CG/LA INFRASTRUCTURE

2018 STRATEGIC 100 GLOBAL INFRASTRUCTURE REPORT

11th Edition

11TH ANNUAL GLOBAL 100 REPORT

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01 THE GLOBAL STRATEGIC 100: GLOBAL GROWTH & LOCAL CREATIVITY

Regional connectivity and urban mobility; an evolving energy system, from generation to a smarter and more resilient grid; and improved access to and use of clean water for burgeoning, vibrant megacities. Nations, cities, communities, and entrepreneurs are striving to improve our world through innovative partnerships, audacious technical undertakings, and creative, transformative applications of new technology. The 2018 edition of the *Global Strategic 100 Infrastructure Projects* list includes a cross-section of projects that provide both a snapshot of key sectors driving the market over the 2018-2019 period and a reflection of the underlying themes shaping demand for infrastructure over the longer term.

The total value of this year's *Global Strategic 100 Infrastructure Projects* list is $644 billion, ranging from large projects measured in tens of billions to projects as small as a few hundred million. Many projects are intended to help stitch together the global economy; port and rail projects associated with China's Belt and Road Initiative, for example, figure prominently. Others are more localized in origin and scope. Each project is unique, intended to address an economic or social need, with enormous – and measurable – benefits in job creation, health or mobility. We have tried to identify the projects that are well-conceived and promise to be well-executed, including those smaller projects that can have outsized impacts as models, hosts for new technologies, and as training grounds for new leadership. The result of the *Global Strategic 100 Infrastructure Projects* research process is a unique snapshot of the global infrastructure project pipeline, constructed piece by robust piece from the strategic projects developed by private -and public- sector leaders around the world.

HIGHLIGHTS OF THE 2018 GLOBAL STRATEGIC 100

The 2018 Strategic 100 includes projects from across the Americas, Eurasia, the Middle East, Africa, and the Asia-Pacific region.

Figure 1 below shows the total number of projects on the list by geographic region. North America, bolstered by active, dynamic markets in the U.S., Canada, and Mexico, has both the highest number of projects, 31, and the highest percentage of total list value, at 36% of the total estimated cost.[1] This is largely because of the reliability of Canada's infrastructure pipeline, and the promise of the Trump Infrastructure plan (along with 25 years of pent-up US demand, in an economy that is growing at 3%/year).

North America is followed by the Middle East (16 projects, 10% by value[2]), Latin America and the Caribbean (14 projects, 7.5% by value), and South Asia (12 projects, 8.5% by value). The list includes 10 European projects, but these large projects together represent nearly 22% of the total value. Ten projects in the Asia-Pacific region make up approximately 13% of the market value of projects on the list.

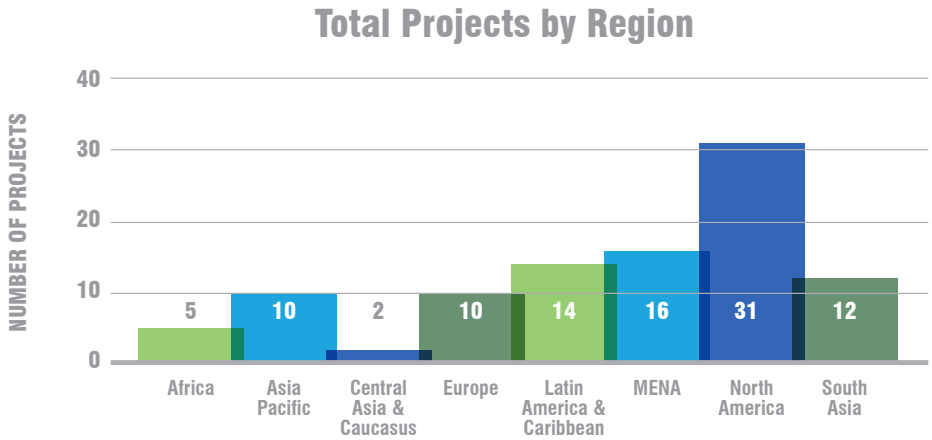

Figure 1: Project Distribution by Region

[1] Each project listing includes an indicative cost figure to provide a simple measure of the project's size. These figures are all expressed in U.S. dollars, and most are estimates of the total capital investment required for a project. They are obtained directly from projects where possible and from other credible, published sources when not.

[2] In this section, "by value" refers to a share of the sum of indicative costs across all 100 projects on the list. It should not be confused with measures of the long-term value (social, economic, or otherwise) created by the projects.

By sector (see Figure 2), transit leads the list with 20 projects, representing an 18% share of value. High-speed rail, just 7 projects, represents over 16% of value, while ten additional heavy rail projects contribute another 7.5% of total value. Six highway projects account for 7% of value, while 10 fixed transportation links (i.e., bridges and tunnels) add 11.5% of value. Six notable airport projects represent 8.5% of total list value, while six additional ports and/or logistics projects account for 3% by value.

(Note: In a recent Ipsos survey conducted in August 2017 of 1500 Brazilians for the Leadership Forum, when asked about the meaning of infrastructure investment, 37% said "health," and 36% said "mobility," and less than 5% mentioned specific types of infrastructure, like highways or airports. People focus on benefits to them.)

In energy, generation contributes 14 projects and 10.5% of value, while electric transmission's share is 11 projects and 5% of total estimated capital expenditure. Six water projects account for 3.5% of the expected total investment.

