SIMANDOU IRON ORE PROJECT

A mining and infrastructure agreement recently entered into by the Republic of Guinea, one of the largest such projects in the whole of Africa, could result in a doubling or thereabouts of the country's GDP.

In May 2014, the Republic of Guinea and Simfer – a company jointly owned by Rio Tinto, Aluminium Corporation of China ("Chinalco"), the World Bank's International Finance Corporation, and the Guinean state – signed a framework agreement for the Simandou iron ore project. This agreement was subsequently ratified by the National Assembly of Guinea in June.

The project, which is the largest combined iron ore and infrastructure project ever developed in Africa, comprises the three following elements:<sup>1</sup>

- The development of high-grade iron ore resources: the phased development of the Oueleba and Pic de Fon mining areas;
- A new railway: a multi-user trans-Guinean bulk railway extending to approximately 650 kilometres in length, linking south-east Guinea with the coast; and
- A new port: a new dedicated port to be located in Forécariah province on the Morebaya River, which will be the first in Guinea to provide access to large cargo ships.

## DIRECT AND INDIRECT BENEFITS

Once fully operational, the mine project will be one of the most important iron-ore-producing assets in the world, producing around 100 million tonnes per year for a period in excess of 40 years. The infrastructure scheme, meanwhile, one of the most significant 'greenfield' infrastructure projects currently planned in Africa, is likely to produce significant secondary effects especially perhaps around Forécariah, as a result of the new port.

Both aspects of the project are likely to encourage considerable local job creation (an estimated 45,000 jobs will be created), but more important will likely be the medium- to longer-term knock-on effects, which can be expected to spread to other more geographically wide-spread businesses and non-mining activities. These benefits seem likely to include:

- Improved passenger and light freight railway services;
- Strengthened non-mining activities such as agriculture, stock-breeding, forestry, and trade;
- Efficiency increases for the improved communication systems;
- Increased construction activities, as a result of upgraded roads; and
- Substantial urban developments (housing, roads, electricity, social infrastructure, etc.).

