



cutting through complexity

INFRASTRUCTURE 100

World Markets Report

Photography

Necessity or opportunity?: William CY Chu/Getty Images

Meet the judges: Andrew Rowatt/Getty Images

Economic Powerhouses: Kentucky Transportation Cabinet, City of New York – A Stronger More Resilient New York, New York City Economic Development Corporation, Rebuild by Design, BIG Team, Abengoa Solar, Basic Design, Move Sao Paulo – Google, Gujarat International Finance Tec-City Company Limited, Broad Sustainable Building Company, Press Association

Emerging Markets: The Public Private Partnership Office of Bangladesh, Kenya Airports Authority, Rio Tinto

Mature International Markets: Alder Hey Children's NHS Trust, Arup, Miller Hare, GMJ Design Limited, King's Cross Central Limited Partnership, The City of

Edmonton, Metrolinx, British Columbia Hydro and Power Authority, Government of Ontario, Carnegie Wave Energy Limited, WestConnex Delivery Authority, Infrastructure New South Wales, Técnicas Reunidas, UK Education Funding Agency, Crossrail Tunnelling and Underground Construction Academy, Nine Elms on the South Bank and Transport for London, Transcity

Smaller Established Markets: Amager Ressource Center, SKA Organisation, Odebrecht Infraestructura, Singapore Land Transport Authority, Facebook, Landsvirkjun, National Power Company of Iceland, 8 Million City, Passenger Rail Agency of South Africa, VSL International Limited, Auckland Council, Taoyuan Aerotropolis Corporation, Storstockholms Lokaltrafik, City of Yokohama

Contents

The Context

- 04 Necessity or opportunity?
- 06 The Infrastructure 100
- 08 Methodology
- 09 Meet the judges

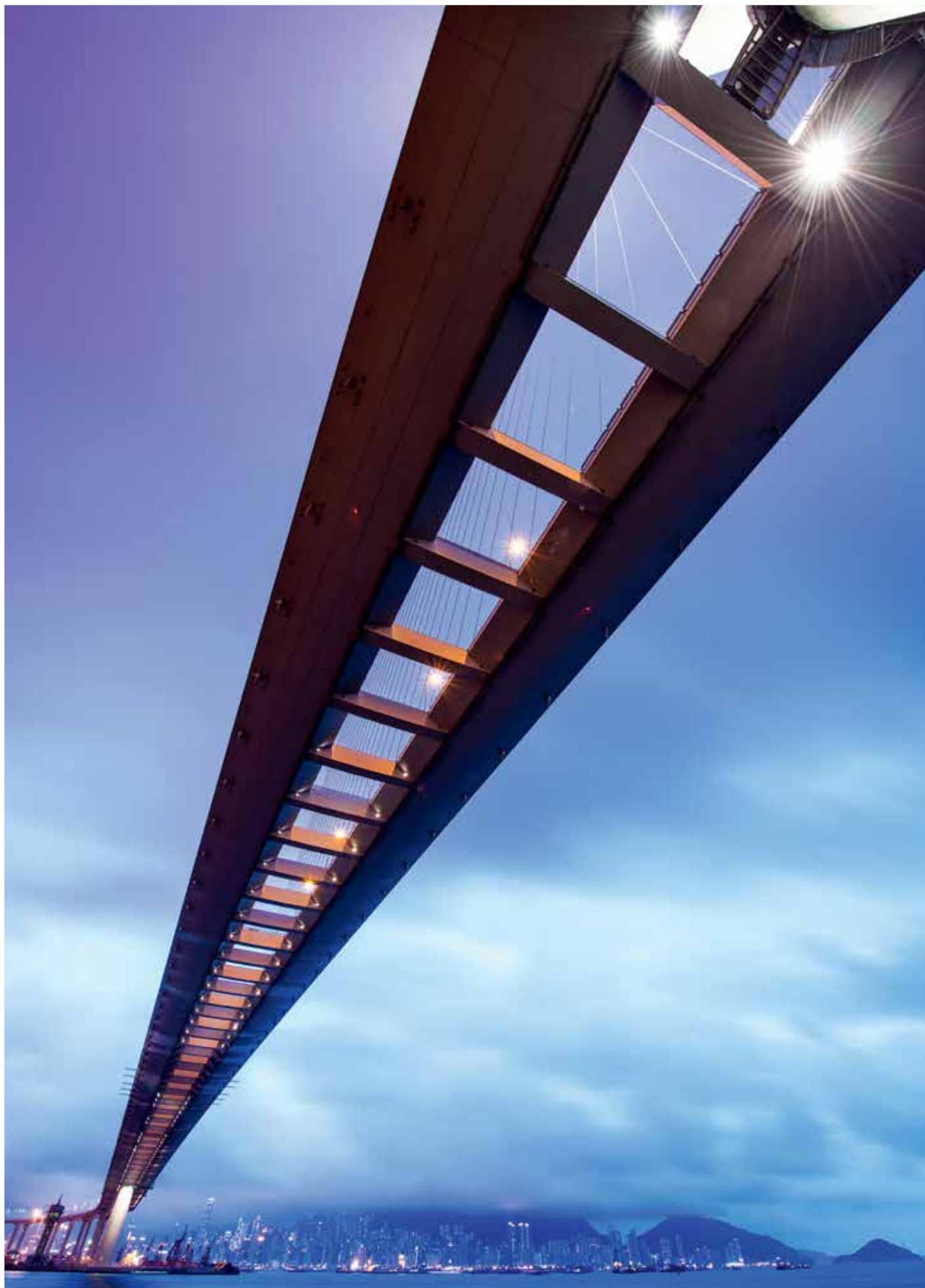
The Markets

- 12 Economic Powerhouses
- 26 Emerging Markets
- 36 Mature International Markets
- 48 Smaller Established Markets

Information

- 58 Index of projects by sector
- 59 About KPMG





Necessity or opportunity?

James Stewart, Stephen Beatty & Julian Vella, KPMG Global Infrastructure

Louis Armstrong famously saw trees of green, red roses too – marvels of nature that light up people's lives and make them joyfully proclaim: "What a wonderful world". It's a timeless song about the present, but also the future and a subtle hope that each new generation will be better off than the last.

That's how we at KPMG feel about infrastructure. We see optimism. We see social impact. We see economic value. We see a better world supported by projects that are desperately needed, those that are opportunistic, and others that are truly visionary. Many of the 100 projects across different global markets listed in this publication are a delicate balance of all three traits. Some projects are operational, others are under construction or in the latter stages of development. Yet for those that are still only designs and dreams, where should society focus – on necessity or opportunity?

We have to remain realistic in our optimism. For that, we see difficult choices, affordability concerns and governments trying to prioritize limited infrastructure spend. It's one thing for leaders to smile for the cameras and cut a ribbon before opening a new US\$200 million children's hospital. It's quite another to approve without ceremony a US\$17 billion, 10-year plan to repair and upgrade an aging urban water and sewer system. Society might need both, but few will cheer (or vote) for the politician who approves an adequate maintenance budget for existing infrastructure.

Political leaders love legacy projects – huge economic investments that promise to lay a new foundation for growth. These projects require big budgets, bold leadership, and occasionally an inflated ego. Silvio Berlusconi fell short of his dream to connect Sicily with mainland Italy via a suspension bridge across the Strait of Messina, but so too did the Romans (and reportedly Charlemagne). Unattainable infrastructure mega projects are like former US General Douglas MacArthur's old soldiers – they never die, they just fade away. Or do they?

Infrastructure is part of the social conscience. It's something that we all seem to want, but can't always agree on what we need. Poverty, for example, remains at desperate levels all over the world and many people lack the essential services that others take for granted. A city might address the immediate concern by providing social housing to help the urban poor move out of a slum. But is that addressing the underlying issue of poverty? The same city could take

"How should we balance economic benefit against social need, given constrained financial resources?"

a longer-term view and prioritize a metro system to connect people to jobs and create wealth over time. Maybe it doesn't need to choose one over the other. Effective mass transportation supports economic inclusion, but can society wait ten years or more for the impact to be felt? Can our conscience deal with the time lag?

We build infrastructure to change the world. It can be good business, but it has to have a positive impact. How then should we balance economic benefit against social need given constrained financial resources? Without economic growth and the social mobility of people moving out of poverty into middle class, a constrained tax base cannot afford necessary investments in water, energy, schools, etc.

Cost is a significant barrier. Could technology help us spend less on infrastructure? Telecoms is one of the few

sectors where change via mobile telephony has been revolutionary – and it happened quickly. Technology not only made the service cheaper and more flexible, it also enhanced profits by creating new markets through consumer applications.

Sadly, there is little evidence of this trend extending to other infrastructure sectors where assets are expensive, built to a previous generation's technical standards and designed to operate for decades. Even where change is encouraged, it is rarely executed cheaply, swiftly, and without great difficulty.

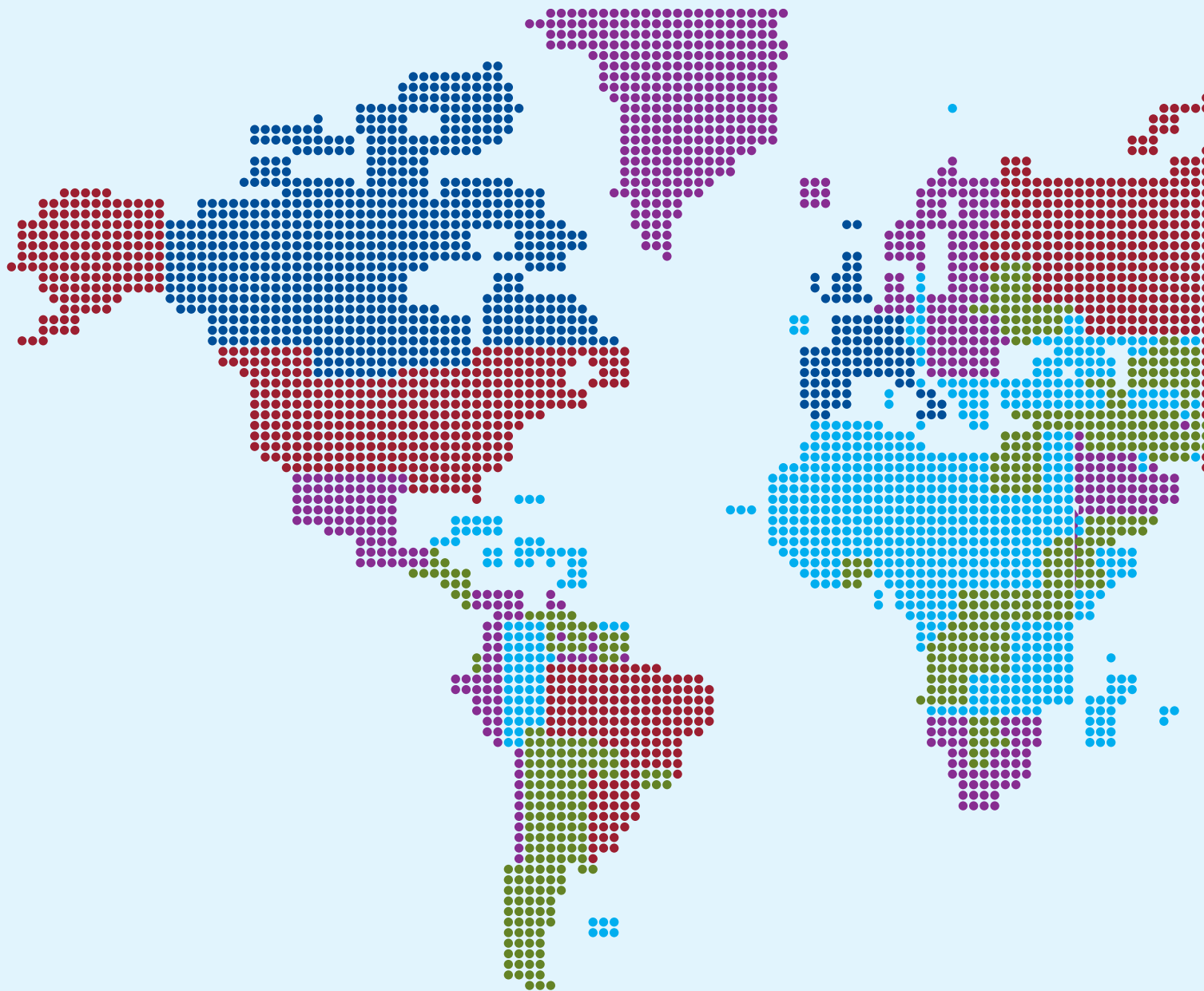
Innovation exists, but infrastructure firms find technology difficult to adopt. A Chinese construction firm began creating homes this year with a 3D printer, but they are still essentially pouring concrete and fitting houses with traditional materials. No one, for example, is yet experimenting with graphene in commercial projects. This thin, lightweight material made from graphite is strong and flexible. It also has the ability to conduct heat and electricity. Although it has widespread applications for energy, healthcare and construction, you will likely find it in your cell phone long before it's widely deployed in everyday infrastructure.

Excellence in infrastructure development is not easily defined. This is our third edition of the Infrastructure 100, and as with the previous publications we have produced an anthology of infrastructure projects that address excellence through scale, feasibility, complexity, innovation or impact on society. We have not set out to define an infrastructure utopia – that is for individual cities, regions and countries to determine for themselves. We have set out to highlight the elements of best practice that makes each and every one of these projects special, and for that we would like to congratulate everyone involved with any of these projects.

We hope that you, the reader, find inspiration in these projects to set about positive changes in your society. The action now sits with you. Is your generation better off than the previous one? Will the next be better off than yours?

What does your wonderful world look like? What can we do to help you achieve it?

The Infrastructure 100



Mature International Markets

Dynamic international economies that are open to a wide variety of private investment opportunities in infrastructure.

Westmill Solar Park *UK*
 Hinkley Point C Nuclear Power Station *UK*
 Priority School Building Programme *UK*
 Queensferry Crossing *UK*
 Alder Hey Children's Health Park *UK*
 High Speed 2 (HS2) *UK*
 Tunnelling & Underground Construction Academy (TUCA) *UK*
 Garden Bridge *UK*
 Northern Line Extension *UK*
 King's Cross Redevelopment *UK*
 A1 'Autostrada' Highway (Sparvo Tunnel) *Italy*
 Liefkenshoek Railway Connection *Belgium*
 Energy East Pipeline Project *Canada*

Valley Line Light Rail Transit Stage 1 P3 Project *Canada*
 Eglinton Crosstown Light Rail Transit *Canada*
 Northern Gateway Pipeline *Canada*
 Site C Clean Energy Project *Canada*
 George Massey Tunnel Replacement Project *Canada*
 Ring of Fire Mining Project *Canada*
 Legacy Way Tunnel *Australia*
 Perth Wave Energy Project *Australia*
 WestConnex *Australia*
 North West Rail Link *Australia*
 Darling Harbour Live *Australia*
 Southern SeaWater Desalination Plant Project *Australia*

The infrastructure market is truly global. Each country is different, yet they all face similar challenges. This report showcases 100 projects that embody the spirit of infrastructure, development, and private finance in four distinctly different markets.



Emerging Markets

Newer markets looking to establish the right conditions to attract private investment in infrastructure.

Myanmar Communications Network *Myanmar*
Mombasa – Kigali Railway *Rwanda*
KivuWatt *Rwanda*
North-South Africa Corridor *Africa*
Oyu Tolgoi Copper Ore Mine *Mongolia*
New Silk Road *Kazakhstan*
TAPI Gas Pipeline *Turkmenistan*
Montevideo Sanitation Project *Uruguay*
Haiti Temporary Wastewater Facility *Haiti*
Hôpital Universitaire de Mirebalais *Haiti*
Buenos Aires Bus Rapid Transit Corridors *Argentina*
Bangladesh Dialysis Centers *Bangladesh*
Jinja Bridge *Uganda*
Kudu Gas Field and CCGT Project *Namibia*
Jomo Kenyatta International Airport Terminal *Kenya*
Hak Se Mill Biomass Gasification Project *Cambodia*
Kathmandu-Kulekhani-Hetauda Tunnel Highway *Nepal*
Los Cocos & Quilvio Cabrera Wind Farms *Dominican Republic*
Trans-Saharan Natural Gas Project *Nigeria to Algeria*
Bouregreg Valley Development Project *Morocco*

Smaller Established Markets

Strong domestic markets open to private finance in infrastructure.

Amager Bakke Incinerator *Denmark*
Copenhagen Climate Adaption Plan *Denmark*
Stockholm Metro Expansion *Sweden*
Facebook Rapid Deployment Data Center (RDDC) *Sweden*
Rail Baltica *Finland*
IceLink (Iceland Subsea Electricity Cable) *Iceland*
The Scandinavian 8 Million City *Norway*
Zagreb Airport *Croatia*
Khi Solar One *South Africa*
Square Kilometer Array (SKA) *South Africa*
Passenger Rail Agency of South Africa (PRASA) Rolling Stock *South Africa*
Mayan Heritage Museum *Mexico*
Durango-Mazatlan Highway *Mexico*
Chaglla Hydroelectric Power Plant *Peru*
Americo Vesputio Oriente Highway *Chile*
Penonome Wind Farm *Panama*
Panama City Metro *Panama*
Singapore Intelligent Transport System *Singapore*
Yokohama Smart City *Japan*
Jakarta Mass Rapid Transit *Indonesia*
Taoyuan Aerotropolis *Taiwan*
Nigeria High Speed Rail *Nigeria*
Orbital Highway Project *Qatar*
Riyadh Metro *Saudi Arabia*
The Auckland Plan *New Zealand*

Economic Powerhouses

Economic giants that are slowly opening up to private finance in infrastructure.

Ohio River Bridges *US*
Willeys Point Development Plan *US*
New York City Resiliency Plan *US*
WindFloat Pacific Project *US*
Solana Power Station *US*
Alaska LNG Project *US*
Morar Carioca Sustainable Community Program *Brazil*
São Francisco River Irrigation Project *Brazil*
Libra Pré-Sal Oil Field Exploration *Brazil*
Transcontinental Railroad *Brazil*
São Paulo Metro Line 6 *Brazil*
Recife Metropolitan Region Sewage Treatment Project *Brazil*
Gujarat International Finance Tec City (GIFT) *India*
Mundra Ultra Mega Power Plant *India*
Interceptor Sewage System *India*
Yamuna Expressway *India*
Delhi Metro *India*
Narmada Canal Solar Project *India*
Beijing International Mega-Airport *China*
South-to-North Water Transfer Project *China*
UHV Power Transmission *China*
Turn the Pearl River Delta into One *China*
Jiuquan Wind Power Base *China*
Yangshan Deep Water Port *China*
Sky City *China*
Kazan Smart City *Russia*
Russia China Gas Pipeline *Russia*
Moscow-Kazan High Speed Rail *Russia*
Moscow Central Ring Road *Russia*
Sochi Olympic Park *Russia*



Infrastructure, development and private finance

Every country in the world has its own approach to developing and funding infrastructure. Each is unique and yet they all face similar challenges.

This publication explores those challenges and highlights the underlying themes that are driving infrastructure activity in four distinctly different markets.

Along the way, we celebrate innovation and the achievements of individual projects and programs that demonstrate excellence through one of our key criteria points – scale, feasibility, technical or financial complexity, innovation and impact on society.

KPMG's Global Infrastructure practice is therefore proud to present The Infrastructure 100: World Markets Report – a showcase of one hundred projects that embody the spirit of infrastructure, development and private finance.

Once again, we have partnered with a distinguished group of independent, external industry experts to shape the content of this report along the lines of how infrastructure is financed, owned and operated:

Economic Powerhouses:
Economic giants that are slowly opening up to private finance in infrastructure.

Emerging Markets:
Newer markets looking to establish the right conditions to attract private investment in infrastructure.

Mature International Markets:
Dynamic international economies that are open to a wide variety of private investment opportunities in infrastructure.

Small Established Markets:
Strong domestic markets open to private finance in infrastructure.

Our judges were asked to debate the current landscape of their market before being given the tough task of weighing the merits of projects that, in many ways, cannot

be compared like for like. More than 300 projects were researched and presented to our experts. No KPMG employees participated as judges, making this report a truly independent and unbiased reflection of some of the best infrastructure projects currently under way around the world.

On behalf of the Infrastructure 100 project team, we would like to thank each of our distinguished judges for their time and their insight. We are confident that – thanks to their valued individual participation and engagement – we have compiled a list of projects that truly reflects the diversity and scale of infrastructure projects across different global markets.

We hope you find these 100 projects as motivational as we do. Most of all, we hope that this report inspires people to improve their communities through original thinking and sustainable infrastructure development.

Meet the judges

Mature International Markets



Martin Rogers FCIQB, FICE

Former Executive Board Member, Royal BAM Group nv, Chairman, BAM Group (UK) Ltd

With over 35 years' experience in the construction industry, Martin played a major role in the re-organization of the BAM UK business which has seen the brand become one of the UK's foremost Construction and Civil Engineering companies. Martin was Managing Director of BAM Construct UK from 2002, and in April 2007 Martin became CEO of BAM Nuttall Ltd. In April 2009, Martin joined the Executive Board of Royal BAM Group nv, with responsibility for BAM activities in the UK, Ireland and International outside Europe. Martin is also an active member of the CBI Construction Council and is Chairman of the CBI South East Regional Council.