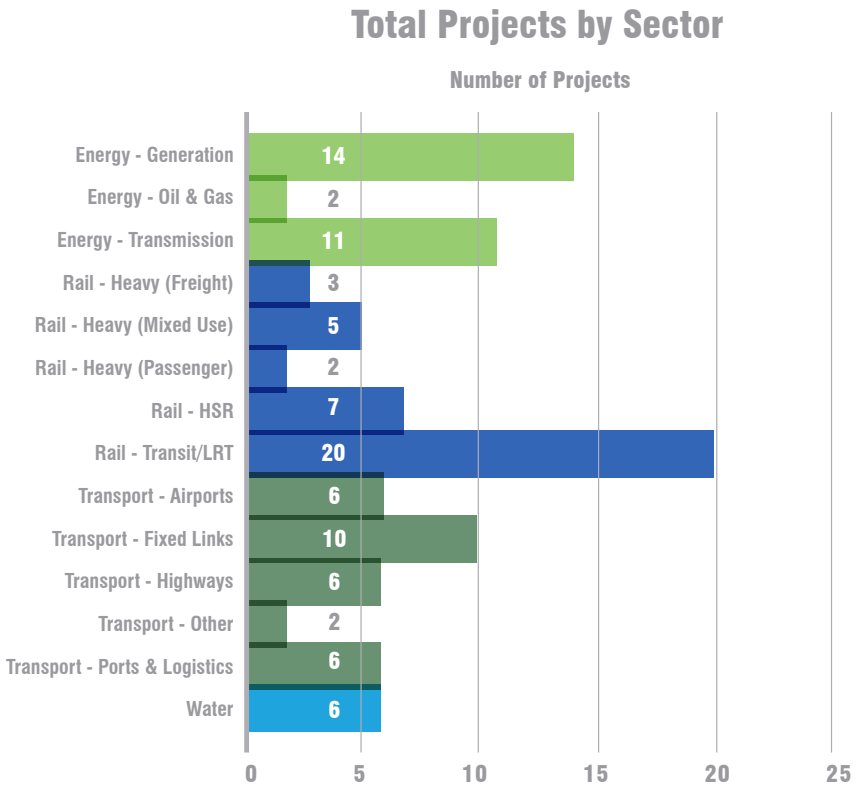

Figure 2: Project Distribution by Sector

WHAT IS THE STRATEGIC 100?

The Global Strategic 100 Infrastructure Projects is an annual list of 100 under-development infrastructure projects that are poised to shape the market over the coming eighteen months. The product of a focused, six-month research and analysis project, the report is intended to be a source of practical intelligence on projects coming to market across all sectors and all regions, helping to distinguish probable opportunities from undeveloped concepts and unworkable dreams.

The cross-sectoral list consists of projects drawn from all regions globally and includes transportation, energy, and water/wastewater projects. Projects on the list are all progressing through development phases, ranging from early feasibility studies and related assessments to those that are nearing construction procurement. Listings usually seek to capture the "whole project" – a high-level, policy-makers' view of project definition; in practice, many projects on this list will be implemented via multiple phases or as focused programs of related projects.

OUR MOTIVATION

With so many needs and never enough resources, how should communities prioritize their investments? On what projects – and markets – should industry leaders, ever mindful of the bottom line, focus their businesses? These are the questions underlying development of CG/LA's Strategic 100 list each year.

[3] Projects located in countries whose markets are less open to international industry, notably China, Russia, and Japan, typically are not included on the list.

[4] Put differently, the list includes projects that are commonly classified as "economic infrastructure" and excludes – with occasional exception – social infrastructure, most pure telecommunications/IT, industrials, and extractive industries like oil/gas/chemicals.

Good infrastructure projects are planned, structured, procured, and managed in ways that fairly balance the costs and benefits and the risks and rewards among myriad public and private parties: those that manage, finance, build, operate, and – critically – use the system. They create long-term value, boosting economic competitiveness, productivity, and/or quality of life while creating quality jobs – directly on the project, indirectly in the community and through the supply chain, and eventually via the new economic opportunities a completed project makes possible. They are socially and environmentally responsible, strengthening communities and using resources sustainably. And, for the Strategic 100, they should be relatively large – regionally, if not globally, significant – projects that are credibly poised to provide real, bookable business opportunities over the coming 18 months.

OUR APPROACH

The Strategic 100 research is built on a review of the market designed to assemble an in-depth picture of the pipeline of major projects in each region. This process makes use of several sources of information: (1) a survey sent to CG/LA's extensive database of infrastructure-industry contacts, inviting this network of professionals to nominate projects for consideration, (2) extensive outreach and discussion with groups of knowledgeable project and business development executives in different sectors from leading firms and key public agencies, and (3) a systematic review of publicly-available information from internet and media sources, including CG/LA's online project platform, GViP.

As staff review candidate projects, consult with expert advisors, and build the list, the driving goal is to highlight strategic infrastructure projects that will contribute positively to a region's economy over the long run, while also providing the infrastructure business community with a sense of where and in what sectors upcoming opportunities are located.

WILL YOU BE THERE?

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02 10 MACRO TRENDS IN THE GLOBAL INFRASTRUCTURE MARKETPLACE: THINKING STRATEGICALLY IN 2018 AND BEYOND

By: Norman F. Anderson, President & CEO of CG/LA

In 2018 the global economy is set to grow in a synchronized manner for the first time in a decade. This is very good news for the infrastructure industry; we are a long-term industry, and the global number of starts tends to be very strong in years of overall growth, and in the 2-3 years afterwards. Below we set out ten macro trends that should inform your win strategy for the next several years.