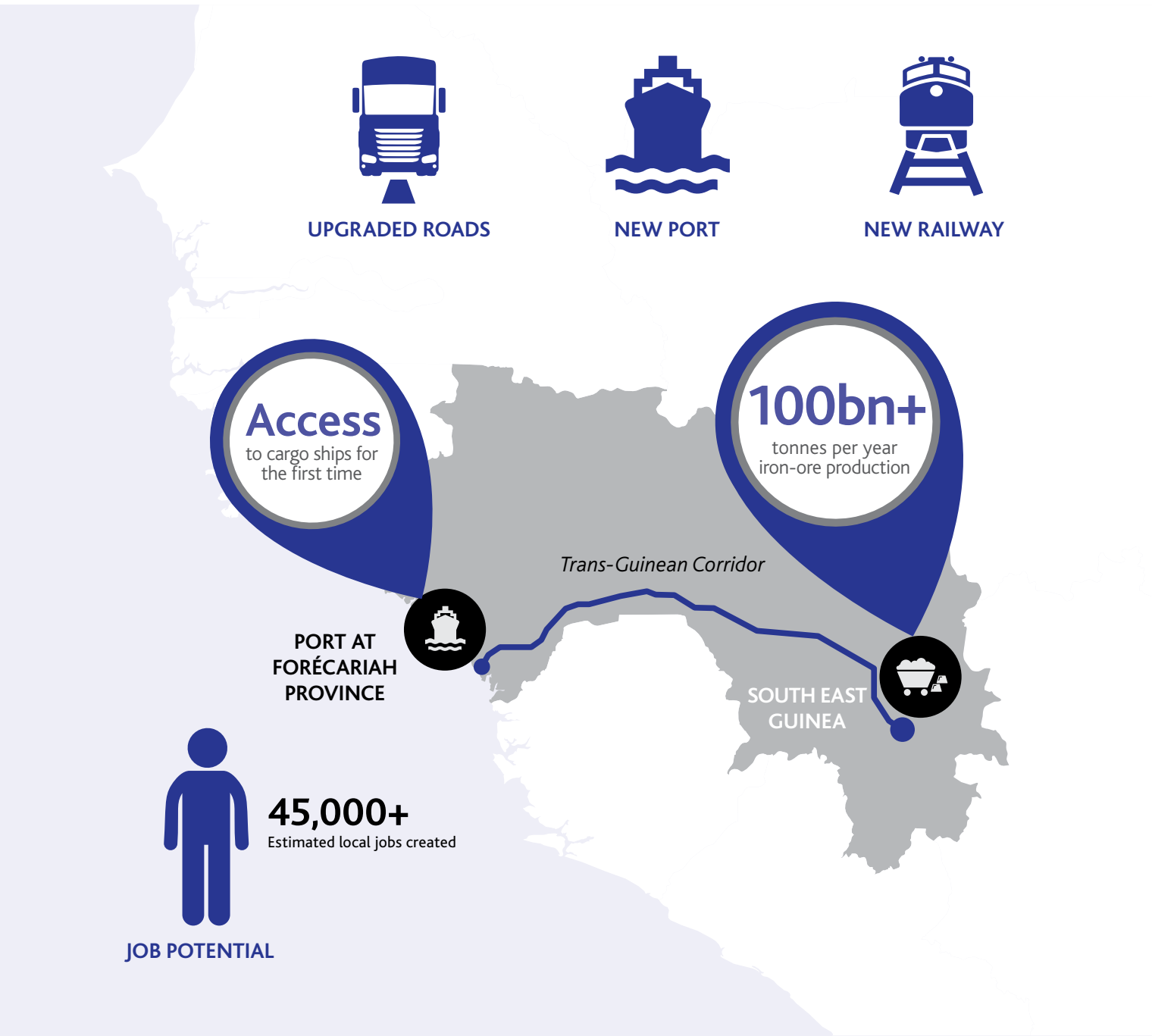


## TRANS -GUINEAN BULK RAILWAY



<sup>1</sup> Rio Tinto <<http://www.riotinto.com/guinea/simandou-4695.aspx>>.





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# CONCLUSIONS

Infrastructure spending is hugely important to the emerging world, first as a key component of aggregate demand management, but more importantly as a means to enhance supply-side potential, foster development, and address the issues of poverty, inequality, and climate change.

To meet the development requirements for infrastructure, it is estimated that annual spending in the EM countries needs to double – from just under \$1 trillion to around \$2 trillion by 2020. The current shortfall in Africa is particularly egregious.

Public-sector sponsorship and financing of infrastructure will continue to play a key role in infrastructural development, but is constrained by the breadth of the competing demands on public purses, the need to contain levels of debt, and by governments' capacity to deliver the appropriate assets in an efficient manner.