Gershon Cohen

Head of Infrastructure Funds, Aberdeen Asset Management

As the Head of Infrastructure Funds at Aberdeen Asset Management, the leading European asset management group ranked by AUM, Mr. Cohen is responsible for the leadership and continued development of an infrastructure funds platform consisting of five unlisted funds and US\$2.3 billion of institutional investment under management. The funds are managed by a recognized and experienced team based in London, Edinburgh, Paris, Madrid, and Sydney and invest in infrastructure projects underpinned by long-term government contracts predominantly in social and economic infrastructure.



Jim Betts

Chief Executive Officer, Infrastructure NSW

Jim Betts was appointed CEO of Infrastructure NSW in June 2013 following five years as Secretary of the Victorian Department of Transport and four years as Director of Public Transport at the Victorian Department of Infrastructure. Key personal achievements during this time include the delivery of the AUD\$33.4 billion Victorian Transport Plan, the overhaul of Victoria's legislative framework to integrate the planning of transport and land use, and overseeing construction of the AUD\$3.8 billion Regional Rail Link project. Mr. Betts' 25 years' experience spans strategic transport planning, infrastructure delivery, and transformational structural reform, including privatization, private finance and regulatory reform, and senior roles in the United Kingdom Government.



Michael Rolland

Chief Investment Officer, OMERS Private Markets

As Chief Investment Officer, Private Markets, Michael Rolland is responsible for all private equity and infrastructure investment activities and assets for the OMERS pension plan. Mr. Rolland oversees more than US\$18 billion in net equity investments, leading international teams that focus on direct investment and active management of high-quality companies well suited to delivering stable, long-term returns to help OMERS to meet its pension obligations. In his 15 years at OMERS, Mr. Rolland has been directly responsible for leading the evolution of OMERS infrastructure investment arm, Borealis Infrastructure, into a leading global investor in large-scale assets. His past experience includes building, financing and developing core infrastructure assets in many sectors, and playing a visionary role in the evolution of the public-private partnership model.



David Stewart

Director General, Transport for NSW

As the Secretary of Transport for New South Wales (NSW), Dave Stewart leads around 25,000 employees of the State's transport cluster, shaping the policy and delivery of public transport, roads and freight across NSW. Mr. Stewart brings over 30 years of experience in identifying and meeting the needs of the transport cluster's diverse customers, including time as Head of Projects in Queensland's Treasury and Director-General of the Queensland Department of Transport and Main Roads. He has led large government transport and infrastructure projects and portfolios, as well as providing policy, strategy, planning, and operational advice. He has worked within the private sector, in Queensland and the UK, on a range of road, construction, and geotechnical and advisory roles. Mr. Stewart is a chartered civil engineer and holds Masters degrees in Business and Engineering Science and has completed an executive program at Harvard University looking at private sector involvement in project delivery. He is a Fellow of Engineers Australia and an Honorary Fellow, Chartered Institute of Transport and Logistics.

Emerging Markets



Thomas Maier

Managing Director, European Bank for Reconstruction and Development (EBRD)

Thomas Maier is the Managing Director in charge of the infrastructure sector at the European Bank for Reconstruction and Development (EBRD). Mr. Maier is Board member in various investee companies of EBRD and is the current Chairman of the Global Agenda Council for Infrastructure of the World Economic Forum.



Ken Tun

Chief Executive Officer, Parami Energy Group of Companies

Ken Tun is the Chairman and CEO of Parami Energy Group of Myanmar. The group has interests in Oil and Gas, Power, Construction, Banking and Insurance. He received his MBA degree from the National University of Singapore and Bachelor of Engineering degree from Yangon Institute of Technology. In his capacity as CEO of Parami Energy Group, he initiated programs to support one third of Monastic schools in Myanmar and to plant 500,000 trees by 2015. He was honored as a Young Global Leader by the World Economic Forum in 2014.



Aminu Diko

Director General/Chief Executive Officer, Infrastructure Concession Regulatory Commission

Aminu Diko, who is currently the Director General/CEO of Nigeria's Infrastructure Concession Regulatory Commission (ICRC), holds a Masters degree in Law and has close to three decades' post-call experience in corporate legal practice. He joined the ICRC in January 2010 as the Executive Director, Contract Compliance Centre, comprising the Monitoring and Compliance/Policy and Regulation Units. His responsibilities include monitoring compliance with the terms and conditions of every concession agreement entered into by the Government, as well ensuring its efficient execution. Before joining the ICRC, Mr. Diko worked as the Group Company Secretary/Legal Adviser of Dangote Group for 14 years, following a successful 10-year career in the banking sector. He is a Fellow of the International Bar Association.



Syed Afsor H. Uddin

Chief Executive Officer, PPP Office, The Prime Minister's Office, Government of Bangladesh

Syed Afsor H. Uddin is the CEO of the PPP Office, under the Prime Minister's Office, Government of Bangladesh. He was appointed in January 2012 to lead the implementation of a renewed PPP program in Bangladesh. Mr. Uddin started his career as a fast track entrant to the British Civil Service. He was the Senior Policy Advisor in the PPP/PFI team at HM Treasury prior to joining PwC (UK) in 2007 as a Management Consultant providing public sector agencies advice on PPP projects. Mr. Uddin completed his LLB (Hons) at the London School of Economics and specialized in Banking and Finance Law during his LLM degree before being called to the Bar from Lincoln's Inn in 1996. As CEO of the PPP Office, Mr. Uddin has spearheaded changes to the institutional and procedural framework in government to enable the development of a pipeline of thoroughly developed PPP projects within a structured timeframe.

Economic Powerhouses



Rahul Asthana

Rahul Asthana has broad public sector experience and has held a number of senior roles within national, state and local government. In his previous role as the Metropolitan Commissioner for MMRDA, Mr. Asthana led the planning, coordination and development of infrastructure for the Mumbai Metropolitan Region. Mr. Asthana has also served as the Chairman of Mumbai Port Trust, Principal Secretary of the Government of Maharashtra's Energy Department, Joint Secretary of the Department of Atomic Energy, and the General Manager of Transport at the Brihanmumbai Electric Supply and Transport Undertaking (BEST). As the Additional Municipal Commissioner of the Municipal Corporation, Mr. Asthana dealt with World Bank projects in the water supply and sewerage department. Mr. Asthana holds an Aeronautical Engineering degree from IIT Kanpur and an MBA from ICPE Ljubljana.



Changhua Wu

Greater China Director, The Climate Group

Changhua Wu is the Greater China Director of The Climate Group. A China specialist for 20+ years and an environment and development policy analyst, she leads the organization's strategic development in the region and manages its Greater China operations from Beijing and Hong Kong. As a member of the Executive Management Team, Ms. Wu heads China Redesign – a catalyzing leadership program to shift China's energy and resource consumption toward low emissions while accelerating green growth. She is a frequent speaker on the subject of China's progress in achieving green growth and low-carbon development. Currently she is Chair of the World Economic Forum's Global Agenda Council on Climate Change; Vice Chair of Asia-Pacific Water Forum Governing Council; Member of Foundation Board of Global Infrastructure Foundation Basel (a global sustainable infrastructure financing platform); and Vice Chair, China Philanthropy Fund of All-China Federation of Returned Overseas Chinese. Prior to joining The Climate Group, Ms. Wu was the Executive Director of China Operations at ENSR. She has also directed the Program for China Studies at the World Resources Institute (WRI) in Washington, DC and consulted for a range of multinational organizations such as the World Bank, UNEP and UNDP.



Kendra York

Public Finance Director, Indiana Finance Authority

Kendra serves as Public Finance Director and head of the Indiana Finance Authority, the quasi governmental agency responsible for overseeing State debt. She has also served as General Counsel and Chief Operating Officer to the IFA. In these roles Kendra has managed the financing of the Lucas Oil Stadium and Convention Center construction and expansion and has maintained the State of Indiana AAA credit rating by Fitch, S&P and Moody's. She is currently the project lead for the Ohio River Bridges Project-East End Crossing and Indiana public-private partnership procurements. Kendra was recently selected as one of Indianapolis Business Journal's 2014 "Women of Influence." Kendra holds an MBA from California State University and a J.D. from the University of the Pacific, McGeorge School of Law.



Felipe Jens

Chief Executive Officer, Odebrecht Properties

Felipe Montoro Jens is currently CEO of Odebrecht Properties. Mr. Jens has previously worked for the Odebrecht Group as the Chief Financial Officer (CFO) of Odebrecht S.A. and the CEO of Odebrecht Participações e Investimentos (OPI), responsible for the Planning, Controlling, Treasury, Corporate and Project Finance divisions. Mr. Jens is a board member of some Odebrecht controlled companies such as: Odebrecht Agroindustrial (Sugar & Ethanol), Odebrecht Realizações Imobiliárias (Real Estate) and Odebrecht Energia (Renewable Energy Generation). He has previously worked at: (i) Terna S.p.A. (Enel Group S.p.A.) in the areas of Project Development and Structured Finance; (ii) Enron in the International Structured Finance division (in Houston) and (iii) Price Waterhouse Coopers (PwC) in the auditing and consulting divisions. Mr. Jens holds a Bachelor degree in Business Administration from Fundação Getúlio Vargas – FGV/EASP (Brazil) and has a Masters Degree in International Management (MIM) from Thunderbird, the American Garvin School of International Management (USA).

Smaller Established Markets



Geoff Hunt

Chief Executive Officer, Hawkins Group

Geoff Hunt was appointed CEO of Hawkins Group in 2013. Hawkins is the largest family-owned infrastructure and building construction business in New Zealand. Mr. Hunt has 35 years of contracting and construction experience across the electricity, telecommunications, rail, and energy sectors, both in New Zealand and offshore. Most recently he led Kordia Group through eight years of growth and transformation, having previously led Alstom and Electrix through substantial growth and into new business areas. He has strategically grown the value and revenue of every organization he has led and is now tasked with leading the Hawkins Group businesses through the next period of growth. Mr. Hunt has a Masters in Engineering (with distinction), has undertaken extensive international management training, and been a director of a number of boards.



Steven J. Puig

Executive Vice President and General Manager, Banco BHD Leon

Steven has been Executive Vice President (EVP) and General Manager of Banco BHD Leon since Banco BHD merged with Banco Leon in July 2014. Prior to the merger, Mr. Puig had been appointed EVP and General Manager of Banco BHD in April 2013. Before joining Banco BHD, Mr. Puig was Vice President for the Private Sector at the Inter-American Development Bank (IDB) from 2007 to March 2013. He was responsible for coordinating private sector and non-sovereign guaranteed operational programs of the IDB Group. Mr. Puig has also held a number of positions with Citigroup from 1997 to 2007, including Managing Director and Regional Head of Trade for Latin America and the Caribbean, President of Citibank Colombia, Country Manager for Citibank El Salvador and Vice President of Corporate Banking and Corporate Finance in the Dominican Republic.



Francisco Gonzalez

Director of Investment Banking, National Bank for Public Works and Services, Mexico

Before joining the National Bank for Public Works and Services (BANOBRAS) in Mexico in 2012, Francisco Gonzalez worked as Director General of Project Finance at the Ministry of Finance for the Government of the State of Mexico from 2006 to 2012 where he was in charge of developing the Ministry's PPP program, structured finance for investment projects, refinancing of the State's Public Debt in 2007 and securing future income of the Public Property Registry. His experience in Mexican development banks include the Mexican National Bank of Foreign Trade (BANCOMEXT), assistant commercial attaché for the Mexican Embassy in France and Chile, and several roles with BANOBRAS including Financial Analyst, Deputy Manager of Special Projects, and Manager of Financial Leasing. Mr. Gonzalez has a BA BS in business administration from The American University (Washington, DC) and a Diploma in Senior Management from the IPADE.



Kogan Pillay

Head of Southern African Development Community (SADC) PPP Network

Appointed Head of the SADC PPP Network in April 2012, Kogan Pillay is responsible for assisting the SADC countries with developing PPP policies, frameworks and institutional arrangements to deliver bankable projects to the marketplace. In addition, he heads up the coordination of stakeholders, other P3 Networks and significant capacity building projects. Formerly Senior Project Development Manager-Project Preparation and Advisory-Investment Banking, other experience includes roles as Director of the Business Development PPP Unit at the National Treasury, Director at IZAZI Solutions, and Senior Policy Advisory for the Ontario Ministry of Financial Institutions. Mr. Pillay has an MBA from Milpark Business School (associated with Thames Valley University) and a Masters Degree in Political Science from York University in Canada.



Alaska LNG Project



Beijing International Airport



Delhi Metro



Gujarat International Finance Tec City



Jiuquan Wind Power Base



Kazan Smart City



Libra Pré-Sal Oil Field Exploration



Moscow Central Ring Road



Mundra Ultra Mega Power Plant



Narmada Canal Solar Project



New York City Resiliency Plan



Ohio River Bridges



São Francisco River Irrigation Project



São Paulo Metro Line 6



Sewage Treatment for the Recife Metropolitan Region



Yangshan Deep Water Port



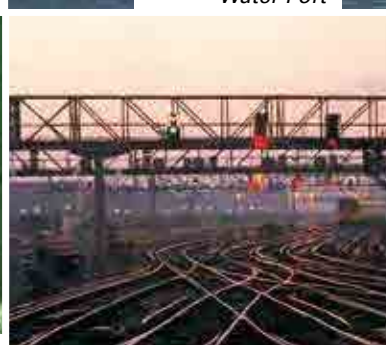
Sochi Olympic Park



Solana Power Station



South To North Water Transfer Project



Transcontinental Railroad



Turn The Pearl River Delta into One



UHV Power Transmission



Willets Point Development Plan



WindFloat Pacific



Interceptor Sewage System



Moscow Kazan HSR



Russia-China Gas Pipeline



Sky City



The Morar Carioca Program



Yamuna Expressway

ECONOMIC POWERHOUSES

Brazil, Russia, India, China and the US now account for 40 percent of the world's GDP, but the state of their infrastructure has been holding them back. Increasing investment is changing that

Markets

Brazil
China
India
Russia
United States



The door to private finance is slowly opening

With large populations spread across huge geographies, each of these countries has significant infrastructure needs, either to support rapid growth and urbanization or, in the case of the US, to fill in the gaps and rebuild decaying assets.

Historically, economic powerhouses have used public money or some form of debt security issued by the state to fund developments. However, the scale of the required investment means that government finance alone is insufficient and public institutions lack the critical capacity of qualified people needed to deliver. Therefore, the private sector needs to play an increasingly important role in delivering and financing critical projects.

Whether the conditions exist to attract international private capital is open to question. Current flows are often limited by strong domestic competition, a lack of transparent tenders and considerable restrictions on inward investment, with further fears over resource nationalism.

As a result, there are fewer direct greenfield opportunities in these markets for international private investors to consider. This is an issue economic powerhouses need to address if they are serious about attracting international investment and expanding the role of the private sector and the use of public-private partnership (PPP) models.

Delivering quality and sustainability

Across such a broad range of countries and regions, it is no surprise that the quality of infrastructure varies from world-class to sub-standard, with many aging assets in urgent need of repair and upgrade. This is supported by the World Economic Forum Global Competitiveness Study which shows that in terms of the quality of infrastructure, while the US is ranked 15, the other four powerhouses rank between 45 and 85.

Our independent judging panel of industry experts said public institutional capacity and capital expenditure pressures challenge infrastructure development, funding, and implementation in these geographies. They recognized the growing importance of cities as engines of national economic growth, but also rural infrastructure, which is vital to social welfare. China, for example, is investing heavily in rural reconstruction across housing, transport and energy.

Demand for power and water is rising fast from expanding cities and factories, driving critical issues such as sustainability and resource scarcity in tandem. Electric utilities struggle with the lack of grids, causing regular outages in India and Brazil. Water is exhausted, over-managed and often polluted. Several powerhouses suffer from a lack of water in general and clean water in particular, a result of unsustainable resource management and under-investment in this crucial resource. These problems are most pressing in expanding urban areas.

As climate change becomes globally acknowledged, efficiency and sustainability are having greater influence upon design and construction. Developments such as **China's Sky City** point the way forward to a greener future, while renewables are growing in importance, with wind and solar power projects likely to proliferate.



"Clean energy remains one of the biggest challenges facing the economic powerhouses"

The 280 MW thermal solar **Solana Power Station** in Arizona is a strong example of how the US has embraced green technologies alongside game-changing drilling techniques that allow the country to extract abundant tight oil and shale gas resources. Renewables have allowed the US to hedge its energy bet while remaining a prolific consumer – and producer – of traditional hydrocarbons.

Clean energy remains one of the biggest challenges facing the economic powerhouses. The **Jiuquan Wind Power Base** is a key part of China's plan to supply 15 percent of the country's energy from alternative and renewable sources by 2020. Carbon dioxide emissions have more than doubled in the past 10 years, taking China past the US as the world's top emitter of greenhouse gases. Although critics have questioned its cost-effectiveness, the US\$17.5 billion development will be the largest collective wind farm group in the world when completed.

Urban regeneration in mature and developing countries

One of the key principles to attracting people and businesses to a city is constant physical renewal. KPMG's recent report on Magnet Cities identified urban renewal as a major driver to economic recovery and growth. Two very different projects along these lines in Brazil and the US caught the attention of our judges to highlight the common challenges of transforming deprived areas of cities.

The first phase of the **Willets Point Development Plan** in the New York City borough of Queens aims to create around 2,500 units of mixed-income housing, retail and entertainment amenities, public open space, a school, hotel and convention center. Phase 1, budgeted at US\$3 billion and funded by private developers, hopes to have a huge social impact in an area that has suffered decades of post-industrial decline by generating employment and improving the overall quality of life for residents. This project also plans to create defenses against the pollution that has plagued the waterways around Willets Point for over a century.

Brazil's notorious favelas are a stark reminder of the country's social divides, but

Savoring every drop

Bastian Simeon
Global Head of Water, KPMG in France

Governments everywhere are waking up to the fact that water is a very precious resource that cannot be taken for granted.

The majority of the world's water is used for industrial and agricultural purposes, with irrigation and coal-fired power stations proving particularly thirsty customers. China, which suffers significant shortages in a number of regions, is trialing the trading of water rights between municipalities, with water-rich areas entitled to charge a truer, unsubsidized price.

Waste water re-use projects have sprung up across the emerging powerhouses, but especially in Brazil, as well as Russia and India, to create a closed loop of recycled water for power and steel plants, oil refineries and mines. These developments call for specialized contractors and project finance. Although technically pure, recycled water has yet to be fully accepted for irrigation or domestic use, due to (unwarranted) fears over contamination.

The US Environmental Protection Agency (EPA) is getting tough by imposing higher fines on mines and other water-intensive users, which is accelerating the drive

towards more efficient usage. Coal power stations account for around half of all water consumed in the US. Desalinization is another more expensive alternative, but given the large amounts of power required to move and process the water, is unlikely to find favor as a large-scale solution.

As the economic powerhouses continue to grow, and global warming has a bigger impact, the pressure on water supplies will become more intense, opening up further opportunities for infrastructure investment in recycling and other efficient technologies.



Cleaning up the water

////////////////////

There has been a historic lack of investment in Brazil and India's water sector. Our judges recognize that action must be taken and have selected these two projects.

São Francisco river

At US\$6.4 billion, the São Francisco River Irrigation project is Brazil's largest water infrastructure project, bringing good quality water to some of the country's poorest people. Water from the São Francisco river will be diverted to rivers in the northeast that have dried up during the arid season, via 720 kilometers of channels covering aqueducts, tunnels and reservoirs. Construction began in 2007 and is still continuing.



Interceptor sewage system

New Delhi has struggled to keep raw sewage from flowing into and polluting the Yamuna River. India's US\$323 million Interceptor Sewage System is designed to divert sewage to treatment plants, enabling the river's water to be used for horticulture and cleaning purposes.