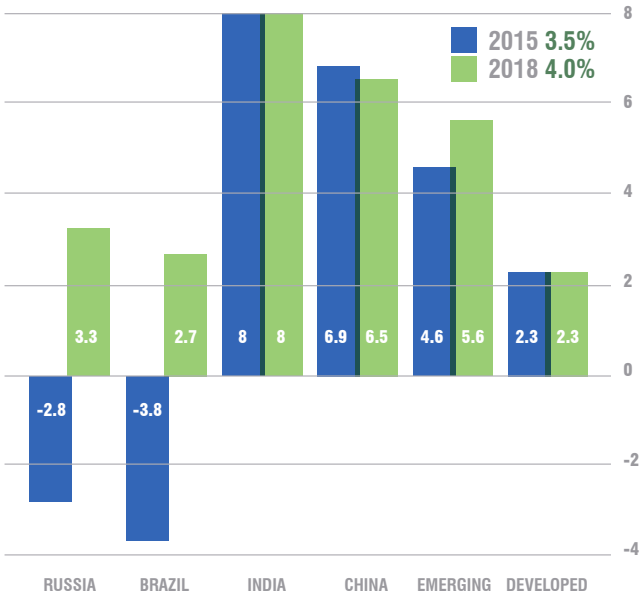
As we enter 2018, ten trends define the macro infrastructure environment:

1. Economic Growth Driving

Overall synchronized economic growth may lead to an infrastructure super-cycle over the next 3-5 years, although we see a significant gap between economic growth and the ability of the global economy to produce bankable infrastructure projects (see next trend).

Opportunity: Growth creates opportunities. In this tenth year of economic expansion, global infrastructure investment is the best means of sustaining long-term growth.

1. Economic Growth 2018 & Forward



Source: Goldman Sachs, November 2017

- **Very robust mature market growth, in the range of 2.3%**
- **Emerging Market growth will be in the 5.6% range in 2018 - and increasing in 2019 (5.7%)**
- **The big news is the reemergence of two of the BRIC countries, Russia (3.3% growth this year), and Brazil (2.7% growth in 2018)**
- **These are Goldman Sachs numbers, and they are - in general - more optimistic than consensus figures.**

2. Project Origination Lagging

Perhaps the most significant brake on global infrastructure project creation is the lack of productivity in the creation of projects. This is the other side of the "There is plenty of money, but where are the projects?" coin. There are a number of key weaknesses here: the time it takes to generate permits and approvals; the general weakness and lack of funding in public sectors around the world; and the lack of funds available for bankable, first-class feasibility studies.

Opportunity: Arguably the value of independent, first-rate, bankable feasibility studies has never been fully recognized, especially in developing countries. There is an opportunity to build up this knowledge, and these capabilities. Currently only about $200 million exists in the development banks to fund feasibility studies of the 80,000+ projects that emerge each year. The waste is tremendous, and the opportunity is enormous - for firms, the public sector, and for users worldwide.

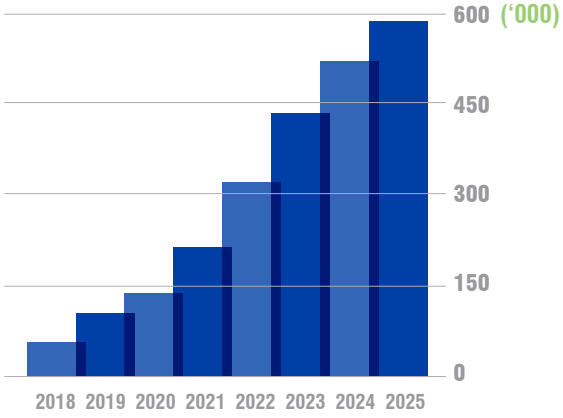
3. Technology Driving Creativity

Technology is driving every aspect of action in the infrastructure space, from project conception to crowd-sourced design all the way to long-term O&M. We believe that this proliferation of new technology will have an outsized impact on productivity in infrastructure, including a transformation of the approvals and permitting process (lending additional weight to the "from ten years to two years" movement). Technology is also going to transform what infrastructure we prioritize and how we use our infrastructure going forward. We need to do a lot of hard thinking on these issues. In addition, we see a transformation in everything from the information available to users, to the ability of retail investors to invest in projects.

Opportunity: The technology opportunity is to see, and build, the future.

Technology Explosion

Fully Autonomous Car Shipments



Source: Business Insider 2017

The pace of technology development and adoption is increasing rapidly, especially in the four areas highlighted below:

1. Driverless Vehicles - Estimates suggest that shipments will increase from 64,000 shipments in 2018 to nearly 600,000 shipments in 2025.

2. Drones - The largest share of the nearly $150 billion/year drone business comes from capital projects and infrastructure, at over $50 billion.

3. 3D Printing - Growing at 25%/year, the market will be over $50 billion by 2025, transforming logistics and O&M around the infrastructure industry.