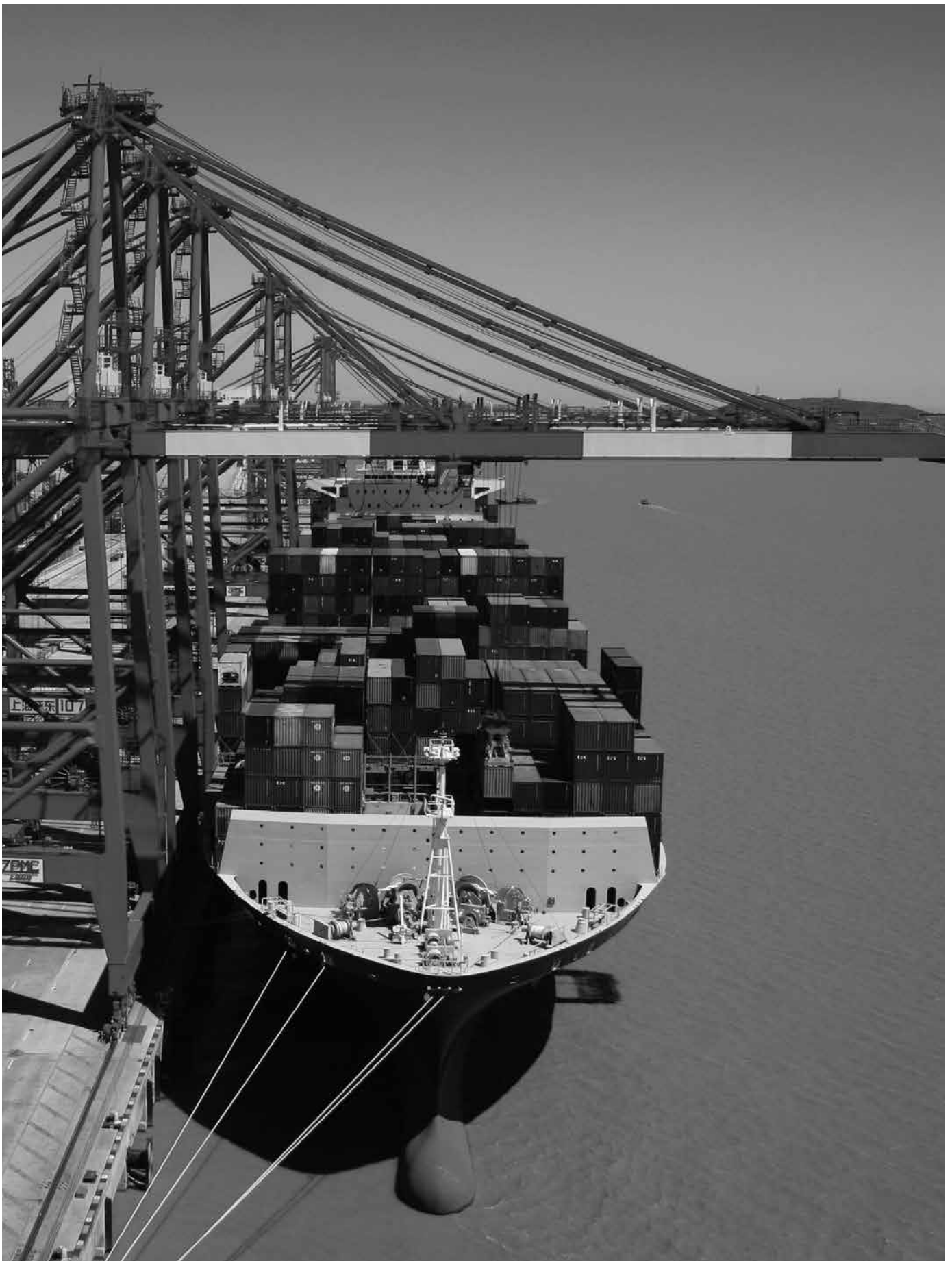
Private sector financing – whether through the traditional route of the commercial banks or through PPPs, institutional investors, or an enhanced direct role for the multinational corporate sector – will therefore have to take up the slack if the financing gap is to be closed and projects delivered more cost effectively.

There are significant barriers to infrastructure investment, both on the supply side (political and macroeconomic risk, regulatory uncertainty, availability of financing structures), and on the demand side (investor scale, lack of expertise, available data). But these obstacles could be overcome with an enlightened approach on all sides. And the potential rates of return are high for all concerned.

Major international companies may increasingly place themselves at the centre of the solution. They have strong organisational and delivery capabilities compared with those of many governments, especially governments in many emerging market economies. They may also have access to financing on a more competitive basis than that available to some governments.

A further way in which major international companies may increasingly become involved is through a cooperative arrangement with governments whereby elements of the infrastructure development which are desired for social or related reasons by the government might be separately funded from the pure commercial development. For example, a railway line between a mine and a port might be extended to loop through, or link to, a town – that additional cost being met from the public purse.

To the extent that this happens, it could open up a potentially important new strand for some international companies' business models.



Transport containers, Yangtze River, China

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# TRAFIGURA: ADVANCING TRADE

Stretching across six continents with 167 offices in 58 countries and a turnover of \$133 billion in 2013, in just over two decades the Trafigura Group has become one of the most successful independent commodity traders and logistics houses.