Urban planning at scale

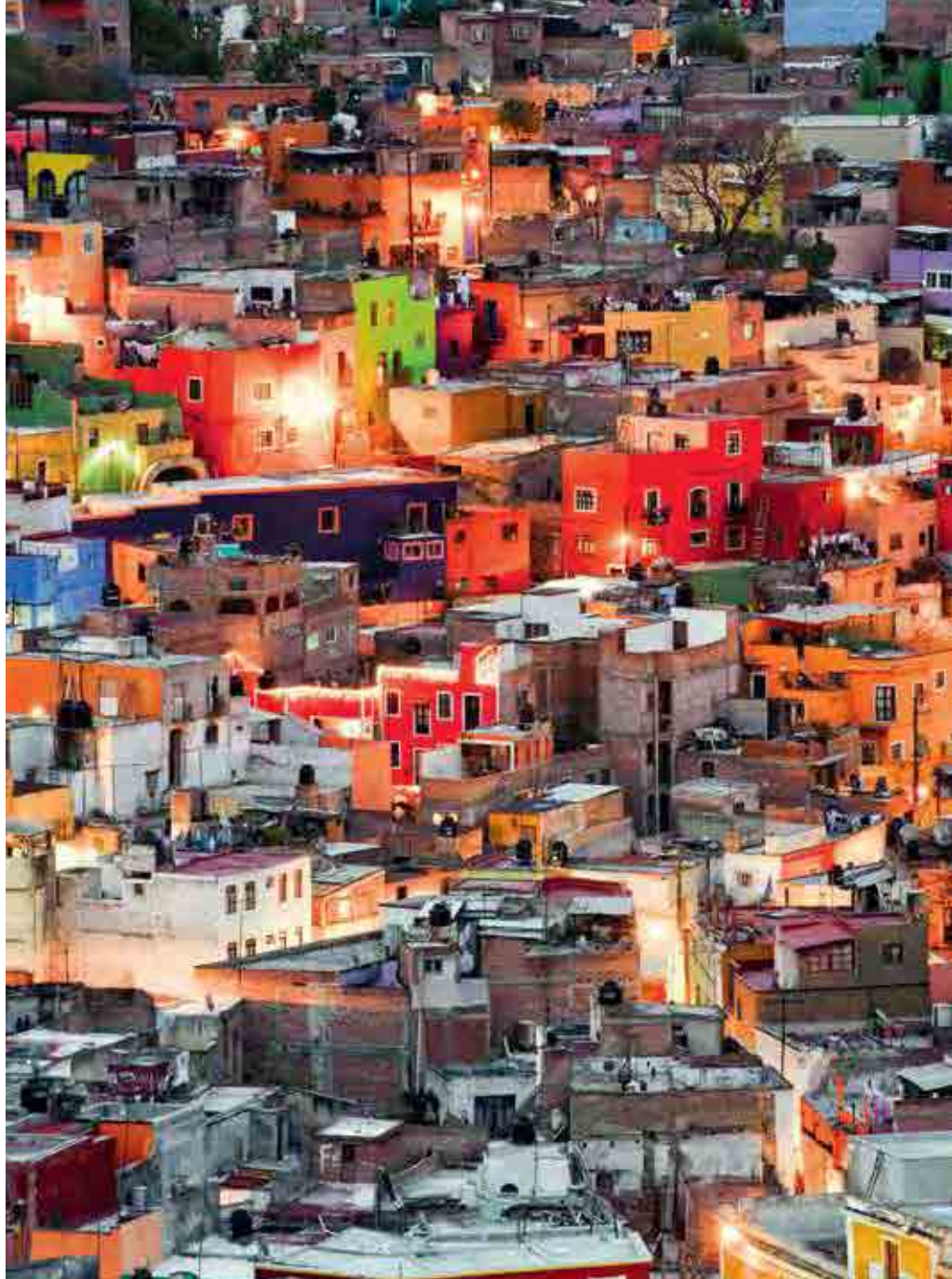
Gujarat International Finance Tec City

Traditional financial services and IT centers may soon be looking over their shoulders at the Gujarat International Finance Tec City (GIFT) in India. This US\$20 billion mega-project combines state-of-the-art connectivity, infrastructure and transportation with sustainable, environmentally sensitive growth. Although only two of the planned buildings have been constructed, new Indian prime minister Narendra Modi backs the initiative, which is designed to change the way India thinks about contemporary urban planning.



Kazan Smart City

Meanwhile in Russia, Kazan Smart City is a US\$10 billion greenfield development that hopes to rank alongside Abu Dhabi's Masdar City and South Korea's Songdo as a sustainable base for international business and a pleasant environment for citizens. Although still at concept stage, Kazan ultimately hopes to attract investment into technology, medicine, education, and tourism.



the US\$4 billion **Morar Carioca Sustainable Community Program** intends to upgrade the slums of the capital, Rio de Janeiro, home to 20 percent of the city's six million inhabitants.

Billed as "an imaginative exercise in sensitive urban renewal", the program plans to retrofit the entire stock of low-cost housing free of charge and renew surrounding public spaces – all by 2020. Although the intention is to keep existing communities together, a small proportion of people will be relocated from areas under high risk of landslides. Funding will be entirely through public money, including the city budget, credit from the federal government, and loans from the Inter-American Development Bank (IDB).

Connecting people and places

With five of the seven largest countries in the world by surface area and four of the top five by population, these powerhouses have to improve connectivity across wide, often diverse landmasses. Airports, roads, ports,

freight rail, and high-speed rail networks are all essential for internal logistics and travel, with some glaring differences in quality both within and among nations.

China has rapidly extended its road, rail, port and grid infrastructure, as the 12th Five-Year Plan targets an increase in the national trunk highway system (NTHS) to 83,000 kilometers by 2015, linking at least 90 percent of cities with populations of over 200,000. As cities expand, urban mobility takes on a high priority, in the form of metro and light rail developments.

Beijing has also spent hundreds of billions of dollars to build the world's largest high-speed rail system – a feat accomplished in less than a decade. There are even ambitious plans for a China-Russia-Canada-America line that would run for 13,000 kilometers across Siberia and pass under the Bering Strait through a 200-kilometer tunnel.

Other exciting new innovations from China include driverless trains, the superfast Shanghai Maglev train – utilizing magnetic



“Economic powerhouses have to improve connectivity across wide, often diverse landmasses”

levitation – and the revolutionary, yet untested Land Airbus concept: a large train-like vehicle holding as many as 1,200 passengers, which straddles roadways and allows cars to freely pass underneath it.

The judges said China's US\$18 billion **Yangshan Deepwater Port** will have a significant economic impact, becoming the world's largest container shipping port when completed in 2020. Located near Shanghai, the port could even help the city overtake Hong Kong for port traffic, while offering alternatives to Singapore and South Korea. The port – which is connected to the mainland via the 32.5-kilometer Donghai Bridge – should do much to keep Chinese domestic and international trade flowing.

In Latin America, **Brazil's Transcontinental Railroad** is an ambitious attempt to overcome the expense and difficulty of getting heavy cargo to port for export to Europe, the Middle East and Asia. Brazil produces soy more cheaply than the US, but by the time the crop gets aboard a

A new era for Indian infrastructure

Arvind Mahajan Head of Government and Infrastructure, KPMG in India

India's infrastructure sector story in the past decade has been a roller coaster ride. The sector initially witnessed large investments across each of its sub-segments aided by the economy, which was growing at a high rate. The share of the private sector has increased steadily over the years, with enabling policy and regulatory environments being put in most segments.

However, over the last few years, the infrastructure sector has been going through a troubling phase due to an economic slowdown, restricted access to capital, and decline in investors' confidence. While the specific reasons for this have differed across each sub-sector, they have included: slow government decision-making, challenges in land acquisition, delays in obtaining environmental clearances, overly aggressive bidding by developers, high interest rates, and underestimating the challenges to be faced in execution.

India's new Government, armed with a decisive mandate, has initiated a number of measures to kick start investment. This has significantly improved investor sentiment, reflected in the increasing market value of infrastructure companies and a significant number of M&A transactions that have been closed by strategic and financial investors, domestic and international.

The new Government considers railways as the 'growth engine' of the country. The rail sector in India is a central government monopoly and has witnessed the least private sector participation. Given the large investments that this sector requires, and financial health of Indian Railways, the new Government has started a process of transformation of the railways sector with increased private sector participation and more liberal foreign direct investment in railway projects. In the MoUs signed recently with Japan and China, the railways sector and specifically, high speed railway lines between Mumbai and Ahmedabad and from Delhi to Patna were specifically recognized.

In the highways sector, in recent years PPPs have emerged as the preferred

mode for implementing road projects.

The National Highway Authority of India plans to award road projects on an Engineering Procurement Construction (EPC) basis to start with and at the same time address issues to kick start the stalled projects. The budget has set aside US\$7 billion for building 8,000 kilometers of new roads.

The Indian civil aviation industry is among the top 10 in the world with an estimated value of USD\$16 billion. This is a fraction of what it can actually achieve. The next generation of aviation growth in India will be triggered by regional airports. Many Indian states have started taking pro-active measures to promote air connectivity. In addition there are going to be interesting PPP opportunities for investors in the new greenfield airports at Navi Mumbai and Goa (Mopa) that are going to come to the market shortly.

Similarly, in the energy sector, the new government is working a number of initiatives to increase the supply of domestic coal, promoting renewables in much larger scale to put them at the center of the fuel basket and undertaking distribution reforms. It is also revisiting the Electricity Act, which needs changes to get private sector interest back into this key sector.

We also expect to see a number of opportunities around the urban infrastructure, water, and waste management and sanitation sectors, as the Government implements its ambitious program of building 'smart cities'.

While the past few years have seen a decline in interest around the infrastructure sector, the new Government is taking a number of measures to revive investment and interest in it. We believe this could lead to a re-rating of Indian Infrastructure.





Moving within and between cities



São Paulo Metro Line 6

Brazil's São Paulo Metro Line 6, a 16 kilometer-long metro extension, is the country's first such project in which the private sector has participated from the very start. The new line will serve university campuses and the district of Higienópolis and is expected to carry around 640,000 passengers daily. A consortium has been selected to build and operate the US\$4 billion, 25-year public-private partnership with services due to start by 2020.



Beijing's new international airport

Beijing's new (and second) international airport will be the largest in the world when completed in 2018, with up to nine runways and capacity for 130 million passengers per year. Construction on this US\$11.2 billion mega-project also includes new highways and railway lines. China's government has pledged to build 55 airports by 2015.



ship, it is more expensive because it must be carried by truck for days along congested, potholed roads to ports. The US\$2.9 billion project is designed to increase production of crops and ore in landlocked northeastern states of Goiás, Mato Grosso and Rondônia and also reduce the strain on the country's roads and motorways. Under a concession model, the government intends to award contracts for the construction and operation of the infrastructure of the new lines. Capacity on these new routes will be purchased by federal railway construction agency Valec, which will then sell it on to companies moving freight under separate operating franchises in an open access railway network.

While China and Brazil focus on heavy rail corridors, India has addressed its road and urban rail networks. Opened in 2012, the 165-kilometer, six-lane **Yamuna Expressway** is India's longest motorway, connecting the capital New Delhi with Agra and creating a corridor for economic growth. By dramatically reducing the travel time between these two historic cities, the US\$1.9 billion project will have a lasting impact on villagers, tourists, traders and working professionals and should expand trade. The expressway also has symbolic value by showcasing the country's ability to develop world-class infrastructure. As

one of India's largest PPP road financing arrangements, the 36-year concession costs are subsidized by cash flows from land sales along the route.

Ten years after its first line opened, the US\$2.3 billion **Delhi Metro** continues to expand, setting a shining example of how to carry out an effective public works program. Taking heed of the problems experienced by the Kolkata Metro – which was badly delayed and 12 times over budget – the development team utilized innovative procurement and strong project and contract management techniques.

The judges were impressed by the fact that the first phase was finished on budget and almost three years ahead of schedule in 2005, followed by delivery of phase II in 2011, with phases III and IV scheduled for





“The 529 km Moscow Central Ring Road will become a link in a pan-European highway from London to China”

Avtodor is responsible for executing the project under a public-private partnership and have put the project to tender as four separate PPP road projects. All sections will be operational by 2018 and international and Russian players will be responsible for the project for 30 years.

Mobilizing investment, major games and mega projects

In a drive to speed up economic growth, the economic powerhouses are striving to accelerate infrastructure development. Both China and Russia have strong, centrally driven programs for developing national infrastructure. Brazil and India have similarly ambitious plans, but with a more federalized political system. In the US, states and cities have a large say in local infrastructure planning and implementation, and despite attempts for a more joined up approach,

many federal funding issues remain unresolved. Strong coordination between national and local government is vital to maintain progress.

Major infrastructure investment requires leadership and occasionally a high-profile international deadline to consolidate political will and funding to meet it. The impressive Olympic Games held in Beijing (2008) and Sochi (2014) helped spur billions of dollars of investment into those cities and surrounding regions. Brazil hopes to replicate that success having hosted the FIFA World Cup this summer (2014) and is looking ahead to the 2016 Olympics in Rio de Janeiro.

Ambitious mega projects are only possible in countries with a high gross domestic product (GDP) and large populations. By 2030, China and India alone will account for 35 percent of the world's people and 25 percent of its GDP. Although the new

completion in 2016 and 2021 respectively. Upon full completion the project will provide an extensive network of 142 stations and 190 kilometers of track. Delhi's business and leisure travelers now enjoy a clean, well-run metro that is also profitable, thanks in large part to government-subsidized power. Funding is courtesy of the national government, the Government of Delhi and a substantial loan from the Japan International Cooperation Agency (JICA).

In Russia, the US\$4.2 billion **Moscow Central Ring Road** will encircle the city, with as many as eight lanes in each direction. With a circumference of 529 kilometers, the road – due to be completed by 2018 – will become a link in a pan-European highway from London to China, via Berlin and Moscow. State-owned



Attracting major events



Sochi Olympic Park

Despite costing an estimated US\$51 billion, the Sochi Olympic Park in Russia expects to continue attracting tourists and investors. There is no doubt that Sochi has boosted Russia's global profile, and the park's legacy will be extended with facilities redeveloped to host the 2018 FIFA World Cup and future Formula 1 races. A majority of the investment was procured from state-owned banks, and despite cost-overruns and concerns that some new infrastructure was not ready ahead of the Games, the judges considered the overall event to be a success for both the International Olympic Committee and Russia.

middle class will put a strain on infrastructure, they will also, in time, provide a wealthier base to help pay for it.

In the new millennium, China has already proven that it can mobilize resources and deliver mega projects on a scale unmatched anywhere else in the world. The **South-To-North Water Transfer Project**, for example, was originally a vision of former leader Mao Zedong and will rank when completed as one of the world's largest engineering feats, reflecting the strength of the nation's political will and central planning. With 20 percent of the world's population but only 7 percent of its freshwater reserves, China is fast running out of water. The project would divert 44.8 billion cubic meters of water per year from the Yangtze River in southern China to the Yellow River Basin in arid northern China, where shortages are frequent. Due for completion in 2050, this government-funded US\$62 billion project has had its controversies, with hundreds of thousands of people resettled to make way for the project, and a huge environmental impact.

The idea of linking nine cities into one mega city larger than Switzerland could probably only happen in modern China. The Pearl River Delta region accounts for a tenth of China's economy and a quarter of its trade, with roads, tunnels and bridges already linking its cities. The **Turn The Pearl River Delta Into One** campaign impressed judges with ambitious plans to create far more connecting infrastructure by spending more than US\$300 billion of state money on rail lines and other improvements to enhance transportation, energy, water, telecoms, medical facilities and schools.



The US also has a rich history of ambitious development programs such as the Federal Interstate Highway System and individual mega projects like the Hoover Dam. One of its latest efforts is a local initiative to protect **New York City** from storm surges, rising sea levels and climate change more broadly. In the wake of 2012's disastrous Hurricane Sandy, the city's **Resiliency Plan** ('A Stronger, More Resilient New York') puts forward initiatives to strengthen coastal defenses, upgrade buildings and construction standards, protect infrastructure, such as the power grid and waste water system, and make vulnerable neighborhoods safer. The plan includes 257 short, medium, and

long-term initiatives, such as a transformative proposal to protect two kilometers of lower Manhattan with a multi-purpose levee.

Addressing 21st-century needs and safeguarding energy supplies

Energy is vital to social inclusion, giving the poorer members of society the chance to experience a normal life. It is also an engine of economic development, providing wealth and powering industrialization and innovation in evolving societies.

China's state-owned grid operators have planned massive investments into new transmission technology to generate more efficient electricity. The **UHV Power**





Investing in sustainable power



WindFloat Pacific

The WindFloat Pacific project, planned off the coast of the US state of Oregon, will be the world's first floating offshore wind farm. If successful, this US\$200 million pilot could open the way to sea-based wind farms in previously inaccessible locations, as well as avoiding the costs of installing fixed turbines. The project developer has received around US\$47 million of US Department of Energy funding.



Narmada canal solar

Another innovative initiative in the Indian state of Gujarat conserves water and generates energy. The US\$17.9 million Narmada Canal Solar project will place a solar photovoltaic grid over the top of a 5.5-kilometer section of the canal, preventing water from evaporating and producing renewable power. In a form of PPP, Megha Engineering and Infrastructure Limited will build the plant and maintain it for 25 years.

Transmission Project will see the State Grid Corporation of China spend more than US\$160 billion between 2013 and 2021 building eight ultra-high voltage transmission lines across the country. This new technology reduces the amount of electricity lost when transmitted over long distances, enabling power stations to be situated closer to coal resources and away from cities.

In a project of global geopolitical significance, the **Russia-China Gas Pipeline** further strengthens ties between the two countries. It also hangs a question mark on Pacific liquid natural gas (LNG) projects, and diversifies Russia's export options at a time of strained relations with the US and European Union. The 30-year, US\$400 billion deal will see state gas company Gazprom deliver Russian gas to China National Petroleum Corporation (CNPC).

With LNG demand rising across the Pacific (and despite competition from Russia), Alaskan legislators have made the state's controversial Arctic reserves available to the market, providing a huge boost to the local economy. The US\$45 billion **Alaska LNG Project** will create a pipeline running 1,300 kilometers from north to south across Alaska. A consortium of major oil companies is working on the initial phases, with the first LNG likely to flow by the early 2020s. In a unique energy partnership, the state will own about 25 percent of the gas produced.

The **Libra Pré-Sal Oil Field Exploration** is a potential economic game changer for Brazil, being led by PETROBRAS and its partners. In an innovative tender process, winning bidders enter into compulsory profit-sharing partnerships with PETROBRAS, of which the state-owned oil company must hold at least a 30 percent share. The offshore project will not only have an impact on Brazil's economy, but further shifts the energy equilibrium away from the Middle East to the Americas.

India's growth has been much hampered by a lack of reliable electricity supplies, with about 400 million people having no access. The US\$4.4 billion **Mundra Ultra Mega Power Project** is a major, coal-fired thermal power plant serving the states of Gujarat, Rajasthan, Maharashtra, Haryana and Punjab. A 25-year concession has been led in what is a landmark PPP for the Indian energy sector.

Overcoming barriers to foreign capital

With their strength and political influence, local capital providers are in a favored position to finance infrastructure in the emerging powerhouses. Few major projects in India or Brazil, for example, get financed without significant contributions from state-owned banks like the State Bank of India and the Brazilian Development Bank (BNDES). In China, 6 to 7 percent of infrastructure costs are likely to be funded

Investors are in for the long haul

Dave Neuenhaus,
Tax Principal, KPMG in the US.
Global Tax Lead, Sovereigns, Pensions
and Infrastructure

With fierce competition for infrastructure dollars, economic powerhouses – despite their scale and range of projects – can suffer from unattractive and complex tax regimes that can deter investors. Capital may instead flow to smaller nations with more accommodating and flexible tax and regulatory systems, offering incentives such as tax holidays or special economic zones (SEZs), by investors seeking improved returns. Given the long-term nature of such investments, infrastructure funds, investors such as sovereign wealth funds and pension funds favor stability and predictability of returns.

Economic powerhouses are aware of this dynamic, and many are taking steps

to address it. For instance, India's new 2014 budget eases restriction on foreign construction capital and plans a number of special economic zones (SEZs), while Brazil is trying to create better conditions for overseas capital interested in infrastructure PPPs with a number of tax concessions. These improvements to the stability and certainty of tax systems will be welcomed by the investment community but further reform is required before international capital starts to flow in some cases.

At the same time, however, a number of globally coordinated initiatives like the OECD/G20 Base Erosion and Profit Shifting ("BEPS") project will introduce new requirements and lead to additional tax uncertainty. All countries, including economic powerhouses, will need to address these developments in the context of their broader fiscal policies and investment policies.

A joined-up effort to rebuild America's transport infrastructure

Tim Wilchetz, Infrastructure partner, KPMG in the US

Many US highways and bridges were built in the 1960s and 1970s and are approaching the end of their useful lives. The public purse is not big enough to fund the estimated US\$3.6 trillion of investment needed by 2020, and the Build America Investment Initiative is a new effort designed to expand the use of private capital. To that end, five key questions have emerged:

- 1 How can innovative financing attract investors?**
- 2 How can new revenue and risk-sharing models make PPPs more attractive to investors and state borrowers?**
- 3 How can smaller projects be bundled together to create scale?**
- 4 Given that many projects cross multiple states, how can states collaborate more effectively?**
- 5 How can existing federal credit programs support infrastructure investment?**

The award-winning Ohio River Bridges project – one of the Infrastructure 100 projects – addresses several of these questions. It involves both Ohio and Indiana authorities working closely together, with each state effectively responsible for one

of the two major river crossings. Although each bridge has a different funding mechanism (one is a PPP and the other a tax-exempt, bond-funded, design-build model), both are tolled, with the proceeds split 50:50, offering a unique solution to a major bi-state priority project.

Separately, in Pennsylvania, 556 bridges are being bundled into one large project with a 42-month delivery deadline, leveraging private innovation to address that state's backlog of outdated and deficient bridges.

Currently, just five US states account for around two-thirds of all transport PPPs, so one imperative is to broadcast the benefits of greater private sector involvement. Build America hopes to create more uniformity of approach and spread best practices, helping to cut through the mass of varying rules and policies across the 50 states.

Overseas investors are showing an interest, in the form of Canadian pension funds and strategic investors from France, Spain and other countries. Meanwhile, many tax-exempt bondholders are foreign corporations and private investors. If this fragmented market achieves greater convergence, we can expect further waves of domestic and international capital keen to back the resurgence of US infrastructure.

centrally, 20 to 30 percent from local governments, and the remainder from Chinese commercial banks and loans from China Development Bank, the Agricultural Development Bank of China and the Export-Import Bank of China. These institutions offer low debt rates to domestic developers that local financiers, let alone international ones, struggle to compete with. The equity markets have more of a public/private mix but are still heavily influenced by state institutions. This thins the pool of available capital and restricts some foreign firms from competing on a level playing field.

Currency is another challenge for foreign developers. The cost of capital for US dollars, preferred by many international investors, is often more expensive than borrowing in the local currency. This exposes the sponsor to a foreign exchange risk if they borrow in US dollars, but generates project revenue in the local currency.

