



GLOBAL INFRASTRUCTURE INITIATIVE

By McKinsey & Company



SpencerStuart



ALBRIGHT
STONEBRIDGE
GROUP

GII 2015: Post-event summary

GLOBAL INFRASTRUCTURE INITIATIVE GLOBAL
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Contents

- 01** Introduction
- 02** Best ideas from GII 2015
- 03** Plan
- 06** Finance
- 09** Build
- 11** Operate
- 13** Thoughts on delivering the next Transbay Tunnel
- 14** Conclusion
- 15** Participants
- 20** McKinsey & Company and the Global Infrastructure Initiative

Introduction

Since McKinsey established the Global Infrastructure Initiative (GII) in 2012, we have worked to stimulate change to improve how infrastructure is delivered. More specifically, we have been working to help build greenfield infrastructure faster, better, and at less cost. We also are working on ways to get more out of existing infrastructure by applying technology and leading-edge maintenance and operations practices. To do so, we provide a forum where global infrastructure leaders can exchange ideas. The emphasis has always been on finding practical solutions that participants can apply to real-life problems.

At the second GII meeting in Rio de Janeiro in May 2014, we identified three themes and 25 actions that could make a positive difference to the infrastructure industry. The themes were: invest early in preparation; build skills in both industry and government; and involve the public.

We then divided the 25 actions among the four “pillars” required to deliver an infrastructure project: plan, finance, build, and operate. These recommendations were specific, ranging from investing heavily in building and tracking citizen engagement (plan) to standardizing insurance packages (finance) to piloting construction innovations (build) to using big data to optimize asset usage (operate). Based on the responses to a survey we sent to GII participants in October 2015, it is clear that there has been significant progress on adopting these 25 recommendations.

For the 2015 GII, held near San Francisco, we decided to explore more broadly how innovation and technology can improve infrastructure delivery – a matter of importance not only to companies in the sector, but also to the societies where they operate. *“If we want to maintain growth, productivity must increase significantly,” McKinsey Partner Jaana Remes told the 2015 GII participants. “Infrastructure has a wlot to contribute.”* It is also important to remember that infrastructure is crucial to improving human lives: 1.3 billion people have no access to electricity 2.5 billion lack adequate sanitation, and 3 billion use wood and dung to cook, a practice that results in millions of premature deaths every year, according to the World Health Organization.

GII 2105 exceeded our expectations. Participants were forthright in discussing the problems they face and creative in devising ways to address them. We also did something new. Based on months of pre-conference work, we convened experts to discuss a specific project – the proposed Transbay Tunnel (TBT) between San Francisco and Oakland.

In the rest of this report, we draw on the work of GII 2015 to suggest specific ways to bolster each of the four pillars; we also discuss the work related to the TBT.

Finally, we would like to thank our partners – the Albright Stonebridge Group, Spencer Stuart, and our host partner, the City of San Francisco. Without their support, GII 2015 would not have been possible.



“If we want to maintain growth, productivity must increase significantly. That is an area where infrastructure has a lot to contribute.”

Jaana Remes, Partner, McKinsey Global Institute

Best ideas from GII 2015

The goal of GII is to identify themes, insights, and actions that participants can then apply. Here are the highlights from GII 2015, followed by an analysis of each.

Plan

- Work with decision-makers at the most local level possible to bring projects to life
- Engage stakeholders and potential partners from the start, creating a vision of what is possible as well as the potential benefits
- Work with governments to help them understand that in building mega projects, supply leads demand
- Encourage experimentation and parallel processing in design, engineering, environmental reviews, and procurement to reduce time and allow for innovation.

Build

- Adapt business models and technologies from outside the traditional construction sector
- Create institutional memory through the use of technologies such as building-information modeling (BIM)
- Anticipate and manage the impact of disruption on people.

Finance

- Collaborate with governments, development finance institutions (DFIs), and the private sector to develop a pipeline of projects that meet investor expectations
- Establish public-sector infrastructure delivery organizations to help reduce political risk
- Look beyond traditional funding sources to get better risk-adjusted returns
- Pursue long-term leases and operating agreements instead of privatizations.

Operate

- Accept that the sharing economy and autonomous vehicles will be part of the future
- Use big data and analytics to increase capacity, reduce maintenance and operating costs, and improve reliability and safety
- Use real-time data and virtual technologies to improve operations.

Plan



Madeleine Albright,
Chair, Albright Stonebridge Group

“The closer you get to municipalities, the more likely there is confidence in what they’re doing, because they relate to people more.”