4. Augmented Reality - Arguably the most transformative new technology, AR puts control in the hands of users.

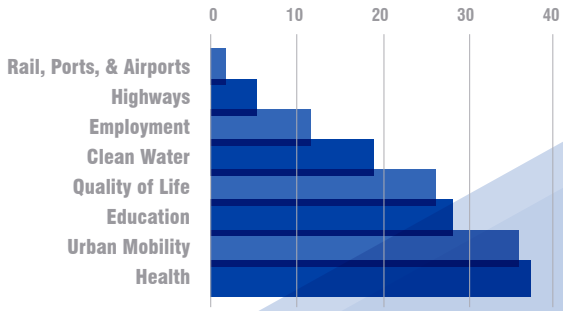
4. The User Experience Inspiring

Thinking deeply about the user experience, and - something very different - engaging users in designing our future infrastructure, will be the source of incredible growth and creativity in the infrastructure industry through 2025. In a survey that IPSOS produced for the Leadership Forum, 37% of 1500 Brazilian respondents thought of 'health' as the priority infrastructure investment, and 36% thought of mobility. Only 4% identified physical assets, like highways. Enabled by increased processing power and a change in the processes behind project design, a powerful user voice is going to drive enormous creativity.

Opportunity: Think deeply about the user experience and use that to identify creative strategies to make people's lives better, and healthier, in the years ahead.

The User Experience

Go Global for a Second



Source: Business Insider 2017

How to users perceive infrastructure?
What is their experience of it?
- 37% associate "infrastructure" with health
- 36% associate "infrastructure" with mobility
- Only 2% associate it primarily with "rail, ports, and airports."

The transformative opportunity for industry leaders is to think far more deeply about the user experience:
- Technology transformation
- Financial transformation
- Global leadership

5. Cryptocurrency Usage Coming

Cryptocurrency is critical to the infrastructure space for three powerful reasons. First, and especially in the developing world, the transparency of the blockchain will be extremely important for revitalizing public trust in infrastructure investment. Second, the blockchain, and an associated cryptocurrency like BuildCoin, can bring new people – and arguably the best expertise – into projects from anywhere in the world, and at any time. Third, the collaborative nature of blockchain is crucial for making improvement in basic solutions, from engineering and product design to financial tools. (Note: CG/LA is working with the BuildCoin Foundation and is making a cryptocurrency investment in infrastructure using BuildCoin.)

Opportunity: The opportunity is to transform the infrastructure project development model, across the entire value chain, by bringing in new players, giving everyone new ways of investing, and creating an ecosystem built on excellence rather than availability.

The Blockchain & Cryptocurrency

Total Value of ICOs in 2017

$3.7 Billion

Total Value of ICOs in 2016 = $103 Million

- Motives for world-class experts to be involved in infrastructure projects
- Six powerful reasons to participate in the BuildCoin infrastructure market

1. Participate in a high-functioning community
2. Recognition of expertise
3. Impact on the world
4. Sharing of ideas
5. Collaboration
6. Traditional payments/salaries

6. China's Strategy Re-Defining

The One Belt, One Road initiative is a truly transformative program: one part a strategic challenge, and one part a commercial initiative oriented toward direct infrastructure investment and long-term trade facilitation. As a macro trend, at a minimum of $1 trillion in long-term investment, it highlights the role of Chinese firms as purchasers of goods and services from the rest of the global infrastructure industry.

Opportunity: CG/LA believes that the opportunity here goes well beyond sales of services or products, and includes engaging in new forms of collaboration with the world's new infrastructure superpower.

This is the largest infrastructure initiative in the world, by far…

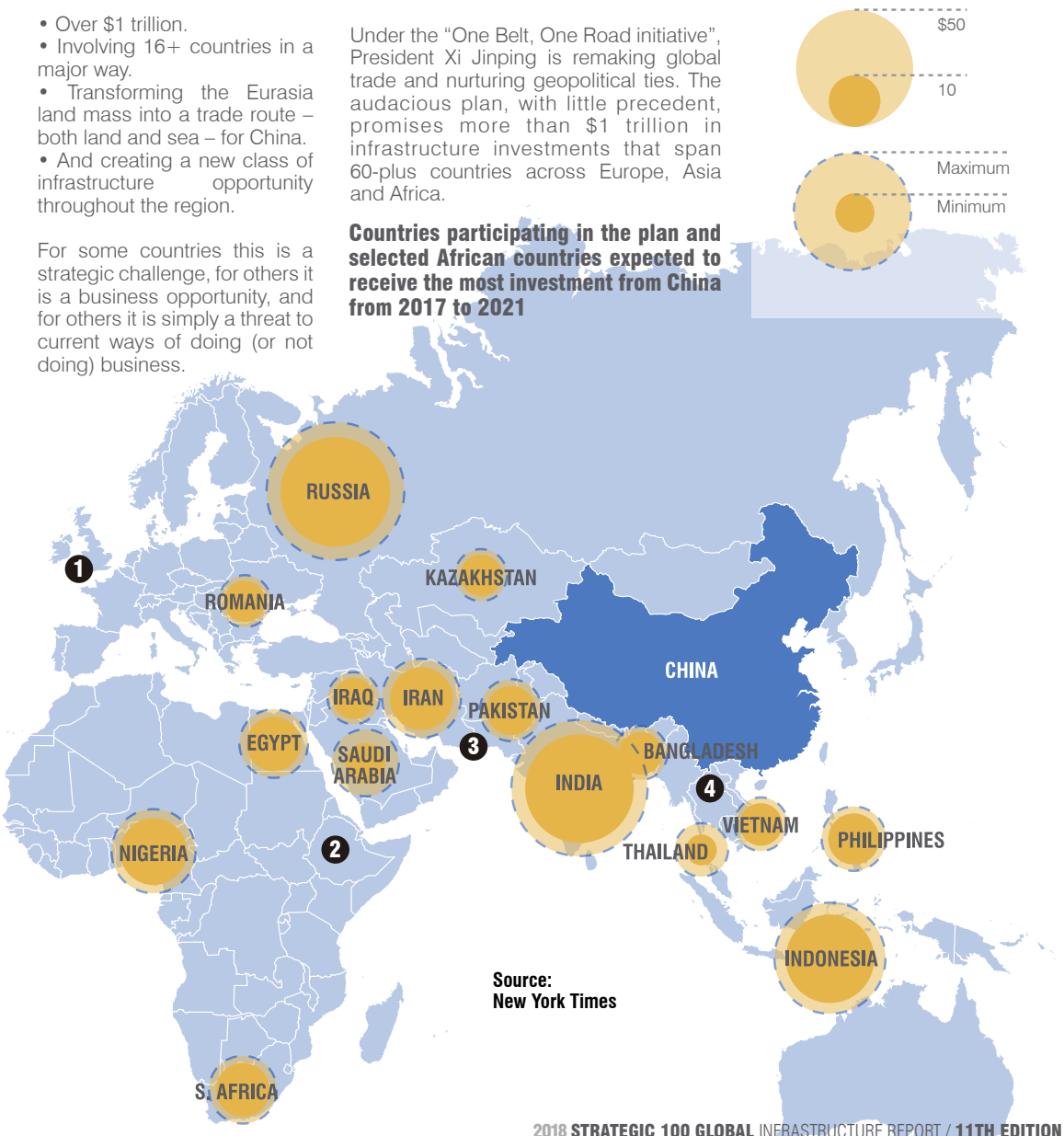
- Over $1 trillion.
- Involving 16+ countries in a major way.
- Transforming the Eurasia land mass into a trade route – both land and sea – for China.
- And creating a new class of infrastructure opportunity throughout the region.