The US isn't as challenging a market from a currency perspective, but it is nonetheless still a difficult market for private debt to compete in. The US has traditionally financed public infrastructure through municipal bond markets. When municipal credit ratings or tax budgets are stressed, alternative financing structures are available but rely heavily on public support such as the Transportation Investment Generating Economic Recovery (TIGER) program, or tax-exempt debt such as Private Activity Bonds (PABs) and Transportation Infrastructure Finance and Innovation Act (TIFIA) loans.

At the same time, there is growing interest in developing secondary markets for infrastructure investment, to recycle capital to fund new capacity, asset replacements, upgrades and refurbishments.

Foreign investors often face many political and regulatory hurdles in economic powerhouses. In 2006, United Arab

"If economic powerhouses truly want to attract global capital and expertise, they must ease off their protectionism"

Emirates-based global port operator DP World was forced to sell its American assets amid US fears over national security. In 2013, BP finally ended its profitable but politically difficult 50 percent stake in Russian oil producer TNK-BP, which was acquired by state-owned Rosneft. Outside ownership of infrastructure is also severely restricted in China, where companies are not permitted to have a controlling interest in the construction or operation of rail networks or passenger services. In Brazil, state-controlled BNDES provides the bulk of long-term financing for





infrastructure, but only lends to foreign companies with headquarters and administration in the country. These are unnecessary barriers restricting competitive international infrastructure investment. If economic powerhouses truly want to leverage their strength and create a cost-effective environment to attract global capital and expertise, they must ease off or abandon such protectionism.

Other challenges foreign investors may face include complicated ownership laws and a drawn-out legal process that makes

the cost of buying and developing land and real estate prohibitively expensive. Taxes – new or retrospective – can also have an impact. Vodafone has been contesting a US\$2.6 billion capital gains tax that the Indian government has tried to levy on the 2007 acquisition of the Indian mobile phone assets of Hutchison Whampoa. These actions can have a polarizing effect on international capital at a time when governments need to be welcoming inbound investment.

Some economic powerhouses are seeking to attract foreign capital, welcoming support

from international financial institutions, development banks and national export-import banks. Others have an outbound focus and recognize that infrastructure finance is needed at a regional level to support cross-border infrastructure efforts. China's finance ministry is behind the Asian Infrastructure Investment Bank, with capital of US\$50 billion paid for by member states. The new bank is regarded as a rival for the IMF, the World Bank, and the Asian Development Bank (ADB). The BRIC countries have also recently announced the creation of a new BRIC development bank.

In the Americas, the US has a long history of financially backing institutions such as the Inter-American Development Bank to support regional investment, but Brazil's direct efforts in this space are far more nascent. In a bid to boost regional development beyond its borders, BNDES set up an office in Uruguay in 2009. Its global outreach program aims to champion Brazilian conglomerates that expand the country's clout abroad, with major construction and extractive firms making significant inroads into Africa.

Prospects for public-private partnerships (PPPs)

The shift towards private ownership of public



assets and consumers paying directly for usage could herald an increase in PPPs and concession contracts. Utilities providing telecommunications, power and water are opening up to private investment in some countries in this group, with foreign capital likely to play a bigger role over time. The technical and financial complexity of mega projects can also benefit from private sector participation to reduce the inherent risks.

Severe public sector financial constraints are likely to accelerate the trend. Various states in the US have established PPP enabling legislation, as the country starts to adopt this form of financing beyond transportation projects. India has a growing PPP program which has been rejuvenated under the Modi government. Russia's PPP program is at a less developed stage but is gathering pace. Even China – which has the least developed PPP market of the countries in this group – is also considering how to embrace the model to improve the efficiency of its project financing.

Governments and supporters must be armed with facts to educate the public on the pros and cons of using PPPs. Standardized contracts, clear performance standards, robust contractor management and better communication are a few things that are needed to achieve a consistent and successful approach to PPPs. This requires



skilled professionals in the public sector with the flexibility to lead non-traditional procurement and project implementation. These skills exist, but they are not consistent across all public departments. The judges said a widening pay gap between public and private sector employees potentially impacts the attractiveness of working in the public sector, which is a growing concern and barrier to more efficient procurement.

Public authorities in the US are leading an innovative project that may one day provide

an effective case study for comparing PPP to traditional procurement. The **Ohio River Bridges Project** aims to increase cross-river mobility by improving safety, alleviating traffic congestion and connecting highways. Two new bridges will be built, along with significant highway and ramp reconstruction. The US\$2.3 billion project involves the largest PPP Public Activity Bond offering completed in the US municipal market, and should provide a major economic stimulus to the Louisville-southern Indiana region.

The novel arrangement involves two similar infrastructure assets built concurrently and funded by different financing structures. The Indiana-led Downtown Crossing project is being delivered through a design-build PPP, where the contractor finances the bridge's construction and operates it on a 35-year concession. Neighboring Kentucky, on the other hand, is financing the East End Bridge using conventional bonds backed by toll revenue, plus funds from a federal infrastructure loan program.

Russia's first true high-speed railway is also its first major rail infrastructure PPP. Scheduled for completion before the 2018 FIFA World Cup begins, the US\$43 billion **Moscow-Kazan High Speed Rail** line will enable passengers to travel the 770 kilometer route in around 3.5 hours. The project combines both government and investments funds, and at the time of writing, at least one Chinese investor had expressed an interest.

In Brazil's largest ever sanitation sector PPP, the US\$2.28 billion **Recife Metropolitan Region Sewage Treatment Project** involves 15 cities, serving 3.7 million inhabitants. The state government aims to provide 90 percent of its urban population with effective waste disposal, with the collection and treatment of sewage via a public-private partnership with a private consortium led by the Brazilian conglomerate Odebrecht.

Look before you leap

Gary Webster Head Capital Project Leadership Practice, Global Infrastructure Advisory, KPMG

In recent years, investors' expectations of transparency and reporting have risen sharply, following some very costly project delays and big overruns, particularly in the mining and energy sectors. The challenge for the economic powerhouses is to build confidence in their ability to plan and deliver well-managed infrastructure projects.

More and more mega-projects contain both public and private capital, and one of the key objectives is to build sufficient private financing to achieve a proper transfer of risk, as a buffer against potential problems. There are too many instances of owners jumping into capital projects without sufficient forethought about operations integration, lifecycle maintenance optimization, environmental and stakeholder management, and political and regulatory risks, any of which can come

back to bite at a later date. A rigorous assessment is, therefore, critical, to ensure every outcome is covered before contract negotiations begin and then managed throughout a project's life.

Key personnel and even governments can change during a project's lifetime, and strong governance and owner-dictated reporting will help protect against such disruptions and keep the initial objectives front of mind. Often these strategic issues are missed as a result of combining bigger, more complex programs which cause program managers to focus more on day to day project issues, and there is a lack of experienced managers.

There may be those who think the old model will work. It may, and we wish them the best of luck. Given the scale and complexity of today's projects and development environment, we believe the prudent course of action involves a much deeper approach to risk analysis and a more holistic view of implementation.

Connectivity breeds success

With the exception of the US, the chosen projects in this section are all helping to drive these economies to the next stage of development, and reflect the shifting global balance of power from West to East. Logistics figure large, as road, rail and ports help to establish connected societies that enable efficient supply chains for raw materials, food and finished goods, and create employment opportunities. In Brazil, China and India, a large proportion of jobs exist close to the coast, and governments need to enfranchise those living in other parts of the country, in order to maintain their legitimacy and ensure that each region is treated fairly.

Commensurate with the size of the economies, projects tend to be on a large scale, with hugely ambitious efforts that are really changing the face of the nation – particularly in China. Many of the world's mega cities can be found in the economic powerhouses, and there is a big focus on fixing and regenerating old cities (in the case of the US and India) and building or extending newer ones in the other countries. Investment in energy, transit, and especially water will make these conurbations more livable and give them the capability to

become powerful engines of growth. Such advances are also essential to meet the demands of, at one extreme, the young and restless, and at the other, the growing, affluent middle classes, which in Brazil now make up over half of the population.

Technology releases the potential for truly intelligent cities that can adapt to climate change and become low or zero carbon. Despite some steps in the right direction, the jury is still out on these countries' full commitment to sustainability.

Key takeaways

- 1 The public purse cannot provide the finance for mega projects on its own**
- 2 Natural resources, especially water, are precious and must be efficiently managed on a sustainable basis**
- 3 Renewing old cities and facilities is as important as creating new ones**
- 4 If the economic powerhouses are to realize their true potential, they must ease their protectionism**

“Investment in energy, transit, and water will give big cities the capability to become powerful engines of growth”





*Bangladesh
Dialysis Project*



Bouregreg Valley Development Project



*Buenos Aires Bus
Rapid Transit Corridors*



*Hak Se Mill Biomass
Gasification Project*



*Hôpital Universitaire
De Mirebalais*



Jinja Bridge



*Jomo Kenyatta
International Airport*



*Kathmandu-Kulekhani-Hetauda
Tunnel Highway*



*Kudu Gas Field
And CCGT Project*



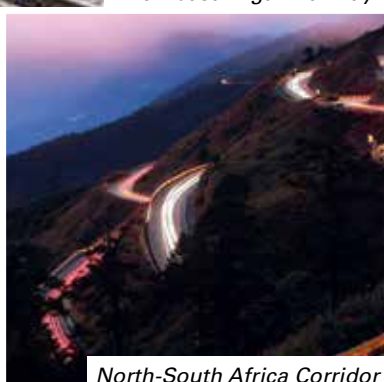
Mombasa-Kigali Railway



*Montevideo
Sanitation Project*



New Silk Road



North-South Africa Corridor



*Oyu Tolgoi
Copper Ore Mine*



Project KivuWatt



TAPI Gas Pipeline





Haiti Temporary Wastewater Treatment Facility



Los Cocos And Quilvio Cabrera Wind Farms



Myanmar Communications Network



Trans-Saharan Natural Gas Project

EMERGING MARKETS

Creating a credible national infrastructure plan would help these countries prioritize the right projects, drive economic growth and encourage private finance to help them fulfill their potential

Markets

<i>Afghanistan</i>	<i>Darussalam</i>	<i>Ghana</i>	<i>Mongolia</i>	<i>Syria</i>
<i>Algeria</i>	<i>Dominican Republic</i>	<i>Guatemala</i>	<i>Morocco</i>	<i>Tajikistan</i>
<i>Angola</i>	<i>Cambodia</i>	<i>Guyana</i>	<i>Myanmar</i>	<i>Turkmenistan</i>
<i>Argentina</i>	<i>Congo</i>	<i>Haiti</i>	<i>Namibia</i>	<i>Uganda</i>
<i>Armenia</i>	<i>Costa Rica</i>	<i>Iran</i>	<i>Nepal</i>	<i>Ukraine</i>
<i>Azerbaijan</i>	<i>Dem Rep of Timor-Leste</i>	<i>Iraq</i>	<i>Nicaragua</i>	<i>Uzbekistan</i>
<i>Bangladesh</i>	<i>Ecuador</i>	<i>Kazakhstan</i>	<i>Nigeria</i>	<i>Uruguay</i>
<i>Belarus</i>	<i>El Salvador</i>	<i>Kenya</i>	<i>Papua New Guinea</i>	<i>Venezuela</i>
<i>Belize</i>	<i>Egypt</i>	<i>Kyrgyzstan</i>	<i>Paraguay</i>	<i>Vietnam</i>
<i>Bhutan</i>	<i>Ethiopia</i>	<i>Laos</i>	<i>Rwanda</i>	<i>Yemen</i>
<i>Bolivia</i>	<i>Georgia</i>	<i>Lebanon</i>	<i>Sri Lanka</i>	
<i>Botswana</i>		<i>Maldives</i>	<i>Suriname</i>	
<i>Brunei</i>		<i>Moldova</i>		



Balancing potential against risks

Together these countries represent an exciting frontier for private finance in infrastructure. However, a combination of lack of funds, inadequate planning, and unstable political and ecological environments have often limited the flow of projects that could attract private money.

Public-private partnerships (PPPs) are in their infancy and usually dominated by domestic providers with a strong understanding of and links with local authorities, businesses and regulators. Most foreign direct investment goes into extracting natural resources such as coal, ore, oil and gas.

Emerging vs. established

The different systems of infrastructure deployed around the world are all similar in terms of the services they offer a society – water, power, healthcare, transport, and so on. What varies from country to country are the quality of services, private or public ownership, technology and the cost of developing, delivering and maintaining the underpinning infrastructure. The countries in this chapter are frontier markets for private investment in infrastructure, and those with perhaps the greatest untapped potential.

Many nations in this group have sizeable, young and growing populations and rapid urbanization. Energy and infrastructure are the building blocks for the strong middle class necessary to drive economic growth, yet, with a modest tax base, governments will have to prioritize projects carefully. This requires a credible national infrastructure plan and funding sources to back it – which most of these countries desperately lack.

Sources of private finance in these countries are largely domestic providers who have clear advantages in understanding local issues and regulation. Some countries in this group may simply not have the economic scale to attract international investment while others may face political hurdles that limit access to foreign private capital. These countries have less experience with PPPs, and typically lack the political structures and institutional frameworks needed to attract international private finance in infrastructure. One thing potentially separating the more advanced of these countries from those in the smaller established markets chapter is execution and having a track record for delivering projects with private investment.

Breaking the barriers that constrain growth

Argentina remains, frustratingly, an emerging market for infrastructure despite its rich history, educated populace and sophisticated cities. Any visitor to the capital **Buenos Aires** cannot fail to notice the traffic congestion, particularly on the city-centre, kilometer-long 9 de Julio Avenue, often called “the widest avenue in the world” with up to 18 lanes of car traffic. Our independent judging panel of industry experts said congestion makes cities less efficient, worsens the local environment and restricts growth. Thanks to innovative new **Bus Rapid Transit Corridors**, journey times on key routes in Buenos Aires have been cut by as much as 50 percent. By the end of 2015 there will be 56 kilometers of dedicated BRT lines connecting the main transport hubs in the city, benefiting 1.2 million people at a cost of just US\$25 million. The city subsequently received a Sustainable Transport Award for 2014 from the Institute for Transportation & Development Policy.



Congestion also impacts regions. As only the second crossing over the Victoria Nile in Uganda, the new **Jinja Bridge** will add critical capacity through an important economic corridor. The river creates a trade bottleneck in this landlocked African nation along the shores of Lake Victoria. The current crossing links the capital Kampala with the country's regions east of the Nile along the Kenya border. The new 525 meter-long, cable-stayed bridge is budgeted at US\$125 million, with the Japanese government financing 80 percent of the cost via a soft loan. A digital monitoring system will track stresses and strains to the bridge, to highlight any maintenance requirements.

Across the border, those arriving by air in Kenya frequently complain about dilapidated facilities restricting the country's growth potential. Our judges noted that airports are typically the initial point of contact between business travelers and any new country they might invest in. First impressions highlight real concerns. Poor infrastructure impacts export costs and could make Kenya's products uncompetitive in the global market. The new **Jomo Kenyatta Airport Terminal** is part of a wider series of infrastructure investments and upgrades designed to address such shortcomings. Costing US\$654 million and with capacity for 20 million



“Buenos Aires’ Rapid Transit Corridors will cut congestion and benefit 1.2 million people at a cost of just US\$25 million”

even threaten the viability of business plans. Large PPP transactions in emerging markets are complex and difficult to deliver.

The first step in creating a healthy environment for partnership is identifying the correct roles for the public and the private sector. This may vary from country to country depending on the regulatory environment as well as local resources. One of the main barriers to progress is the dearth of public sector talent in engineering, IT, purchasing, project management and planning. Projects can easily get stuck in the development pipeline if governments lack the skills and expertise to prepare them for the private sector market.

One notable challenge is that skilled workers in these areas have chosen higher-paying jobs in the private sector. They have also taken their skills abroad

to access a wider pool of global opportunities. As a result many of the projects that have been successful or are progressing are those where the development has been led or supported by the private sector. However, the government’s role remains critical. The key to a project’s overall success is defining the public and private sector roles and ensuring that both sides have access to the correct expertise.

Sustainability has also become a major consideration, as national and local governments seek to preserve the habitat and lives of rural or remote dwellers and minimize pollution. Developers have to work harder to earn a social license to operate, while governments are under pressure to prove that its country’s resources are truly benefiting its people.

passengers a year, the project is being financed largely with Chinese money.

Regeneration is an important part of breaking barriers to growth, and the **Bouregreg Valley Development Project** in northwest Africa is a strong example of redevelopment designed to impact the wider region. Cut into the banks of the Bouregreg River between the cities of Rabat and Salé in Morocco, the project is an impressively designed, large urban regeneration and development project featuring a port and marina, as well as residential, commercial, cultural and leisure spaces. The site will address growth constraints yet remain in harmony with local monuments such as a 12th-century fortress. The project is estimated at US\$1 billion and brings together five sovereign wealth funds and international financial institutions (IFIs) to finance it.

Underdeveloped private finance sectors

Few if any of these markets can boast well thought out, long-term infrastructure strategies for supporting private finance, or established frameworks for procurement and contracting. Without a coordinated policy, new laws and rulings are constantly emerging, which is unsettling to private sector developers and investors and can

Clearing muddy waters

Klaus Findt

Chief Operating Officer, Infrastructure, Africa, KPMG in South Africa

Given the limited track record of infrastructure projects in many emerging countries, investors are right to show caution. Faced with underdeveloped regulations and incomplete capital markets, limited budgets and a lack of political continuity, the risks of a 20-plus year investment are all too apparent.

Fast-growth sectors such as telecommunications are often a more reliable option, as initial capital expenditure is lower and the payback period is shorter. On the other hand, mining and energy investments are highly dependent upon good offtake agreements for future purchases of the extracted materials, to assure a strong revenue stream.

It is a similar story for freight rail developments, where a pit-to-port line with proper long-term arrangements

should give greater certainty of a return. Passenger or multi-purpose rail construction carries a much greater risk, as most fares are highly discounted, which can leave a funding gap that must be addressed by government.

Highway infrastructure, on the other hand, tends to have a faster payback than rail, but the limited potential for tolling means governments will have to look at alternatives such as petrol levies or vehicle tax to repay the debt.

In high growth markets, circumstances can change quickly, so investors should try, where possible, to create flexible contracts. Ultimately, any capital is subject to the winds of political change, and factors such as resource nationalism must be considered ahead of any investment decision.

If the great potential of many of these developing markets is to be realized, the answer will be found in political stability, multi-lateral support and identifiable and durable revenue streams. Not an easy task.



Pioneering PPPs



Kathmandu-Kulekhani-Hetauda Tunnel Highway

Labelled as a '4P' (private, public, partnership and people), the Kathmandu-Kulekhani-Hetauda Tunnel Highway will be a milestone for Nepal if it goes ahead with a build, operate, own and transfer model. The Nepal Purbadhar Bikas Company Limited was set up as the country's first infrastructure development organization to build it. At a cost of US\$354 million, the 58 km road and tunnel will cut across the challenging Himalayan terrain to dramatically cut travel times, reduce vehicle fuel and maintenance expenses, boost business and improve citizens' lives.



Kidney Dialysis Centers

Bangladesh is launching its first healthcare PPP: two dialysis centers in the cities of Dhaka and Chittagong at a cost of US\$1.8 million. The private sector will procure and erect equipment within existing state-owned healthcare facilities, and employ all staff (except doctors). The new units should bring affordable care to two regions of a country with an estimated 20 million kidney patients. The government is keen to implement a nationwide program of PPPs across the health sector, and has pledged to legally protect investments of private parties.

One example of the private sector leading a major infrastructure development is Rio Tinto's role in the US\$6.6 billion expansion of the **Oyu Tolgoi copper ore mine** in Mongolia. The global mining company is responsible for both the project's day-to-day management and development over the mid-term, and through its 51 percent stake in Turquoise Hill Resources (which in turn owns 66 percent of the mine) has a majority interest. The Mongolian Government controls the resource, but needs international expertise to monetize the asset for the benefit of the nation. The economic uplift from Oyu Tolgoi could account for up to one third of the country's total GDP by 2020. The judges said the project had the potential to open up the country to even greater foreign investment, and all the many benefits that would be associated.

Myanmar remains one of the last untapped telecommunications markets in Asia, and the country's new **communications network** is considered vital to economic revitalization. From a low base, mobile phone penetration among the 62 million-strong population is expected to surge to around 75 percent by 2015 to 2016. Built by an international consortium of NEC, NTT Communications and Sumitomo, the network will improve internet connectivity for three main cities, using state-of-the-art technology that surpasses many developed countries. The independent Japan International Cooperation Agency provided US\$17 million in aid to assist the program, as part of an economic cooperation policy between the two nations.

If built, the US\$20 billion **Trans-Saharan Natural Gas project** will be one of the world's most expensive energy export programs. Providing a critical link between resource-rich areas in Africa and attractive markets in Western Europe, the pipeline would help Europe diversify supply by transporting natural gas from Nigeria, through Niger to Algeria and then northwards to Spain and Europe. The Nigerian National Petroleum Corporation (NNPC) and Sonatrach of Algeria will hold 90 percent shares of the equity of the project, with the national oil company of Niger taking the remaining 10 percent.

However, the project might benefit from having an additional international partner with cross-border pipeline experience. Gazprom wisely decided to partner with several European energy companies to deliver the twin Nord Stream gas pipelines between Russia and Germany via the Baltic Sea. While this arrangement provided some additional financial support, it had a greater benefit securing international expertise and political consensus through the impacting jurisdictions.



