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BRIDGING GLOBAL INFRASTRUCTURE GAPS

JUNE 2016

IN COLLABORATION WITH MCKINSEY'S CAPITAL PROJECTS AND INFRASTRUCTURE PRACTICE

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25

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MGI is led by three McKinsey & Company senior partners: Jacques Bughin, James Manyika, and Jonathan Woetzel. Michael Chui, Susan Lund, Anu Madgavkar, and Jaana Remes serve as MGI partners. Project teams are led by the MGI partners and a group of senior fellows, and include consultants from McKinsey offices around the world. These teams draw on McKinsey's global network of partners and industry and management experts. Input is provided by the members of the MGI Council: McKinsey senior partners Eric Labaye (chairman of MGI), Andres Cadena, Richard Dobbs, Katy George, Rajat Gupta, Eric Hazan, Acha Leke, Scott Nyquist, Gary Pinkus, Shirish Sankhe, Oliver Tonby, and Eckart Windhagen. In addition, leading economists, including Nobel laureates, act as research advisers.

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BRIDGING GLOBAL INFRASTRUCTURE GAPS

JUNE 2016

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PREFACE

More than three years ago, the McKinsey Global Institute (MGI) published a comprehensive report evaluating the world's future infrastructure needs. We found that while trillions of dollars in annual investment will be required well into the future just to keep up with expected rates of growth, a pattern of underinvestment has produced a growing shortfall and allowed many foundational systems to deteriorate. Yet there are solutions for ensuring that global infrastructure spending goes further. The consistent application of leading practices in the planning, delivery, operation, and maintenance of existing assets could make it possible to save up to 40 percent on global infrastructure spending.

This research offers an updated perspective based on the latest infrastructure spending data and a fresh evaluation of the world's needs. It adds detail and nuance on what the sector can do to improve, based on our client work and case studies from around the world. We also lay out our latest thinking on infrastructure financing, including not only strategies for private financing but also measures to encourage public investment.

This research update was directed by Nicklas Garemo, a senior partner of McKinsey & Company based in Abu Dhabi. Jan Mischke, an MGI senior fellow based in Zurich, led the research. Robert Palter, a Toronto-based McKinsey senior partner who leads the Firm's Global Capital Projects and Infrastructure practice; Jonathan Woetzel, a McKinsey senior partner and MGI director based in Shanghai; and Martin Hjerpe, a McKinsey partner based in Stockholm, provided overall guidance. The project team comprised Priyanka Kamra, Arpit Kaur, Anshubhi Karolia, and Salil Mathur. Lisa Renaud served as senior editor. Sincere thanks go to our colleagues in operations, design, production, and external relations, including Tim Beacom, Marisa Carder, Matt Cooke, Deadra Henderson, Richard Johnson, Julie Philpot, Rebeca Robboy, Margo Shimasaki, Holly Skillin, and Patrick White.

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This report contributes to MGI's mission to help business and policy leaders understand the forces transforming the global economy, identify strategic locations, and prepare for the next wave of growth. As with all MGI research, this work is independent and has not been commissioned or sponsored in any way by any business, government, or other institution. We welcome your comments on the research at **MGI@mckinsey.com**.

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IN BRIEF

BRIDGING GLOBAL INFRASTRUCTURE GAPS

Today the world invests some $2.5 trillion a year in the transportation, power, water, and telecom systems on which businesses and populations depend. Yet this amount continues to fall short of the world's ever-expanding needs, which results in lower economic growth and deprives citizens of essential services. Building on MGI's 2013 report *Infrastructure productivity: How to save $1 trillion a year*, this research updates our estimates of the world's infrastructure needs and projected investment shortfalls. It also offers refined recommendations for bridging those gaps. Among our findings:

- From 2016 through 2030, the world needs to invest about 3.8 percent of GDP, or an average of $3.3 trillion a year, in economic infrastructure just to support expected rates of growth. Emerging economies account for some 60 percent of that need. But if the current trajectory of underinvestment continues, the world will fall short by roughly 11 percent, or $350 billion a year. The size of the gap triples if we consider the additional investment required to meet the new UN Sustainable Development Goals.
- Infrastructure investment has actually declined as a share of GDP in 11 of the G20 economies since the global financial crisis, despite glaring gaps and years of debate about the importance of shoring up foundational systems. Cutbacks have occurred in the European Union, the United States, Russia, and Mexico. By contrast, Canada, Turkey, and South Africa increased investment.
- There is substantial scope to increase public infrastructure investment. Governments can increase funding streams by raising user charges, capturing property value, or selling existing assets and recycling the proceeds for new infrastructure. In addition, public accounting standards could be brought in line with corporate accounting so infrastructure assets are depreciated over their life cycle rather than adding to deficits during construction. This change could reduce pro-cyclical public investment behavior.
- Corporate finance makes up about three-quarters of private finance. Unleashing investment in privatized sectors requires regulatory certainty and the ability to charge prices that produce an acceptable risk-adjusted return as well as enablers such as spectrum or land access, permits, and approvals.
- Public-private partnerships have assumed a greater role in infrastructure, although there is continued controversy about whether they deliver higher efficiency and lower costs. Either way, they will continue to be an important source of financing in the future. But since they account for only about 5 to 10 percent of total investment, they are unlikely to provide the silver bullet that will solve the funding gap. Public and corporate investment remain much larger issues.
- Institutional investors and banks have $120 trillion in assets that could partially support infrastructure projects. Some 87 percent of these funds originate from advanced economies, while the largest needs are in middle-income economies. Matching these investors with projects requires solid cross-border investment principles. Impediments that restrict the flow of financing, from regulatory rulings on investment in infrastructure assets to the absence of an efficient market, have to be addressed. The most important step, however, is improving the pipeline of bankable projects.
- Beyond ramping up finance, there is even bigger potential in making infrastructure spending more effective. Accelerating productivity growth in the construction industry, which has flatlined for decades, can play a large role in this effort. Additionally, as our 2013 research showed, improving project selection, delivery, and management of existing assets could translate into 40 percent savings. Since our original report was published, we have completed a detailed diagnostic measuring the efficiency of infrastructure systems in 12 countries. Even the most advanced economies have significant room to learn from each other and to build stronger capabilities and learning institutions with strong oversight. A rigorous assessment that benchmarks each aspect of infrastructure development against global best practices can identify the areas where a well-targeted transformation could yield substantial results.

The world invests **$2.5 trillion** annually in transport, power, water, and telecom

Today

The world needs to invest **$3.3 trillion** annually just to meet growth forecasts to

2030

How can the world bridge its infrastructure gap?

Find a way to attract the

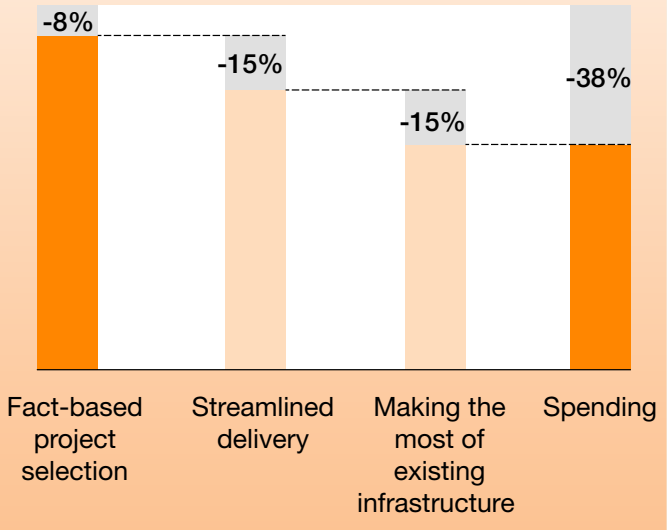
$120,000,000,000,000

under management by banks and institutional investors to infrastructure finance through ...

- A better pipeline of well-developed projects
- Changes to regulation and risk mitigation
- Market facilitation and standardization
- Solid cross-border investment principles

Make investment more productive

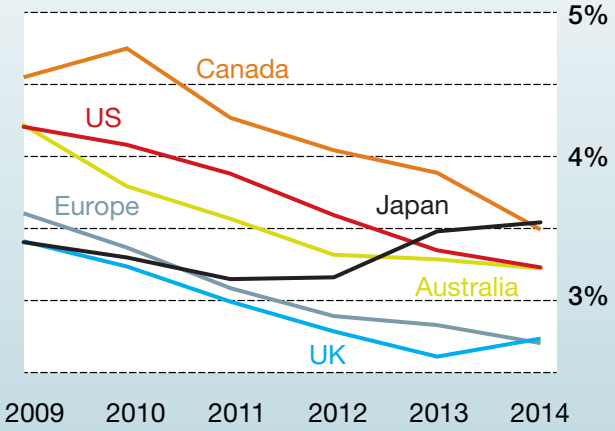
Strong governance in three areas can save almost 40% of spending



Unlock public funding

Public investment has been declining

General government gross fixed capital formation



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1. GLOBAL INFRASTRUCTURE GAPS HAVE WIDENED

The world spends some $2.5 trillion a year on the transportation, power, water, and telecom systems that underpin economic activity and provide essential services. But this has not been enough to avoid significant gaps, and investment needs are only growing steeper. We estimate that investment needs to average $3.3 trillion annually through 2030 just to support current economic growth projections. This figure is equivalent to about 3.8 percent of global GDP.

Despite the clear socioeconomic benefits associated with building infrastructure, investment rates have actually declined in much of the world since the global financial crisis. The current trajectory points to a shortfall of about $350 billion a year even without addressing maintenance backlogs. Furthermore, the size of the gap triples when we compare current investment against what would be required to meet the UN Sustainable Development Goals, which are critical for the future of undersupplied regions such as Africa.

$3.3T
annual infrastructure investment needed just to support projected economic growth

Too many countries—emerging and advanced economies alike—have paid insufficient attention to maintaining and expanding their infrastructure assets, creating economic inefficiencies and allowing critical systems to erode. Epic traffic jams, bottlenecked ports, blackouts, deteriorating dams, and tainted water supplies are clear signs that the world's infrastructure needs cannot be deferred indefinitely. Glaring gaps exist in the developing countries of South Asia and Latin America but also in the United States and other advanced economies.

Too many countries have been underinvesting for decades, a trend that threatens to constrain growth.

The McKinsey Global Institute (MGI) tackled this issue in a comprehensive 2013 report that quantified the world's future investment needs and warned of looming shortfalls. But it also showed that a better flow of finance, combined with measures to improve project selection, delivery, and operations, could close those gaps.[1] Today we are refreshing this analysis to provide a longitudinal review and measure whether progress is being made to address this problem.

This research reviews the latest data on infrastructure spending across countries and asset classes, updates projections of infrastructure needs, and pinpoints the gaps. Subsequent chapters will discuss steps that could unlock more funding from public coffers as well as private corporate and institutional investors. We conclude by showing that making spending more efficient through better management can be even more important than finance. Drawing on our work on the ground in multiple countries, we offer new insights into how economies around the world can move in this direction, using a diagnostic that assesses infrastructure programs on key dimensions.

[1] *Infrastructure productivity: How to save $1 trillion a year,* McKinsey Global Institute, January 2013.

1.1. INFRASTRUCTURE PROVIDES A CORNERSTONE FOR SOCIOECONOMIC PROGRESS

Roads, ports, airports, rail, and telecom networks are the conduits of trade and mobility. Electricity fuels production, and clean water underpins public health. Investment that modernizes and maintains these systems can propel economic growth.

Because it is a critical enabler of both direct and indirect societal benefits, infrastructure is a core element of the UN Sustainable Development Goals. These include:

- Ensuring the availability and sustainable management of water and sanitation for all.
- Ensuring access to affordable, reliable, sustainable, and modern energy for all.
- Building resilient infrastructure, promoting inclusive and sustainable industrialization, and fostering innovation.

MGI estimates that infrastructure typically has a socioeconomic rate of return of around 20 percent. In other words, one dollar of infrastructure investment can raise GDP by 20 cents in the long run. These economic effects stem mostly from making a given region more productive through means such as reduced travel time and costs, access to reliable electricity, and broadband connectivity that allows individuals and businesses to plug into the digital global economy. Some infrastructure investments, if well chosen and well executed, can have benefit-cost ratios of up to 20:1.

A dollar of infrastructure investment can raise GDP by 20 cents in the long run by boosting productivity.

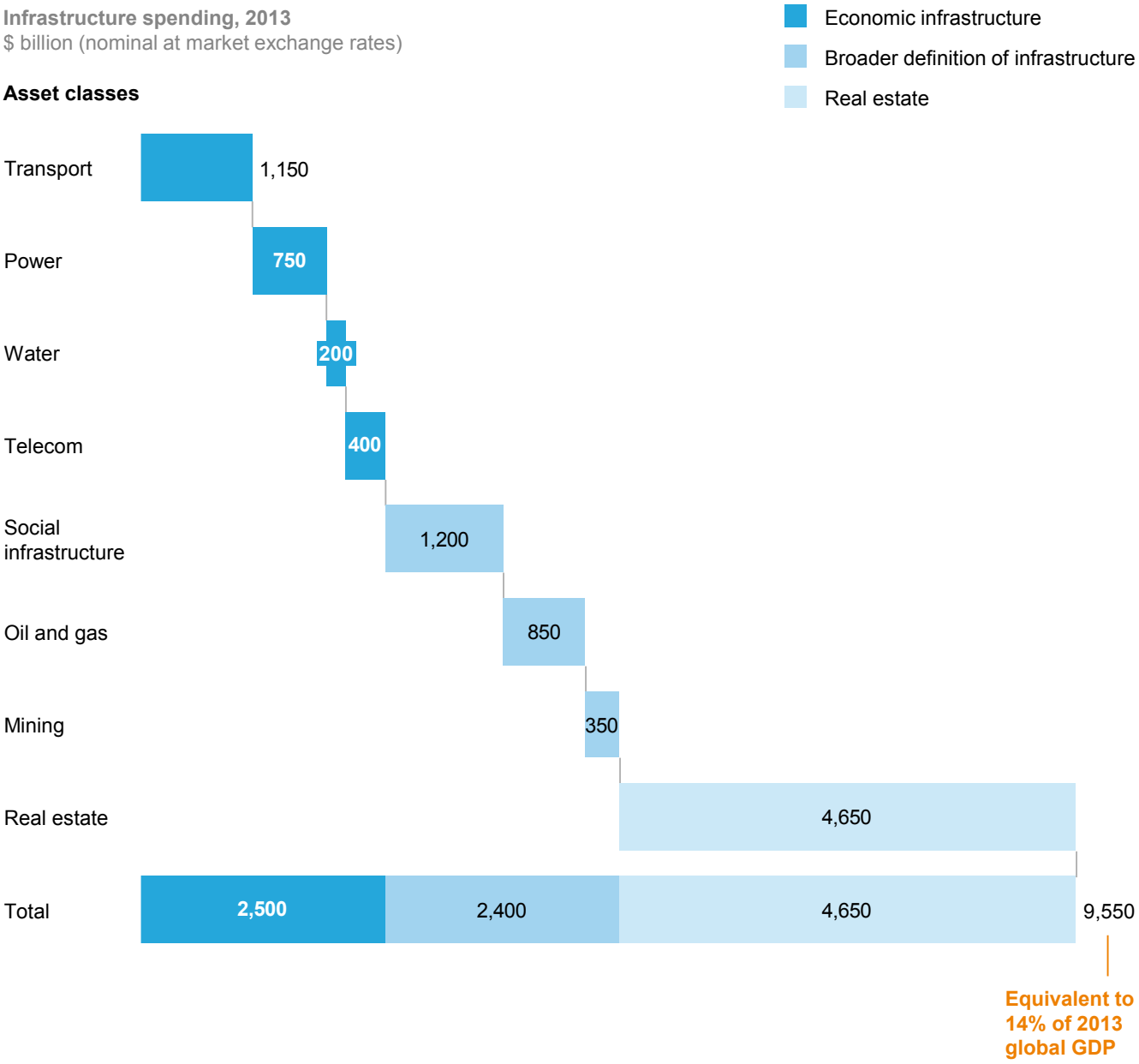
Ramping up investment over the next decade in line with economic needs could add about 0.6 percent to global GDP. The boost could be even larger in countries with large current infrastructure gaps: the United States, for example, could boost GDP by about 1.3 percent, while Brazil could add 1.5 percent.

In addition to the long-term productivity benefits, infrastructure construction immediately creates jobs. Our analysis suggests that in the shorter term, increasing infrastructure investment by one percentage point of GDP could generate an additional 3.4 million direct and indirect jobs in India, 1.5 million in the United States, 1.3 million in Brazil, and 700,000 in Indonesia.[2]

[2] Ibid.

Exhibit 1

Using the broadest definition of infrastructure, the world spent $9.6 trillion on all types of asset classes in 2013



SOURCE: IHS; Euroconstruct; IMF; World Bank; OECD; McKinsey Global Institute analysis

1.2. INFRASTRUCTURE IS A MULTITRILLION-DOLLAR MARKET

Using the broadest definition of infrastructure—which includes real estate, social infrastructure, and backbone systems for the oil, gas, mining, and processing industries—the world spent $9.6 trillion, or 14 percent of global GDP, on infrastructure in 2013 (Exhibit 1).