For some countries this is a strategic challenge, for others it is a business opportunity, and for others it is simply a threat to current ways of doing (or not doing) business.

China's Global Ambitions

Under the "One Belt, One Road initiative", President Xi Jinping is remaking global trade and nurturing geopolitical ties. The audacious plan, with little precedent, promises more than $1 trillion in infrastructure investments that span 60-plus countries across Europe, Asia and Africa.

Countries participating in the plan and selected African countries expected to receive the most investment from China from 2017 to 2021



Source:
New York Times

7. Cultural Reality Determining

The center of gravity in infrastructure decision-making is increasingly moving to technology firms. Consider the increasing efficiency of drones, new ways of crowd-sourcing citizens' ideas, and new ideas around ownership. This shift matters, because technology enables cultural voices - local cultures, to be sure, but also the very different cultures of the professions. Decision-making was once held by the engineers, long-term thinkers with a 40- to 50-year time horizon. More recently financial decision-makers have come to dominate strategic decisions, with anywhere from an "end-of-year bonus" mentality to a project ROI horizon. Overseeing this entire process, we have had public sector professionals, with either an owner's or a long-term caretaker's attitude. Now we have the sudden emergence of the technologists, bringing a new way of thinking to project creation and new ways of wringing value from existing highways, airports, and transit systems.

Opportunity: To seize this moment when nothing is really established, and everything is possible.

Professional Culture - Technology Time

- There are five different "cultures" and five different frames of time driving infrastructure decision-making:
  - Engineering/Construction
  - Finance
  - Political
  - Public Sector/Civil Servants
  - Technology
- This last - technology - is bringing a new energy and way of doing things, a new paradigm, to infrastructure project creation.

8. Ownership Transforming

One of the most important issues in infrastructure is ownership - not public versus private, or federal versus local, but rather who in the private sector will own infrastructure assets, and how the public sector will ensure that those assets are managed according to contract, for the public good. With increasing public unhappiness with PFI (and P3), the rise of Chinese financing, the technology explosion, and the pension fund crises around the world, 2018 should be the year when infrastructure ownership is opened to the masses.

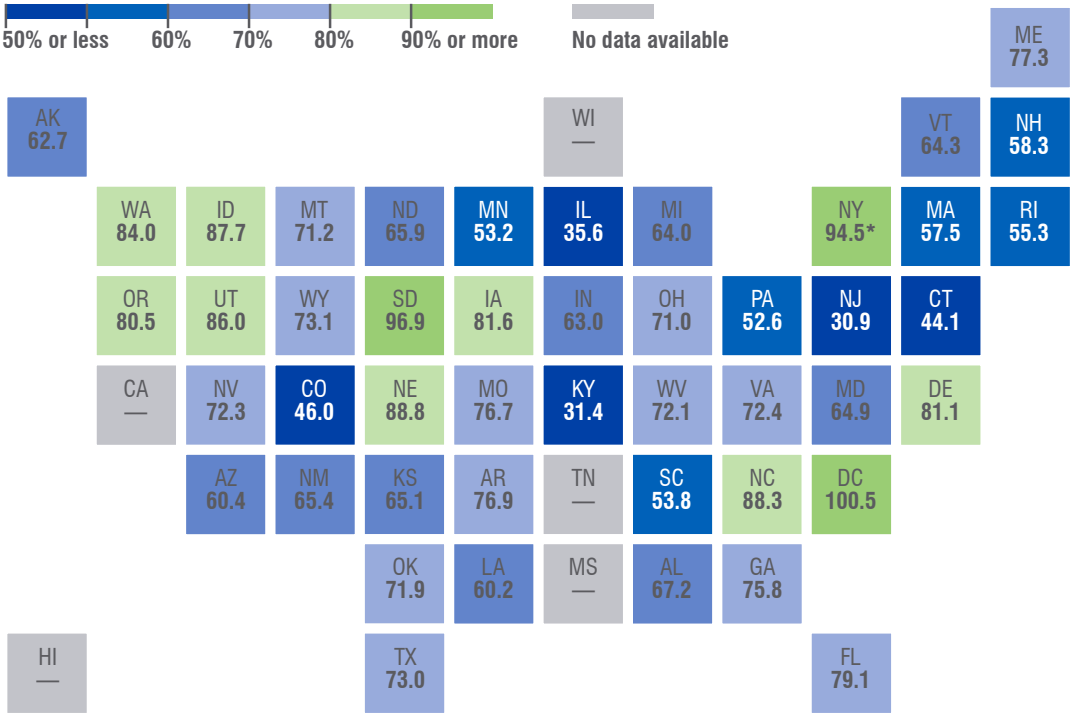
Opportunity: Bringing in whole new classes of investors is an opportunity to redefine both the metrics around infrastructure projects, and the objectives of the governance of those projects.