Madeleine Albright



Kasim Reed, Mayor of Atlanta

Work with decision-makers at the most local level possible to bring projects to life.

In the United States, 75 percent of GDP growth is expected to occur in US metropolitan areas, and the ratio is similar elsewhere. To build the new infrastructure and maintain the existing infrastructure required to sustain GDP growth, infrastructure professionals should seek out decision-makers at the most local level possible. *“The closer you get to municipalities,”* noted Madeleine Albright, *“the more likely there is confidence in what they’re doing, because they relate to people more.”* Moreover, the reality is that infrastructure is delivered and utilized locally. Hence, the local level is the best level at which to address infrastructure issues.

Local governments most acutely feel the benefits and costs of infrastructure delivery. Regional- or national-level governments have many competing infrastructure initiatives and thus do not see nor feel the benefits and costs as acutely. It is this proximity to the infrastructure issues which drives local governments to be so involved and seek solutions. As Mayor Kasim Reed of Atlanta put it, *“Cities are going to move faster and lead because the federal structure is just not built to accommodate the rate of change that’s going to be required globally.”* National governments can support this shift by helping local leaders to solve problems and by serving as strategic thought-partners.

Engage stakeholders and potential partners from the start, creating a vision of what is possible as well as the potential benefits.

To win the public over, stakeholders should create a shared perspective on what problem the infrastructure project

“Cities are going to move faster and lead because the federal structure is just not built to accommodate the rate of change that’s going to be required globally.”

Kasim Reed

is meant to solve, and why the proposed project is the right answer. A vision for the infrastructure project should be established up front and its benefits – direct and indirect, environmental, social, and economic – should be communicated. To explore the full spectrum of options, a process should be established for different visions to be identified and then compared.

When it comes to how we build the project, milestones should be clearly defined and the public kept informed of their progress. To do this well, infrastructure professionals should:

- Establish a baseline
- Prove the economic benefit as the project progresses
- Document the benefits after the project has been completed.

The Panama Canal Expansion presents a case study of how this can work. The leaders of the project built support by outlining the benefits to the country. In fact, the expansion is on track to deliver 30 percent more revenues annually than expected, as well as significant environmental and socio-economic benefits. Stakeholders and the public have been made aware of these achievements as they have occurred.

Engaging with the right community partners can help to achieve the project’s vision and define the related benefits. Working with a wide set of potential partners and exploring what is possible is a good place to start. Once everyone is agreed on what can be done, the developer can focus on building the actual asset, while community institutions concentrate on establishing secondary social and economic benefits.



Uwe Krueger, CEO, Atkins Global

“The challenge facing the cities of tomorrow is to think about a kind of holistic approach. The infrastructure, water, transportation, energy, waste water, and social environment of the city all has to come together in order to have a responsible and future-proof design.”

Uwe Krueger





Jeff Morales, CEO, California High-Speed Rail Authority and
Vahid Ownjazayeri, President, Global Civil & Infrastructure, AECOM

“Government is very risk adverse, by definition, and it’s going to thwart innovation if we don’t have the other side of the table as a full partner, really advocating and helping people understand infrastructure risks and benefits.”

Jeff Morales

Work with governments to help them understand that in building mega projects, supply leads demand.

Big projects can create economic benefits far beyond expectations. When this is done well, such as the transformation of China’s Shenzhen mega city or the development of East London during and after the 2012 Olympics, the socio-economic benefits can be impressive.

These examples suggest the importance of thinking comprehensively and expansively. Infrastructure needs to be designed beyond its 30- to 40-year life, with the ability to scale up to meet demand. Consider India, for example, which will need to build the equivalent of one New Delhi a year to meet the nation’s needs, given trends in urbanization and population growth. Planners also need to anticipate the economic impact of mega projects, and build the necessary infrastructure to meet their development curve.

Encourage experimentation and parallel processing in design, engineering, environmental reviews, and procurement to save time and allow for innovation.

As governments and planners think about the future, they must be thoughtful around how to adapt to fast-moving technology shifts and changes in consumer preferences. Di-Ann Eisnor of Waze, a traffic and navigation app, elaborated, *“With so many new things happening, we all need to have an increased sense and a culture of experimentation.”*

Flexibility is the key. A project must be allowed to change, especially to include suggestions from important stakeholders such as users and advocacy groups. Ideas from these sources can be beneficial, but they need to be evaluated objectively and openly, given the tradeoffs in time and money. Carol Browner, a former Head of the Environmental Protection Administration under President Clinton and Director of Climate Change Policy in the White House from 2009 to 2011, made the case for reimagining the environmental review process in the U.S. to become a search for solutions as opposed to a negotiation with interested parties on the price of their consent.