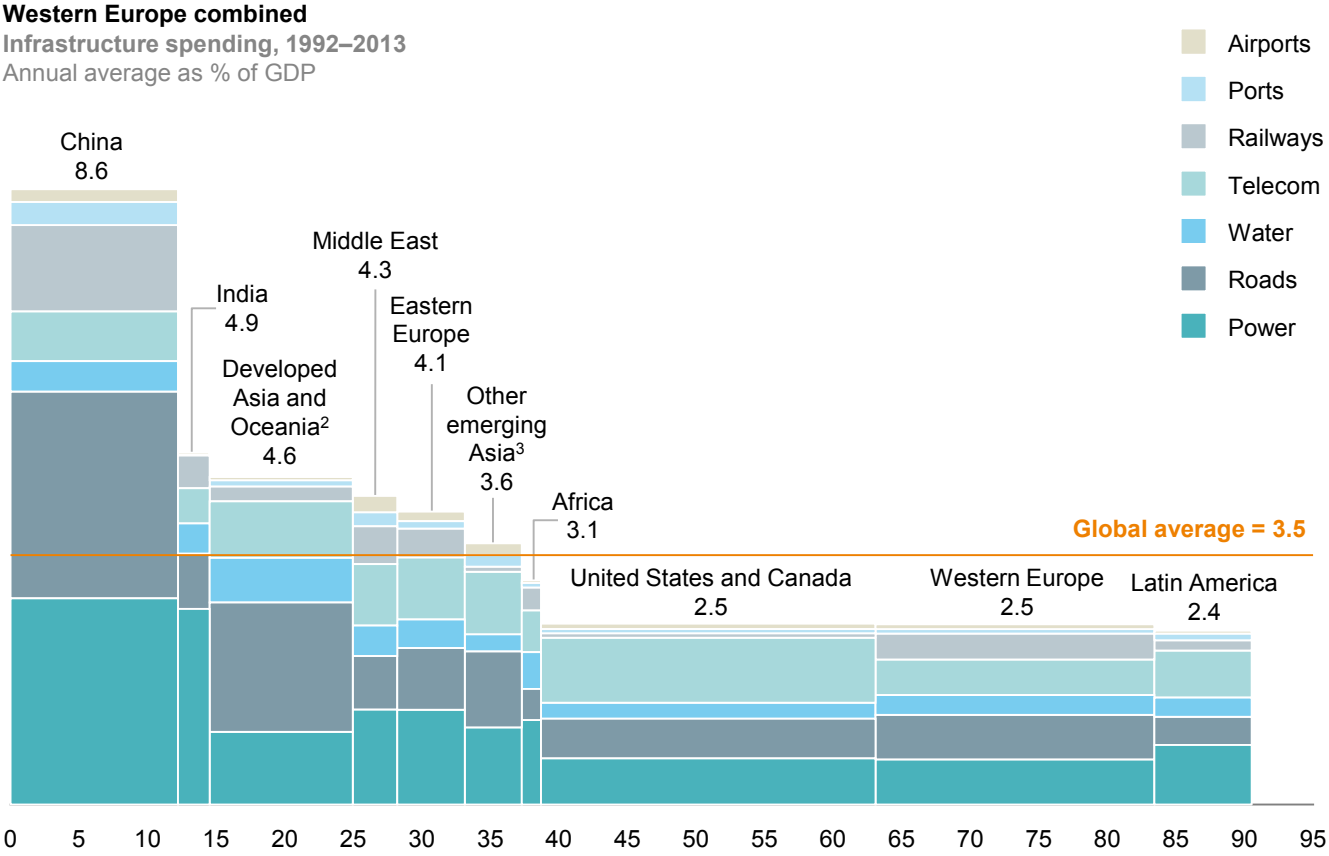
Our research focuses on a narrower subset of this spending, namely networked economic infrastructure. This consists of transport (roads, railways, airports, and ports), water, power, and telecom systems (which include digital infrastructure such as broadband). Together these asset classes accounted for $2.5 trillion of global investment in 2013. Over the past two decades, investment has averaged 3.5 percent of global GDP (Exhibit 2).

Exhibit 2

China spends more on economic infrastructure annually than North America and Western Europe combined

Infrastructure spending, 1992–2013

Annual average as % of GDP



Infrastructure spending, 2013

$ billion

1 Percentage of world GDP generated by the 75 countries in our analysis for 2013.
2 Includes Australia, Hong Kong, Japan, New Zealand, and Singapore.
3 Includes Bangladesh, Indonesia, Malaysia, Pakistan, Philippines, Sri Lanka, Taiwan, Thailand, and Vietnam.

SOURCE: IHS Global Insight; ITF; GWI; National Statistics; McKinsey Global Institute analysis

1.3. THE CURRENT TRAJECTORY OF INVESTMENT WILL LEAVE COUNTRIES AROUND THE WORLD FACING MAJOR GAPS

Past spending has not been enough to meet today's requirements—and if current rates are maintained, the gaps will continue to grow. We estimate that the world will need to invest $3.3 trillion annually (in constant 2015 prices) from 2016 through 2030 simply to keep pace with economic growth forecasts (Exhibit 3).[3] These needs are highly sensitive to growth rates since economic activity increases demand on infrastructure assets as well as generating the funding required to build them. While it is possible for governments to decrease infrastructure investment and maintain economic growth for a short period of time, this pattern could create a drag on growth in the future—a scenario that is now likely to unfold in some countries.

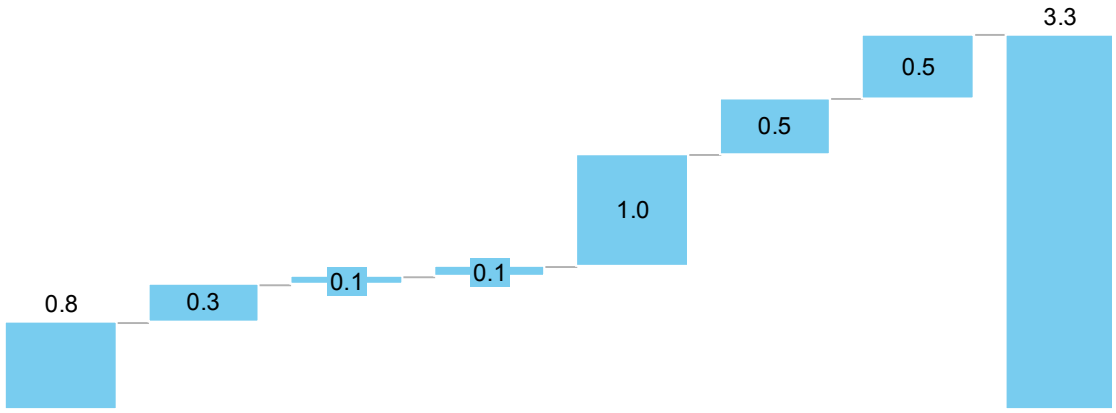
[3] We use the same methodology from our 2013 report to arrive at this new estimate of the spending gap. For full details, see *Infrastructure productivity: How to save $1 trillion a year,* McKinsey Global Institute, January 2013.

Our estimate of $3.3 trillion in required annual investment adds up to a cumulative need for $49 trillion over the entire period from 2016 to 2030.[4] It should be noted that this amount is based on an average global GDP growth rate of 3.3 percent. But if global growth averages one percentage point slower, the total investment need would fall by about $13 trillion. If it exceeds that rate by one percentage point, the figure would be about $14 trillion higher.

Exhibit 3

The world needs to invest $3.3 trillion in economic infrastructure annually through 2030 to keep pace with projected growth

Average annual need, 2016–30
$ trillion, constant 2015 dollars



	Roads	Rail	Ports	Airports	Power	Water	Telecom	Total
Annual spending % of GDP	0.9	0.4	0.1	0.1	1.1	0.6	0.6	3.8
Aggregate spending, 2016–30 $ trillion	11.4	5.1	0.9	1.3	14.7	7.5	8.3	49.1[1]

1 The estimate of total demand is lower than the $57 trillion projection in previous MGI research. It has been adjusted for the following reasons: this projection covers a 15-year period (2016–30) rather than an 18-year period (2013–30); water numbers have been reduced by 40 percent, as Global Water Intelligence adjusted its water capex definition to exclude equipment spending; base year prices have been revised from 2010 to 2015; and GDP growth forecasts have been revised downward by IHS.
NOTE: Numbers may not sum due to rounding.

SOURCE: IHS Global Insight; ITF; GWI; National Statistics; McKinsey Global Institute analysis

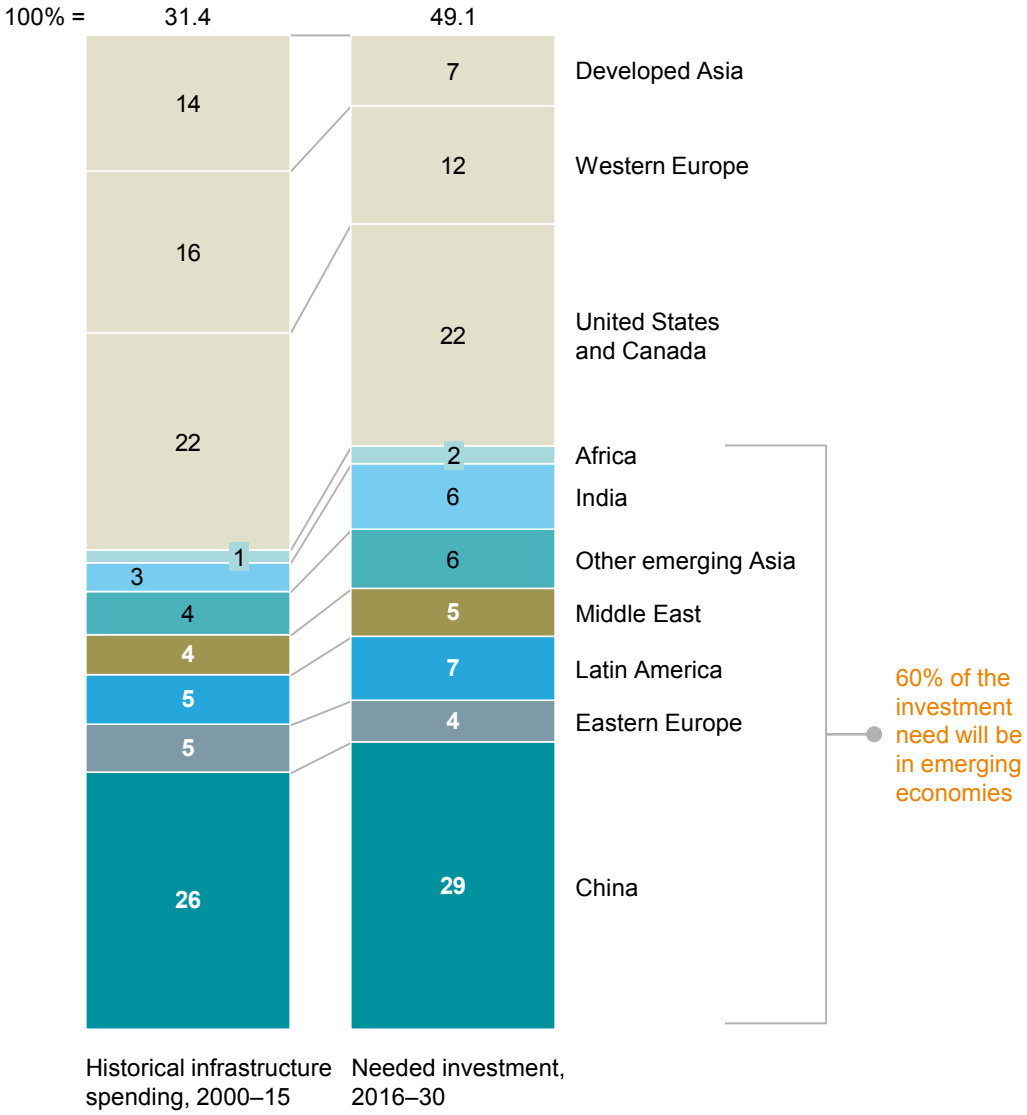
While the United States and Europe have substantial needs, the majority of this investment will be required in emerging economies. China's needs for the future remain vast despite its recent overinvestment; this will hold true even if the country experiences the economic slowdown that many are predicting (Exhibit 4). In fact, our estimate is based on average GDP growth of 5.7 percent for China across this period, which is well below the economy's current performance.

4 This projection is lower than the $57 trillion cumulate estimate in our 2013 report. It has been adjusted for the following reasons: it covers a 15-year period (2016–30) rather than an 18-year period (2013–30); the definition of water infrastructure has been changed to exclude equipment; and GDP growth forecasts have been revised downward by IHS.

Exhibit 4

Infrastructure investment will continue to shift to emerging markets

Investment needs
Economic infrastructure; %, $ trillion (at constant 2015 prices)



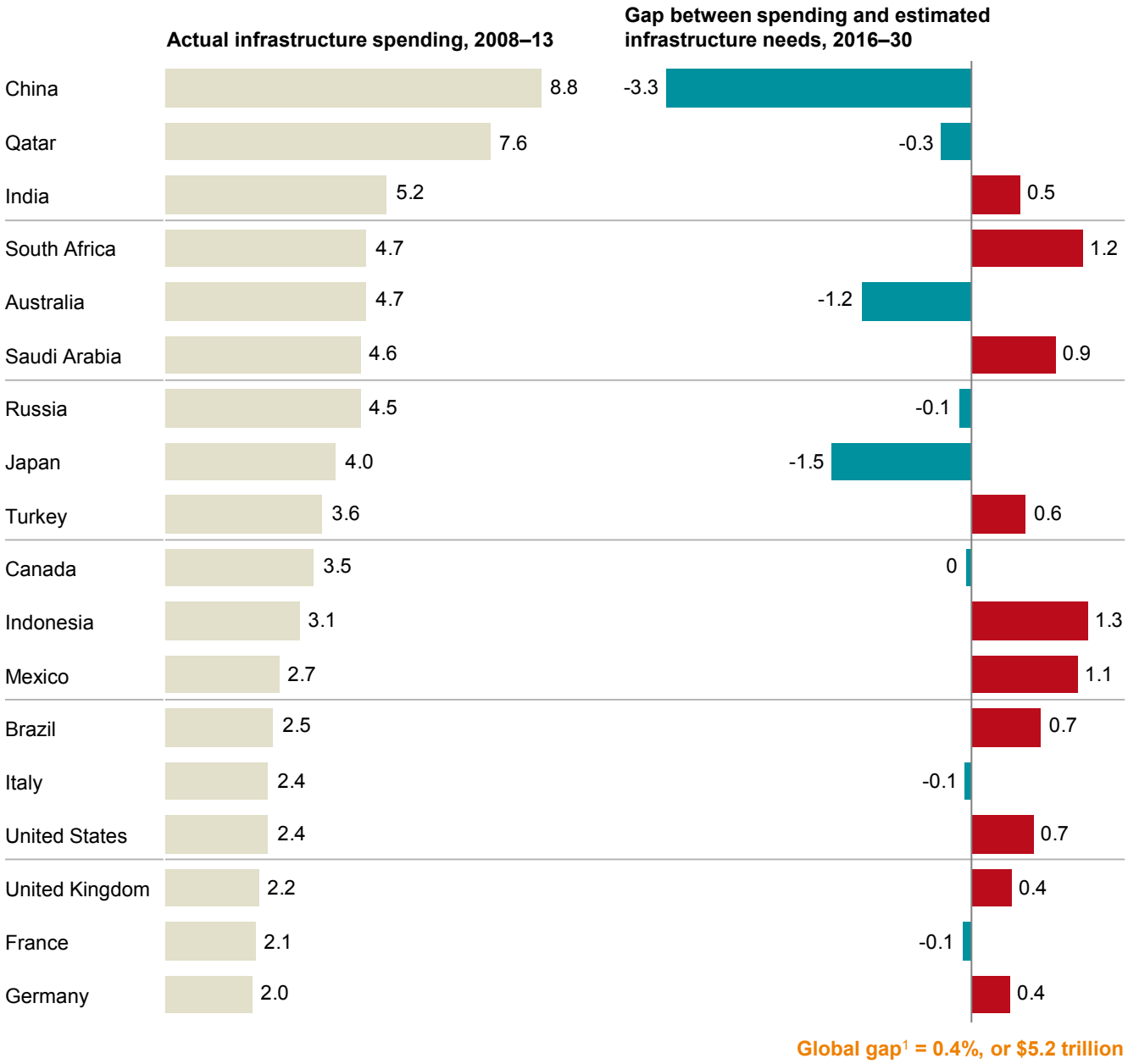
SOURCE: IHS Global Insight; ITF; GWI; National Statistics; McKinsey Global Institute analysis

If current investment rates remain unchanged, the world will fall far short of these projected needs. Baseline needs already exceed investment by around 0.4 percent of global GDP, or $350 billion annually. In cumulative terms, the gap totals $5.2 trillion globally across the entire period from 2016 to 2030. Many of the world's largest economies, emerging and developed alike, are on trajectories that will produce notable shortfalls (Exhibit 5).

Exhibit 5

The size of the infrastructure investment gap varies widely by geography

Economic infrastructure; % of GDP



1 The global gap for 2016–30 as a share of GDP is calculated by adding negative values, converting to dollar terms, then dividing by cumulative world GDP. Without adjusting for positive gap, the value is 0.2 percent. This has been calculated from a set of 49 countries for which data are available for all sectors. This gap does not include additional investment needed to meet the UN Sustainable Development Goals.
NOTE: Not to scale.