Bringing New Owners into Infrastructure

- Global pension funds contain more than $28 trillion in assets - with only 1% invested in infrastructure.
- In the U.S. alone, public pension funds contain $3.6 trillion in assets, yet they are dramatically underfunded, able to pay for only about 60% of promised benefits.
- The inclusion of retail investors in infrastructure would be even more exciting – bringing new funding sources to the table and releasing the energy that a new class of ownership brings.

In the U.S., public pension funds are able to pay only about 60% promised benefits.

Public employee pension funding ratio by state, 2016 figures



Source: Bloomberg

9. Corruption Destroying

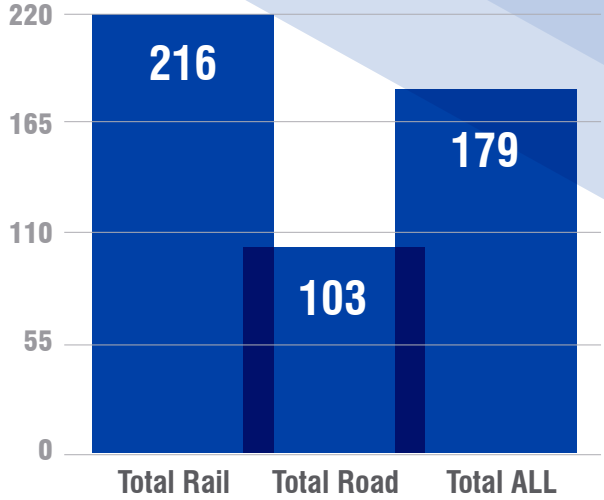
This is an issue that is being actively ignored by the global infrastructure industry at a time when it should be actively and creatively addressed. I recently had a conversation with a business owner from a small developing country, one whose president is constantly feted by the international community. The businessman said that corruption had previously been at the 10% level, but with the new president "You pay for everything"; and, "For example, I provide meals for school lunches, and, to get and maintain the business, I have to kick back 20% of the revenue; for government construction contracts, it's now 30% across the board."

Opportunity: There is a tremendous responsibility for the infrastructure industry to confront the issue of corruption globally, and encouraging radical transparency would drive enormous market value, increasing the number of projects that come to market, the speed of execution of those projects, and the value of those projects to the public.

Corruption

- Corruption yields enormous harm
  - to the credibility of the infrastructure industry
  - to the public treasury, and to the
  - ability of political systems to dedicate funds to infrastructure.
- A sustained attack on corruption would be tremendously beneficial to the infrastructure industry worldwide.

Average Cost Overruns on Italian Rail & Road Projects



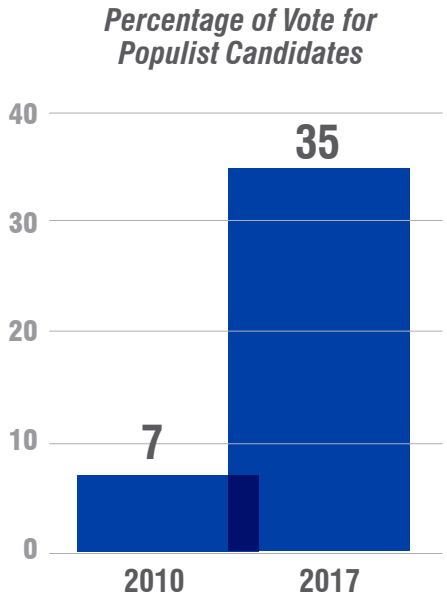
10. Populist Wave

Populism is washing over the democratic world, and, whether this trend is fleeting or something more enduring, its impact on infrastructure has the potential to be tremendous, particularly when combined with the technology explosion. (To provide a point of reference, in 2010 7% of the vote was for populist candidates, but by 2017 that figure had increased to 35%.) The result is a deep questioning of the private finance model, as in the UK, and a drive to generate increased transparency in project decision-making and management.

Opportunity: The opportunity is to once again address the critical issues of investment, public goods creation and long-term governance - along with leadership authority. These issues have to do with the infrastructure model.