For experimentation to flourish, operational stability is crucial. Governments must provide an environment within which the partners can operate with confidence; this is especially the case with public-private partnerships (PPPs).

Finance

Collaborate with governments, development finance institutions (DFIs), and the private sector to develop a pipeline of projects that meet investor expectations.

There is no shortage of capital to finance new projects. The shortage is in projects that meet investors' risk-return expectations, due in part to the lack of public policies to promote investment and capabilities to identify and develop those with commercial potential. Without those things in place, the private sector will not have the confidence to invest.

The lack of capabilities results from limited experience with PPPs, political cycles, high turnover, and politicization of the project development process. Initiatives and institutional arrangements that can foster the right capabilities and help to create project pipelines are essential because they reassure private-sector investors of the government's ability to act as a long-term partner. The most successful PPP and power-purchase agreement (PPA) programs generally have one element in common: they recruit high-quality experts and keep politics to a minimum.

One criticism is that investors have unrealistic risk-return expectations. That is sometimes the case, but it is also true that when the enabling environment is poor, as in many emerging markets, investors will want higher premiums. Multilateral banks and DFIs have a role to play here by improving the enabling environment, guaranteeing loans, and devising innovative finance models.

To get better results, private-sector investors could work with DFIs and governments to build their capabilities and help governments understand their thinking on risk. For their part, governments can help themselves by creating an organization staffed with people skilled



Wong Heang Fine,
CEO of Surbana-Jurong

“To the degree that the new infrastructure banks put pressure on the governments to create capabilities and build pipelines, more power to them. But if there is just more capital, that is not solving our challenges.”

Jordan Schwartz



Jordan Schwartz, Head of the Global
Infrastructure Facility (GIF), World Bank Group

in structuring and completing projects. This, combined with a well-reasoned process to put projects together and a clear set of rules on procurement and financing, will go a long way toward reassuring investors.

Establish public-sector infrastructure delivery organizations to help reduce political risks.

There is an inherent tension between how long large greenfield projects take and how short political life cycles are. Some politicians see no gain in starting projects that are unlikely to be finished on their watch, and new administrations can bring different priorities. Investors value political stability, established infrastructure pipelines, and strong enabling environments. They value long-term partnerships with governments that go beyond the political cycle.

“There needs to be a better political mechanism to ride out the political cycle ... the political cycles effectively kill the delivery of infrastructure.”

Werner von Guionneau, CEO of Infrared Capital Partners

Local programs, such as Infrastructure New South Wales and Infrastructure Ontario, have gained political support and are successfully moving ahead on projects by having capable teams, clear mandates that are protected from political changes, and consistent rules. These specialized units build teams of experts that can support the government on project selection, evaluation, structuring, and sometimes portfolio management. By providing a third-party review of projects, these entities reduce the risks faced by politicians and provide a long-term and politically independent framework that increases investor confidence.



“Independently assessed project pipelines should ultimately drive more confidence in the market.”

Robert Milliner, Director of the Global Infrastructure Hub

Infrastructure and local development banks can be particularly helpful when capital markets are not well developed and liquidity is an issue. Some local development banks, such as FDN in Colombia, have used their limited capital to invest in infrastructure, thereby reassuring domestic investors and helping to catalyze new pools of capital.

Look beyond traditional funding sources to get better risk-adjusted returns.

Some projects must develop multiple revenue streams to obtain financing. This is often the case when there are low annual returns or long-term repayment schedules. One path is to imbed real estate and retail components into the commercial models. For example, development rights can be sold or leased to property developers near a new metro station to raise project development funding and to boost rates of return.

Another option is for infrastructure projects to be financed through “value capture” techniques. In this

instance, financing is raised against the new tax revenues or higher real estate values that will be created by the infrastructure project.

Pursue long-term leases and operating agreements instead of privatizations.

Even when governments face strong fiscal pressure, getting the political support to sell assets to the private sector is often challenging. In addition, in places that under-charge users for infrastructure, it can be difficult to convince residents to pay for infrastructure.

Concession models, long-term leases, and operating agreements are therefore increasingly attractive alternatives to full-fledged privatization. There are some market standards for concessions, particularly for road assets, but more standardization would be helpful. Design-build-operate (DBO) models, without third-party ownership, are already well established.