SOURCE: IHS Global Insight; ITF; GWI; National Statistics; McKinsey Global Institute analysis

On top of the baseline needs calculated above, additional spending will be required to mitigate climate change and cope with its effects. Achieving the UN Sustainable Development Goals (SDGs) as described earlier in this report will also require more ambitious funding, particularly in Africa, South Asia, and other low-income regions where access to basic infrastructure is lacking. UNCTAD estimates that current spending on economic infrastructure will need to increase by a further $1.1 trillion a year to fulfill the SDGs in developing economies and support growth; much of this would need to be allocated toward expanding power systems. This roughly triples the size of the spending gap we

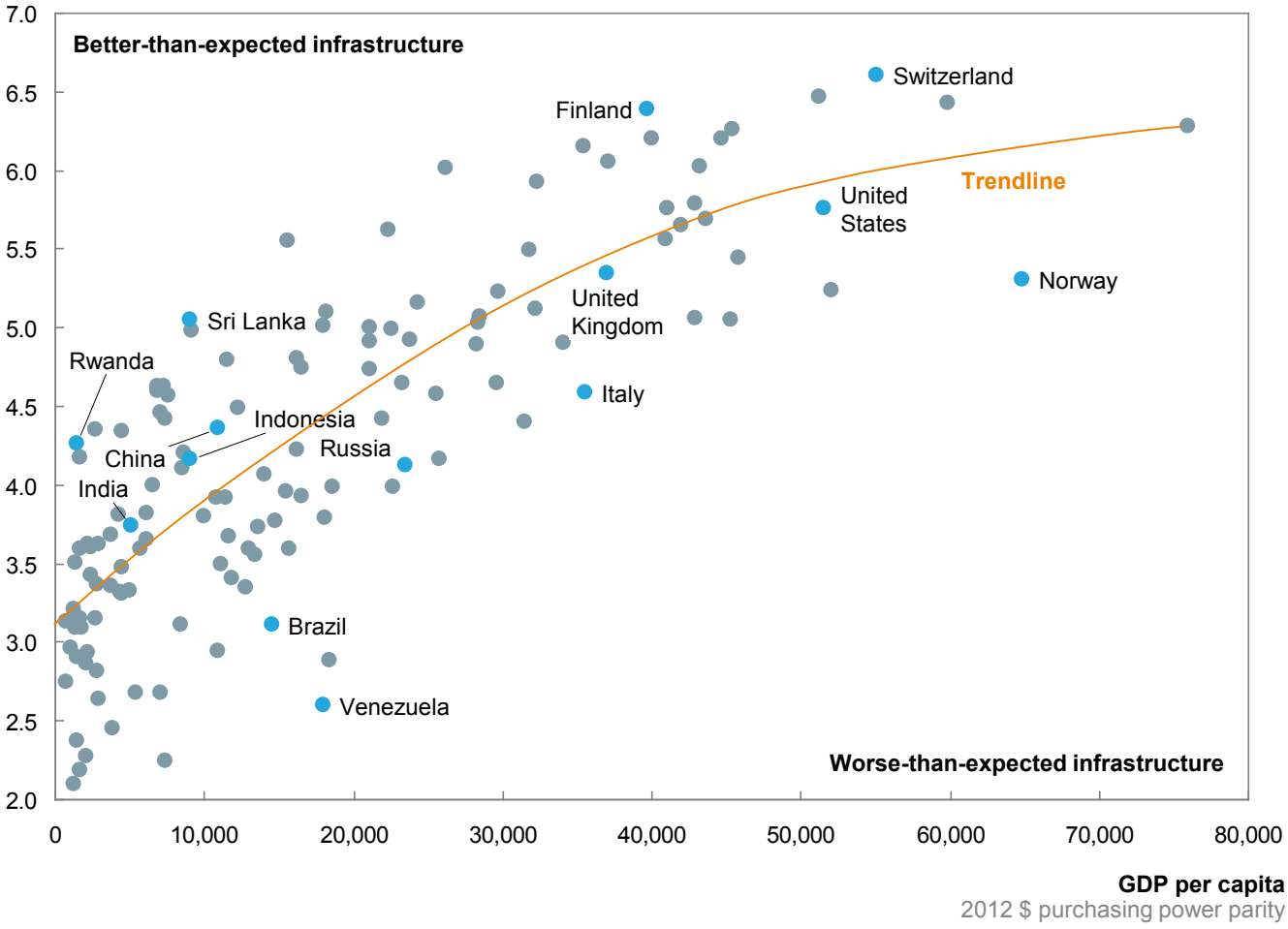
obtain from comparing current investment patterns against expected rates of economic growth alone.[5]

Infrastructure quality strongly correlates to income level, and many countries typically described as having particularly weak or strong infrastructure seem to be, in fact, simply very poor or very rich. It is instructive to look instead at which economies stand out relative to their income level (Exhibit 6).

Exhibit 6

Assessing each country's infrastructure quality against GDP per capita gives an indicator of its progress

Infrastructure quality vs. GDP per capita for selected countries



SOURCE: World Economic Forum; World Bank; McKinsey Global Institute analysis

Switzerland, for instance, has the highest-quality infrastructure in the world; it outperforms even among other very high-income peer economies. In contrast, for example, Norway "underperforms." The country has very good infrastructure, but its road network in particular does not attain the quality rating that would be expected for a country at such a high income level (an issue that might relate to the fact that it is thinly populated and has difficult

[5] In addition to the $1.1 trillion needed annually for economic infrastructure, some $1.4 trillion annually might be needed in developing regions to meet SDGs for climate change and adaptation, health, education, food security, and biodiversity. *See World investment report 2014: Investing in the SDGs: An action plan,* UNCTAD, June 2014.

topography). Some countries that have reputations for poor infrastructure, such as India and Indonesia, are still at very low income levels despite expectations of growth. Considering their actual GDP per capita, their infrastructure is better than might be expected. Historic underinvestment and chronic inefficiency in infrastructure builds have left Brazil significantly underperforming relative to its income level. By contrast, certain very low-income economies such as Rwanda have surprisingly solid infrastructure for their stage of economic development, and they might provide templates for other countries to follow.

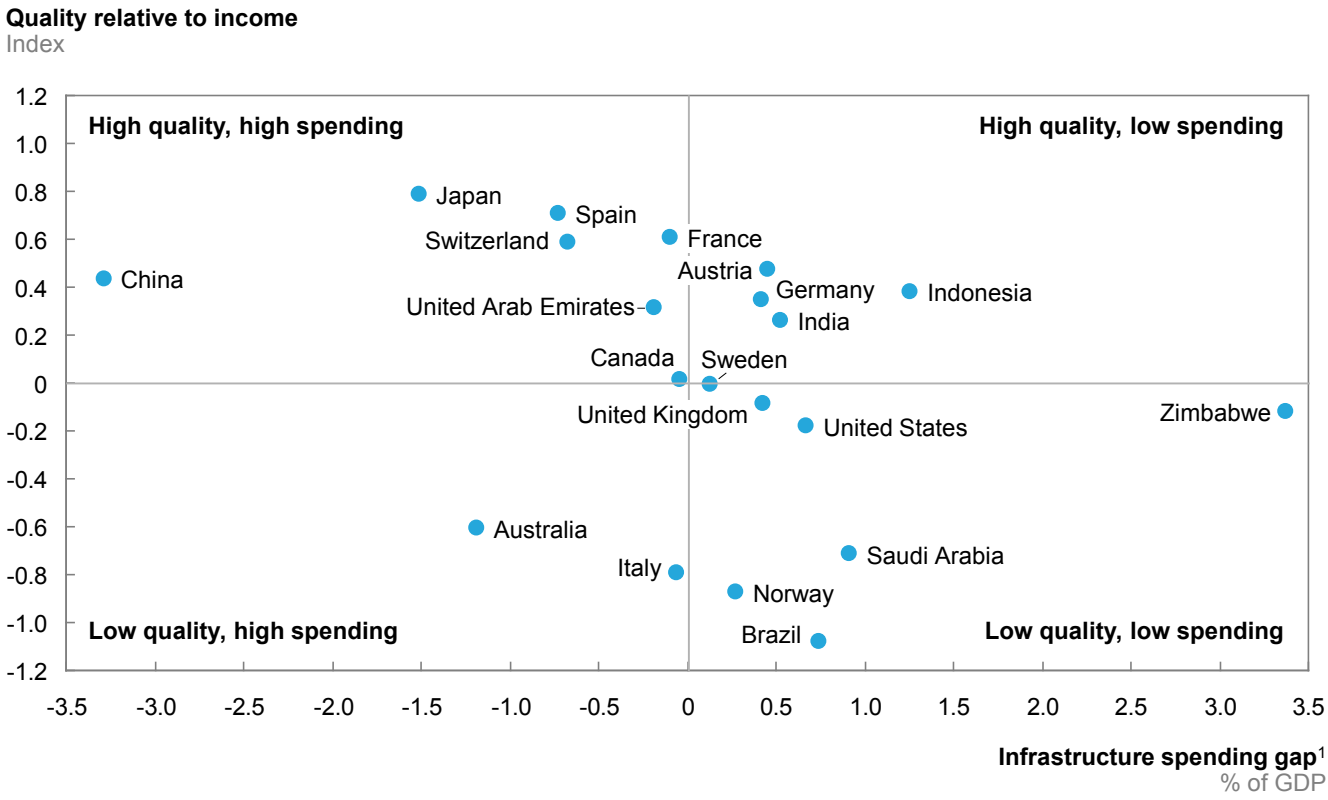
Looking at the picture dynamically over time, the overall curve tends to shift upward as more of the world builds out infrastructure systems, even though individual countries do not necessarily move along the same line. But infrastructure quality rankings actually declined since the crisis for some countries, such as Germany and the United States. Others, like Spain, defied the odds and posted strong improvement despite declining income levels after the global financial crisis.

In many economies, underinvestment is quite visible in the shortcomings of basic systems. Others manage to sustain high quality standards despite relatively low investment—and still others invest heavily but nevertheless wind up with subpar infrastructure quality. This suggests significant differences in the productivity of spending, although such analyses are affected by the time lag between spending and outcomes (Exhibit 7).

Exhibit 7

Countries perform differently in terms of investment gaps as well as quality gaps

Infrastructure quality vs. spending



1 Difference between historical spending levels from 2008–13 and the investment spending as a share of GDP that will be needed in 2016–30.

SOURCE: IHS Global Insight; ITF; GWI; National Statistics; World Economic Forum; World Bank; McKinsey Global Institute analysis

1.4. DESPITE HIGH-LEVEL ATTENTION AND PAST COMMITMENTS, INVESTMENT RATES HAVE DECLINED IN MANY PARTS OF THE WORLD

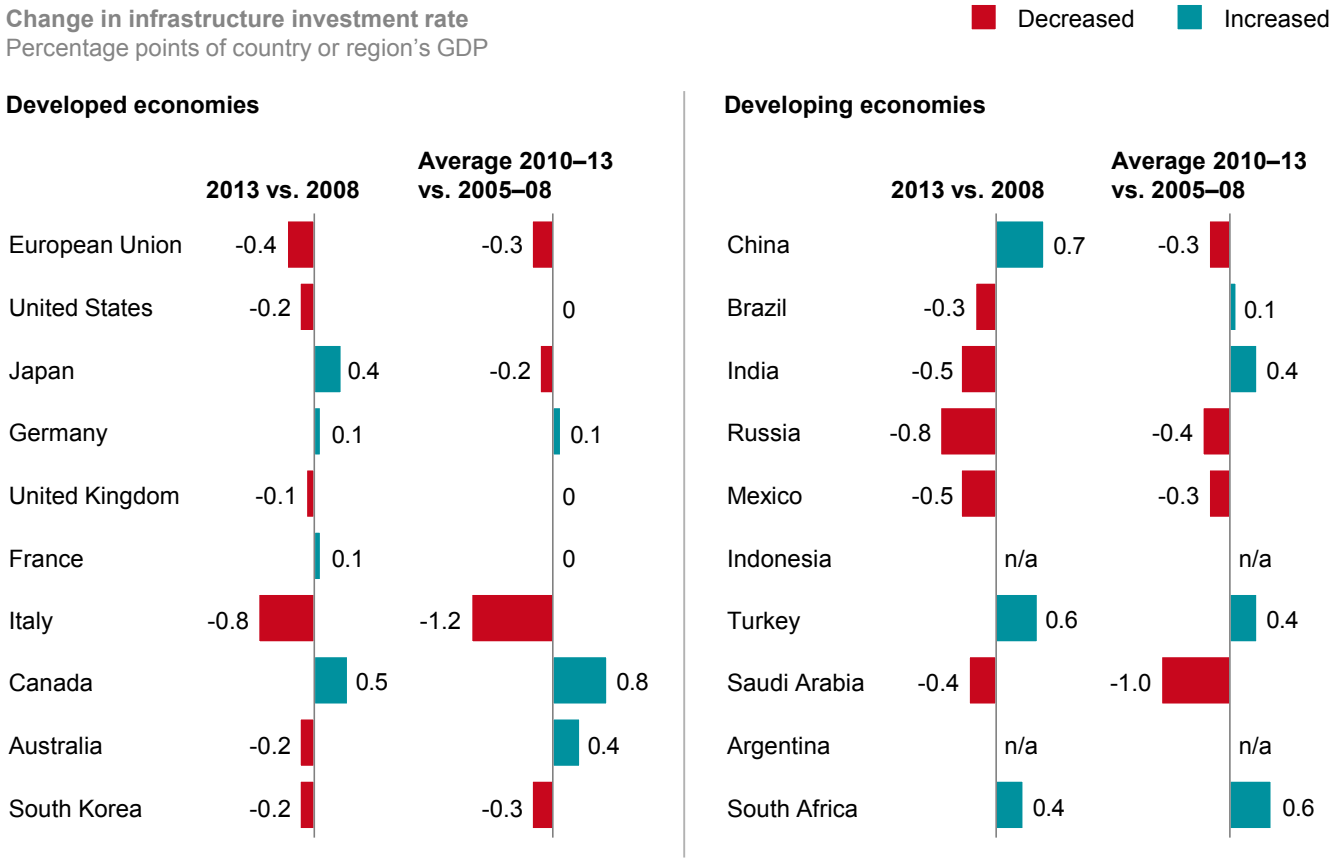
Multiple studies and summits over the years have highlighted glaring gaps in infrastructure and the obvious need around the world for economic stimulus. But good intentions and past commitments have not been enough. Investment rates have declined in many parts of the world since the global financial crisis.

This is particularly true in Europe, where investment has declined most notably in roads and telecom infrastructure (Exhibit 8). In the United States, there was a small reduction in telecom investment. But some emerging economies have also pulled back. Russia, for instance, boosted investment in its power infrastructure but cut back across all other asset classes. Mexico increased spending on roads but decreased power and telecom investment. Some countries appear to have bucked the trend, though. Investment is clearly up in Canada, Turkey, and South Africa.

Exhibit 8

In many G20 economies, infrastructure investment rates have declined since the global financial crisis

Change in infrastructure investment rate
Percentage points of country or region's GDP



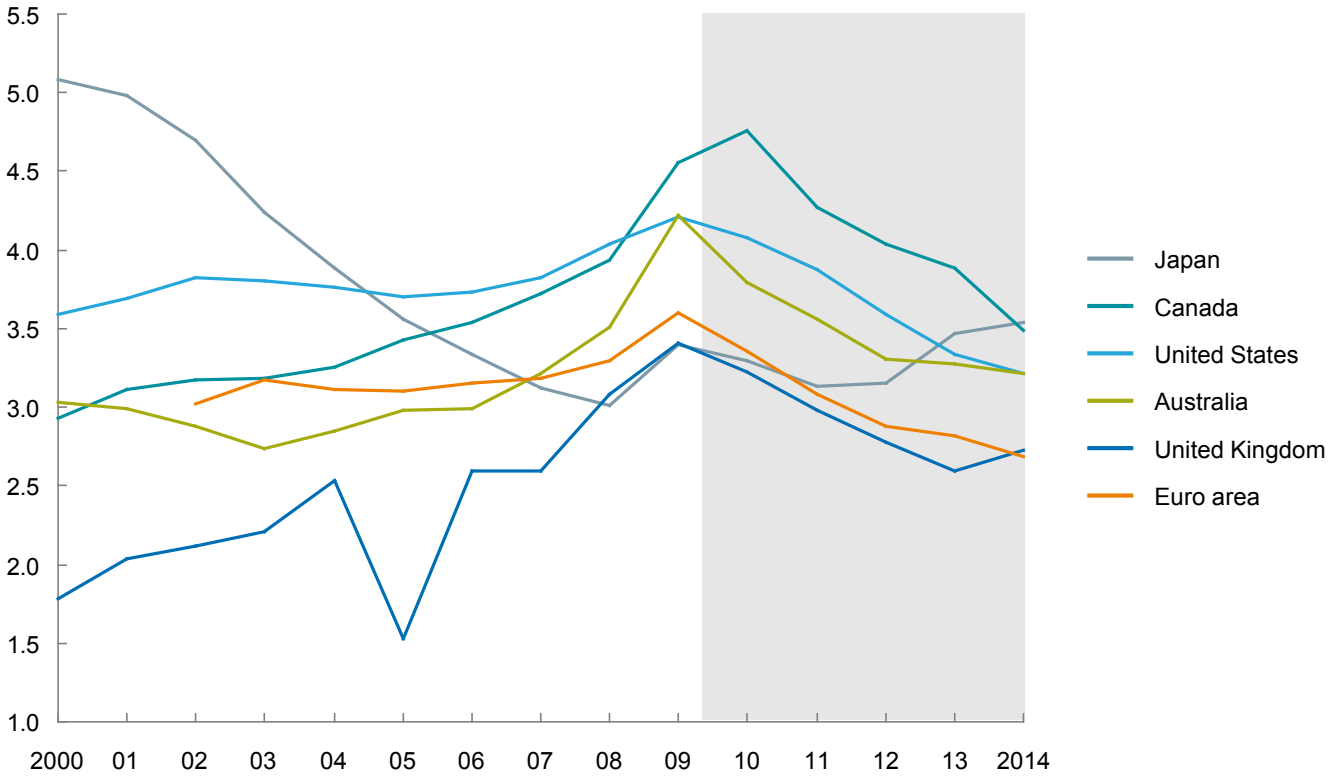
SOURCE: IHS Global Insight; ITF; GWI; National Statistics; McKinsey Global Institute analysis

Looking specifically at public investment since the global financial crisis, a number of the large advanced economies among the G20 membership undertook stimulus spending that peaked around 2009 but have since cut back. This trend has affected other areas of public investment in addition to infrastructure spending (Exhibit 9). The picture is more mixed in emerging economies.

Exhibit 9

Government investment has been declining in a number of major developed economies since the crisis

General government gross fixed capital formation as share of GDP
%



SOURCE: OECD; McKinsey Global Institute analysis

Research remains ambiguous at best about the opportunity to invest in infrastructure for countercyclical fiscal stimulus. A lack of shovel-ready projects, coupled with long planning and approval cycles and ineffective decision-making frameworks, has historically led to investment with questionable returns or such long lags that the real stimulus effects from construction activity did not occur until the economy had already swung back to expansion.

11
of the G20 economies have cut investment in infrastructure since the global financial crisis

But actually *cutting* investment during an almost decade-long period of weak economic performance and low aggregate demand in much of the world runs counter to basic macroeconomic theory. Unfortunately, public investment tends to be pro-cyclical; it is one of the few discretionary spending items governments can cut without strong immediate stakeholder opposition. Despite the fact that infrastructure-related expenditure tends to account for only 5 to 8 percent of public budgets overall, it is often the target of the budget ax. The Eurozone's fiscal compact mandating public spending cuts to move closer to fiscal targets is a prime illustration of this trend.[6]

[6] This is not meant to downplay the many positive aspects of the fiscal compact for the Eurozone. For further discussion, see *A window of opportunity for Europe,* McKinsey Global Institute, June 2015.

1.5. THE G20 ECONOMIES HAVE WIDELY VARYING INVESTMENT PATTERNS AND OUTCOMES

A multifaceted scorecard offers the best overview of specific gaps in the world's major economies. The heat map below illustrates investment gaps and trajectories, infrastructure quality relative to income, and metrics on access to the most important basic infrastructure services. The results show that no country is uniformly strong or weak. Each one has scope for improvement, although the size of the gaps differs widely (Exhibit 10).