Populism

- Many countries have experienced a relatively sudden trend toward populism, signaling that voters are unhappy with elites and uneasy about the future.
- On the one hand, this creates a significant demand for infrastructure — people want the mobility, health and opportunity that infrastructure brings.
- On the other hand, people want the things that infrastructure brings, without necessarily having to rely on the private sector and elites - and extraordinary costs - to deliver that infrastructure.
- If you underinvest by $1 trillion/year, and if basic needs are not being met well, a backlash becomes almost inevitable.



As a final thought, perhaps BlackRock CEO Larry Fink's recent letter to shareholders is a good - and important - punctuation mark here, as relevant for the global infrastructure industry as for publicly traded companies in developed markets:

The public expectations of your company have never been greater. Society is demanding that companies, both public and private, serve a social purpose. To prosper over time, every company must not only deliver financial performance, but also show how it makes a positive contribution to society. Companies must benefit all of their stakeholders, including shareholders, employees, customers, and the communities in which they operate.

03 BUILDCOIN:
The value of cryptocurrency in the infrastructure space

By: John Cronin, Chairman of the BuildCoin Foundation
Norman Anderson, President & CEO of CG/LA

Cryptocurrency is in the news, with the Big Three Bitcoin, Ethereum & Litecoin dramatically increasing in value through the final weeks of 2017. Is this a bubble, or is there underlying value that these currencies can can release from the depths of our global economy?

Christine Lagarde, the Managing Director of the International Monetary Fund, in a presentation at the Bank of England on September 29, 2018, said that cryptocurrencies would disrupt the banking system as we knew it, a system that had been operating for 200 years and would set the stage for a new, more efficient monetary system. The Bank of International Settlements, the central bank of central banks, also provided a framework for how it believes cryptocurrencies will be integrated into the global economic system.

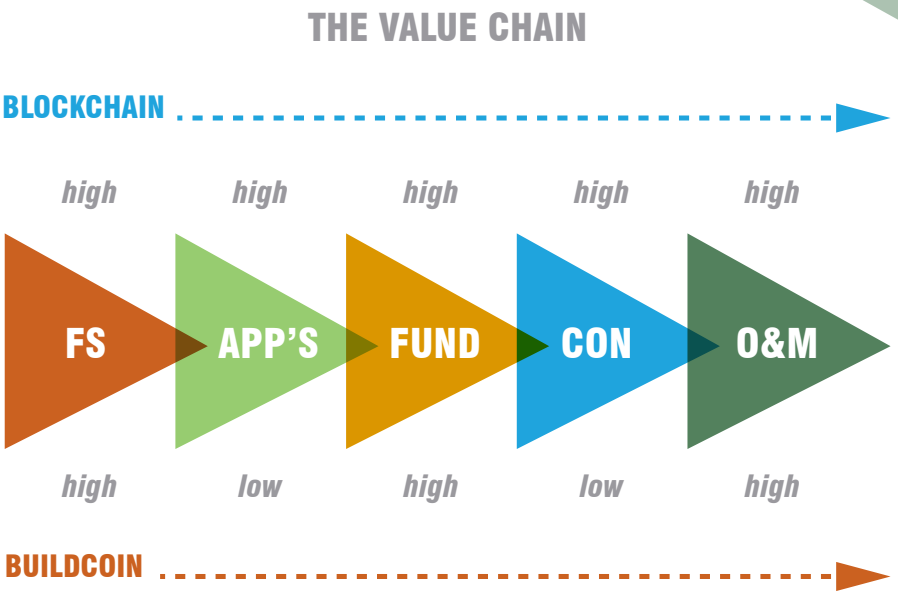
The Infrastructure Market

Cryptocurrency has a strong potential and it is transforming the global infrastructure marketplace.

BuildCoin is not just a currency, it is a creation of a broad and deep digital ecosystem that provides increased transparency, more inclusion and more efficient value transfer through the infrastructure supply chain, from project conception through 40+ years of O&M.

According to the Boston Consulting Group, the global infrastructure market underperforms by as much as $1 trillion/year; the greatest impediments to growth being lack of innovation and/or areas that have too much risk (like water and wastewater, or social infrastructure like schools and hospitals). In many developed countries, transportation infrastructure is failing and the current paradigm for project creation and funding is simply not working. Citizens' quality of life is declining as they are spending more time sitting in cars or on congested trains, or waiting for gates in airports that were designed 70 years ago.

We need to take a new look at the infrastructure market as a wave of new technologies transforms the possibilities for what the built environment can, and should, look like in the future. Do we need to replace old infrastructure with more of the same? Or, would citizens be better served with building transformational transportation like Hyperloop? Is there a better way to fund feasibility studies? Can we crowd source ideas directly into the planning process, so that user experience is optimized?



BuildCoin will address at least three issues fundamental to improving performance in the infrastructure marketplace: increasing the velocity, quality and volume of infrastructure investment globally.

1. The Mechanics Funding for Feasibility Studies

Money for feasibility studies is scarce, particularly for those projects involving innovation, or projects that have other high risk components. We estimate that roughly 70-80,000 projects are started globally, with only about $200 million available for feasibility studies annually - so at $1,000,000 per study, we are addressing a tiny fraction of projects. At the same time, feasibility studies are critical to the infrastructure market - the source of project origination! A $1,000,000 feasibility study can unlock $1 billion or more in project value, which in turn can produce millions of jobs, economic value, and new taxes over the life of the project. It currently takes too long for projects to get started – the project origination process from idea to "shovel ready" can take five to ten years. Buildcoin has a solution to streamline the origination process. We can solve the funding problem, provide more transparency, get more expertise, and remove bureaucracy for strategic infrastructure projects. If citizens need a Hyperloop, we want to deliver it seven years sooner.