Another transformational energy development is Namibia's **Kudu Gas Field and Combined Cycle Gas Turbine (CCGT) Project**, which is due to open by 2018. The country's first large-scale power plant seeks to exploit domestic resources by developing the offshore Kudu field's estimated 1.3 trillion cubic feet of gas. The 800 MW power plant will add much needed domestic generation capacity to limit imports and tackle a widening energy deficit. Gas will be delivered through a 170 kilometer pipeline, enabling Namibia to become a net exporter of energy and reduce its dependence upon



South Africa. National power utility Nampower selected China's Shanghai Electric as preferred bidder to finance 49 percent of the US\$1.1 billion project as well as provide international expertise.

Multilaterals are paving the way

Not all the emerging countries for private finance in infrastructure are poor by any means. Iran and Venezuela have the world's 21st and 30th largest GDPs respectively. The richer countries in this list either have no need for private and foreign direct investment in infrastructure, or they actively restrict it. However, most countries in this category have a relatively small public pot from which to fund infrastructure projects, and they rely heavily on support from multilateral finance groups during both the development and implementation phases.

Development banks, export-import banks and other international financial institutions (IFIs) such as the Multilateral Investment Guarantee Agency in the World Bank Group have significant influence with governments and foreign investors. They provide transparency and international support to mitigate political risks and resolve fairly any

Building blocks for a new Asia

Roddy Adams

Partner, KPMG in Singapore
Head of ASPAC Infrastructure Markets

Export credit agencies (ECAs) play an important role, both as sources of finance and as intermediaries through which to channel financing into their domestic markets. Asian ECAs have taken the lead in recent years, by assembling a full suite of stakeholders for infrastructure projects, including contractors and equipment suppliers.

Despite frenetic activity in many of Asia's emerging markets, infrastructure development has been relatively slow. In response, the Asian Development Bank (ADB), a multilateral institution providing financing in the region, has started to focus on building frameworks for project delivery within government, and prioritizing projects that can best support economic growth.

Countries like Vietnam have dozens of state-owned companies that qualify for ADB support, yet these are typically over-staffed and inefficient. Following a number of poorly delivered projects, the ADB is seeking to improve program and project management, creating better feasibility studies and business cases, managing performance more tightly, and educating governments to choose the best engineering and construction partners, rather than the cheapest. ADB's proposed Asian Project Preparation Facility (APPF) should help.

Consumers in less wealthy countries may not be able to afford the price of electricity or toll roads, which leaves a gap in funding that can only be filled by large government subsidies or additional financing by ECAs and/or development banks. If these bodies are unwilling to make such commitments, infrastructure progress could stall.

“Trade corridors support regional stability, and having suitable infrastructure makes it easier to export goods and resources”

issues that may come up. But multilateral organizations do not just provide finance or manage issues like currency risks: they also bring much-needed knowledge and discipline to increase budgetary and project efficiency, minimize corruption and manage environmental and social impacts. They can also help address the aforementioned skills gap, by establishing centers of excellence or technical training institutes. More recently, some have set up specific Project Preparation Facilities which are designed to help fund development costs on a semi-commercial basis, with the reimbursement of project preparation costs borne by the winning concessionaire upon successful financial close.

IFIs are essential for collaboration across international borders. The judges noted how trade corridors support regional stability, and having suitable infrastructure in place makes it cheaper for countries to export goods and resources to international markets.

For example, the US\$11 billion **North-South Africa Corridor** is an ambitious attempt to connect eight African countries with more than 10,000 kilometers of roads. Stretching from South Africa to Zambia and the Democratic Republic of Congo, and from Botswana to Malawi, the route will boost cross-border trade and tourism. Bidding for tenders started in mid-2014, with the overall project run by a ‘tripartite’ of the Common Market for Eastern and Southern Africa, the East African Community and the Southern African Development Community. Funding is likely to come from a wide variety of development partners including national governments and the World Bank.

An equally bold but as yet unrealized dream is the **New Silk Road** from China to Western Europe via Kazakhstan and Russia. Over 8,400 kilometers long and costing an estimated US\$7 billion, this new economic corridor aims to open up new trade opportunities to encourage regional stability. The concept is particularly important to China and Russia, according to our judges. Multilateral institutions already have a stake in different sections of this project, with some considering the added value of integrating other types of infrastructure

(such as solar energy) into a broader Silk Road Economic Belt.

Africa’s landlocked countries have poor infrastructure and struggle to reach global markets, paying up to 84 percent more to export their goods than a coastal country. The 2,935 kilometer **Mombasa-Kigali Railway** will link the port of Mombasa in Kenya with Tanzania and landlocked Rwanda and South Sudan, helping transport coffee, tea, other agricultural products, minerals, and machinery. Costing US\$13.5 billion, the line is to be built in sections by different Chinese engineering and construction companies, with loans provided by, among others, China’s Exim Bank, and paid for by public funds from the countries involved.

Around 33 billion cubic meters of gas per year are expected to be pumped from Turkmenistan to Afghanistan, Pakistan and India through the 1,735 kilometer **TAPI Gas Pipeline**, due to be completed by August 2017. The judges agreed that the US\$7.9 billion link, nicknamed ‘the peace pipeline,’ could establish stronger political and economic ties between traditionally uneasy neighbors. Project security remains a concern after the 2014 withdrawal of US forces from Afghanistan. Transaction advisor Asian Development Bank is building a consortium that would build and operate the line.

Expect the unexpected

Egypt offers a good example of both the promise and the danger of investing in emerging market infrastructure. By 2009, after several years of economic reforms, the country’s first ever PPP was awarded to an Egyptian-Spanish consortium in the form of a 20-year concession for the New Cairo Wastewater Treatment Facility. Little more than two years later, other PPP initiatives had stalled in the wake of Egypt’s 2011 revolution.

For every success story about a country that has rebounded from conflict to attract new investment, there is a Syria or Ukraine – once stable economies that have descended into social and economic chaos. Infrastructure investors are in it for the long-term, and seek political stability and assurances against resource nationalism and







corruption. Argentina is just one of many states that have caused disruption by nationalizing industry or changing regulations and taxes, impacting the returns for overseas companies in the energy sector. Frequent changes of government policy can be unsettling, but a strong base of institutional civil servants can give more consistency through different administrations.

Those countries making progress are leveraging international expertise to deliver better, more comprehensive services. A good example is sanitation, which is still a critical issue for much of the developing world. Uruguay's **Montevideo Sanitation Project** will extend the sewer system to 100 percent of the population by 2015, allowing the city to clean up its most popular beaches, and reduce contamination of rivers. Financed with support from the Inter-American Development Bank, the US\$280 million program has benefited from a long-term institutional and political framework, which can cope with any changes in government.

Climate change has increased the threat of natural disasters. Resilience plans must ensure that infrastructure is durable enough to withstand catastrophes. "Haiti's infrastructure was among the world's worst in the best of times," the country's former ambassador to the US, Raymond Alcide Joseph, told CNN following an earthquake that killed tens of thousands in 2010.

That disaster resulted in **Haiti's Temporary Wastewater Facility**, a project designed to prevent the spread of cholera in a camp of 9,000 people displaced by the earthquake.

Judges were impressed by the reaction time. Built in just three months and funded

by the Spanish Agency for International Development, the treatment plant played a critical role on a site that had suffered a daily death rate of 50. The facility has a 10-year lifespan, and requires minimal technical knowledge to maintain.

Also in Haiti, the **Hôpital Universitaire de Mirebalais** is the world's largest solar-powered hospital, designed to withstand environmental disasters. With 1,800 solar panels, the building is immune to the country's frequent power cuts, and on very sunny days can produce a surplus that will boost the flailing national grid. The hospital is equipped with the latest technology, including virtual teaching facilities. Private funding for this PPP came from donors such as the American Red Cross, the GE Foundation and Artists for Haiti, with US-based international aid organization Partners in Health leading the project.

In Africa, one power-based infrastructure project was designed to avert catastrophe, not react to it. Lake Kivu is probably Rwanda's greatest natural resource but also its biggest liability, as it can spontaneously erupt carbon dioxide and methane, with disastrous effects on the local environment.

KivuWatt is a unique new 100 MW power plant on the lake shore, which extracts the methane to generate electricity. At US\$92 million, this is Rwanda's first independent power project and largest single private investment, with financing arranged by the Emerging Africa Infrastructure Fund, African Development Bank, Netherlands Development Finance Company, BIO (the Belgian Investment Company for Developing Countries), and Belgian Development Bank.



Innovation in renewables



Hak Se Mill Biomass Gasification

Only 50 percent of rural villages have access to electricity in Cambodia, where tariffs are among the highest in the world. Hak Se Mill Biomass Gasification is the country's first integrated biomass solution, producing renewable power by converting rice husks into biogas. This US\$10 million project should encourage further private sector investments in renewables and more affordable power resources to aid economic growth.



Los Cocos and Quilvio Cabrera Wind Farms

The Dominican Republic's Los Cocos and Quilvio Cabrera Wind Farms will be the first such facilities in the entire Caribbean region. For an investment of US\$100 million, the farms will cut the country's imports of oil by 700,000 barrels a year at a saving of US\$20 million, as well as reducing CO₂ emissions by 1,700 tonnes.

Managing expectations

In relation to the size of these economies, some of the projects in this section are incredibly ambitious. On the plus side, this gives them a potentially transformative power; conversely, such scale also highlights the risk of failure. Cities, transport, and oil and gas pipelines dominate the discussion, as countries strive to put in place the building blocks for growth. Technology is another huge enabler. A country like Myanmar can leap directly to a wireless-driven society faster even than a more mature market, empowering business and e-commerce.

Multilateral agencies and export credit agencies have a vital role to play, but should become more hands-on. Rather than providing capital as a form of aid, they need to evolve towards behaving like more traditional financial institutions, by setting stricter conditions and milestones, instilling more commercial principles into projects they support, and being prepared to withdraw support from underperforming projects. Such 'tough love' will raise the standard of project execution and ultimately benefit the receiving nations.

Governments, on the other hand, have to up their game in terms of procurement and transparency, to bring the kind of discipline

and professionalism that international investors expect and appreciate. Political risk is never too far away, and regimes that can ring-fence infrastructure from changes of government have a better chance of sustained growth.

Although some of the more aspirational projects may not see the light of day, another group of micro-projects, with very modest price tags, could bring exceptional value, and show the benefits of pragmatism.

Key takeaways

- 1 Energy and infrastructure are the building blocks to create the strong middle class needed to drive growth**
- 2 Poor infrastructure impacts export costs and makes products uncompetitive in the global market**
- 3 Defining roles for public and private is about finding the right balance**
- 4 Countries making most progress are leveraging international experience**

“Cities, transport, and oil and gas pipelines dominate discussions, as countries try to put in place the building blocks for growth”





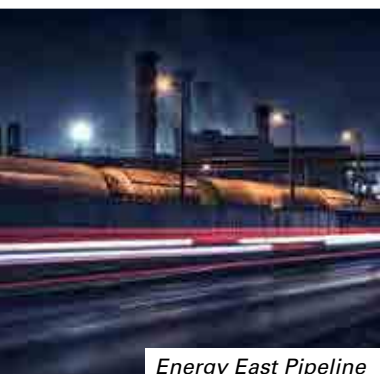
Alder Hey
Children's Health Park



Darling Harbour Live



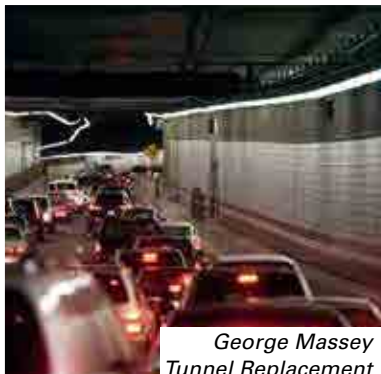
Edmonton Valley
Line Light Rail



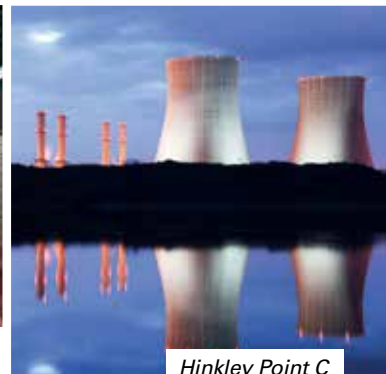
Energy East Pipeline



Garden Bridge



George Massey
Tunnel Replacement



Hinkley Point C



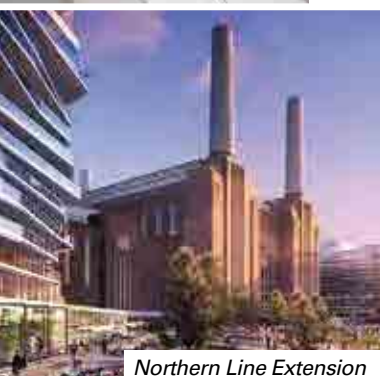
HS2



King's Cross Redevelopment



Legacy Way Tunnel



Northern Line Extension



North West Rail Link



Northern Gateway
Pipeline



Priority School
Building Programme



Queensferry Crossing



Ring Of Fire Mining Project



Site C Clean Energy



A1 'Autostrada' Highway



Tunneling & Underground
Construction Academy



WestConnex



Eglinton Crosstown



*Liefkenshoek
Railway*



Perth Wave Energy



*Southern SeaWater
Desalination Plant Project*



Westmill Solar Park

MATURE INTERNATIONAL MARKETS

Many impressive projects designed to boost economic development are in the pipeline, but access to finance and key skills will determine whether the momentum is maintained

Markets

*Australia
Austria
Belgium*

*Canada
France
Germany*

*Ireland
Italy
Netherlands*

*Portugal
Spain
United Kingdom*



Will infrastructure remain at the forefront of public policy discussions?

These markets recognize the importance of infrastructure as an economic stimulus, and have enjoyed significant international private investment in a diverse range of energy and infrastructure projects, including transport, social infrastructure, water, power and telecommunications. New infrastructure is typically of high quality with a

strong private sector track record for delivering projects on time and on budget.

Green infrastructure is also on the rise, with Germany and Spain proven leaders in the clean technology that mitigates the effects of climate change. There is considerable potential to export such expertise to other nations.



European Green Capital

Kru Desai Head of Government and Infrastructure, KPMG in the UK

The UK city of Bristol has been named European Green Capital 2015 in recognition of its environmental achievements and future commitments. Throughout the year, Bristol will hold a series of seminars, exhibitions and summits that can inspire other cities to take similar action.

With US\$240 million invested in energy efficiency and US\$650 million in improvements to transport, Bristol is committed to change behavior in order to make the city more livable and improve air quality.

As Green Capital, the city will showcase its resilience and infrastructure planning, renewable energy, recycling and waste reduction strategies, with a strong emphasis on good planning and project management. The involvement of communities and business is paramount to generate support and reduce the reliance on government, by attracting private infrastructure investment. We think the city will succeed if it is able to convince the public and businesses of the benefits, so people can see both the short-term 'micro' benefits along with the longer-term environmental returns.

A challenging market for private finance

Canada, Australia and the UK are at the global forefront of public-private partnerships (PPPs) and privatization, with well-developed policies and regulatory frameworks. Although infrastructure remains a high priority in these countries, the pipeline for new infrastructure projects – and PPPs in particular – in Europe may have peaked following a decade of strong investment.

Despite a pressing need for maintenance and new infrastructure builds, weak economic growth and falling productivity restrict development. With fewer near-term openings for greenfield projects, the stable Eurozone economies should offer a number of brownfield options.

There are small signs of recovery in some of the more stressed markets such as Spain, Italy and Ireland. For example, the Irish National Development Finance Agency and the Department of Justice and Equality recently shortlisted four consortia for seven courthouses under a single PPP.

Investors are generally attracted by healthy flows of projects (as opposed to one-off projects) and a strong political commitment. Canada is seen as a standard bearer for good practice, with dedicated provincial infrastructure units, ongoing conversations in government, efficient and punctual procurement, and a frequent and controlled flow of assets into the market. Opportunities from Australia, by contrast, have been more cyclical but are currently on the rise, with more funds available from the

Zero carbon cities: fact or fantasy?

Alan Mitchell Executive Director, Cities Global Center of Excellence, KPMG in Canada

Munich aims to be zero carbon by 2058 and many other cities around the world share similar goals. As local governments embrace this huge task, they need to tackle the big energy users: buildings, waterworks and private transport.

Most offices, factories, retail units and housing are privately owned, either by individuals or real estate and facilities management groups, and only legislation can force upgrades in insulation, low-energy lighting, heating, elevators and escalators. Older properties are a particular challenge, as renovation costs are far higher, and subsidies may be needed.

We think these older buildings can be brought up to standard with 'micro' incentives targeting individual decision makers that will lure private sector firms to innovate and transform their buildings in order to allow society to achieve the much broader 'macro' goals.

There are already moves to encourage the use of energy-efficient domestic appliances, which also calls for coordination with manufacturers. The EU has legislated on the maximum power of hairdryers and vacuum cleaners, while technology such as smart water meters may also help to change behavior.

Mass transportation, at capacity, consumes far less energy per person than automobile journeys, and many cities – such as Edmonton in Canada, featured later in this section – are

pursuing rail and bus schemes. London's ambitious SkyCycle initiative (another Infrastructure 100 project) envisions masses of cyclists navigating the city on elevated cycle paths. These and other policies call for strong political will and considerable coordination between city, regional and national authorities, citizens' groups and the private sector.

Few civic officials would disagree with the premise that sound land use/master plans coupled with leadership commitment will result in success. Therein lies the problem, as many cities struggle to decide on a long-term vision for how they should transform themselves and make the commitment to achieving their goals. Strong, courageous leaders are required if the promise of tomorrow is to be realized.



Looking further afield

Craig Walter, Partner, Infrastructure and Transaction Services, KPMG in Canada

Institutional investors such as pension funds, sovereign wealth funds, large insurance companies and investment management companies are allocating an increasingly large proportion of their portfolios towards infrastructure. With limited opportunities in the core markets of UK, Canada and Australia, and concern over the 'tainted' Eurozone nations of Italy, Ireland, Portugal, and Spain, returns have fallen due to intense competition.

The more seasoned investors are now better able to understand the risks within

infrastructure and are confident enough to back projects in emerging countries such as Colombia, Peru, Mexico, Brazil, Turkey, Indonesia, the Philippines, and South Africa. Several of these projects were previously considered the exclusive domain of developers, due to their high risk/high return profile. They carry construction risk, and the subsequent revenue streams are far from assured, as the companies they are investing in may not have monopoly positions. As the large investors learn about these new markets and come to understand better greenfield project risk, we see a significant growth in these markets.

proceeds of asset sales. In the UK, negative press reports and strong anti-private finance initiative opinions in the ruling Coalition government have, to some extent, dampened the enthusiasm for private finance in recent years.

A mix of private and publicly funded transport projects

Up to a few years ago, PPPs were the dominant procurement method in these mature markets. However, more recently there has been a greater proportion of publicly funded projects, as governments have looked to transfer best practice from PPP into a public procurement environment and have realized that a PPP is not always the best approach. The result is that we now have a mix of public and privately funded projects.

Private finance is at the heart of Sydney's US\$7.7 billion **North West Rail Link** – Australia's largest public transport infrastructure project currently under construction. In addition to the project's obvious scale, our panel of industry experts appreciated the Australian Government's forward thinking and deployment of advanced technology. When completed, it will be the first fully automated rapid transit rail system in the country, and includes construction of twin 15 kilometer tunnels, eight new railway stations and supply of rolling stock.

For the first time, there will be a reliable public transport service in a fast-growing region with the largest car ownership levels per household in Australia. Trains will have high levels of customer safety, including constant CCTV monitoring and platform screen doors. The project sits within

Canada's tap is still flowing

Brad Watson National Practice Infrastructure Leader, KPMG in Canada

Compared to other jurisdictions, the availability of traditional, greenfield, mega projects in the public sector may be limited, but that should not obscure the major infrastructure development taking place in Canada, including power and utilities, oil exploration and refineries, liquid natural gas (LNG) pipelines, and mining. Many are expected to cost billions of dollars, and likely to require a public/private finance mix.

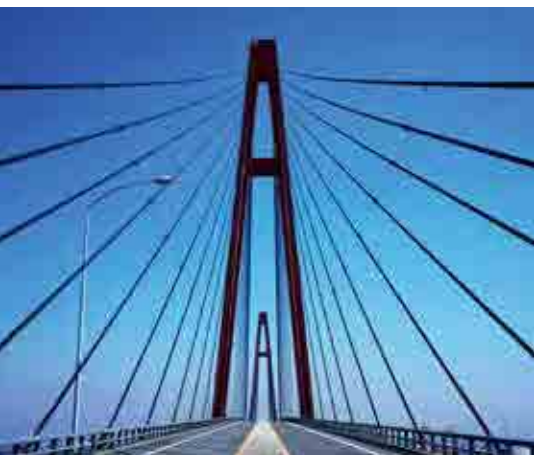
With a stable economy, transparent regulatory environment and established history of PPPs, Canada should prove an appealing destination for private finance. However, investors should be aware of the potential differences in approach at the federal, provincial and municipal levels. Ontario and British Columbia have the strongest track record in PPPs, but many projects have been developed using the model in Alberta, Quebec, New Brunswick and, more recently, Saskatchewan.

With less experience of major infrastructure projects, these provinces arguably carry a higher level of uncertainty, but initiatives such as the Edmonton Light Rail Transit – detailed in this section – could pave the way for similar deals. The public infrastructure gap is most acute at the municipal level, where decades of under investment, combined with increasing population

density is straining the infrastructure necessary to support the economic aspirations of Canadian cities. Looking to the future, we expect greater spending by municipalities across a host of different asset classes.