Exhibit 10

A balanced scorecard shows the G20's infrastructure gaps

Top Middle Bottom

	Investment trajectory			Infrastructure quality and access gaps			
Countries	**Infrastructure investment gap** Need 2016–30 vs. actual 2008–13, percentage points of GDP	**Post-crisis infrastructure investment increase** Percentage points of GDP 2008–13 vs. 2000–07	**Post-crisis public investment increase** Percentage points of GDP, 2010–14 vs. 2004–08	**Infrastructure quality gap** Points in WEF ranking, actual vs. income-expected	**Share of households without access to electricity** %	**Share of individuals without Internet access** %	**Share of individuals without access to clean water** %
Argentina[1]	n/a	n/a	n/a	n/a	4.0	35.3	0.9
Australia	-1.2	1.0	0.3	-0.6	0	15.4	0
Brazil	0.7	0.3	n/a	-1.1	0	42.4	1.9
Canada	0	0.3	0.5	0	0	12.8	0.2
China	-3.3	0.3	0.3[2]	0.4	0	50.7	4.5
France	-0.1	0	0	0.6	0	16.3	0
Germany	0.4	0	0.3	0.3	0	13.8	0
India	0.5	0.6	n/a	0.3	25.0	82.0	5.9
Indonesia	1.3	0.4	n/a	0.4	24.0	82.8	12.6
Italy	-0.1	-0.6	-0.4	-0.8	0	38.0	0
Japan	-1.5	-0.7	-0.1	0.8	0	9.4	0
Mexico	1.1	0	0.6[2]	-0.1	5.0	55.6	3.9
Russia	0.1	0.1	-1.0	-0.6	11.0	29.5	3.1
Saudi Arabia	0.9	-1.6	n/a	-0.7	1.0	36.3	3.0
South Africa	1.2	1.2	n/a	0.5	15.0	51.0	6.8
South Korea	n/a	n/a	-0.4[2]	0.3	5.0	15.7	0.3
Turkey	0.6	0.5	n/a	0.7	5.0	49.0	0
United Kingdom	0.4	-0.1	0.4	-0.1	0	8.4	0
United States	0.7	0	-0.2	-0.2	0	12.6	0.8

1 Argentina's data cover only power, water, and telecom.
2 2013 rather than 2014 data.

SOURCE: IHS Global Insight; ITF; GWI; National Statistics; World Economic Forum; World Bank; McKinsey Global Institute analysis

Australia, for instance, has spent more on infrastructure to date than it will need to spend going forward. It increased spending after the crisis and has achieved near-universal access to infrastructure services—but its quality score lags behind what would be expected for a country of its income level. Brazil, which has a reputation for deficient infrastructure, has

consistently underinvested but has nonetheless managed to achieve universal access to electricity for its households.

1.6. DISRUPTIVE TECHNOLOGIES WILL CHANGE INFRASTRUCTURE NEEDS IN WAYS WE CANNOT YET QUANTIFY

Technological disruption may completely upend estimates of infrastructure usage and investment needs, and any long-term projection needs to carry that caveat. Some breakthroughs could render some current types of infrastructure obsolete, but they may create entirely new needs—and the transition itself will require investment. Below are just a few of the possibilities:

- **Autonomous vehicles.** Cars available on the market today are already taking us to the edge of autonomous driving. Broad adoption of fully autonomous vehicles over the next decades could shift traffic from public transit systems back to cars, increase road traffic, and change patterns of traffic flow. It could eventually even reshape city design, urban layout, and real estate investment if proximity to public transit becomes less valuable or travel time becomes less costly to commuters who can work or watch videos during the trip. Self-driving vehicles could also substantially increase road capacity as vehicle-to-vehicle communication allows tighter spacing between cars and as street crossings gain more efficient protocols than today's traffic lights.

- **Drone deliveries.** Companies like Deutsche Post and Amazon are already experimenting with this approach, which could take some delivery vehicles off the road while requiring new approaches to air traffic control.

- **Additive manufacturing technologies and advanced automation.** 3D printing and automated production could shorten manufacturing supply chains, reducing demand for container shipping as more goods are produced near the point of consumption. We already see a trend of nearshoring.

- **Advanced materials and renewable or unconventional energy.** The patterns and volumes of bulk freight traffic for commodities like coal and oil could be disrupted as more of the world's energy needs are met with renewable sources. Volatility in electricity production and new sources of demand from electric vehicles and grid-scale storage facilities will require an overhaul of grid infrastructure. And, of course, shale gas and light tight oil exploration requires new access and transport infrastructure as well as changes in the electricity production mix.

- **Digitization.** E-commerce can change demand across logistics networks. Smart cities can better direct traffic flows. Digital technologies can track and price the usage of roads and public transit systems in a more accurate and convenient way; this could influence traffic volumes and modes as well as providing a more accurate reading of the demand for new infrastructure. At the same time, demand for mobile and fixed broadband infrastructure and bandwidth will undoubtedly continue to increase.

There will also be disruptions in the way infrastructure is built, and these could have significant implications for costs and investment needs. Modular and industrial construction techniques could dramatically cut project time; China's Broad Group, for example, erected a 30-story tower in just 15 days. Applying more advanced digital tools to construction planning and monitoring and even deploying drones for site surveying are just a few of the possibilities.

While these profound transformations add significant uncertainty to infrastructure development, they also offer opportunities that were largely unforeseen not too long ago. Governments that move ahead can likely boost the competitiveness of their infrastructure sectors and the industries that use them, improve the quality of life for their citizens, and economize on infrastructure investment in the long run.

•••

Years of chronic underinvestment in critical areas such as transportation, water treatment, and power grids are now catching up with countries around the world, as is resource misallocation in many past projects. If these gaps continue to grow, they could erode future growth potential and productivity. At the same time, there is plenty of liquidity in markets, with investors seeking stable long-term returns. It is therefore critical to get finance flowing into urgently needed projects. The following chapter will look at strategies that can mobilize not only private infrastructure finance, but also more traditional public and corporate investment.

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2. IMPROVING THE FLOW OF INFRASTRUCTURE FINANCE

As discussed in the previous chapter, providing the infrastructure needed simply to support expected rates of economic growth will require $3.3 trillion annually through 2030—a substantial boost over current rates of investment. Advanced and developing economies alike are wrestling with the question of how to pay for urgently needed projects as governments cut back spending in an effort to chip away at their debt burdens.

There is a major disconnect between institutional investors (such as insurers, pension funds, and sovereign wealth funds) seeking opportunities and the projects that need their capital. Banks and institutional investors have $120 trillion in assets under management, and there has been much discussion over the years about how to unlock this source of financing and create a better-functioning market. There is significant room to make headway on this front. But too much focus on opening up the project finance market would create a shortfall, because as the vast majority of infrastructure will likely continue to be financed by the public and corporate sectors. This chapter will discuss concrete strategies for getting finance flowing from all of these sources.

Opening up the infrastructure project finance market will not be enough, as the vast majority of infrastructure will likely continue to be financed by the public and corporate sectors.

2.1. DESPITE LARGE INFRASTRUCTURE NEEDS AND INVESTORS CHASING OPPORTUNITIES, THE MARKET FAILS TO CLEAR

Given the right setup and structures, the case for attracting private capital to infrastructure projects is compelling. Governments want to circumvent tight budgets and benefit from private-sector efficiency. Institutional investors are desperately seeking stable, long-term, inflation-protected returns to match their obligations. But the flow of funds is not what it could be. The issue is not about finding more money; it is about getting current pools of capital to flow more freely into infrastructure projects globally.

Although quantifiable evidence is hard to come by, the largest constraint seems to be the development of a sufficient pipeline of well-prepared, bankable projects that provide investors with appropriate risk-adjusted returns (Exhibit 11). In many places, privatization is met with a large dose of political skepticism. In others, the early stages of concept development are so complex and costly in terms of stakeholder involvement, legal opposition, or lengthy review and permitting that ideas are unable to move forward. Still other places lack sufficient skills and resources for developing concepts into well-prepared projects with solid economics.

There are also constraints on the supply side of financing, including capital charges from regulations such as Basel III and Solvency II as well as pension rules. The European Union, however, recently accepted infrastructure as an asset class to lower the risk weighting for institutional investors seeking to invest in infrastructure under Solvency II.

Capital markets for infrastructure assets remain relatively complex, non-standardized, and illiquid. Investors may not be deterred by liquidity risk, since it goes hand in hand with the higher returns they are seeking. But limited standardization and pooling of projects still increase transaction costs.

Exhibit 11

The gaps and bottlenecks are different around the world

ILLUSTRATIVE AND SIMPLIFIED

● Yes ● No

		China	Japan	Germany	United Kingdom	United States	Brazil	Low income
Is there a gap in public finance?		●	●	●	●	●	●	●
Is there a commitment to public-private partnership financing?		n/a	n/a	○	●	○	●	●
Are ideas turned into credible concepts?				n/a	○	○	○	●
Are projects well prepared?					●	●	○	●
Is sufficient institutional capital accessible for the country?	Domestic				●	●	○	●
	International				●	●	○	●
Infrastructure as an asset class	Have regulatory bottlenecks for institutional investment been resolved?				○	○	○	●
	Is there a liquid market for trading assets?				●	●	●	●
	Are there streamlined approvals and adequate government transaction capabilities?				?	?	?	?

SOURCE: McKinsey Global Institute analysis

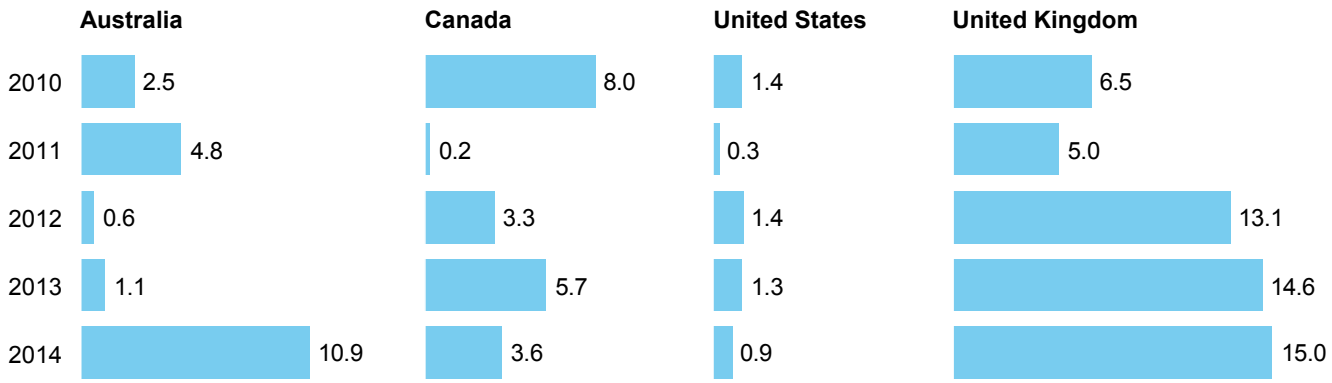
2.2. PPPS ARE OFTEN DISCUSSED AS A SOLUTION, BUT THEY ARE NOT A PANACEA

Many people point to public-private partnerships as the solution for closing infrastructure gaps during periods of tight public funding. However, even in economies that make strong use of them, PPPs typically make up only about 5 to 10 percent of overall investment in economic infrastructure (Exhibit 12). Particularly in developed economies, classic corporate infrastructure investment by telecom operators or electricity and water utilities typically dwarfs PPP investment (Exhibit 13).

Exhibit 12

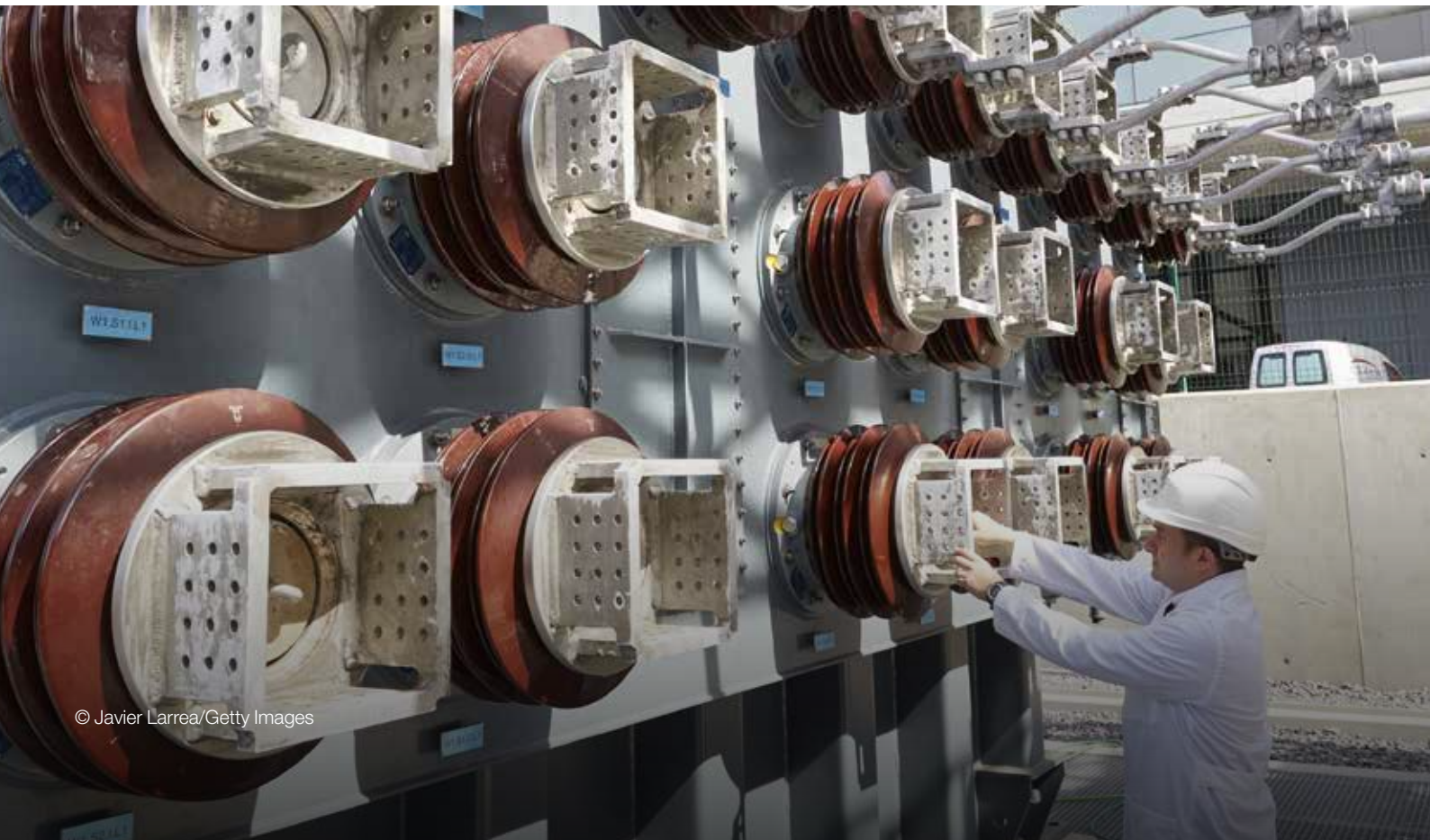
Public-private partnerships account for 10 to 15 percent of infrastructure investment in some advanced economies, but the average is 3.1 percent

PPP spending[1] as a share of total infrastructure spending
%



1 Project value for transport, power, communication, water, and sewage sectors, excluding refinancing deals.

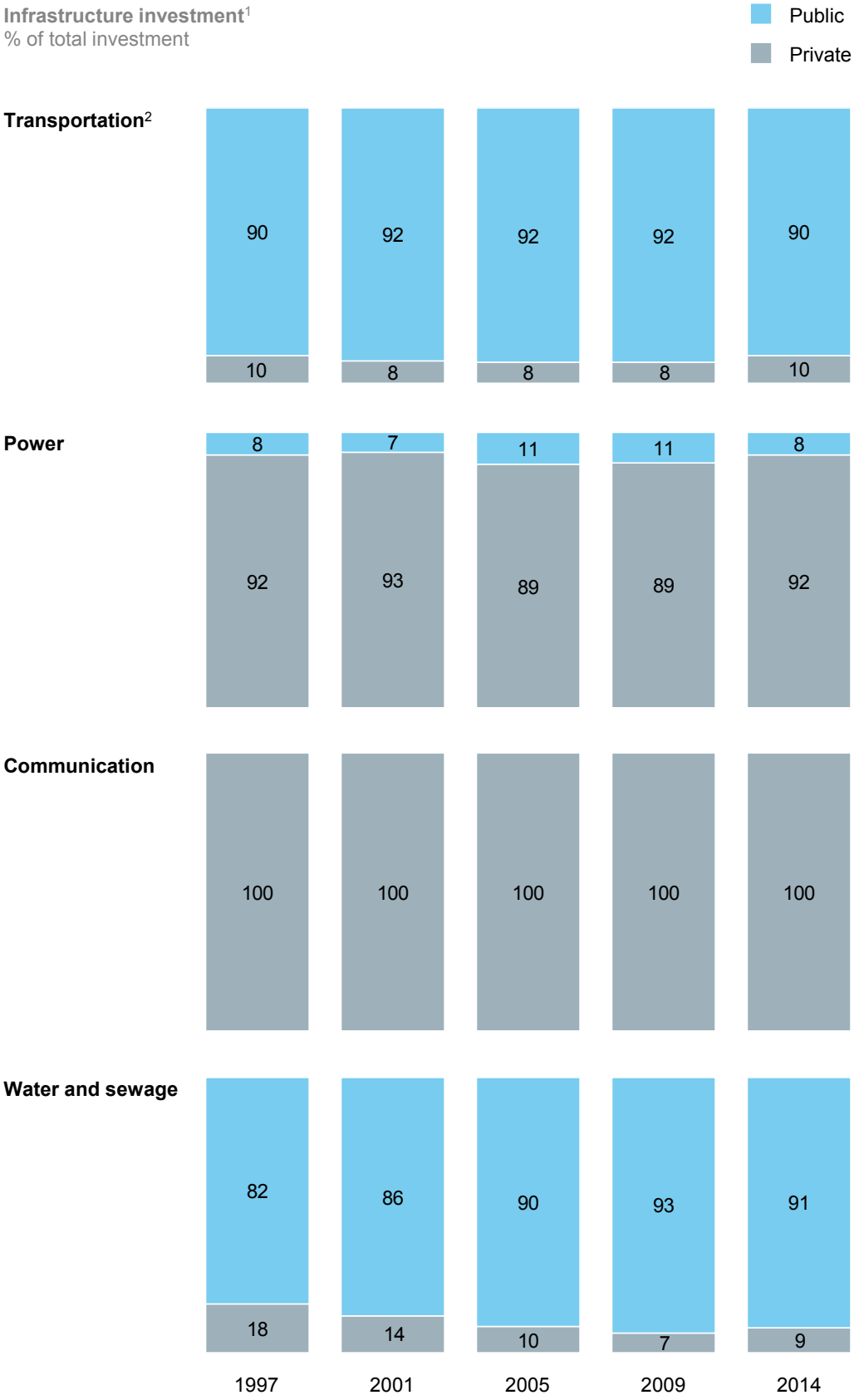
SOURCE: Infrastructure Deals, February 2016; McKinsey Global Institute analysis



© Javier Larrea/Getty Images

Exhibit 13

In the United States, most private infrastructure finance comes from privatized corporate sectors



1 Includes data for transport, power, communication, water, and sewage.
2 Transportation private investment does not include transport equipment (such as buses and trucks, other rolling stock).