For these models to succeed, governments could benefit from a better understanding of what services may be best owned or operated by the private sector. This analysis is happening one transaction at a time but a better approach is to make a systematic reckoning of the whole portfolio of assets. Pär Nuder, Chairman of the Third Swedish National Pension Fund, put it this way: *“It is time to have a trilateral conversation between these three sources of capital – sovereign wealth funds and pension funds; government; and the private sector – to reach new solutions for financing infrastructure.”*



Joaquim Levy, Minister of Finance (until December 2015), Brazil



Kevin Connelly, CEO, Spencer Stuart

Build



Michael Marks, Founding Partner,
Riverwood Capital; Chairman, Katerra

Adapt business models and technologies from outside the traditional construction sector.

The construction industry is globally important, but it has also been slow to innovate. On the whole, it has pursued incremental changes; the result has been flat productivity over the last 30 years.

Entrants into the industry like Katerra, a Silicon Valley construction start-up, and the Broad Group, a Chinese modular construction company, are demonstrating that new business models have big potential. Katerra has integrated all the steps of the construction supply-chain and used new technology to improve design, material selection, logistics, and construction. The Broad Group has adopted manufacturing technologies and standardization to greatly reduce construction costs and time. The next big move in the industry may be toward 3D-printed buildings and lifecycle management through building information modeling (BIM).

“Over the past hundred years, the global supply base has been split into all these little buckets and everybody’s trying to avoid risk. It puts all kinds of overhead and cost into the system in order to not be the one holding the bag when something goes wrong. We’re actually going to embrace that risk and say, ‘Yeah, that’s our problem. We’re going to take care of it.’ ”

Michael Marks

Create institutional memory through the use of technologies such as building-information modeling (BIM).

“Every project is unique”: That is a guiding principle of the infrastructure industry. And it has locked engineering and construction companies into constantly re-inventing the wheel, rather than steadily improving productivity. The effective use of building information models (BIM) during design can help organizations create an institutional memory that enables them to store and re-use designs; document lessons learned; and incorporate productivity-enhancing changes. Using BIM throughout the project lifecycle (from design to asset management) expands the capacity to monitor building performance and incorporate lessons learned into future activities.

Field technologies such as predictive analytics – based on sensor data from job sites – and productivity data from equipment can help managers monitor project performance in real time. Such methods increase the

industry's ability to understand the performance of projects throughout their lifecycle.

Anticipate and manage the impact of disruption on people.

As forces such as urbanization, aging, and global interconnectedness take effect and new business models and technologies are deployed, companies should anticipate, and mitigate, the impact on people.

At one leading construction company, the average age of staff has dropped from 57 to 35 years old as senior staff retire. This could mean a loss of critical decision-making capability. By matching older and younger staff, for example, companies can get the best of both worlds – developing both technological prowess and structured decision-making capabilities.

As new technologies improve the efficiency of work in the field or move work from the field to industrial construction facilities, less-skilled workers could be displaced, particularly in developing countries. Some companies are investing in training and support programs to keep workers from falling behind.



William Ruh, Chief Digital Officer,
GE and CEO, GE Digital



Donald (Ed) Jackson, Major General,
U.S. Army Corps of Engineers



Michael Della Rocca
Infrastructure Partner, McKinsey & Company

Operate

Accept that the sharing economy and autonomous vehicles will be part of the future.

Innovation and technological advances are resulting in rapid and dramatic shifts in consumer choices. One GII 2015 participant noted that when it comes to the car, the new question is, “Should I buy a car for my son or simply set up an Uber account?”

Average car ridership in the United States could increase from 1.2 people per vehicle to more than two through ride-sharing and other on-demand shared-economy approaches. They could also reduce car ownership because of simple cost and convenience considerations – instant mobility at the click of a button on your phone at much lower prices compared with ownership. Such offerings should be seen as complements to public transport. To tap their potential, planners need to address questions such as getting people to and from transit stops.

By allowing cars to drive closer to each other, autonomous vehicles could expand the capacity of the road network, without building new roads. US Secretary of Transportation Anthony Foxx recently announced three pilot projects in New York City, Tampa, and Wyoming to collect data on how connected and autonomous vehicles work in different environments.

These are fascinating and mostly positive developments, but they will require rewriting the traditional transportation rulebook. The liability issues alone are enormous, and technology typically moves much faster than regulation.

Use big data and analytics to increase capacity, reduce maintenance and operating costs, and improve reliability and safety.