Canada has been blessed with an enviable resource base and we continue to see significant capital expenditures to extract these resources. In the power sector, several billion-dollar projects are being pursued to support additional hydroelectric generation. Plans for new projects in Alberta's oil sands continue to make headlines, as do the pipeline projects key to getting the product to market. The rush to address a growing need for LNG continues, where the outcome of these investments remains to be seen. Lastly, in the mining sector, as minerals become harder to extract, companies must explore more remote, less accessible locations, which calls for new ports, rail, roads and housing to support their efforts.

Taken together, it is clear that Canada remains an attractive infrastructure market. Based on our research, over 300 projects – each of which is greater than US\$224 million in size – are either under construction or expected to start in the next decade – totaling in excess of US\$536 billion. Infrastructure investors, developers and contractors would do well to consider the Canadian market when contemplating their own aspirations for growth.



a well-conceived plan and has been procured as a PPP, with demand risk retained by government and a substantial contribution made during construction.

In contrast, the UK's **High Speed 2** (HS2) rail line will be publicly funded for at least the development and construction phase. The judges were strongly divided on the US\$84.4 billion link between London and the north of the country. Proponents have billed it as the single biggest opportunity for UK economic growth in a generation, reducing travel times, releasing capacity, and better connecting the nation's capital with the provinces. However, sceptics argue that public money could be better spent on local rail upgrades, with further concerns over environmental damage. The latest estimates suggest that HS2 will return around £2 worth of benefit for every £1 invested.

Belgium's largest PPP project, **Liefkenshoek Railway Connection**, involves the construction and maintenance of the civil infrastructure for a new 16.2 kilometer freight-only railway linking the western and eastern Antwerp docks. Judges appreciated that this project would help relieve increasing traffic congestion and serve as an alternative to roads. The US\$1 billion venture, scheduled for completion in 2014, is a design, build, finance, and maintain agreement.

Scotland's biggest infrastructure project in a generation will strengthen a critical

"Governments can get fixated on large programs. Smaller ventures may yield more bang for the buck"

connection in the country's transport system. The US\$1.3 billion **Queensferry Crossing** is a new 2.7 kilometer un-tolled cable-stayed bridge, located alongside the Forth railway bridge, with a pleasing design. The crossing replaces an aging road bridge and is seen as vital to the country's economic wellbeing, improving the reliability of journey times for all modes of transport. Judges noted that the project (formerly the Forth Replacement Crossing) was procured in a recession and could be delivered below budget. Scotland's government has chosen to fully fund the project with public money.

The **George Massey Tunnel Replacement Project** in British Columbia, Canada also seeks to address the issues of congestion and aging infrastructure. The existing tunnel is a critical component of

the regional transportation system in and around Vancouver, carrying more than 80,000 vehicles each day. The provincial government is developing a business case to build a new bridge on the existing Highway 99 corridor. Subject to environmental review, construction is expected to begin in 2017 to ensure the route continues to meet the growing needs of communities, businesses and stakeholders that rely on this crossing.

In another government-funded transportation program, the world's largest boring machine was used to create the 2.6 kilometer **Sparvo Tunnel**, part of a US\$208 million project improving road infrastructure between the Italian cities of Bologna and Florence. Judges noted the importance of maintaining strong national connectivity through Italy's economic core, noting the 70 kilometer extension for the **A1 'Autostrada' highway** will clear bottlenecks and shorten traffic journeys. The machine, named Martina, has a boring diameter of 15.615 meters and comprises two parallel tubes 2.5 kilometers in length.

The **Legacy Way Tunnel** in Queensland, Australia will provide a direct, high-speed link between the residential growth areas to the west of Brisbane and the airport in the north – effectively bypassing the city center. The project highlights the need for urban mobility and is a vital component of Brisbane City Council's TransApex transport

plan, aimed at reducing inner-city congestion. It is scheduled to be completed in 2015.

Keeping up with the public and regulatory debate

Demand is heavily influenced by national discussions over economic versus social infrastructure and other competing agendas. Although governments can get fixated on large showcase programs, economic prioritization may identify smaller ventures that yield more bang for the buck.

Even in those countries that appear to have embraced PPPs, the argument is by no means over, with private finance sometimes seen as a default alternative only when the public purse is empty. Cash-strapped governments are naturally concerned about their ability to fund a growing army of pensioners, and infrastructure spend is just one of the categories fighting for a share of the public purse.

Authorities in these more mature infrastructure investment markets have highlighted the synergies between pension

In regulators we trust

Dr Matt Firla-Cuchra, Infrastructure Partner, KPMG in the UK

Private ownership of infrastructure, including core utilities and transport, is prevalent in a number of mature international markets, most notably in the UK, but also lately in Australia where the phenomenon is growing with the substantial asset sales program.

Given the essential nature of utilities and their natural monopoly status, network companies are typically subject to detailed economic regulation, with expenditure and costs closely scrutinized. The incentives-based approach rewards companies for outperformance and penalises them if targets are not met. At the same time, it is down to the companies that assume responsibility for developing business plans and investment programs to ensure service delivery is to the required standards.

The capital expenditure made by these privatized companies often dwarfs that of the government, with investors willing to commit capital on a long-term basis if they can recover it over time by way of well-understood mechanisms.

Under stable and predictable regulatory regimes, much of this expenditure can be funded by relatively low-cost investment-grade corporate debt without any state support.

Many large, standalone projects are built and funded 'on balance sheet'. However, true 'mega projects' – such as the UK's Hinkley Point C nuclear power station (mentioned in this section), or the Thames Tideway Tunnel – might be treated more as one-offs and funded with project finance solutions. These are often supported by a contract with some form of state intervention or a bespoke regulatory solution.



PPP and Public Finance – Canada's light rail projects

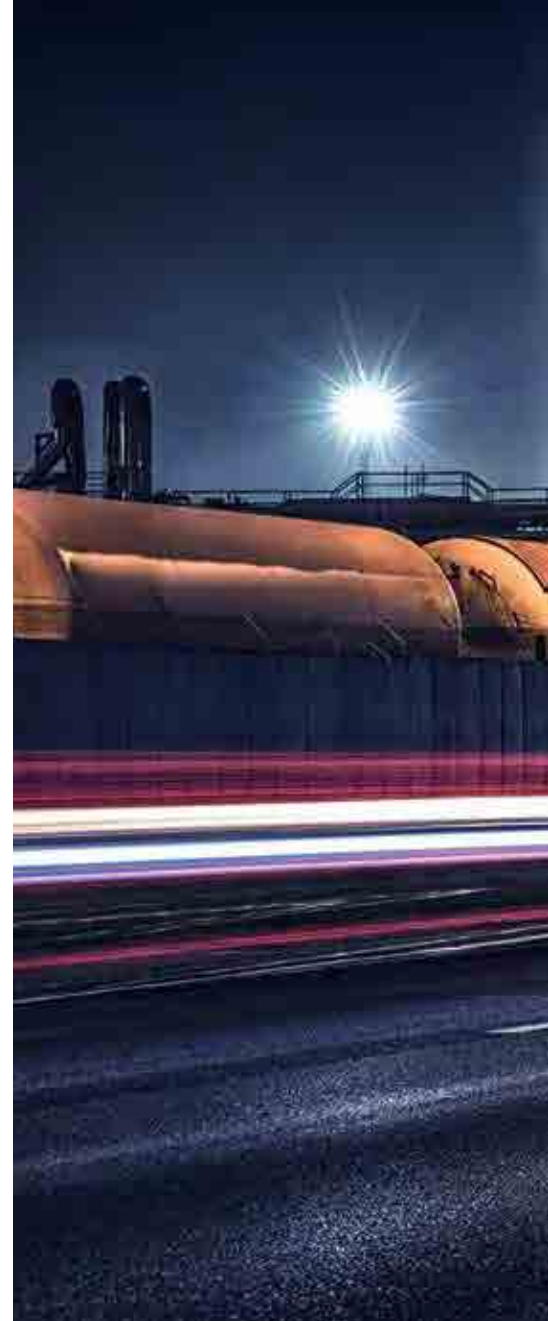
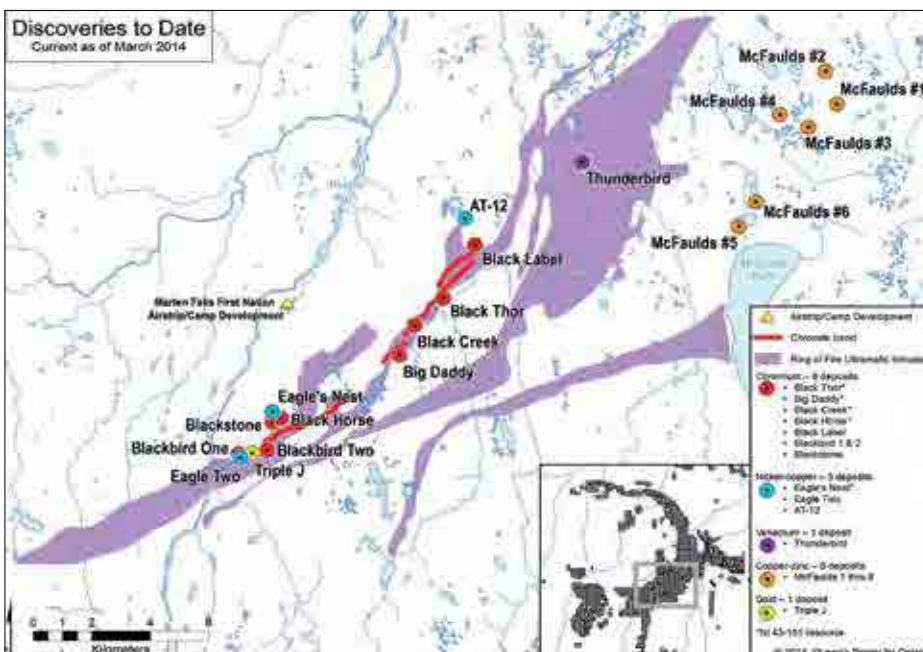
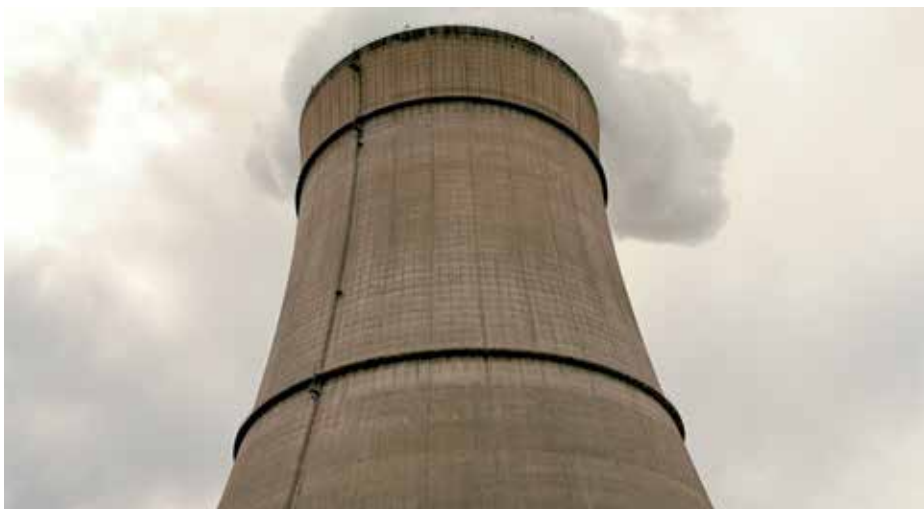
Eglinton Crosstown

Despite Canada's enthusiasm for private finance, public authorities in Ontario are largely funding Toronto's US\$5.85 billion Eglinton Crosstown Light Rail Transit with public money. The province will issue green bonds to raise US\$443 million from environmentally conscious private investors. Ontario will be the first government in Canada to use green bonds to fund public infrastructure. The partially underground 19 kilometer light rail line should make Toronto's existing subway system more accessible to its growing population. Due to finish in 2020, it is the largest transit expansion in the history of Toronto.



Valley Line

With its Valley Line Light Rail Transit Stage 1 P3 Project, the city of Edmonton in Canada is taking another significant step towards building a full transit network. The capital city of Alberta is pursuing its network build-out under its sustainable transport framework, with the aim of expanding mobility and getting commuters and other travelers off the roads. The US\$1.6 billion PPP-funded project will see a private sector contractor design, build, partially finance, supply light rail vehicles for, and operate and maintain the line. There will be up to US\$355 million in capital funding from each of the government of Canada and the government of Alberta. Initial daily usage at the target date of operation (winter 2020) is projected to be 28,000 passengers, increasing to 49,000 by 2044.



capital and the predictable long-term returns of infrastructure investment. They are actively working with fund managers to develop a financial model that successfully addresses both needs.

The uncertainty surrounding governmental change is a big deterrent to investors. The judges said civil servants tasked with planning and implementing infrastructure programs should ideally gain greater independence and authority to engage with the private sector. For example, Australia's state and territory governments have started to work more closely with central authorities on infrastructure issues and the country's energy plans include protected, ring-fenced funds.

Germany's strong, privatized utilities operate in a secure, well-regulated environment, which offers a good model for other sectors to emulate. The Labour Party in the UK has endorsed a proposal to set up an independent Infrastructure Commission to depoliticize long-term infrastructure planning.

"Hinkley Point C nuclear power plant in the UK will provide around 7 percent of the country's electricity demand"

Energy and natural resources drive investment

Energy can become a political football, with nuclear power and renewables coming in and out of fashion amid concern over costs and safety. Fuel poverty and energy security are also driving the debate, as governments seek to keep costs down and gain greater control over longer-term supplies. Private capital often lies at the center of these debates.

Hinkley Point C will be the first new nuclear power plant to be constructed in the UK in over 20 years, once the final

investment decision is taken. The project will generate around 25,000 jobs during its nine years of construction and provide a boost for UK business, with around 57 percent of the value of construction expected to go to UK firms. The project will also improve UK skills, especially in the South West, where EDF has worked with local colleges to establish energy and construction skills courses to maximize the opportunities for local people. The new plant will provide for around 7 percent of UK electricity demand, equivalent to some five million homes.



Northern Ontario's **Ring Of Fire** is a massive proposed mining and smelting development, covering some 5,000 square kilometers. To exploit these rich resources, around US\$2 billion of infrastructure investment is needed for roads, railway, electricity and broadband. Ontario's Government wants to share the financial burden with the federal authorities, but no agreement has yet been reached. The plans are complicated by concerns over aboriginal land rights and environmental damage.

Elsewhere in Canada, the judges emphasized current congestion problems related to the transportation of oil and gas across North America. New pipelines originating from production centers in Saskatchewan and Alberta are needed to diversify flows that currently have nowhere to go but south. Creating new corridors to the east and west would have a knock-on effect in the northern US and alleviate congested rail traffic currently carrying Bakken crude along the Burlington Northern corridor.

One of two projects addressing this challenge is the US\$11 billion,



4,500 kilometer **Energy East Pipeline**, a truly ambitious private initiative. The pipeline will carry up to 1.1 million barrels of crude oil per day from Alberta and Saskatchewan to refineries in eastern Canada, which should help spread some of western Canada's resource wealth across the country. The pipeline is predicted to add more than US\$35 billion to Canada's gross

domestic product (GDP) over 40 years and reduce dependence on foreign oil. There has been opposition from environmental groups concerned about pollution and the focus on fossil fuels.

The additional project looking west is the proposed **Northern Gateway Pipeline**, which will provide access to new markets in the Pacific Rim. This project is expected to grow Canada's GDP by more than US\$270 billion over 30 years. Although the US\$7.9 billion, 1,177 kilometer line is hailed as bringing significant economic and social benefits, opposition remains stiff from environmental and first nations groups. Northern Gateway has received conditional approval from the federal government.

Maturity and competition expands the market

A combination of privatization, regulation and a wide range of investors has heightened competition for infrastructure in this group of markets. The Canadians and Australians were early exporters of outbound institutional capital focused on



A renewable future



Site C Clean Energy

A proposed dam, generating station and reservoir on the Peace River in northeast British Columbia, Canada, Site C Clean Energy will cost US\$7.2 billion. It will provide clean and renewable power for over 100 years, powering 450,000 homes and creating direct and indirect jobs. Additional capacity from the project could be used by BC Hydro to export more power into the US via its Powerex subsidiary.



Perth Wave Energy

Off the coast of Western Australia, the Perth Wave Energy project features the first complete, grid-connected, commercial system of its type. It has a fully submerged device that uses wave power to pump water to shore for conversion to electricity. Private company Carnegie Wave Energy is behind the US\$29 million venture and as part of a landmark agreement, the Australian Government Department of Defence has agreed to purchase the power.

Westmill Solar Park

Based in Oxfordshire, Westmill Solar Park is the UK's first and world's largest cooperatively run, community-owned solar farm. Judges liked this approach as it integrates the project into the community and reduces NIMBY (not in my back yard) issues. Consisting of 30 acres of over 20,000 panels, it provides a reliable source of renewable energy, reducing CO2 emissions by 1,800 tons per year and generating enough clean electricity to power 1,400 homes. Some of the profits go to the community.



infrastructure. Inbound investment into UK infrastructure regularly involves foreign capital, whereas domestic investors have historically been dominant in Australia and Canada – although that has now changed. An open market environment is a sign of maturity, with diversified ownership that includes insurance companies, sovereign wealth funds, pension funds, private equity and infrastructure fund managers competing for similar assets. This creates a robust secondary market and a golden opportunity to recycle capital.

One notable development is capital recycling, where government equity is sold partway through the project and proceeds are used to fund subsequent phases. An example of this is Australia's **WestConnex** underground trunk road and widening project, which plans to recycle capital at the end of each of three phases. At US\$10.7 billion, this is Australia's largest infrastructure project, linking western and south-western Sydney with the city, airport and port through a 33 kilometer continuous motorway. WestConnex is expected to ease congestion, cut travel times and create jobs across the area.

The judges appreciated the improved quality of life this project would deliver by returning surface roads and land to local communities to enable urban revitalization and space for new homes. Construction will

commence in July 2015, with completion of all stages expected by 2023.

As these infrastructure markets continue to mature, an emerging trend from experience is that governments are applying PPP principles to other public services. In Australia and the UK, long-term performance

contracts have been tendered for health, social care, probation and job creation. Rather than relying on a single public sector supplier, the aim is to create a contestable market to nurture a number of providers – often with payment by results (or outcomes) to stimulate competition and raise standards.

Transport takes center stage

Tony Rocker, Partner, Global Head of Infrastructure Investment, KPMG in the UK

The very maturity of the markets in this chapter means that capital is scarce due to reduced tax revenue from, and greater expenditure on, aging populations. Consequently, governments increasingly have to borrow money, or sell off certain assets in order to fund investment. After a decade of heavy activity in energy – including a push towards renewables – transport has taken center stage, with a growing number of mass transit projects; something reflected in this year's selected 100.

Driving higher performance of assets

Given the huge investments in infrastructure by both private and public organizations, asset management has not surprisingly become a hot topic, with a greater focus on the entire asset lifecycle.

A holistic asset management strategy views assets from both an operational and a financial perspective, with continual assessments of cost of use, quality of performance and ongoing risks. Overworked assets can fail, causing costly delays and necessitating expensive repairs and replacements. Conversely, under-used assets tie up capital unnecessarily. Ultimately, effective asset management delivers longer-term value by improving efficiency and reducing the whole cost of individual assets. Safety is a further consideration, as poorly managed assets can create additional risks to workers and citizens.

A good example of this is **Alder Hey Children's Health Park** in Liverpool, UK,



which is funded through a PPP with three engineering and construction companies holding investment equity, one of which will maintain the infrastructure. This unique new hospital offers a radical vision of a holistic healthcare environment. An outmoded 100-year-old hospital will be demolished and replaced by a brand new facility with 270 beds and 16 operating theatres. Sustainability lies at the heart of this US\$452 million project, with 60 percent of energy generated onsite and a surrounding park that includes gardens and terraces, maximizing the interaction between patients, visitors and their surroundings.

Stiff regional and international competition from Singapore and Malaysia places asset performance at the core of the **Darling Harbour Live project** in Sydney, Australia. The government of New South Wales is delivering the project in partnership with the private sector to allow faster delivery of the convention, exhibition and entertainment facilities, draw upon global industry expertise, foster innovation, and achieve value for money. Judges appreciated that design excellence, environmental sustainability and community engagement are central to the project.

Asset management has also proven critical in Australia's water sector. The country spent billions building six huge seawater desalination plants during a severe drought from 1997 to 2009. Today, four are shut down because the cost of the water became non-competitive when rain finally came. The judges noted that desalination is not cheap, but it may be essential for growing cities in unpredictable arid climates.

The **Southern SeaWater Desalination Plant** near Binningup, Western Australia, is the latest such project, and began operating at full capacity in January 2013. Western Australia remains locked in a severe drought, recording its sixth-driest August on record. Judges liked that energy requirements for this project are offset by the 10 MW Greenough River Solar Farm and the 55 MW



“Desalination is not cheap, but it may be essential for growing cities in unpredictable arid climates”

Mumbida Wind Farm. The project's owners purchase 100 percent of the output from these two energy sources near Geraldton.