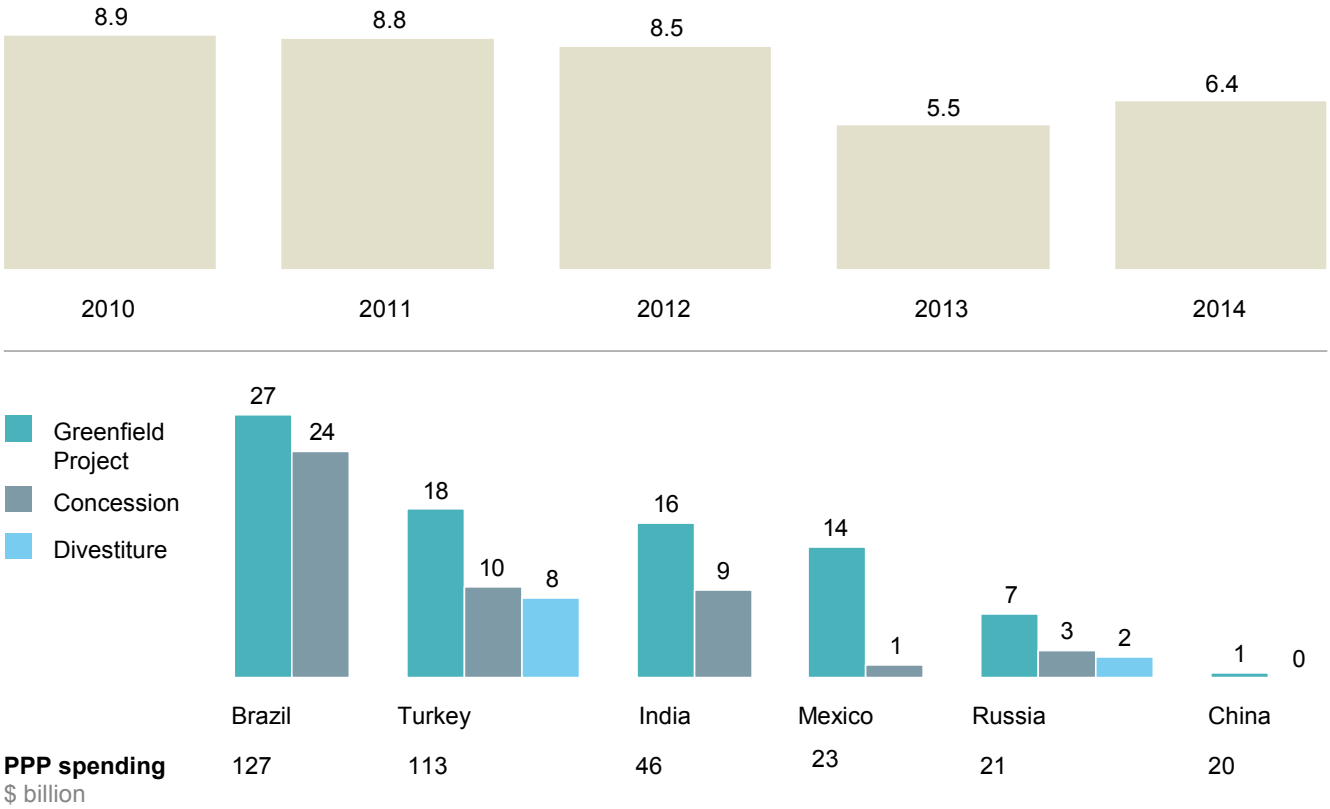
SOURCE: US Bureau of Economic Analysis; McKinsey Global Institute analysis

Nonetheless, PPPs are on the rise, and they account for a substantial share of infrastructure investment in certain emerging economies (Exhibit 14). In some cases, the high share going to PPPs may reflect low levels of public investment more than high levels of private finance. But PPPs can play an important role—not only financially but also in terms of increasing efficiency and innovation in the sector.

These arrangements have to be undertaken thoughtfully, as there have been many failures alongside the successes (see Box 1, "Polarized opinions on PPPs"). Ultimately, PPPs are a tool for financing infrastructure projects that works well when particular conditions exist: the project makes economic sense; there is a clear and efficient process to select a partner; there is appropriate risk transfer between the government and the partner; and there is a revenue stream to provide appropriate risk-adjusted returns. Not all projects can meet these conditions—and thus not all projects are well suited for PPPs.

Exhibit 14

PPPs account for an average of 7.5 percent of infrastructure investment in major developing countries, and a much higher share in some countries



1 Total investment data for transport, power, communication, water, and sewage.
2 Countries included are Brazil, Russia, India, China, Mexico, and Turkey. Data for Russia available only for 2010–12.

SOURCE: World Bank, January 2016; McKinsey Global Institute analysis

Box 1. Polarized opinions on PPPs

Public-private partnerships have been touted as highly efficient alternatives to the public sector, benefiting from more efficient construction, lower cost overruns, more innovation, and an optimization of full life-cycle cost. They have also been criticized as being a waste of public money; they may provide 10 to 15 percent returns on private capital when public debt is available at below 1 percent. They may be lightning rods for strong opinions, but black-and-white assessments miss many of the nuances associated with these deals.

First, the cost of public capital is much higher than debt rates would indicate. When a publicly funded project is launched, many risks are not priced into the initial public borrowing costs—but for a fair comparison, they should be. In a PPP, the private partner may take on construction risk, for example, shielding the public sector from claims and overruns. But a publicly funded project puts these risks onto taxpayers, who often receive sizable bills for overruns well after the fact. In principle, higher private-sector capital charges can thus be in line with the risk that the private partner assumes. In addition to the risks borne by taxpayers in publicly funded projects, it is important to consider the opportunity costs of directing tax and public debt funding to a given project when many priorities are competing for scarce resources.

Second, private-sector projects tend to be more efficient, with more discipline applied to project preparation, fewer overruns, and greater propensity to innovate (such as finding ways to generate ancillary revenue in airports; Exhibit 15). It is important to note, though, that some of these advantages can also be captured via contractual structures (such as the "design-build-operate-transfer" model) without private financing.

In practice, PPPs do sometimes turn out to be a waste of money. Many factors skew rational value-for-money considerations toward or against the use of PPP structures.[11] PPPs can often go wrong in the following circumstances:

- When they are used as a vehicle to circumvent budget constraints and as off-balance-sheet finance. Some governments address this by treating PPPs like publicly funding projects in budgetary terms. Accounting standards have improved, but in many cases, the door is still open for abuses.
- When a lack of transparency or competition allows private partners to reap windfall profit margins.
- When inappropriate risk transfers to the private sector (such as regulatory changes, land access, and traffic volumes) increase capital costs.
- When projects are too small or non-standardized, increasing their administrative costs.[2]

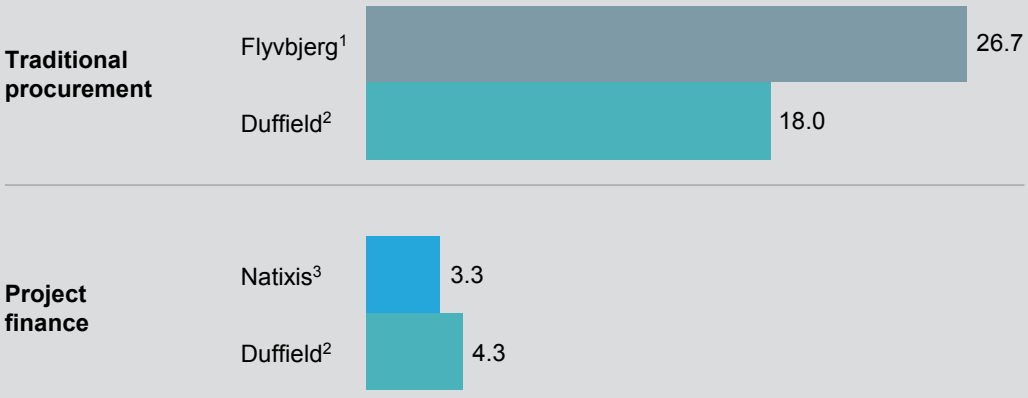
1 Philippe Burger and Ian Hawkesworth, "How to attain value for money: Comparing PPP and traditional infrastructure public procurement," *OECD Journal on Budgeting,* volume 2011/1, 2011.

2 See, for instance, *A new approach to public private partnerships,* UK HM Treasury, December 2012.

Exhibit 15

Studies have shown that PPPs and project finance structures can improve the management of construction risk

Average cost overrun of infrastructure projects, %



1 At decision to build.
2 At contractual commitment.
3 Upon closure.

SOURCE: Summary of these research studies from Frederic Blanc-Brude and Dejan Makovsek, *Construction risk in infrastructure project finance*, EDHEC Business School, February 2013; McKinsey Global Institute analysis

2.3. SEVERAL STRATEGIES CAN UNLOCK FINANCING FROM INSTITUTIONAL INVESTORS

$120T
assets under management by institutional investors

Institutional investors seem like an obvious source of capital for infrastructure projects. They can match the long-term, relatively low-volatility, and inflation-protected nature of those investments with long-term liabilities. In fact, many institutional investors have significantly higher infrastructure investment allocation targets than current holdings. Even more important, they hold about $120 trillion in total assets under management. These break down as follows:[7]

- Banks: $40 trillion in assets
- Investment companies (including investment banks, asset managers, wealth managers, family and multifamily offices, investment trusts, and investment companies): $29 trillion
- Insurance companies and private pensions: $26 trillion
- Public pensions and superannuation plans: $11 trillion
- Sovereign wealth funds: $6 trillion
- Infrastructure operators and developers: $3 trillion
- Infrastructure and private equity funds: $3 trillion
- Endowments and foundations: $1 trillion

To attract these investors, governments and other stakeholders need to develop their project pipelines, remove regulatory and structural barriers, and build stronger markets for infrastructure assets (Exhibit 16).

Exhibit 16

The project pipeline is key to securing a flow of financing from institutional investors

- User fees, public revenue support, ancillary funding
- Stakeholder management and approvals
- National infrastructure plans
- Project preparation facilities, early-stage funds, unsolicited bid frameworks
- PPP units and capabilities

- Standardization of terms and risk categories, risk-return reviews, development of indexes
- Project pooling, development of funds and securitization
- Development of securities exchanges with multilateral development banks and governments as market makers, brownfield asset pipelines

- Regulation (Basel III, Solvency II, pension fund allocation rules)
- Mezzanine finance and credit enhancement, political risk insurance
- Improving general and international investment frameworks, such as adopting the OECD Declaration on International Investment and Multinational Enterprises

SOURCE: B20 Coalition; McKinsey Global Institute analysis

[7] Ibid.

2.3.1. Developing better project pipelines is crucial

The lack of infrastructure finance is much discussed. But insurance companies and banks recount instances in which investors outbid each other in a rush to finance the rare infrastructure deals they consider "bankable" and that have appropriate risk-return profiles. This speaks to the scarcity of projects that fit that profile. Strengthening the pipeline of suitable projects has to be a core priority of any effort to improve the build-out and financing of infrastructure. Options for improving the situation include:

- **User charges, public revenue support, and ancillary funding.** Private investors can only finance projects that generate sufficient revenue to provide them with attractive risk-adjusted returns over the project life cycle, with operations and maintenance costs fully covered. Yet user charges tend to be politically unpopular, availability payments may put strain on public budgets, and ancillary funding models such as property value capture are not always well developed.

- **Stakeholder management and approvals.** Building infrastructure for citizens is, ultimately, a political challenge. Decision makers need to work with stakeholders and build governance structures that include rigorous review and a fair hearing to those who might be negatively affected (for example, from air traffic noise caused by a proposed new airport). But these processes cannot be allowed to drag on for years and should be time-bound. Fairly compensating those who are negatively affected can mitigate opposition.

- **National infrastructure plans and project pipelines.** Investors need to commit significant resources to bid on projects. Governments in turn need to provide them with transparent long-term investment paths so they can see what lies ahead. Yet even within the G20, only half of the countries publish upcoming project pipelines.

- **Concept development and project preparation.** A great deal of infrastructure development fails at the outset. A high-level need is never addressed or a big idea is never developed into a viable concept because the challenges are complex, the time lines long, and the outcomes uncertain. Land rights may need to be obtained from many owners, political support and funding may need to be secured from multiple jurisdictions, or business models may depend on a large number of co-investors for ancillary revenue generation, to name just a few scenarios. Beyond addressing some of the constraints (such as changing land rights jurisdiction) head-on, venture fund structures or early concept development units could help overcome those types of hurdles. Particularly in emerging economies, the public sector often struggles to keep up with the needed capacity and capabilities to perform those tasks. Frameworks for unsolicited bids by private corporations will help. Access to support such as the World Bank's Global Infrastructure Facility can provide expertise and money to create fully bankable project proposals.

- **PPP units and capabilities.** The development of successful PPP structures requires specialist capabilities as well as experience. But decision-making entities such as municipal transport agencies and state-level airport authorities typically lack this experience. Creating pools of expertise and resources documenting best practices at the national and international level can help to meet this need.

2.3.2. Removing regulatory and investment framework impediments can improve access for institutional investors

Regulation, risks, and cross-border investment rules often limit investor appetite for infrastructure projects. Potential solutions include:

- **Regulatory adjustments.** Basel III and Solvency II mandate high-risk capital allocations for infrastructure, which actually runs counter to the often low-risk profiles of the investments. In addition, pension funds often have allocation rules that specifically limit their exposure to certain asset classes and countries. Recognizing infrastructure as an asset class with dedicated risk charges and allocation rules, as the European Union is now doing for Solvency II, can support the flow of financing.

- **Mezzanine finance, credit enhancement, and political risk insurance.** Institutional investors often seek out infrastructure investment as a higher-yield yet still relatively low-risk, inflation-protected alternative to long-term government bond purchases. Development banks can provide mezzanine finance as first-loss absorber or deploy other tools for credit enhancement, as well as insure against political risk. This could be accomplished via the Multilateral Investment Guarantee Agency.

- **Improving general and international investment frameworks.** Different political, regulatory, and legal frameworks and policies lead to inconsistent regulatory decisions that increase investor uncertainty. With more than 3,200 fragmented international investment agreements, G20 governments need to develop a non-binding international investment rule model (principles of international investment) to reduce complexity. This would include establishing and enforcing a body of laws and regulations that provides for fair and equitable treatment, national treatment, and most-favored-nation treatment of foreign investment; setting clear limits on expropriating investment and providing for payment of prompt, adequate, and effective compensation when it occurs; and providing for resolution of disputes between business and government through binding dispute-resolution mechanisms. Adoption of the OECD Declaration on International Investment and Multinational Enterprises could be an important step for those countries that have not yet done so.

2.3.3. Developing infrastructure as an asset class with a well-developed market could improve the matching of investors and projects

Investors with limited resources, time, and expertise, such as pensions and insurance companies, can find it difficult to assess projects when standards are fragmented and markets undeveloped. Having to create unique financing structures for each project and jurisdiction increases transaction time and costs. Infrastructure experts at development banks estimate that the use of lawyers, engineers, transaction specialists, and other advisers can account for 1 to 5 percent of project costs—and these costs are difficult to recoup since they are not capitalized. This issue can be addressed through the following strategies:

- **Review of risk-return characteristics.** Full transparency on the actual returns and materialized risks of infrastructure investment, including but not limited to defaults, is a precondition for giving investors greater clarity, developing indexes and other investment products, and justifying changes to regulatory treatment.

- **Standardization.** Across countries, and even within a single country, infrastructure projects often have completely different contractual terms, making it difficult to develop expertise and assess a larger number of them efficiently. Greater standardization would help to attract funds into smaller infrastructure projects, where high due-diligence costs relative to the total investment frequently deter investors. When possible, governments, multilateral development banks, and other institutions should promote the standardization of project preparation and evaluation, by, for instance, using common risk assessment frameworks and documentation.[8]

[8] *B20 infrastructure and investment taskforce policy paper,* B20 Turkey, September 2015.

- **Project pooling.** Another way to reduce transaction costs for investors is by pooling projects, including the development of respective funds, indexes, and securitization vehicles.

- **Development of securities exchanges.** Governments can significantly increase private investment in infrastructure assets by adding liquidity to securities exchanges. For example, they can issue equity and debt on government-owned infrastructure projects and infrastructure operators to encourage private investment. Governments should play the role of market maker and encourage multilateral development banks to sell their investments as individual or bundled assets to increase liquidity.[9]

2.3.4. Cross-border infrastructure finance is particularly important

As mentioned, private investors, including institutional investors, have $120 trillion in assets under management. Today $73 trillion (or 60 percent) of that comes from Europe and North America. By 2020, however, that could be down to 53 percent; the Asia-Pacific region alone could account for 40 percent of private assets under management.[10] This shift in resources will enable some developing regions to increase domestic investment or attract foreign investment from within their own region.

Some 87 percent of assets under management are in high-income countries, and 11 percent in upper-middle-income countries. But most demand for infrastructure from 2015 to 2030 will come from middle-income countries. An analysis of data from 2005 to 2014 found that more than 60 percent of PPP infrastructure financing flows to middle-income countries came from other middle-income countries and, more importantly, from domestic sources. Low-income countries, by contrast, receive only 8 percent of finance from domestic sources, with the rest coming from high- and middle-income countries (39 percent and 53 percent, respectively).