The group identifies and acts on imbalances worldwide between supply and demand, moving oil and petroleum products and metals and minerals from places where they are plentiful to where they are in short supply – in a reliable, efficient and responsible manner. Its marketing and distribution capabilities combined with its ongoing infrastructure investments have helped transform the marketplace for international physical commodities by increasing efficiencies and seamlessly connecting producers and end users around the globe.

Trafigura builds and develops new logistics and infrastructure where required in order to ensure that supply meets demand, connecting new producers to global markets and ensuring reliable supply to meet the world's increasing demand for energy and industrial raw materials. It brings to the task world-class trading and risk management capabilities and deep financial resources.

Trafigura's core physical trading and logistics business is supported by industrial and financial assets including global oil products distribution company Puma Energy; joint venture company DT Group; global terminals operator Impala; Trafigura's Mining Group and Galena Asset Management.

[www.trafigura.com](http://www.trafigura.com)

## SOME EXAMPLES OF TRAFIGURA GROUP INFRASTRUCTURE ASSETS

The Trafigura Group is engaged in multiple infrastructure projects across the globe focused on facilitating trade flows as part of our multi-billion dollar capital investment programme.



### 1 | Callao, Peru

Impala's \$200 million investment in the Port of Callao has made it the largest export site for the Peruvian mining sector employing over 340 people and providing specialised logistics services to producers and traders for storage, loading, unloading and blending of ferrous and non-ferrous concentrates and refined metals. The facility has over 2.8 million metric tonnes of throughput capacity and provides 175,000 m<sup>2</sup> of warehousing.



### 2 | Porto Sudeste, Brazil

Impala co-owns and operates the brand new \$2 billion port facility for iron ore exporters in Ilha da Madeira, Itaguaí, Brazil. The strategically positioned facility employs over 320 people and provides Brazil's iron ore miners with rapid, effective and reliable access to international markets. It will handle 50 million tonnes of iron ore per annum when fully operational, with the potential to increase capacity to 100 million tonnes.

■ Impala and Puma Energy locations





Impala owns and operates a network of over 50 terminals in 28 countries which provides port, warehousing and multi-modal logistics services to support Trafigura and third-party clients in the movement of essential commodities.



Trafigura is a 49% shareholder in Puma Energy, a global oil and petroleum products distribution company. It handles over 22 million m<sup>3</sup> of oil products annually with 14 million m<sup>3</sup> sold via a network of 77 bulk storage terminals, 38 airports and more than 1,800 service stations in 45 countries.



DT Group is a joint venture between Trafigura and Cochan focused on Angola with interests spanning trading, shipping infrastructure, asset management, logistics and mining.



Trafigura's Mining Group manages mining operations, develops projects, conducts technical audits of existing and potential partner projects, and provides advisory and support services to Galena Asset Management, Trafigura's trading desks and trading partners.



Galena Asset Management is a wholly owned subsidiary of Trafigura with over \$2 billion in managed assets. Galena Asset Management provides investors focused on the commodities sector with specialised alternative investment solutions.



3

### 3 | Walvis Bay, Namibia

Puma Energy acquired Namibia's Walvis Bay depot in 2011. The depot, which is at Namibia's only deepwater port and handles a growing proportion of the country's oil imports, was rebuilt to international standards with an increased capacity to further improve its operational performance. The company has invested \$20 million in the terminal's upgrade, which will provide 110,000m<sup>3</sup> of fuel storage.



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### 4 | Ndola, Zambia

Impala's terminals in Ndola, Zambia and Lubumbashi in the Democratic Republic of Congo support copper producers in both countries providing over 10,000m<sup>2</sup> of warehousing and on site blending to international or customer-specific specifications. Combined, both facilities represent an investment of \$55 million and employ over 210 employees.



### 5 | Dar es Salaam, Tanzania

In July 2012 Puma Energy started to work to construct two new storage tanks along with all associated pumps and pipework at its Dar es Salaam storage facility in Tanzania. With well over 80,000m<sup>3</sup> of new storage capacity, Puma Energy is helping to develop Dar es Salaam as the port of choice on Africa's eastern seaboard.