Achieving an affordable cost of capital

Commercial project finance banks fuelled an infrastructure boom with cheap debt in mature international markets between 2005 and 2008. When the market recalibrated after the global financial crisis, governments argued that the pendulum had swung too far in the opposite direction, and that they were now paying excessive prices. In financing infrastructure, countries need a cost of capital that is high enough to attract private finance, but low enough to be considered a fair deal by users and the public – while avoiding state interference in the pricing mechanisms. Governments should also ensure that they get real value via proper contracting and payment by results.

One way to cut the cost of financing is to give investors more confidence in the sustainability of the market, thus encouraging competition for contracts. Private financiers



are interested in a defined pipeline of projects, political stability, a stable legal and procurement environment, and long-term revenue structures.

The Australian Government is considering guaranteeing the bonds of companies involved in major road and rail building projects, to help them raise funds more cheaply by leveraging the country's top triple-A credit rating. Similarly, Infrastructure UK launched a US\$64.5 billion guarantee scheme in 2012, and this summer Mersey Gateway became the first project to be supported by a UK Government Guaranteed Bond under the program.

The UK has focused much of its efforts in recent years on achieving a lower cost of capital provided by institutional investors. The country's US\$3.8 billion **Priority School Building Programme (PSBP)** will rebuild 261 schools in a five-year period. The program is being delivered by a central government team with results already demonstrating reduced timescales and a 35 percent reduction in cost from the previous school building program. It is funded using traditional capital and private finance. The private finance is being raised using an "aggregator model" which can access the lower cost of capital provided by institutional investors. Following on from this success, a second phase (PSBP2) was launched in May 2014.



Reshaping London's urban landscape

King's Cross Redevelopment

After years of urban decay, London's King's Cross district is nearing the end of a US\$3.2 billion makeover, including the redevelopment of two neighboring Victorian railway stations, one of which now houses the sleek Eurostar service to Paris. The area around King's Cross is at the center of one of Europe's largest regeneration projects, which includes space for new offices, shops, leisure facilities and about 2,000 apartments. Judges who were familiar with this formerly decaying part of London marveled at how transformational the work has been.



Garden Bridge

From regenerating old spaces to creating new ones, a proposed pedestrian footbridge over the River Thames in London has been dubbed a "floating paradise garden". The US\$253 million Garden Bridge includes a stunning new public garden and will be covered with foliage, creating an instant landmark. Primary funding is expected to come from private donations, with around US\$50 million coming from the UK Government.

Staying in the UK, a new extension of the London Underground will improve transport links and public spaces in an area of massive regeneration, creating up to 25,000 jobs and 16,000 new homes. The US\$1.6 billion **Northern Line Extension** project is being funded through a unique financing mechanism — paid for initially by a loan, with the UK Treasury guaranteeing repayment to reduce borrowing costs. Through a vehicle known as "tax increment financing," this loan is expected to be repaid over time by tax revenues from new businesses that settle in the separate and parallel 2 million m² Nine Elms and Battersea Redevelopment along the site of the new Underground line.

Investing in essential skills

A major challenge for these mature markets is developing enough skills capacity and retaining skills in the face of international competition. With a number of tunneling projects emerging, the UK is seeking to address a skills shortage through its **Tunnelling & Underground Construction Academy**. This purpose-built US\$21 million facility, which opened in 2011, is the only soft-ground, tunneling training facility in Europe. The academy should provide vital skills for projects such as London's Crossrail, High Speed 2, and the Thames Tideway Tunnel, as well as National Grid and EDF electricity cable tunnels.

Developing specialist skills holds the key

The projects in this chapter are impressive in their size, planning and importance. Most, if not all, have been designed to address crucial areas of infrastructure that will impact the nation's economic growth. Some governments across this group have not been passive observers and, in the face of the financial crisis, have intervened in the market to ensure that investment projects to meet the real and pressing needs in energy, transport and urban regeneration remain on track. There has also been a growing emphasis upon renewables and green cities. Even in mature markets, however, political risk remains, as evidenced by the Spanish Government's reversal of some of its renewable subsidies, which has reduced investment in the sector.

One potential threat to this momentum is the limited supply of specialist talent able to deliver infrastructure, such as master planners, experienced developers, knowledgeable fund managers and nuclear engineers to name a few. Although countries are striving to tackle the skills shortage through academies and other links to further education, they also need to ensure

that there is a continuous availability of challenging work for these individuals. Otherwise, talent will emigrate in search of new opportunities.

Further challenges lie ahead with the changes in demographics. The population in these countries is aging with life expectancy increasing and birth rates falling. This will put significant strain on health facilities and restrict tax revenue – a double jeopardy.

Asset sales or privatizations are likely to increase as countries seek to follow the UK's example. Australia has overcome some of the political obstacles by promising to ring fence some of the proceeds and allocate them to infrastructure investment. Another benefit of this approach is that future capital investment is carried out by the new, private entity and, therefore, is off the public sector's books.

Although PPPs and other sophisticated financial structures will undoubtedly have their place in the mix, the regulated asset regime can also deliver significant benefits, enabling utilities and other providers to raise capital at low cost. For example, in the UK, the privatized water sector has invested over £90 billion in the past 20 years.

Key takeaways

- 1 Governments have been prepared to intervene to support projects**
- 2 Limited supply of specialist talent could threaten momentum**
- 3 Aging populations could affect state funding**
- 4 Asset sales or privatizations are likely to increase**





Américo Vespucio
Oriente Highway



Amager Bakke Incinerator



Chaglla Hydroelectric
Power Plant



Copenhagen Climate
Adaptation Plan



Durango Mazatlán
Highway



Facebook Rapid
Deployment Data Center



IceLink



Mayan Heritage Museum



Khi Solar One



Panama City Metro



Penonome Wind Farm



Rail Baltica



Riyadh Metro



Singapore Intelligent
Transport System



Square Kilometre Array



Taoyuan Aerotropolis



The Auckland Plan



Yokohama Smart City



Scandinavian
8 Million City



Jakarta Mass
Rapid Transit



New Orbital
Highway Project



PRASA Rolling Stock



Stockholm Metro
Expansion



Zagreb Airport

SMALLER ESTABLISHED MARKETS

Whether they need to renew their infrastructure or build it up, these countries are making manageable, affordable investments that should improve their national competitiveness

Markets

<i>Bosnia & Herzegovina</i>	<i>Estonia</i>	<i>Lithuania</i>	<i>Philippines</i>	<i>Sweden</i>
<i>Bulgaria</i>	<i>Finland</i>	<i>Malaysia</i>	<i>Poland</i>	<i>Switzerland</i>
<i>Chile</i>	<i>Greenland</i>	<i>Mexico</i>	<i>Qatar</i>	<i>Taiwan</i>
<i>Colombia</i>	<i>Hungary</i>	<i>New Zealand</i>	<i>Romania</i>	<i>Thailand</i>
<i>Croatia</i>	<i>Iceland</i>	<i>Nigeria</i>	<i>Saudi Arabia</i>	<i>Turkey</i>
<i>Cyprus</i>	<i>Indonesia</i>	<i>Norway</i>	<i>Singapore</i>	<i>United Arab Emirates</i>
<i>Czech Rep.</i>	<i>Japan</i>	<i>Oman</i>	<i>Slovakia</i>	
<i>Denmark</i>	<i>Kuwait</i>	<i>Panama</i>	<i>South Africa</i>	
	<i>Latvia</i>	<i>Peru</i>	<i>South Korea</i>	



Can foreign capital bridge the infrastructure funding gap?

Despite wide variations in the maturity of their economies and infrastructure, these countries have a common penchant for domestic financing. Where local or regional banking or capital markets have been strong, some have gone down the public-private partnership (PPP) financing route, but a lack of major projects combined with cheaper sources closer to home have deterred international

investors. Currency risk is a major concern and overseas money is seen as costlier, with a greater exchange risk. Traffic components, where income may not reach expectations, are another deterrent.

Industrial (as opposed to financial) backers have predominated, typically taking shareholdings in a few specific sectors, while a few markets – such as Mexico – have waded gently into the PPP pond.

Shifting demographics and growth

The more developed of these countries tend to have aging populations, a wealthier middle class and established infrastructure.

However, the demographic changes taking place in these small established markets is going to put significant pressure on health and welfare systems and budgets. Although tax revenues can support much of these needs, these markets will have to look further afield for cash as the proportion of working-age and tax-paying citizens declines.

It is a different matter for many of the emerging nations which have younger, poorer populations and desperately lack the infrastructure needed for growth, and in some cases the provision of essential services. Finding the means to pay is often a major issue, although some of the more fortunate ones are starting to better exploit the value of their rich natural resources and invest the returns into infrastructure.

Fast-expanding cities are struggling to cope with large-scale migration from the countryside and are in urgent need of



Easing the path to private finance

Julian Vella, AsPac Regional Head, Global Infrastructure, KPMG

It is clear that the world has a massive infrastructure deficit in both emerging and developed markets. One recent report estimated the cost of infrastructure spending worldwide will grow to approximately US\$78 trillion by 2025. In response to this, many politicians and other commentators have become accustomed to referring to the use of private finance as the panacea for addressing this investment challenge.

To some extent this is true, but it's not quite as simple as presented. Private sector equity and debt investors will only do so in the expectation that they will earn a return on their investment which is commensurate with the risk they are taking. Before considering private capital governments must first establish how infrastructure projects will be funded or paid for, to provide investors with a revenue stream. Historically the main sources of funding have been taxes and levies, or direct user payments such as utility rates or tolls.

With limited public purses and governments keen to maintain or improve their credit rating, infrastructure projects which have a funding solution

will often access private equity and debt finance to get a project up and running, particularly through the construction phase. In some cases, the provider will design, build and operate the asset over a period of 20 to 30 years, and receive an agreed revenue stream, with penalties or rewards for under/over-performance to encourage good performance. More recently, some countries are paying off the remaining debt capital once the build is complete.

In certain markets, such as Australia, 'asset recycling' has come into vogue, whereby governments sell infrastructure assets and use the proceeds to invest in new projects. This is a powerful new angle on financing new assets. Privatization is not new, although in many countries it is politically sensitive. However, directly linking the proceeds of an asset sale to a commitment to build new infrastructure for the local community has gone some way to addressing this. Another major advantage is that it creates a virtuous and (hopefully) perpetual circle whereby the capital of investors such as pension funds, who generally prefer brownfield assets with an operating track record and immediate revenue streams, can be indirectly applied to fund new infrastructure.

Greenfield projects, such as toll roads, which seek to transfer the risk of demand to the private sector, have become increasingly difficult to finance. In recent times there have been a number of high-profile cases where actual demand in the early years was materially less than had been forecast, affecting the provider's ability to repay debt, and leading to financial distress. To overcome this concern, governments are demonstrating a preparedness to retain this demand risk by collecting the tolls and other revenue themselves and paying the contractor a guaranteed revenue stream. Interestingly, this is a return to some of the practices of Chile in the 1990s.

Given the size of the infrastructure challenge, the preparedness of some governments to pursue alternative approaches to financing infrastructure, including approaches considered to be politically challenging, is very welcome.

Globally there is no shortage of private capital seeking to invest in infrastructure. Government privatization of brownfield infrastructure assets, with subsequent recycling of the proceeds into new well-structured infrastructure projects, provides a great opportunity to harness that capital.



“Stockholm’s metro expansion creates a framework around which new houses can be built”

clean water, mass transportation, schools, sanitation, housing and hospitals. Nor can the welfare of rural areas be neglected, if they are to provide the food to support their country’s new metropolises.

Stockholm is one of Europe’s fastest-growing cities, with its population forecast to rise from 2.1 million to 2.6 million by 2030, generating demand for new housing. The US\$3.9 billion **Metro Expansion** not only connects inhabitants better, but also creates a framework around which 78,000 new homes can be built. Starting in 2016, 19 kilometers of new metro lines and nine new stations will be completed by 2025. Funding will come via contributions from the various public authorities involved, along with an increase in vehicle congestion tax and the sale of land to home-builders.

The **Taoyuan Aerotropolis** in Taiwan is another impressive integrated planning effort to boost the country’s regional and global

competitiveness. Taoyuan is already a well-positioned hub for international trade and manufacturing, with the existing Taoyuan International Airport and Taipei Port connected locally via a comprehensive network of highways, railways and Mass Rapid Transit. The development focuses on zoning around these assets and considers every aspect of 21st-century urban development – from affordable housing to sustainable water and resource management. The project is a cornerstone in the government’s ‘i-Taiwan 12 Projects’ blueprint for economic development.

With its population expected to increase from 5.7 million to 8.3 million by 2030, Riyadh in Saudi Arabia is in urgent need of better mass transit. Public transport currently accounts for only two percent of the city’s 7.4 million daily commutes. The volume of cars is choking the streets and polluting the air. In what is hailed as the world’s biggest transport infrastructure project, the US\$22.5 billion **Riyadh Metro** consists of six rail lines extending 176 kilometers and carrying electric, driverless trains, plus a new bus network and park-and-ride services.

The project will be owned and operated by the Arriyadh Development Authority (ADA), financed by the Saudi Arabian government through the Public Investment Fund. Due for completion in just four years (by 2017), this truly international initiative involves architects, management consultants, construction firms, rolling stock suppliers and railway technology firms from the Middle East, Europe, the United States and Asia, employing 15,000 workers at its peak.



Paving the way for growth



Américo Vespucio Oriente Highway

The Américo Vespucio Oriente Highway in Chile is a 13 kilometer underground tolled motorway procured through a PPP. The project has been in development for nearly 10 years and is designed to address traffic congestion problems in the capital city of Santiago – reducing journey times between El Salto and Avenida Francisco Bilbao from 60 minutes to eight. If it succeeds, the judges said this would be a remarkable improvement to urban mobility. A consortium formed by OHL Concesiones and Sacyr Concesiones Chile was named preferred bidder in January 2014. Part of the tunnel will be bored and part will be cut-and-cover.



Qatar Orbital Highway

With the 2022 FIFA World Cup fast approaching, hosts Qatar’s new Orbital Highway is one of a number of critical infrastructure projects to be delivered ahead of the event. At 200 kilometers in length and 14 lanes wide, the US\$1.7 billion motorway connects the new port at the Qatari capital Doha with Ras Laffan, the gas-producing industrial city in the north of the country.

“Governments must factor resilience into their planning to ensure infrastructure can withstand an increasingly harsh environment”

Phase one of Central America's first subway system opened in 2014, in the form of the US\$2 billion **Panama City Metro**. Carrying up to 40,000 people an hour by the time it is fully completed in 2035, the metro will ease the city's severe traffic congestion. Half the annual operational costs will be covered by fares. The judges said if this project is successful it might inspire similar efforts in other crowded Central American cities.

South Africa's passenger rail service carries over 2.6 million commuters daily. This is achieved under grave challenges of old technology and unreliable rolling stock. In 2011 the **Passenger Rail Agency of South Africa (PRASA)** announced its acquisition of a new **Rolling Stock Program**. PRASA has also initiated a 20-year Modernization Program which will update signaling, permanent way and old technology to reverse the historic under-investment in passenger rail.

A manufacturing contract valued at US\$4.6 billion was signed in October 2013 to build 600 new trains (3,600 vehicles) over a period of 10 years, including the technical support and spares agreement for maintenance of the new trains over the next 18 years. Through the Modernization Program and acquisition of new rolling stock PRASA will in the near future deliver reliable and world-class services. The judges noted that this program is a solid example of how South Africa has prioritized infrastructure within its modernization efforts.

Planning sustainable solutions

Inconsistent policies and inadequate planning are holding back sustainable infrastructure development in many of these markets. Today's governments are becoming far more aware of the environmental and social impact of industrialization – and some have learned harsh lessons, suffering

pollution as well as political unrest over displaced or neglected communities.

Mexico has a thriving fishery sector, yet its rivers, lakes and seas are in danger of contamination from rapid manufacturing growth. New Zealand's successful dairy sector requires a lot of irrigation and fertilizers, which puts pressure on water supplies and risks damaging the soil. The impact of climate change is a further consideration, with more areas in danger of flooding – and disasters such as the Fukushima reactor meltdown in Japan, the 2004 Indian Ocean tsunami, and the earthquake in Christchurch, New Zealand all reminders of the fragility of existing eco-systems and infrastructure.

Governments must factor resilience into their economic planning, in order to ensure that infrastructure can withstand the demands of an increasingly harsh environment. Better regulations are also essential, to avoid the continued incidences of collapsing buildings and bridges, resulting from ill-administered and sometimes illegal construction programs.

While some countries struggle with this new reality, others have responded with innovation. Thanks to its **Intelligent Transport System**, Singapore is one of the least congested major cities in the world despite a growing urban population and limited physical space. This integrated pay-as-you-use system maximizes the capacity of the road network with vehicle quotas, sophisticated electronic road pricing (ERP) tolls that vary according to traffic flows, and alerts to drivers, all controlled in real time from an operations center. Consequently, average car speeds of 27 km/hour compare favorably to 16 km/hour in London and 11 km/hour in Tokyo.

The judges considered this a clever system that encourages motorists to change their mode of transport, travel route or time of travel. The next-generation ERP II will use a global navigation satellite system and be implemented by 2020.

Copenhagen's US\$400 million **Amager Bakke Incinerator** is a visible manifestation of the city's green goals. This unique waste-to-energy plant will not just produce heat for 160,000 households and electricity for 62,500; it will also be a much-needed leisure facility, with 1.5 kilometers of ski runs atop the 80 meter-high roof. When complete in 2016, it will be the cleanest incinerator of its type in the world and 25 percent more efficient than its 40-year-old predecessor. Total annual carbon emissions are estimated at 200,000 tonnes – well below the 1.2 million tonnes of an average coal-fired power station.

In a big step forward for renewable energy – and for private finance – the Spanish conglomerate Abengoa is building

Sizing the iceberg

Alan Mitchell, Executive Director, Cities Global Center of Excellence, KPMG in Canada

Most cities are sitting on a huge set of aging, publicly owned assets that will need to be restored or replaced, some in the not too distant future. However, few authorities are fully aware of the exact composition of this estate, its current state of repair, and the costs of refurbishment or rebuilding.

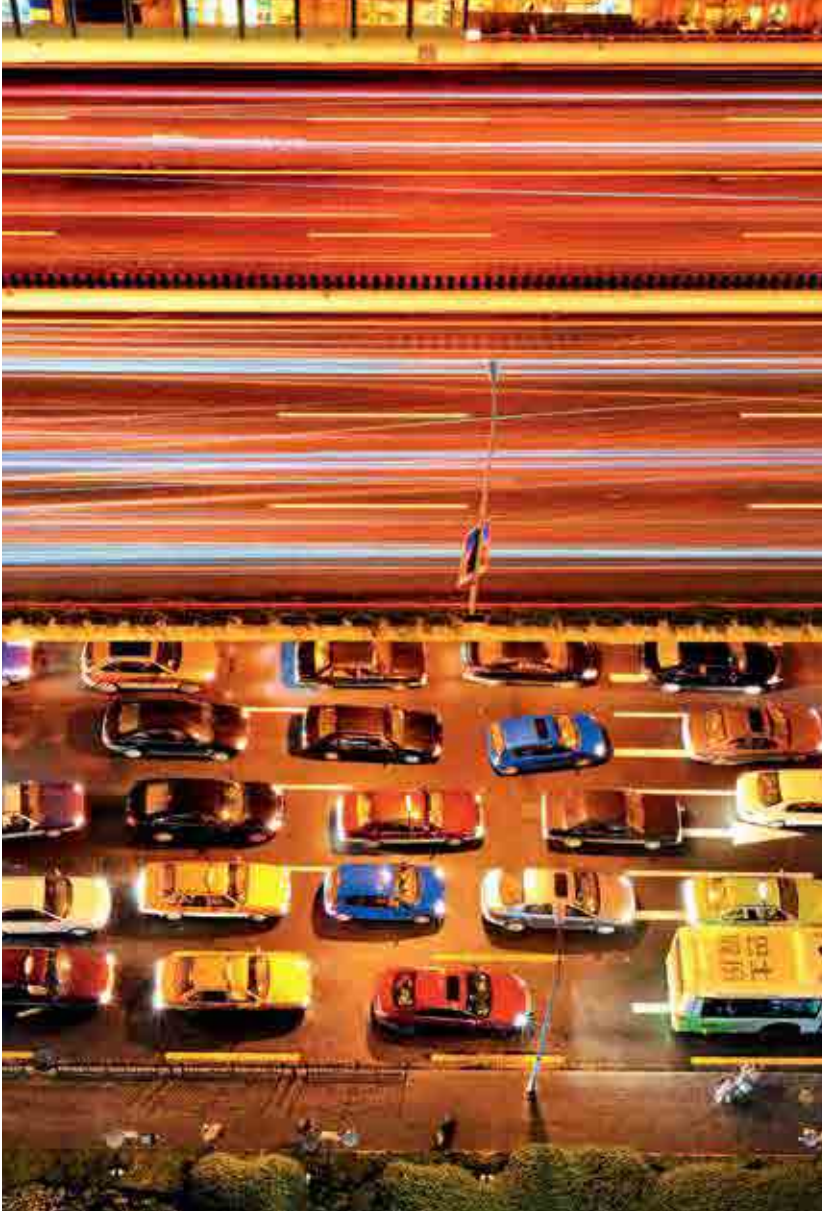
Many city roads, rail networks, waterworks, buildings or utilities have an unknown life expectancy. This uncertainty is causing budget holders great concern, as they strive to understand their full financial liabilities. The impact of an incident such as a burst water main or a road crater is equally unclear, and could have severe economic consequences, which again need to be quantified.