There is often a perceived mismatch of risk between high-income country investors and low-income country infrastructure demand. A study by Moody's suggests that the highest default rates were in Latin America, Southeast Asia, and North America (14.8 percent, 10.0 percent, and 9.9 percent, respectively) while the lowest were in the Middle East, Africa, and Europe (1.6 percent, 2.2 percent, and 4.8 to 5.2 percent, respectively).[11] The same review also found that default rates for project finance bank loans in the 34 OECD countries were 5.7 percent, compared with 8.2 percent in non-OECD countries. The ultimate recovery rate, however, was almost identical: 80.1 percent for OECD countries and 80.9 for the rest. Infrastructure investment outside of OECD countries, if structured well, may be less risky than commonly perceived.

2.4. PUBLIC FINANCE IS STILL THE PRIMARY SOURCE OF FUNDING, AND THERE IS A HUGE OPPORTUNITY IN REVAMPING IT

Governments around the world have clamped down on infrastructure investment, giving precedence to fiscal concerns and debt fears. Many face years of fiscal consolidation and deleveraging to bring public debt down to manageable levels. Despite these constraints, there are opportunities to increase public financing and close the investment gap. These include various forms of taxes, user fees, and divestitures. In addition, changing public accounting and budgeting systems could help to break the traditional pattern of pro-cyclical investment behavior.

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9 "B20 Turkey Infrastructure and Investment Taskforce policy paper," September 2015.

10 *Funds and limited partnership investors,* Preqin Infrastructure Online, June 2015.

11 *Default rates for project finance bank loans improve,* Moody's Investor Service, March 3, 2015.

2.4.1. Public infrastructure–related revenue optimization

- **Road pricing and other fees.** Road pricing is a strategy to reduce congestion by affecting both supply of and demand for road space. User charges help to determine how much capacity to add and how to monetize the benefits of that new capacity while creating an additional stream of funding for governments. While they are unpopular among voters, toll roads, bridges, and tunnels are increasingly common around the world. Cities including London have introduced congestion pricing on urban roads.

- **Property value capture.** Governments that acquire or own land around an infrastructure project can either lease or sell it at a profit once the project is completed, using the resulting funds for new infrastructure investment. Spain has gone as far as anchoring the notion of property value capture (that is, the public's taking a substantial share of the value increase in infrastructure and general urban redevelopment projects) in its constitution. Other methods include raising general or specific property taxes and fees from owners or developers, such as betterment levies, impact fees, and developer exactions. Property value capture works particularly well in transit-oriented development structures, since land values tend to sharply increase in concentrated areas around new or planned transit hubs. A variant of the concept is tax increment financing, where a post-investment reassessment of property values translates into increased property tax receipts that can be used to back initial investment or debt.

2.4.2. Capital recycling

Governments can divest brownfield infrastructure assets and earmark part or all of the proceeds for new infrastructure developments—an approach particularly strongly promoted in Australia, where the federal government provides a 15 percent incentive to states when they sell revenue-generating assets and reinvest the sales price into new infrastructure. New South Wales, for instance, has a plan to invest some A $20 billion (US $14.7 billion) into urban and regional transport; it will be financed partially by proceeds from a long-term lease of 49 percent of electricity networks.

2.4.3. Changes in public accounting and budgeting frameworks

Treating infrastructure as an asset on a public balance sheet and depreciating it over time rather than adding the entire cost of a project to the fiscal deficit up front can help avoid the tendency to regard public investment as the most discretionary of spending items. This change, which mirrors corporate accounting practice, could be enormously helpful to state and municipal governments that have strict or perceived limits on deficits and debt.

Suppose a three-year, €6 billion road project is contracted out to a private construction firm, and the government pays half of that amount up front and the rest on completion. Today, although the government is actually paying money only in years one and three, it books spending of €2 billion in each of the three years. However, the roads will be operational for the next 20 years. It would make just as much sense for the government to book an expense of €300 million every year for 20 years as the public asset is consumed.[12]

Many public assets, unlike private assets, do not have corresponding revenue streams attached to them. However, socioeconomic rates of return on public investment can far exceed the government's cost of capital—and substantially increase the future tax base in a way that makes the project self-funding over the long run. This makes it appropriate to treat such investments as assets from a fiscal as well as a social point of view.

An important caveat is that this accounting approach could undermine the productivity of public investment. There is a risk that government leaders, freed from the responsibility of having projects appear in their fiscal expenses during their tenure, might decide to spend

[12] *A window of opportunity for Europe,* McKinsey Global Institute, June 2015.

ineffectually on white elephants. This may be politically useful in the short term—boosting particular constituencies such as construction workers and the unemployed—but the costs would be borne by future generations. In order to address this risk, a powerful oversight body would be required to stress-test the productivity of investment programs and advise on the depreciation schedules of projects and a mechanism for impairment.

2.5. A STABLE AND ATTRACTIVE REGULATORY MODEL IS KEY TO CORPORATE FINANCE

Corporate investors, such as energy companies, telecoms, and public utilities, make up 65 to 75 percent of private infrastructure spending.[13] Verizon, the US telecom company, has invested more than $80 billion in infrastructure over the past five years.[14] American Water plans to spend $5.8 billion on capital investment from 2014 to 2018, with much of that allocated to asset renewal and capacity expansion.[15] In most advanced economies, the experience of privatizing telecoms and power generation has been generally positive, and there are also good examples of doing the same with water infrastructure.

But companies will maintain or increase investment only if the risk-adjusted financial returns are there—and this requires regulatory certainty and room to maneuver to establish cost-covering pricing. They require clarity on issues such as carbon pathways, maintenance cost recovery, and feed-in tariffs, as well as phase-outs of subsidized power and water prices in favor of vouchers or other means of support for poor households in emerging economies. Unexpected policy and regulatory changes can alter the basic feasibility equation for a private operator.

On average, companies whose businesses are tied to infrastructure assets require real rates of return of 5 to 9 percent for new investment. This can range from 5 to 6 percent for power and water utilities, to 7 to 8 percent for energy companies, to 9 to 10 percent for engineering and construction companies. These ranges are based on estimated weighted average cost of capital for representative companies in each industry.

In addition to adequate returns, companies also need to be enabled to build the infrastructure they would like to build. In mobile telecom, spectrum access is key. In the European Union, for instance, the lack of consistent spectrum availability across countries is a barrier to expanding 5G networks. In fixed telecom, rolling out fiber optic cable typically requires coordinating with road agencies to lay the requisite subsurface infrastructure. In electricity, right-of-way issues can stall the construction of transmission networks, particularly for overland lines. And building the capacity for new generation requires navigating a plethora of planning, permitting, and approvals processes; even though these are based on important and justifiable environmental concerns, they are often not time-bound.

•••

Unlocking the flow of financing is only half the battle. Given that capital is a scarce resource for public works, every dollar has to be stretched as far as it can go. But capital productivity is a notorious problem in the infrastructure sector, which has a long history of cost overruns and delays. Chapter 3 will examine the tremendous cost savings that are possible by applying a relentless focus on better project selection, planning, and execution.

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[13] See *Financing change: How to mobilize private-sector financing for sustainable infrastructure,* McKinsey Center for Business and Environment, January 2016.

[14] Verizon 2014 annual report.

[15] "American Water reports solid first quarter results," company press release, May 7, 2014.

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3. THE INFRASTRUCTURE PRODUCTIVITY OPPORTUNITY

Problems in infrastructure development extend beyond financing and difficulties in clearing the market for infrastructure assets. Productivity is a major issue for the construction sector as well as for the entities that plan, oversee, and operate infrastructure assets. Delays, blown budgets, and quality issues in major projects are all too common. Cost overruns for large projects average 20 to 45 percent.[16] Often this means that taxpayer money is wasted—and when one project exceeds its budget, funding may not be available for the next one to ever break ground.

40%
cost savings possible from stronger infrastructure delivery systems

These problems point to an enormous opportunity, however. We often see cost differences of 50 to 100 percent in similar projects carried out by different countries, even those of similar income levels. If countries that are routinely plagued with inefficiencies apply the best practices that have already been proven effective in leading countries, they can achieve remarkable results.

Governments have to transform the institutions, capabilities, and processes under their direct control to make their infrastructure delivery systems more effective.

The first element involves putting a real spotlight on the productivity performance of the construction industry itself, pushing for meaningful progress, accountability, and a greater embrace of innovation. The second piece is improving the planning, project management, and operational capabilities of government agencies and other stakeholders that are charged with carrying out infrastructure builds. Our 2013 research showed that it was possible to provide infrastructure services at a 40 percent cost savings—and our subsequent work with governments around the world has borne this out. Capturing the opportunity will require a detailed understanding of where processes tend to veer off track in each country. Virtually every location needs to invest in building specialist capabilities and establishing the right organizational structures for learning critical skills and sharing best practices.

3.1. THE CONSTRUCTION INDUSTRY NEEDS A STEP CHANGE IN PRODUCTIVITY

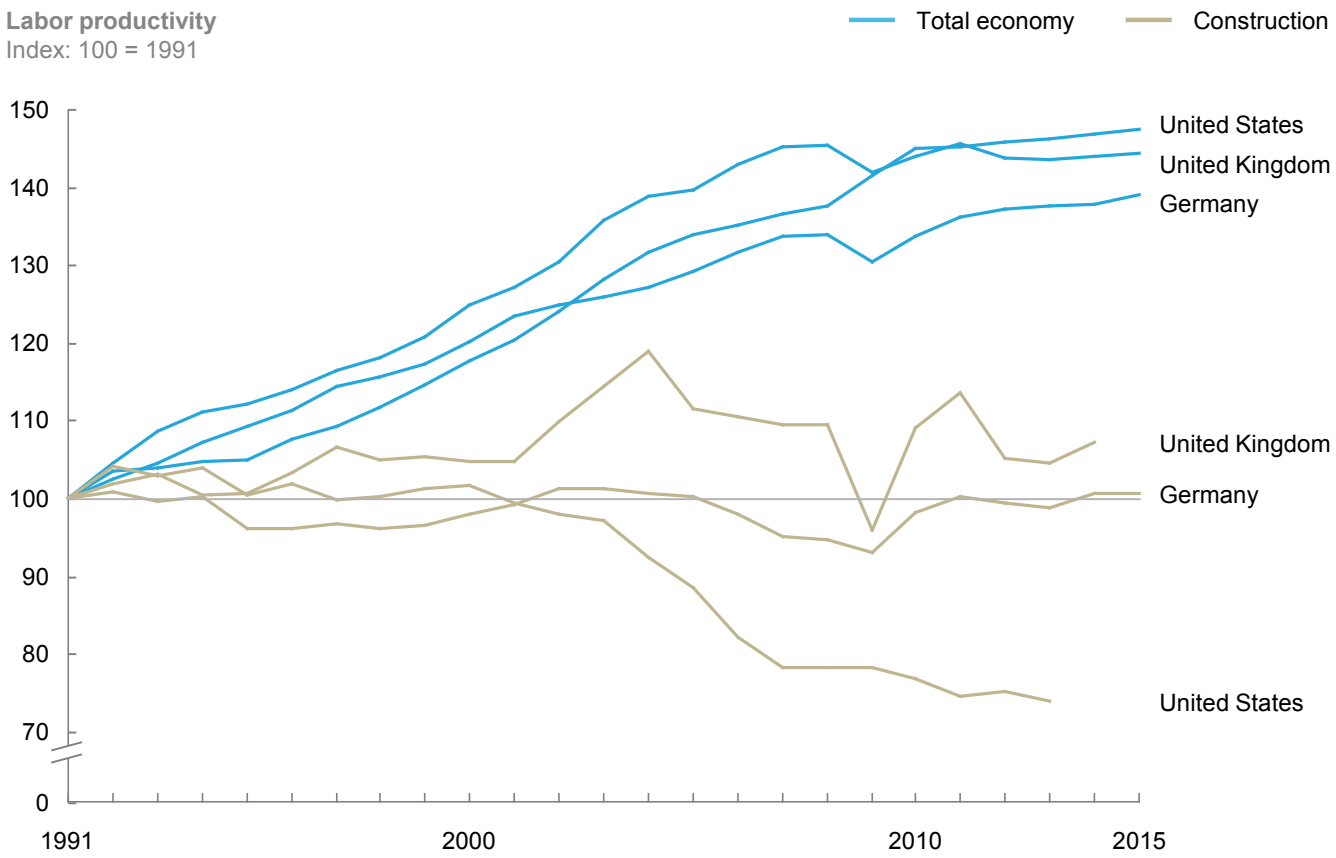
A great deal of the quality, timeliness, and efficiency of any given greenfield infrastructure project comes down to the performance of the builder. There are many data problems that make it difficult to measure such a fragmented, project-based industry in a particular country.[17] But the overall trend is clear: productivity growth in the construction sector has been slow or negative in many economies (Exhibit 17).

[16] Bent Flyvbjerg, "Survival of the unfittest: Why the worst infrastructure gets built—and what we can do about it," *Oxford Review of Economic Policy,* volume 25, number 3, 2009.

[17] See, for instance, Bernard Vogl and Mohamed Abdel-Wahab, "Measuring the construction industry's productivity performance: Critique of international productivity comparisons at industry level," *Journal of Construction Engineering and Management.* volume 141, issue 4, April 2015, or Leo Sveikauskas et al., *Productivity growth in construction,* US Bureau of Labor Statistics working paper number 478, October 2014.

Exhibit 17

Construction productivity has been flat or falling in many advanced economies



NOTE: Significant variance of construction productivity depending on choice of source data and deflator, but overall a clear trend.

SOURCE: OECD; McKinsey Global Institute analysis

3.1.1. There are a number of reasons for slow productivity growth

The reasons for weak productivity growth are broadly understood yet hard to measure:[18]

- **Fragmentation.** The construction industry has many small-scale players. For example, about half of construction output in the United States is produced by firms with fewer than 50 employees.
- **Skills.** Research shows that educational attainment has decreased over the years for the average US construction worker at age 30.[19] This has implications for sector performance. The skill level of supervisors and project managers is critical for good on-site productivity, but it can vary greatly among employees across the same firm. Skill gaps also limit the introduction of new technology.
- **Insufficient planning and design.** Large projects typically require more than 5 percent of total investment during the planning phase to run smoothly. This up-front investment is often not made, resulting in time-consuming problems and change orders.

[18] See, for instance, Paul Teichholz, "Labor-productivity declines in the construction industry: Causes and remedies (another look)," AECbytes, Viewpoint number 67, March 2013, or Wen Yi and Albert P. C. Chan, "Critical review of labor productivity research in construction journals," *Journal of Management in Engineering,* volume 30, issue 2, March 2014.

[19] Stanley W. Gilbert, *Characterization of the US construction labor supply,* NIST Special Publication 1135, December 2012.

- **Ineffective procurement processes and contracts.** One-round lowest-price bidding processes, for instance, can encourage firms to use changes and claims as a core revenue stream.

- **Workflow split.** The differing skill sets and working styles of architects and engineers affect the way they work with contractors and can prevent the right degree of cooperation and overlap needed for optimizing the design-build process.

- **Limited use of industrialized construction techniques.** Approaches such as lean construction, the use of big data-driven building information modeling (BIM) systems, full prefabrication methodologies, and construction flow balancing (that is, the full optimization of material flow and team rebalancing to eliminate downtime) are often not applied to their full potential.

- **Limited use of technology.** The sector is perceived as being slow to innovate—in fact, most construction work looks just like it did 50 years ago. Recent MGI research found that the construction sector lagged behind most other parts of the US economy in the intensity of digital assets, usage, and labor.[20]

- **Risk aversion.** Construction is typically a low-margin business. This tends to create a preference for proven technologies and approaches, since there is an insufficient financial buffer to support experimentation and innovation. Furthermore, failures tend to be highly visible, with direct impact on future business, as well as costly and hard to correct.

- **Significant dispersion of performance.** There is a wide gap between frontier firms and the average firm in the construction sector—and there are enormous gaps across geographies.

- **Uniqueness of projects and project mindset of companies.** There is a tendency to approach each project as a unique case. Even if that stems from a desire to provide the client with craftsmanship or personalized service, it has the unfortunate effect of limiting standardization of designs and construction modules or prefabrication. It also discourages contractors and owners from drawing on lessons learned across various projects.

3.1.2. Improving construction productivity will require addressing some intrinsic characteristics of the sector as well as market failures

If the reasons for weak productivity seem well understood, why is change not happening? Even industries such as retail and food service have been consolidating, standardizing, innovating, and adopting advanced IT systems and lean processes. But the construction sector faces some unique challenges that will have to be addressed:

- **Factor immobility.** Land is key for any construction project and cannot be moved. Land markets are fragmented, often with limited turnover and liquidity. Opportunities for economies of scale within a given region are limited. In large cities, it is not unusual for construction to make up only 25 percent of the total unit cost of a building, with the remainder coming from materials (25 percent) and land (50 percent). Owners who pay dearly for land are likely to maximize what they can build on that land in terms of both size and high-end finishes to boost the marketability and value of their building; optimizing for construction costs and productivity is not always a top concern. In addition, construction material tends to be heavy and bulky, so supply chains are difficult to consolidate. Prefabrication always needs to be somewhat local.

[20] *Digital America: A tale of the haves and have-mores,* McKinsey Global Institute, December 2015.

- **Principal-agent problems and incentive structures.** Public owners operate on public budgets, and their incentives steer them toward risk mitigation rather than innovation. In some cases, they are more focused on building a legacy than on controlling costs. Contractors may not have an incentive to improve designs and specifications, as that might lower their contract volume and stand in the way of charging for change orders later.

- **Information asymmetry.** Owners tend to be unsophisticated buyers of construction, and because there is limited market transparency, they are often hard pressed to compare. Residential buyers often make a decision to build only once in their lifetime and cannot compare costs or value because housing solutions are relatively unique. Public owners often have professional and specialized staff, but many decisions are made at the city and regional level, where agencies may lack deep experience for non-standard projects.

- **Regulation.** Sometimes well-intended labor market regulation leads to industry fragmentation, encouraging the sector to use small-scale subcontractors, self-employment structures, or informal workers to circumvent wage and safety rules. In turn, very low-cost labor, together with the boom-bust cycle of the industry, creates disincentives for higher capital intensity in the sector. In the United States, for instance, there has been a 30-year decline in real construction wages relative to wages of workers in other industries. Complex local building codes are often a source of additional cost and further limit standardization. Important reviews by health, safety, and environmental regulators can slow progress and keep resources idle if they are not well planned and executed quickly.