The use of big data and analytics can provide significant benefits in operating infrastructure assets. Similarly, new technologies such as robotics and remote sensing, can improve the performance of existing assets such as ports and airports.

“Data is infrastructure.”

Di-Ann Eisnor

Using big data is complicated and expensive but “four times cheaper than expanding capacity using bricks and mortar,” according to one participant. For example, building a demand management system to administer capacity for a bridge is much cheaper than expanding or building a new one. Sharing and accessing data in the cloud allows for benchmarking, providing the metrics to improve asset performance across a portfolio.

“Owning assets may no longer be where the value is, but rather determining how you increase efficiency and productivity.”

William Ruh, Chief Digital Officer, GE and CEO, GE Digital

Using big data well requires investing in the right technology and analytical skills. To date, the industry is just scratching the surface with regard to how big data can change the way infrastructure is operated. Getting this right will certainly help to close the infrastructure finance gap.



Di-Ann Eisnor,
Head of Growth, Waze

Use real-time data and virtual technologies to improve operations.

Participants shared a number of examples where migrating from sample data to real-time data improved operational efficiency.

One interesting innovation is the digital twin – a virtual model of an asset that is completed alongside the physical one, such as a power plant, transportation network, or water system. The virtual twin runs in parallel and feeds off real-time data generated by the physical system. The digital twin’s data is then used by its physical counterpart to improve efficiency and productivity as well as prevent problems through predictive maintenance.

In another case, a freight rail company collects 200,000 images of rolling stock a day to improve maintenance and reliability. These images help managers predict maintenance needs and order new parts automatically, before they wear out or break down. Water utilities use data and analytics to predict which pipes are likely to fail based on weather and traffic conditions. Even airport parking can benefit – the use of parking robots to optimize space utilization in one airport has increased capacity by 60 percent.

Also, social media can be used to engage customers and keep up a steady flow of information on operations, delays, and possible improvements. *“Consumers and customers can be put to work to become an army of unpaid inspectors,”* said one participant. The Waze app, for example, reports congestion and potholes; traffic authorities can use this information to improve flows and manage maintenance.



Anthony Foxx, U.S. Secretary of Transportation and McKinsey Partner Rik Kirkland



Liew Mun Leong, Chairman, Changi Airport Group



Carol Browner, Albright Stonebridge Group and Michael Berkowitz, President, 100 Resilient Cities Rockefeller Foundation

Thoughts on delivering the next Transbay Tunnel

The Bay Area's population is growing while the transport infrastructure is aging. There is no alternative to the Bay Area Rapid Transit (BART) tunnel. Preliminary research from the San Francisco Bay Area Core Capacity Transit Study indicates that a second multimodal transbay tunnel may be the solution to reducing congestion, improving system resilience, and sustaining economic growth in the Bay Area. The 2015 GII provided a unique opportunity for global leaders to collaborate to address this critical infrastructure challenge: How can the San Francisco Bay Area complete the next Transbay Tunnel (TBT) by 2025?

In a plenary session, San Francisco MTA Executive Director Ed Reiskin, Oakland Mayor Libby Schaaf, and Femern Managing Director Claus Baunkjær made the case for why the TBT is necessary. Participants then divided themselves into four structured workshops, where they considered questions related to each of the four stages in delivering this mega project.

Plan

How can the planning process be streamlined to optimize existing infrastructure, while ensuring system resilience and maximizing socio-economic outcomes?

Finance

What financing and funding models should the Bay Area use to accelerate and improve project delivery?

Build

What would it take to complete the construction phase in ten years? Or five?

Operate

Who should own and operate the TBT? How can it be designed to remain flexible to incorporate inevitable changes in technology and society?

Three key recommendations stand out from the sessions:

1. Define the problem the TBT will solve, and demonstrate objectively that it is the best solution to the problem.
2. Involve a wide variety of stakeholders to create a vision for the TBT, and use this vision as the starting point for what the TBT will achieve.
3. Determine the ownership structure and governance model for the TBT's delivery, and seek innovative ways to plan, finance and construct the project. Prepare for new technologies and consumer preferences in the TBT's design.

At GII 2015, California officials agreed to create a high-level working group composed of the major stakeholders to consider the ideas presented and to figure out how to move the project ahead. The Bay Area has much to gain if it can harness the expected growth headed to the region — and infrastructure investment will be a key enabler of the Bay's continued prosperity.