Where facilities already carry a user fee – such as water rates or toll roads –

it may be possible to raise these charges to pay for the replacement. In other cases, city governments will have to seek funding support at national level.

Before such help is forthcoming, they need to carry out a comprehensive study of their assets, checking their existing condition and scanning records for original life expectancy. They should then carefully prioritize the required maintenance and construction work according to its social and economic importance, coordinating schedules to minimize disruption; for example, to avoid digging up a section of road multiple times for different utilities.

So let's be frank for a moment. Every city in the world carries a tremendous burden of aging infrastructure. What do cities need to do to break this cycle of deterioration or, more importantly, to avoid the consequences of catastrophic infrastructure failure? Clearly a well thought out investment strategy and plan is critical to breaking through.



Cleaner living in smart cities



Auckland Plan

New Zealand's Auckland Plan is a shared vision to create the world's most livable city, and in the process address transport and housing shortages, create more jobs and protect the environment. With its city rail link, green expansion strategy, and social housing and schools, the holistic approach brings together communities, government, businesses, educational institutions, social agencies, developers and financiers.



Yokohama's Smart City

Yokohama in Japan is targeting an 80 percent reduction in CO₂ by 2050 with its Smart City initiative, which combines renewable power, energy management in households and organizations, and next generation transport. Citizens, companies and government are all heavily involved in the planning, with incentives to limit electricity use and curb energy demand. Electric vehicles are being encouraged via a network of charging points.

Carbon Neutral Copenhagen

The Danish capital aims to become the first carbon-neutral city by 2025 and protect its citizens against climate change. Its Climate Adaptation Plan – based on PPPs – is a collection of projects linked to energy consumption and production and to green mobility. Facilities such as wind farms and biomass plants will help make the city an international center for cleantech companies. Flooding and climate adaptation will be viewed as a resource, with warning and response systems to deal with abnormal conditions, and preventive infrastructure to cope with damage, loss and traffic disruption.



a US\$445 million solar tower in South Africa's Northern Cape region. The 205 meter high **Khi Solar One** is a technically stunning thermal power development with more than 4,000 rotating mirrors. Judges said this project stands apart from other impressive efforts within South Africa's first state renewables procurement program. It will prevent approximately 183,000 tonnes of CO₂ emissions per year as part of the country's goal of generating 17.8 GW of renewables by 2030. The project has been supported by US\$70 million of European Investment Bank funding and should encourage other investors and lenders to support renewable schemes in South Africa.

The global march of renewable energy has also arrived in Panama, where the **Penonome Wind Farm** will be the largest alternative energy facility of its kind in Central America. The project, enabled by legislation in 2011, will help diversify energy production in a country that has traditionally relied on fossil fuels and hydro power, and cut CO₂ emissions by nearly 450,000 tonnes annually. Due for completion in 2014, the US\$134 million project is financed by leading banks and a syndicate of local, regional and international lenders. Further phases of the project are currently in progress.

Creating a private finance-friendly culture

A robust central planning and regulatory framework can attract private investors, but government should not underestimate the importance of winning over skeptics rooted in the philosophy of state-owned assets and opposed to the private sector making profit from the provision of public services. This should be driven through effective public consultation, full transparency, and the factual presentation of costs and long-term



Creative PPPs

Mayan Heritage Museum

Southern Mexico's Yucatán peninsula is a major tourist attraction, featuring thousand-year-old Mayan architectural relics. It is also the beneficiary of an innovative PPP that funds the Mayan Heritage Museum (Gran Museo del Mundo Maya), which opened in 2013 at a cost of almost US\$60 million. The Mexican government has embraced private finance to back infrastructure projects, and the museum was developed in partnership with the Inter-American Investment Corporation (IIC), which provided a loan of US\$7.4 million to develop and stock the museum, and provide ongoing maintenance.

benefits. Procurement administrations often place too much focus on price, and not enough on a project's wider value to society gained from improved quality of services and better asset management.

PPP is about accountability, maximizing public value, addressing public concerns and delivering a better quality of service. It creates efficient operating structures and

ensures a whole-life cost perspective on maintenance and upfront capital expenditure. Investors, particularly foreign investors, will only step into these long-term contractual arrangements if they are confident about their returns over the long-term. They are wary of threats such as changes in policy, corruption, overbearing bureaucracy, resource nationalism, or regime changes that might reverse previous decisions and have a negative impact on their investment. Effective regulation and balanced contracts are key.

Forward-thinking authorities in Latin America are aware of these issues and doing more to make the region attractive for private investment in infrastructure. Colombia, for example, has created a specialist unit – the Agencia Nacional de Infraestructura (ANI) – with experienced professionals to manage



A quest for continuity

Santiago Barba, Infrastructure Partner, KPMG in Chile

Smaller established markets in Latin America often fail to achieve a consistent, cross-party infrastructure vision, which leads to large changes in direction when new regimes come to power. Even within a government, ministers responsible for public works seem to be replaced frequently, each with different ideas and skill sets. Such volatility can slow down projects and deter investors, who become uncertain of the value of contracts, given their

potential to be revised. Uruguay is arguably the exception, with a strong level of continuity and consistency over its infrastructure policy. Too many others look haphazard and poorly prepared.

In healthcare, stakeholders such as health leaders, managers and senior clinicians are not always consulted ahead of a deal being struck. This can lead to problems in implementation, as the arrangement may have overlooked technical and administrative challenges. Inexperienced advisors must share part of the blame for the variable quality of some contracts.

“Croatia’s new PPP-financed airport in Zagreb sets a benchmark for private finance in the region”

PPP concessions for the design, construction, maintenance, operation, and administration of transport infrastructure. Other countries such as Chile, Mexico and Peru have also recognized that international investors are most attracted by a regular flow of projects. Each has upped the volume and predictability of projects open to private capital.

Not every country is so progressive. Governments and their procurement agencies should raise procurement standards and manage projects more effectively to keep costs in line with expectations and ensure that contractors deliver value for money. Also, governments should have confidence in the contracts they negotiate and stick with the risk transfer arrangements. Too often governments step in to contracts when problems arise and the press rightfully criticize the impact on the public. To avoid such situations, there must be clear agreement over which party absorbs which risks, and the public sector needs to show some patience and allow the contractual mechanisms to work.

With private finance often comes the benefit of international experience. Large, complex projects can present quite a challenge for smaller nations, which may have neither the experience nor the local expertise to manage them.

The **Chaglla Hydroelectric Power Plant**, set to be the second-tallest concrete-faced dam in the world and the third largest hydro project in Peru, benefits from such external expertise. At US\$1.2 billion, the project is being built by Brazilian energy group Odebrecht Energia, aided by a US\$150 million loan from the Inter-American Development Bank. The facility features a 199 meter-high dam, a 466 hectare reservoir, a 1 kilometer-long diversion tunnel, and hydroelectric generation facilities. Its installed power of 406 MW enables it to provide approximately 13 percent of the country’s installed hydropower, reducing CO₂ emissions by 467,000 tonnes annually.

Croatia’s new PPP-financed **airport** in the capital **Zagreb** is a major accomplishment



Demonstrating ambition



Durango-Mazatlán Highway

Mexico’s Durango-Mazatlán Highway is an incredible engineering feat, with its 230 kilometer length featuring 115 tunnels and 63 bridges, including the tallest cable-stayed bridge deck in the Americas. Replacing a slow and treacherous route infamously known as Espinazo del Diablo (Devil’s Spine), the new road should transform northern Mexico by linking port cities on the Gulf of Mexico and the US, quadrupling traffic volume to five million vehicles a year. A tolling system aims to recoup the US\$2.2 billion cost.



Nigeria High Speed Rail

Financing for Nigeria’s massive new US\$13 billion High Speed Rail network is primarily in the form of a loan from China’s Export Import Bank. The China Railway Construction Corporation is set to build the 3,218 kilometer network, which will be a major boost to the economy, connecting Lagos, Kano, Kaduna, Warri, Bauchi, Abuja, and Port Harcourt. The system will be digitally operated using fiber-optic cables, radio communication and wireless services. Judges appreciated that the project, which will remove heavy freight from Nigeria’s stressed roads, could save the country millions on road maintenance.



IceLink (Subsea Electricity Cable)

IceLink, a subsea electricity cable, is an ambitious attempt to connect the power grids of Iceland and the UK. Iceland produces all of its electrical power by the means of renewable energy, such as hydro, geothermal and wind, and has potential well beyond local consumption. Total investment in the cable and related production and grid infrastructure in Iceland has been assessed in the range of US\$5 billion. When completed, this clean-tech venture would be the world’s longest subsea power cable, delivering as much as five terawatt-hours a year of renewable electricity to the UK at a cost lower than offshore wind in UK territories. UK-based ventures have shown interest in funding the interconnector but Icelandic power companies will build the power-generating facilities and onshore infrastructure in Iceland.

“Trade is at the heart of regional collaboration, but infrastructure is the system that allows it to function”

for a recent EU entrant, setting a benchmark for private finance in the region. This US\$387 million, 65,000 square meter concession has a traffic-risk component and includes maintenance of the airport infrastructure, positioning the country as a gateway between the western Balkans and the rest of Europe.

Meanwhile **Jakarta's** city administration is considering a PPP to finance the second line of its **Mass Rapid Transit** system connecting the Indonesian capital's east and west districts. Such an arrangement would deviate from the current foreign loan-based funding model and provide a critical service for a city with 9.6 million inhabitants.

The MRT is the first of its kind in Indonesia, designed to reduce travel times,

enhance economic growth, and cut CO₂ emissions.

Strength through collaboration

Sometimes infrastructure requires strength in numbers. Auckland in New Zealand had seven 'city/district' authorities before merging them in 2010 to create the largest city council in Southeast Asia. This allowed the city to centralize its planning, with the clout to push forward major airport and wastewater developments.

Inter and intra-regional collaborations are also increasing in number. Examples of such blocs include the Southern Common Market (Mercosur – consisting of Argentina, Brazil, Paraguay, Uruguay, Venezuela and Bolivia), the Commonwealth Caribbean

(comprising independent English-speaking countries of the Caribbean region), and the Dominican Republic-Central America-United States Free Trade Agreement (CAFTA-DR).

While trade is often at the heart of regional collaboration, infrastructure is the circulatory system that allows it to function. One regional project that our judges supported is the US\$5.1 billion **Rail Baltica**, which they said will promote better integration in the eastern Baltic region of Europe by linking Finland, Estonia, Latvia and Lithuania with 960 kilometers of track. With trains travelling at up to 240 km/hour, a trip from Tallinn in Estonia to the Polish-Lithuanian border will take just four hours. Up to 85 percent support is needed from the EU, with the other 15 percent coming from the cash-strapped Baltic governments and the private sector in each country. The countries are forming a joint venture to move the project forward, with construction due to start in 2018 and finish by 2023.

Also part-funded by the EU, the **Scandinavian 8 Million City** will similarly link the capitals of Norway, Sweden and Denmark with a 600 kilometer high speed rail line. This US\$24.6 billion initiative aims to enhance sustainable economic growth by reducing travel time, and providing closer business and academic cooperation that will help these countries punch above their weight globally.

Finally, the **Square Kilometer Array (SKA)** project is an international collaborative effort to build the world's largest radio telescope, with an incredible one million square meters of collecting area. Costing US\$900 million, this is one of the largest scientific endeavors in history, bringing together some of the world's finest scientists, engineers and policy makers. By using hundreds of thousands of radio telescopes in Australia and South Africa, the SKA will be able to survey the entire sky thousands of times faster than any current system, breaking new ground in astronomical observations.

The SKA Organization is a not-for-profit company with members from 10 countries. Construction is set to begin in 2016.



Rapid deployment



Facebook Rapid Deployment Data Center

The Facebook Rapid Deployment Data Center, in the town of Luleå in Sweden, takes a modular approach to design and construction to accelerate the speed of assembly. Paying homage to another great Swedish institution, IKEA, Facebook claims that the centers can be built and deployed twice as fast as comparable facilities. The northern location also takes advantage of the surrounding Arctic temperatures to achieve a 100 percent renewable energy-powered cooling system. Judges said this project is indicative of the direct approach large internet-based companies are taking to address the growing scale of infrastructure required to support their businesses.

Biting off what you can chew

The relatively small size of many of these markets brings pluses and minuses. On the plus side, many governments have been able to develop strong domestic infrastructure programs that involve manageable, affordable chunks of infrastructure that are making a significant impact upon their national competitiveness.

However, there are two big challenges. First where scale is required, it is often achieved through collaborative, cross-border projects. There is a need to develop strong transnational networks – such as oil and gas pipelines, energy distribution networks, and rail and road routes – to reduce smaller nations' dependence on single sources of energy, food or raw materials and to improve connectivity and therefore international trade. Cross-border projects are inherently more complex to deliver and carry greater political risk.

The second challenge is, given their modest purchasing power and limited pipelines, economies of this size will generally struggle to attract the interest of foreign investors and developers. Such investors will also often be further deterred by currency risk, unfamiliar languages and a degree of political uncertainty. It is, therefore, challenging to produce the kind of project conveyor belt that appeals to international players. This explains why these markets have a more domestic feel and why delivery of complex projects can often be a challenge. Again, these conditions

strengthen the case for joint efforts along the lines of the Scandinavian 8 Million City initiative.

Many of these countries have been early adopters of PPPs. Looking forward we believe that there will be many more asset sales and privatizations of state-owned utilities. These will produce transactions of scale which will be attractive to international investors while taking advantage of the surplus of funds available and the current appeal of the infrastructure asset class. Such sales should also increase the efficiency of the utilities, providing customers with even greater value for money. The challenge will forever be scale.

Key takeaways

- 1 Smaller countries struggle to attract the interest of international investors**
- 2 Foreign investors will only step into long-term financing arrangements if there is long-term certainty**
- 3 International investors are most attracted by a regular flow of projects and asset sales**
- 4 Inter and intra-regional collaborations are increasing**

“There is a need for strong transnational networks to reduce smaller nations' dependence on single sources of energy, food or raw materials”



Index of projects by sector

Communications

Facebook Rapid Deployment Data Center (RDDC) *p56*
Myanmar Communications Network *p30*

Global Connectivity

A1 'Autostrada' Highway (Sparvo Tunnel) *p40*
Beijing International Mega-Airport *p18*
Durango-Mazatlán Highway *p55*
High Speed 2 (HS2) *p40*
Jinja Bridge *p28*
Jomo Kenyatta International Airport Terminal *p28*
Kathmandu-Kulekhani-Hetauda Tunnel Highway *p30*
Mombasa – Kigali Railway *p32*
Moscow-Kazan High Speed Rail *p24*
New Silk Road *p32*
Nigeria High Speed Rail *p55*
North-South Africa Corridor *p32*
Passenger Rail Agency of South Africa (PRASA) Rolling Stock *p52*
Rail Baltica *p56*
Square Kilometer Array (SKA) *p56*
Transcontinental Railroad *p17*
Yamuna Expressway *p18*
Yangshan Deep Water Port *p17*
Zagreb Airport *p55*

Energy & Natural Resources

Alaska LNG Project *p21*
Chaglla Hydroelectric Power Plant *p55*
Energy East Pipeline Project *p43*
Hak Se Mill Biomass Gasification Project *p34*
Hinkley Point C Nuclear Power Station *p42*
IceLink (Iceland Subsea Electricity Cable) *p55*
Jiuquan Wind Power Base *p14*
Khi Solar One *p54*
KivuWatt *p34*
Kudu Gas Field and CCGT Project *p30*
Libra Pré-Sal Oil Field Exploration *p21*
Los Cocos & Quilvio Cabrera Wind Farms *p34*
Mundra Ultra Mega Power Plant *p21*
Narmada Canal Solar Project *p21*
Northern Gateway Pipeline *p43*
Oyu Tolgoi Copper Ore Mine *p30*
Perth Wave Energy Project *p44*
Penonome Wind Farm *p54*
Ring Of Fire Mining Project *p43*
Russia-China Gas Pipeline *p21*
Site C Clean Energy Project *p44*
Solana Power Station *p14*
TAPI Gas Pipeline *p32*
Trans-Saharan Natural Gas Project *p30*
UHV Power Transmission *p20*
Westmill Solar Park *p44*
WindFloat Pacific Project *p21*

Recycling & Waste Management

Amager Bakke Incinerator *p52*
Haiti Temporary Wastewater Facility *p34*
Interceptor Sewage System *p15*
Montevideo Sanitation Project *p34*
Recife Metropolitan Region Sewage Treatment *p24*

Water

São Francisco River Irrigation Project *p15*
South-to-North Water Transfer Project *p20*
Southern SeaWater Desalination Plant Project *p45*

Healthcare

Alder Hey Children's Health Park *p45*
Bangladesh Dialysis Centers *p30*
Hôpital Universitaire de Mirebalais *p34*

Urban Mobility

Américo Vespucio Oriente Highway *p51*
Buenos Aires Bus Rapid Transit Corridors *p28*
Delhi Metro *p18*
Eglinton Crosstown Light Rail Transit *p41*
Garden Bridge *p46*
George Massey Tunnel Replacement Project *p40*
Jakarta Mass Rapid Transit *p56*
Legacy Way Tunnel *p40*
Liefkenshoek Railway Connection *p40*
Moscow Central Ring Road *p19*
North West Rail Link *p39*
Ohio River Bridges *p24*
Panama City Metro *p52*
Qatar Orbital Highway Project *p51*
Queensferry Crossing *p40*
Riyadh Metro *p51*
São Paulo Metro Line 6 *p18*
Singapore Intelligent Transport System *p52*
Stockholm Metro Expansion *p51*
Valley Line Light Rail Transit Stage 1 *p41*
WestConnex *p44*

Urban Regeneration

The Auckland Plan *p53*
Bouregreg Valley Development Project *p29*
Copenhagen Climate Adaptation Plan *p53*
Darling Harbour Live *p45*
King's Cross Redevelopment *p46*
Morar Carioca Sustainable Community Program *p16*
New York City Resiliency Plan *p20*
Northern Line Extension *p46*
Sochi Olympic Park *p19*
Willems Point Development Plan *p14*

New & Extended Cities

Gujarat International Finance Tec City (GIFT) *p16*
Kazan Smart City *p16*
Scandinavian 8 Million City *p56*
Sky City *p14*
Taoyuan Aerotropolis *p51*
Turn The Pearl River Delta Into One *p20*
Yokohama Smart City *p53*

Education

Mayan Heritage Museum *p54*
Priority School Building Programme *p46*
Tunnelling & Underground Construction Academy (TUCA) *p46*

KPMG's Global Infrastructure practice

Integrated services

Impartial advice

Industry experience

When it comes to infrastructure, KPMG firms know what it takes to drive value. With extensive experience in most sectors and countries around the world, our Global Infrastructure professionals can provide insight and actionable advisory, tax, audit, accounting and compliance-related services to government organizations, infrastructure contractors, operators and investors.

We help clients to ask the right questions that reflect the challenges they are facing at any stage of the lifecycle of infrastructure assets or programs – from planning, strategy and construction through to operations and hand-back. At each stage, KPMG's Global Infrastructure professionals focus on cutting through the complexity of program development to help member firm clients realize the maximum value from their projects or programs.

Infrastructure will almost certainly be one of the most significant challenges facing the world over the coming decades. That is why KPMG's Global Infrastructure practice has built a team of highly-experienced professionals (many of whom have held senior infrastructure roles in government and the private sector) who work closely with member firm clients to share industry best practices and develop effective local strategies.

By combining valuable global insight with hands-on local experience, KPMG's Global Infrastructure practice understands the unique challenges facing different clients in different regions. And by bringing together numerous disciplines such as economics, engineering, project finance, project management, strategic consulting, and tax and accounting, KPMG's Global Infrastructure professionals work to consistently provide integrated advice and effective results to help member firms' clients succeed.

For further information, please visit us online at kpmg.com/infrastructure or contact:



James Stewart
Global Infrastructure
Chairman
Partner, KPMG in the UK
E: jamesa.stewart@kpmg.co.uk



Stephen Beatty
Americas and India
Head of Global Infrastructure
Partner, KPMG in Canada
E: sbeatty@kpmg.ca



Julian Vella
Asia Pacific Head of
Global Infrastructure
Partner, KPMG in Australia
E: jpvella@kpmg.com.au

kpmg.com/infrastructure

© 2014 KPMG International Cooperative ("KPMG International"), a Swiss entity. Member firms of the KPMG network of independent firms are affiliated with KPMG International. KPMG International provides no client services. No member firm has any authority to obligate or bind KPMG International or any other member firm vis-à-vis third parties, nor does KPMG International have any such authority to obligate or bind any member firm. All rights reserved.

The information contained herein is of a general nature and is not intended to address the circumstances of any particular individual or entity. Although we endeavor to provide accurate and timely information, there can be no guarantee that such information is accurate as of the date it is received or that it will continue to be accurate in the future. No one should act on such information without appropriate professional advice after a thorough examination of the particular situation.

The KPMG name, logo and "cutting through complexity" are registered trademarks or trademarks of KPMG International.

The views and opinions expressed herein are those of the interviewees and authors and do not necessarily represent the views and opinions of KPMG International or any KPMG member firm.

Designed by Haymarket Media Group Ltd. Publication name: Infrastructure 100: World Markets Report Editors: John Kjorstad, Laura Jablonski and Dane Wolfe. Publication number: 131854. Publication date: November 2014.



cutting through complexity

WWW.KPMG.COM/INFRASTRUCTURE100