3.1.3. The construction sector is ripe for change

There is growing pressure on the sector to change. Public budgets are tight. Global competition is increasing in the sector, and transparency is increasing around the world. Urbanization is proceeding at the most rapid rate in history. This trend has left more than 300 million households unable to afford decent homes, a situation that will require a radical rethinking of costs and approaches to rapid building.

The construction industry can take significant steps forward by emulating the pockets of excellence in its own midst. Some of the traditional solutions that top-performing firms use to achieve good results are simply focused on better organization and processes. End-to-end processes are designed for seamless flow across owners, contractors, and subcontractors, for instance. Value engineering and lean techniques include better planning, critical path management, the elimination of waste on sites, and construction flow balancing to make sure that the necessary materials and manpower are always at the ready to prevent delays. Leading firms also have excellent project management practices, including more sophisticated performance management and the ability to access expertise when needed. Techniques such as modular building and prefabrication can also make a difference.

And the digital revolution, together with the introduction of new materials, is spreading into the sector. New breakthroughs are possible with radical process digitization, advanced analytics, the Internet of Things, digital mapping and surveying, 5D BIM, real-time crew mobility, near-field communications, advanced robotics, and many more technologies.

3.2. IMPROVING INFRASTRUCTURE GOVERNANCE AND DELIVERY

As discussed above, productivity is a long-standing issue in the construction sector. There are positive instances of innovations being adopted, but governments and other stakeholders cannot pin their hopes on the industry's ability to make rapid progress. It is crucial for the entities charged with planning, overseeing, and operating major assets to continuously improve the institutions, capabilities, and processes under their direct

control—particularly if they are entrusted with public funds. If these agencies insist on greater accountability, they can be a catalyst for efficiency in the construction sector as well.

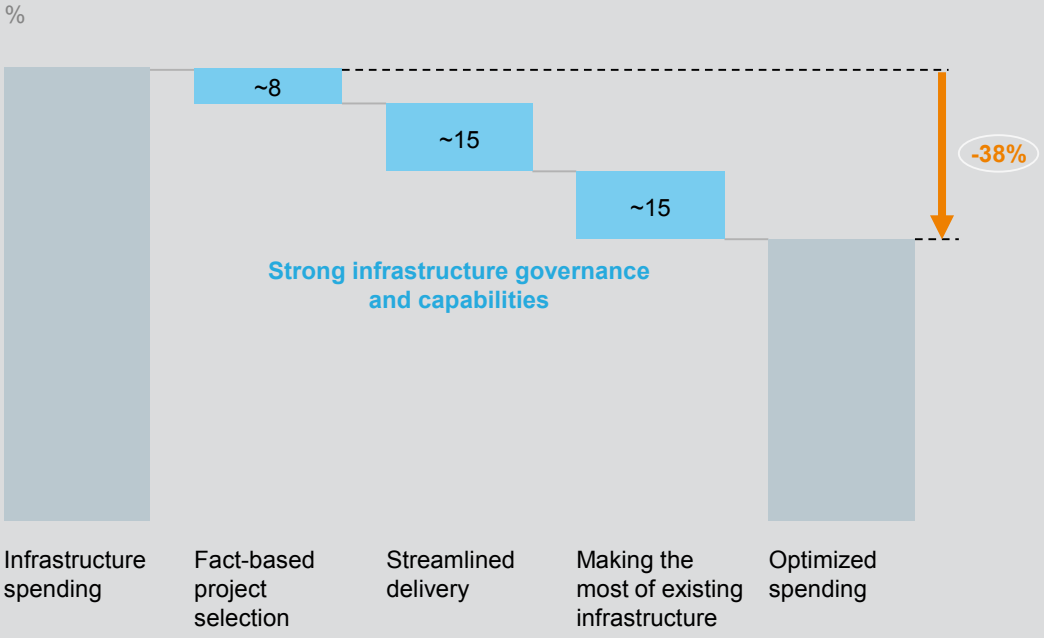
Our 2013 research showed that adopting leading global practices can reduce the cost of infrastructure by 40 percent (see Box 2, “Capital productivity matters: The 40 percent savings opportunity in planning, delivery, and optimization”).

Box 2. Capital productivity matters: The 40 percent savings opportunity in planning, delivery, and optimization

Infrastructure productivity: How to save $1 trillion a year, MGI's 2013 report, quantified the enormous savings that can be captured by applying the best practices developed by leading countries more consistently across the world (Exhibit 18). This research, based on 400 global case studies, suggests that governments could save up to 40 percent on infrastructure spending by focusing on three areas: improving project selection, streamlining delivery, and making the most of existing assets. None of these actions requires radical change, and leading countries are already demonstrating approaches that work.[1] Below is a brief recap of the central findings.

Exhibit 18

Introducing globally proven best practices could save some 40 percent of spending



SOURCE: McKinsey Global Institute analysis

Fact-based project selection

One of the most common problems in infrastructure development is making decisions about what to build without considering the country's larger socioeconomic objectives. This happens when officials look at projects one by one rather than considering how each fits into the entire portfolio. Or they do not evaluate whether other projects might have better returns. Additionally, decisions are sometimes made through political horse trading rather than objective economic analysis. The specifications that are considered also have to be realistic and accurate. Traffic forecasts, for instance, are regularly off by more than 20 percent.

Research shows that countries that take the time to get this right can eliminate projects that are not viable and reduce overruns in the projects they do launch. The key is creating a rigorous, transparent, and fact-based process to decide what needs to be done and in what order. None of this is easy, and it needs to involve calculating not only the direct benefits but also the indirect and long-term socioeconomic benefits.

[1] The following synthesis is extracted from Nicklas Garemo, Martin Hjerpe, and Jan Mischke, "The infrastructure conundrum: Improving productivity," *Rethinking infrastructure: Voices from the Global Infrastructure Initiative,* volume 2, McKinsey & Company, May 2015.

Despite these challenges, there are ways to improve project selection. One example is Infrastructure Ontario, a corporation owned by the province of Ontario that provides a wide range of services to support the government's infrastructure efforts. Over the past decade, it has implemented a long-term investment plan and essentially rebuilt the province's hospital infrastructure. Infrastructure Ontario has organizational independence, clear responsibilities, and a close partnership with the private sector. South Korea's Public and Private Infrastructure Investment Management Center has helped to lower the nation's infrastructure budget by 35 percent, in part by instituting a much more rigorous selection process. Today 46 percent of projects that it reviews are rejected, compared with a 3 percent rejection rate before it was established. The United Kingdom set up a cost-review program that identified 40 major projects for prioritization, reformed overall planning processes, and then created a cabinet subcommittee to oversee delivery. These measures reduced spending by as much as 15 percent.

Streamlined delivery

In simple terms, "delivery" refers to getting the job done. These are the important tasks that tend not to receive a lot of political credit. Infrastructure is a long-term investment, which can lead to complications when it is dictated by shorter political cycles. Infrastructure units should be insulated from political pressures and the shifting priorities of successive administrations as much as possible.

An investment in early-stage planning, typically 3 to 5 percent of the total projected cost, is critical to improving project delivery. This involves making the commercial case as well as completing the technical drawings, specifications, risk assessments, and environmental and social-impact analyses. Eager to break ground, clients tend to rush through this phase, later landing in trouble. Banks and donors often do not want to fund early-stage development but should insist that it take place; not investing in planning opens the door to disaster.

Accelerating convoluted permitting and land-acquisition processes can cut costs. Governments can also improve the way they manage contractors by using state-of-the-art procurement and contracting structures, rigorously tracking their performance, and building a strong owner's team.

Making the most of existing infrastructure

When governments address an infrastructure need, their default response tends to be building a new project. But the cheapest, least intrusive infrastructure is that which does not have to be built. There are three main ways to better manage and maintain existing assets—and these can often provide equally effective solutions.

The first is reducing infrastructure demand by implementing pricing mechanisms such as congestion charges. These are often politically unpopular, but they can smooth out spikes in demand and create revenue streams. If there is no charge to use a road at 6 a.m. but there is a $5 fee an hour later, for example, some people will move their commuting time to save money, redistributing demand. This theory has worked in places as diverse as Riga, Singapore, and even central London. The Panama Canal also uses congestion pricing. Many ports, airports, and railways charge more to the boats, planes, and trains that want to use their facilities at the busiest times of day.

Second, existing assets can be made more efficient. "Intelligent" transportation systems use advanced signaling to squeeze more capacity out of existing roads and rail lines; they can sometimes double the amount of traffic they can handle. Lean operations can allow airports, ports, or train-marshaling yards to handle more traffic. Operators can also stem leakage and theft in water and power systems.

The third strategy is simply prioritizing maintenance. It is not nearly as exciting as cutting the ribbon on a new project, but if assets are allowed to deteriorate, the costs of both operation and reconstruction increase markedly. Leading countries avoid this in part by scheduling maintenance often enough to avoid deterioration and breakdowns and by scheduling it at thoughtful times to minimize disruption.

3.2.1. Recruiting the right talent and building the right skill sets

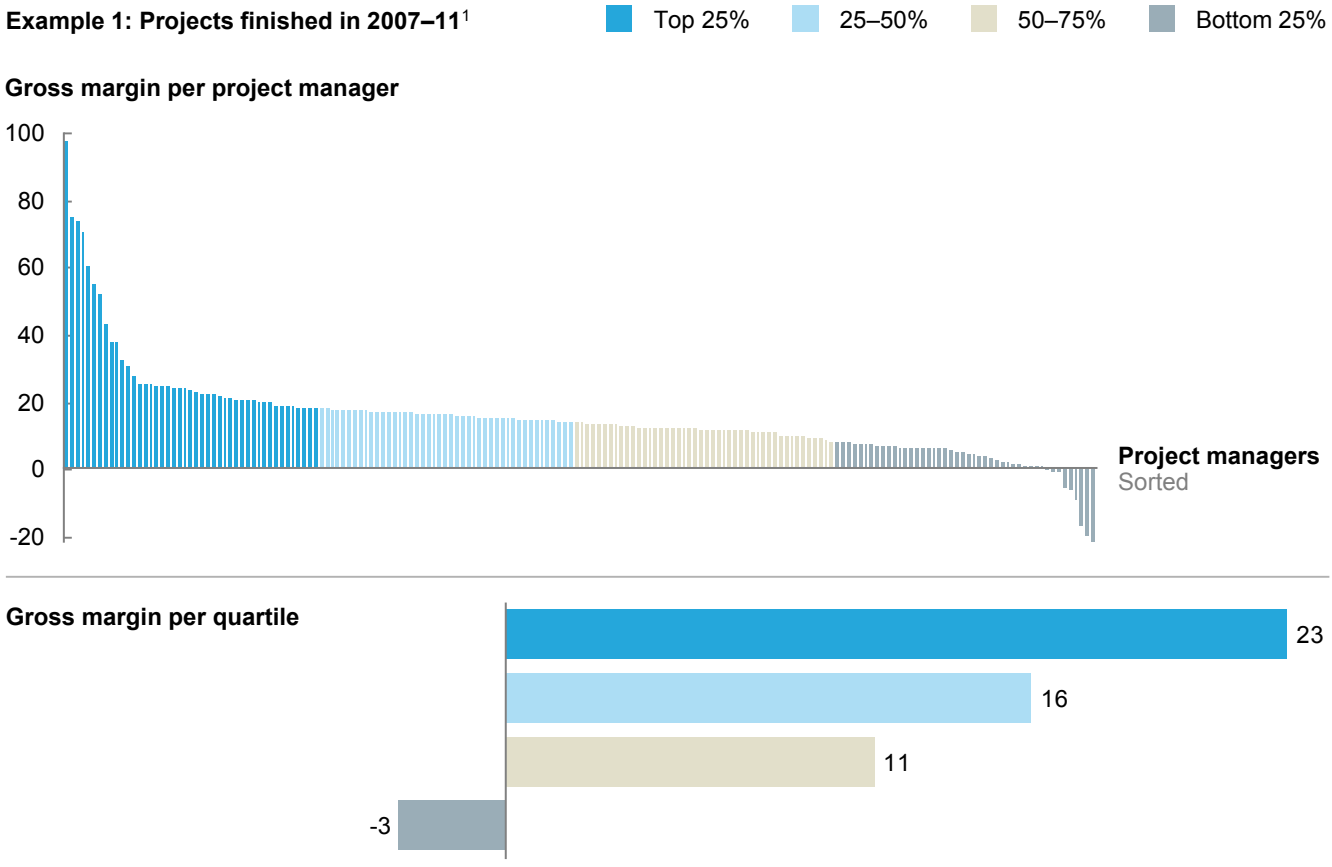
Governments and other infrastructure owners need expertise, and most of them do not have enough of it. Some are addressing this issue by building central training centers, rotation programs, or academies to develop critical skills. Others are partnering with or building external entities to attract private-sector talent, as in the case of Infrastructure Ontario.

On the delivery side, the skills of the project manager make the difference. Our research across thousands of projects indicates that top-quartile project managers consistently deliver projects ahead of time and below cost, whereas the opposite is true for the bottom quartile (Exhibit 19). Building project management capabilities takes time but is key to success.

Exhibit 19

Project manager capabilities are critical for success

Example 1: Projects finished in 2007–11[1]



Example 2[2]

1 Project managers with at least three projects (56% of total revenue).
2 Based on 1,000 projects over five years and only project managers with more than 10 projects.

SOURCE: McKinsey Global Institute analysis

3.2.2. Investing in data, collaboration, and governance

Beyond cultivating the right skill sets, improving capital productivity requires addressing challenges we found to be nearly universal in our work. Every country needs solid data and the ability to analyze it, structures that lend themselves to collaboration, and better governance (Exhibit 20).

Exhibit 20

Virtually every country has opportunities to improve capabilities, data transparency, collaboration, and governance

Capabilities and data	**Capabilities** ▪ Leadership and vision at the top ▪ High-quality project managers and planners	**Data and accounting** ▪ Infrastructure balance sheets ▪ Consistent data
Collaboration	**Private-sector orchestration** ▪ Competitive markets ▪ Early involvement of private sector in planning proposals	**Stakeholder engagement** ▪ Transparency ▪ Trust ▪ Communication ▪ Compensation
Governance	**Coordination among institutions** ▪ Coordinated decision making across asset classes and subnational levels of government	**Technocrats vs. politicians** ▪ Politicians to set objectives ▪ Technocrats to do planning and evaluation
	Continuity of budgets and plans ▪ Master plans that extend well beyond election cycles, with particular ring fencing of maintenance spending	**Incentives to innovate and take risk** ▪ Incentives for planners and decision makers to try different designs and approaches rather than sticking to business as usual
	Strong oversight ▪ Infrastructure unit accountable for improvement to delivery system	**Learning institutions** ▪ Regular evaluation and benchmarking over time and across asset classes, subnational governments, large projects, and international peers

SOURCE: McKinsey Global Institute analysis

High-quality data can provide the kind of clear measurement needed to optimize spending. While there is often good detailed data on, say, the state of road surface wear and tear, few countries today have clear cascading dashboards of management-level information. They need the capabilities to see and combine data on the financial balance sheets of infrastructure assets, delivery progress across multiple projects, and international benchmarks.

There are also ways to overcome some of the public opposition and political interference that often dog the infrastructure sector. A broader group of stakeholders needs to be engaged to overcome opposition from narrow interest groups that may block projects that are in the wider public interest—and transparency is critical for agencies to win and maintain public trust in their decision-making processes.

When it comes to governance, coordinating across multiple levels of government is a particular challenge, but it has to be tackled to avoid wasteful investment, such as competing airports in nearby cities or inappropriate coordination between national and municipal decision makers. Separating technical and political responsibilities (as Sweden has done with the establishment of Trafikverketet as its transport agency) can mitigate otherwise frequent political interference in technical and executional matters. Building learning organizations with strong oversight has proven to deliver improvements over time, as we show in the next section.

3.3. MEASURING THE PERFORMANCE OF THE INFRASTRUCTURE DELIVERY SYSTEM AND DESIGNING A TRANSFORMATION

Each country is unique, and none excels at all aspects of infrastructure delivery. Policy makers are not always sure where their country stands relative to peers and what really constitutes best practices and best-in-class cost of delivery internationally. McKinsey has found cases in which the cost of a build-out in one country was up to 50 percent higher than in a neighboring country with similar characteristics. This discrepancy was produced by different approaches to design, engineering, management, procurement, and sourcing.

Additionally, most countries could improve on many aspects of infrastructure development and have completed reviews of multiple issues. But they could make much faster and more tangible progress by identifying and prioritizing the three to five interventions that would make the biggest difference in how their national infrastructure delivery system performs in the short to medium term.

Competitiveness rankings from the World Economic Forum and the International Institute for Management Development measure the availability of infrastructure. Country- and sector-specific benchmarks, such as the UK Infrastructure Cost Review, measure costs. The IMF's proposed Index of Public Investment Effectiveness compiles data on transparency, audit standards, and internal controls to evaluate governance. Bringing these aspects together offers a more complete picture.[21] But none of these metrics measures and compares actual *practices* against benchmarks as a basis for clear recommendations for what to change.

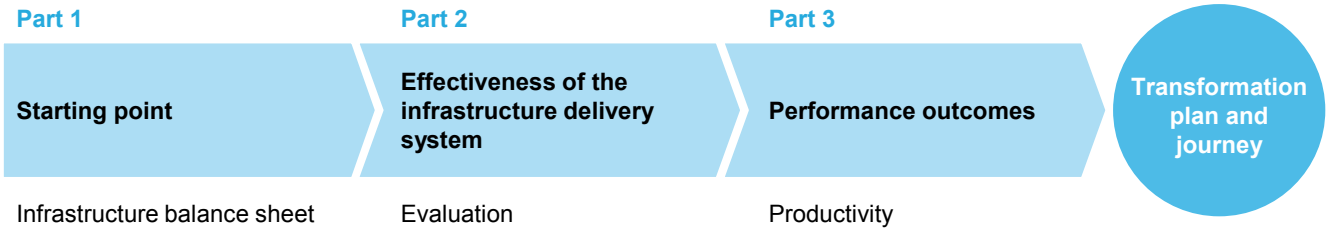
3.3.1. Determining current performance relative to leading practices

To complement existing metrics, we have developed a three-part infrastructure diagnostic. It provides a comprehensive assessment of infrastructure delivery and offers a database of more than 500 examples of leading practices (Exhibit 21).