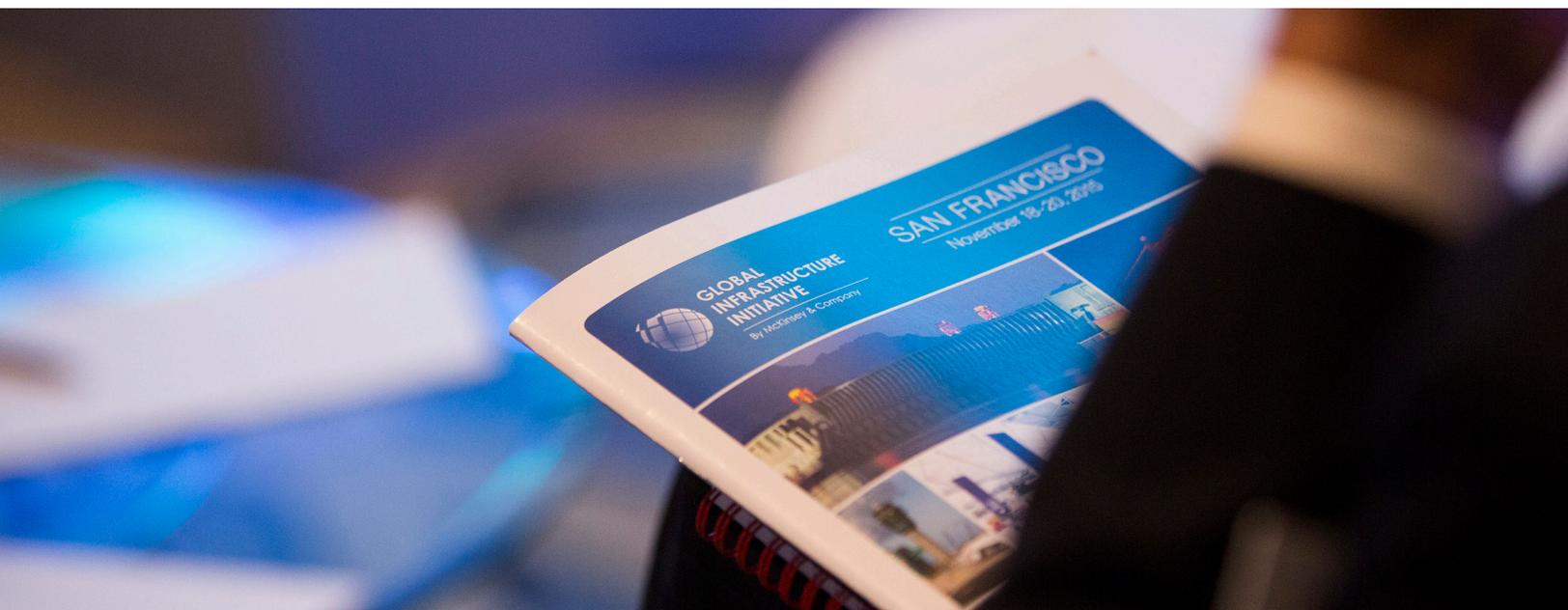
Libby Schaaf, Mayor, City of Oakland

Conclusion

The point of the Global Infrastructure Initiative is to stimulate leaders to improve the way that they deliver critical infrastructure and also to get more out of existing infrastructure. Based on the two days of discussion at GII 2015, we believe this is happening: The infrastructure industry is making progress in implementing the 25 actions identified in Rio. But there is still much to be done to embrace innovation, collaborate more effectively, and take the bold steps necessary to deliver 21st century infrastructure.

We hope that the ideas in this report will help create change in how infrastructure is approached around the world. In the spring, we plan to publish more ideas in a new digital edition of *Voices from the GII*. We will also be convening a number of GII regional roundtables and preparing for our next global event in Asia in 2017.

We thank those who attended GII 2015 for their energy and insights. We look forward to staying in touch — and to continuing the conversation.



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Our research suggests that up to 40 percent of global infrastructure investment is poorly spent because of bottlenecks, lack of innovation, and market failures. McKinsey established the Global Infrastructure Initiative to address these issues, promote economic growth, and contribute to more resilient and secure communities. GII is a separate entity and collaborates with infrastructure leaders from around the world.

While GII operates independently from the Capital Projects & Infrastructure Practice, McKinsey provides access to the Firm's skills, resources, and convening power. McKinsey and GII are committed to improving infrastructure, because we believe it is our responsibility to work on the world's biggest challenges. Developing and operating great infrastructure helps all of us — our clients, our people, and our societies.

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