Exhibit 21

It is critical for infrastructure leaders to establish a fact base and compare practices and system performance with global peers

The McKinsey Infrastructure Diagnostic



Infrastructure balance sheet
- Quality and availability
- Asset value
- Planned vs. needed spending

Evaluation
- Fact-based project selection
- Streamlined delivery
- Making the most of existing infrastructure
- Strong infrastructure governance and capabilities
- Robust funding and finance framework

Productivity
- Cost vs. international benchmarks
- Project performance

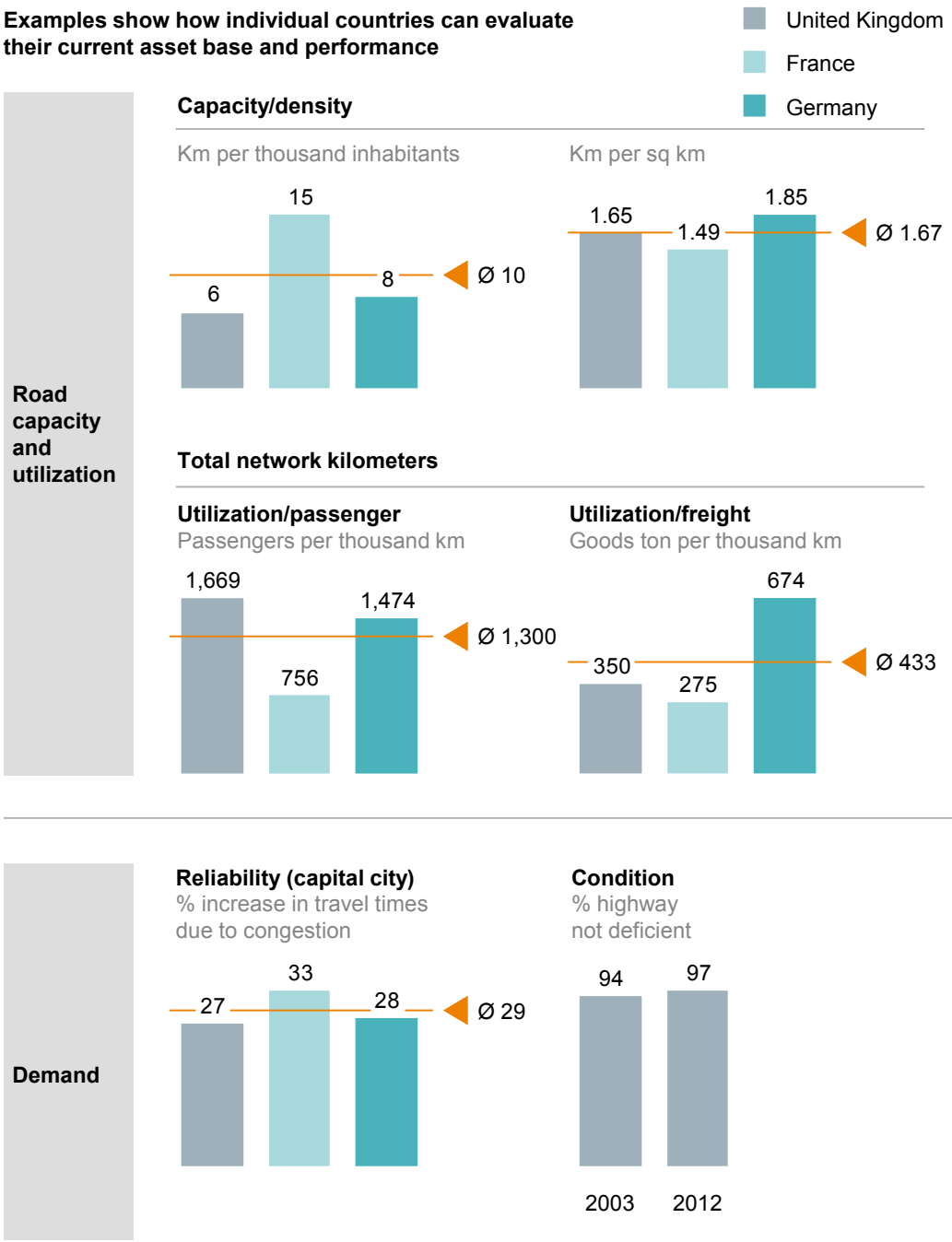
SOURCE: McKinsey Global Institute analysis

[21] Era Dabla-Norris et al., *Investing in public investment: An index of public investment efficiency,* IMF working paper number 11/37, February 2011.

- **Part 1: Establishing a starting point** (Exhibit 22). What's the state of the infrastructure? Do citizens have broad access to quality infrastructure? Does planned funding match future needs?

Exhibit 22

Examples show how individual countries can evaluate their current asset base and performance



SOURCE: Public databases; McKinsey Global Institute analysis

- **Part 2: Measuring effectiveness and productivity in a quantifiable way.** It is critical to evaluate five key areas: project selection, funding and finance, delivery, asset utilization and maintenance, and governance. Our own evaluations break these down into 30 categories and 78 subcategories, each representing a globally leading practice.

  To turn qualitative assessments of practices into quantitative rankings, for each category, we codify good, average, and low performances against a set of clear criteria, providing a basis for evaluating each government's performance on a five-point scale. This kind of

approach allows decision makers to understand where breakdowns occur and where transformation could yield the biggest returns. In an area such as master planning, for example, a low-scoring government may consider each project one by one, while a high-scoring government would have a long-term plan coordinated across infrastructure asset classes, with broad commitment and aligned funding. In project evaluation, a poor performance would involve evaluating projects without state-of-the-art tools and standards, with inconsistent assumptions for costs and benefits. An excellent score would indicate politically determined, clear, quantitative, and prioritized objectives and criteria for making trade-offs. Standardized inputs and assumptions on social costs and benefits would be consistent, and quantitative analyses built on those inputs would be subject to independent reviews.

- **Part 3: Assessing outcomes.** What is the cost of delivering a road in Country X compared with next-door Country Y? Do projects come in on time and on budget? Do they meet quality requirements? How many changes are required after first sign-off? The diagnostic considers quantitative indicators on availability, cost, and time to come up with an aggregate outcome, and it creates a basis for benchmarking.

Our diagnostic is one way to approach one of the most important priorities for governments around the world: evaluating their performance against global leading practices and educating themselves about what is possible across regions, asset classes, and time. It is critical to understand what constitutes good, average, and bad performance by international standards—and to learn from what other countries are doing.

McKinsey's experiences on the ground show there is room to improve and learn in almost all countries. Even the best-performing countries—those that routinely top international rankings for solid infrastructure and good institutional governance—score an average of just 3.7 on our diagnostic, leaving room for improvement. A comprehensive review can reveal areas where they can continue to find efficiencies (Exhibit 23).

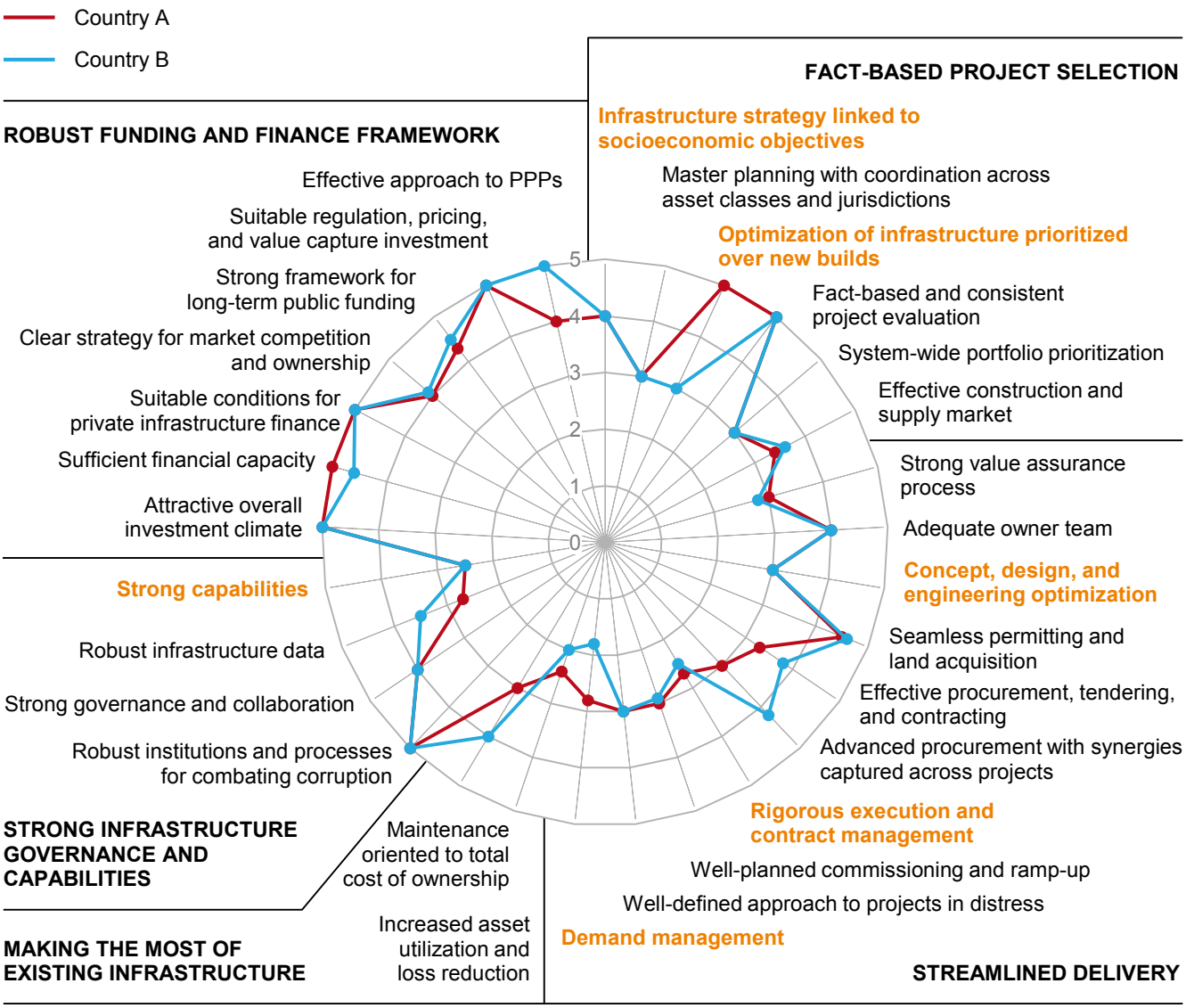
One of the most valuable steps government agencies can take is simply educating themselves about what their counterparts around the world are able to achieve.

There may also be substantial variation within the same country when it comes to the way different asset classes are governed. A given country may have an effectively run water system but inadequate processes and governance for its power grid; another may have excellent organization of rail infrastructure but crumbling roads because of money wasted in the process of building and maintaining them. Many times, better practices already exist right at home. In one country we reviewed, for example, processes and governance for the transport sector were much more rigorous than those in the energy sector, which had only limited planning and project oversight capabilities.

Exhibit 23

Capabilities, governance, demand management, execution, concept development, and portfolio management are key gaps in infrastructure

Example diagnostic results



SOURCE: McKinsey Infrastructure Diagnostic™; McKinsey Global Institute analysis

3.3.2. Developing tailored transformation programs

While some issues are common priorities around the world, there is no one-size-fits-all formula for making the infrastructure development machinery in a particular country more efficient. Each country will have slightly different priorities and areas for improvement.

Decision makers are typically aware of issues in their infrastructure delivery systems, of course. But they are confronted by so many diverse issues—planning, procurement, execution, skills, the overall investment climate, and financial regulation—that it is difficult to know which areas should be prioritized for reform efforts in order to achieve the greatest savings and efficiency.

Our experience shows that it is most effective to zero in on a limited number of targets and focus on immediately resolving them. Bureaucracies do not change easily, so a rigorous and unflinching assessment of strengths and weaknesses has to be combined with a willingness to shake up the status quo.

One already fairly advanced country, for example, prioritized a five-point action plan to improve performance in its roads sector. That included further upgrading already strong planning procedures to link projects more clearly to overall socioeconomic development objectives—the type of approach taken by the Singapore Land Transport Authority or Infrastructure Australia. On the delivery side, this involved coordinating with suppliers to emphasize design-to-value and total cost of ownership optimization. Another priority was accelerating high-impact projects and implementing lean approval processes. This type of approach can resolve long-standing bottlenecks in permitting that stand in the way of faster and more efficient infrastructure upgrades, particularly for the most urgently needed projects. To better manage demand, it was suggested that agencies begin using dynamic heat maps to monitor traffic. Lastly, refinements to governance structures were proposed, creating fewer but larger and more capable hubs as well as well-defined processes to coordinate with other infrastructure sectors.

We have also seen emerging economies make substantial strides. One country identified 11 weaknesses and resolved to address them over three years to make a leap forward in terms of infrastructure delivery as well as cost. These included new governance structures that enforced better state and federal agency coordination as well as credible project evaluation standards, introducing more competition in the construction sector, improving procurement processes, accelerating dispute resolution in the land acquisition stage of new projects, ensuring adequate maintenance budgets, reviewing user fees and PPP frameworks, and closing capability gaps in project structuring.

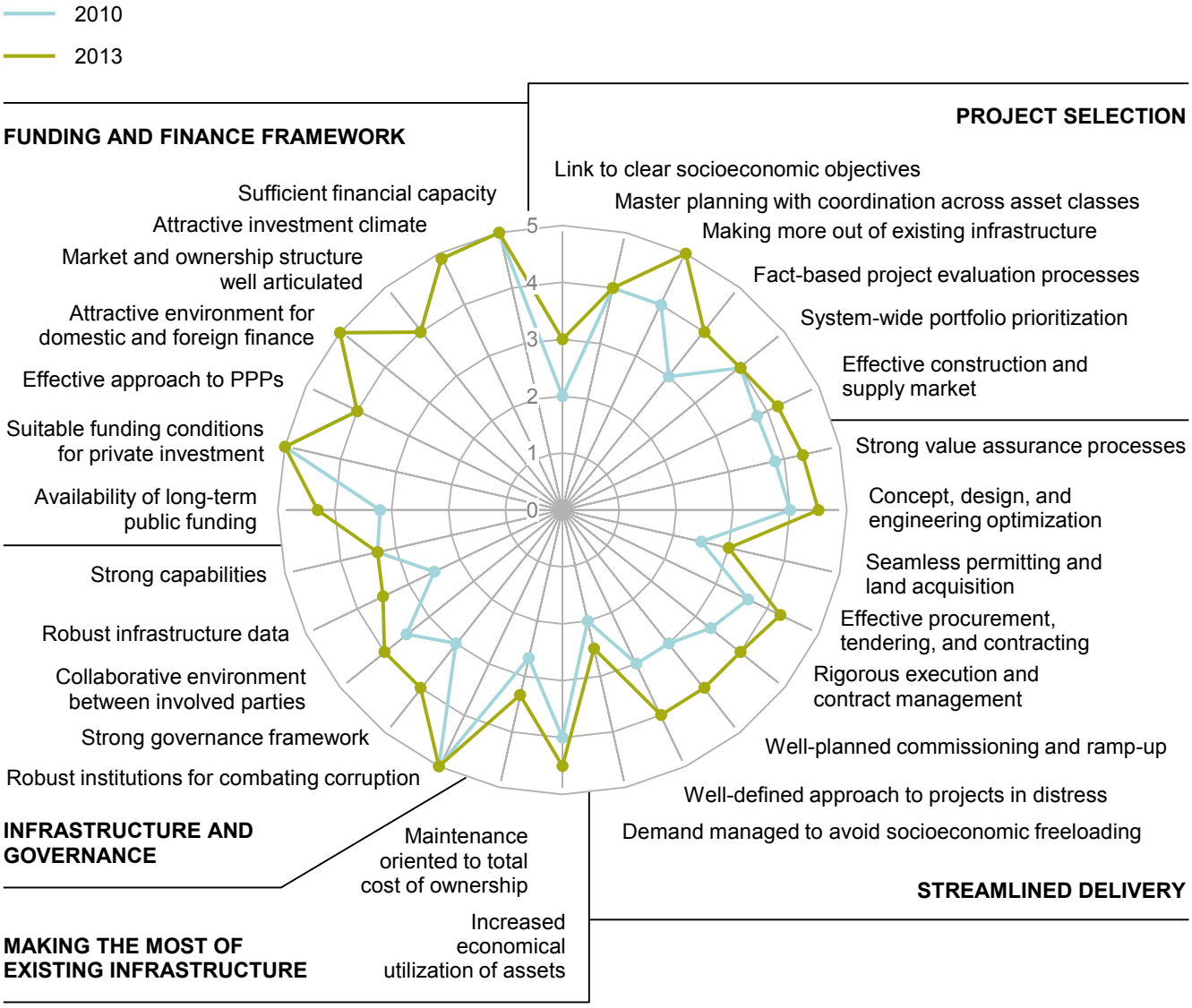
Infrastructure delivery units report to the highest level of government and are charged with overcoming technical and political bottlenecks.

One strategy that has proven effective for transforming the approach to infrastructure is the creation of a dedicated unit. “Delivery units” are increasingly used in countries around the world; they report to the highest level of government and are charged with overcoming technical as well as political bottlenecks. Alternatively, dedicated infrastructure units could be semi-independent agencies that bundle the responsibilities and capabilities to build and sustain world-class infrastructure at benchmark cost.

Such dedicated oversight can make a difference. One country that we reviewed put in place a dedicated unit to improve infrastructure planning and cost effectiveness for the country. Over the course of three years, average scores improved from 3.6 to 4.1 on our diagnostic in one asset class (Exhibit 24). The country started by developing a clear infrastructure strategy and plan, then standardizing and upgrading project evaluation. It introduced a tighter stage-gate process for value assurance, hired additional project managers, and built an academy to train them. Optimization of existing assets became a higher priority, and as a result, the country introduced intelligent traffic-management systems. Agencies also instituted tighter review and evaluation of supplier performance.

Exhibit 24

Countries can make strong progress in just a few years



SOURCE: McKinsey Global Institute analysis

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Infrastructure investment is a powerful economic stimulus in the short term, but it is ultimately about investing in the future. In many developing countries, millions are still deprived of access to decent infrastructure. The quality of infrastructure is a major determinant of the quality of life for citizens everywhere, and it shapes the basic competitiveness of economies. Financing may seem scarce in a world of debt and deleveraging, but a number of tangible steps could attract more public and private finance—and the opportunities to make spending more effective actually constitute an even bigger opportunity. If governments and private-sector leaders act on these strategies, the world can begin to bridge its infrastructure gaps.

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