Look at these three examples, the first two of which we are actively developing:

• 18 feasibility studies of municipal lighting in Brazil, which will create more than $1.5 billion in projects;
• the Pink Line in Montreal Canada, championed by the newly elected mayor, Valerie Plante, that will create more than $5 billion in project value; and
• the feasibility study for Virgin Hyperloop One's prospective line between Kansas City and St. Louis, which would transform an entire region of the Midwest

How does BuildCoin bring money to the right projects? It is a vehicle through which people from all over the world can identify and channel investment into projects that are valuable, important, and interesting to them - clean and efficient lighting for Brazilians, the fulfillment of a campaign promise to provide mobility to an underserved population in Montreal, and the transformation of the American Midwest through quickly bringing revolutionary technology to bear.

These are opportunities that capture people's imaginations, and now there is a currency and a platform for them to invest in select projects, putting their imaginations to work, creating and collaborating for results and sharing in the results.

2. The Market Modernizing the Infrastructure Ecosystem

What gets smart people up in the morning? Currently in the infrastructure space the only currency is fiat currency, in which people work in large firms - or in boutique firms, or as individual consultants - to address project related challenges. They get paid for it, or they don't work on it. But our experience with the highest performing professionals is different - engineers, scientists, technologists, are motivated by at least three other 'alarm clocks:'

• The promise of creating something new
• The opportunity of sharing a design or solution that they've created, that might be useful for someone, and
• The honest opportunity to be recognized for their contributions

These are powerful motivations, every bit as powerful as cash payments. As we integrate blockchain into the GViP platform (a major projects platform developed by CG/LA Infrastructure with help from three development banks around the world, along with the U.S. Army Corps of Engineers) we are creating an ecosystem that allows new kinds of motivations to drive participation more fully in projects anywhere in the world, both recognizing and 'voting up' expertise, and rewarding outsized contributions, particularly recognizing the value of collaboration, with the BuildCoin cryptocurrency.

3. The Focus
Bringing Users into the Project Discussion

BuildCoin will crack open the infrastructure market by bringing all sorts of new and motivated participants into project decision-making as primary actors. They will not just have a voice, they will be contributors in everything from crowdsourcing priority projects to expert-sourcing solutions to projects (optimizing the user experience, through design, and technology), and fund-raising for the actual projects (bringing a whole new class of investor into ownership). Once this happens, then our top down infrastructure model is turned on its head and a new paradigm, with all of the energy implied, will explode on the scene through the release of enormous amounts of focused creativity. This technology will allow new and exciting business models to unfold. We can take crowdfunding to a new level and allow citizens to participate in the funding of a project by pre-purchasing rides on a Hyperloop.

Next Steps

Moving forward, we believe that BuildCoin is in a position to transform the infrastructure marketplace by bringing the best minds, smart investors, and new technologies together to address on a project–by–project basis – the infrastructure challenge, something that is arguably the most important public policy challenge that the world faces.

The potential partnership between BuildCoin and Virgin Hyperloop One will bring the currency revolution and the mobility revolution together in a way that investors, public policy professionals, users and citizens around the world will find both extremely attractive and incredibly compelling. Together, we will bring exciting new infrastructure to the citizens of the world by harnessing blockchain technology to upgrade outdated infrastructure with new exciting transportation systems. We will get the projects to citizens faster by harnesses global expertise, engaging citizens and providing an increased level of transparency into these projects.

John Cronin is Chairman of the BuildCoin Foundation, based in Zug, Switzerland. He is a serial entrepreneur.

Norman Anderson is the President & CEO of CG/LA Infrastructure, a firm focused on developing infrastructure projects in the US and around the world. He is also a member of the BuildCoin Foundation's Advisory Board.

GVIP

BUSINESS INVESTMENT OPPORTUNITIES

PROJECT DEVELOPERS

TEAMS OF EXPERTS

DESIGN
CONSTRUCTION
FINANCE
LAW
GOVERNMENT

INSIGHTS

3,000 MEMBERS

103 COUNTRIES

12% CONSULTING

8% CONSTRUCTION

2% INSURANCE

1% MACHINERY

TRANSPORTATION
WATER
ENERGY
SOCIAL INFRASTRUCTURE
INDUSTRIAL PROJECTS

2,100 PROJECT PROFILES
SECTOR
STAGE
BUDGET
LOCATION

www.gvip.io

04 GVIP PROJECT INSIGHTS FROM OUR DIGITAL PLATFORM

THE GViP COMMUNITY: A BIRD'S-EYE VIEW

GViP is CG/LA's online community for infrastructure professionals. Using GViP, project developers from across the globe form teams of experts from the worlds of design, construction, finance, law, government, etc. Those experts share their insights with project developers, and in return receive early access to business and investment opportunities.

At the time of writing, GViP has almost 3,000 members located in 103 countries. Members have expertise in disciplines ranging from consulting (12% of all members) and construction (8%) through to insurance (2%) and machinery (1%). They span all sectors, including transportation, water and energy, as well as others such as social infrastructure and industrial projects. Members have access to over 2,100 project profiles, searchable by sector, stage, budget and location.

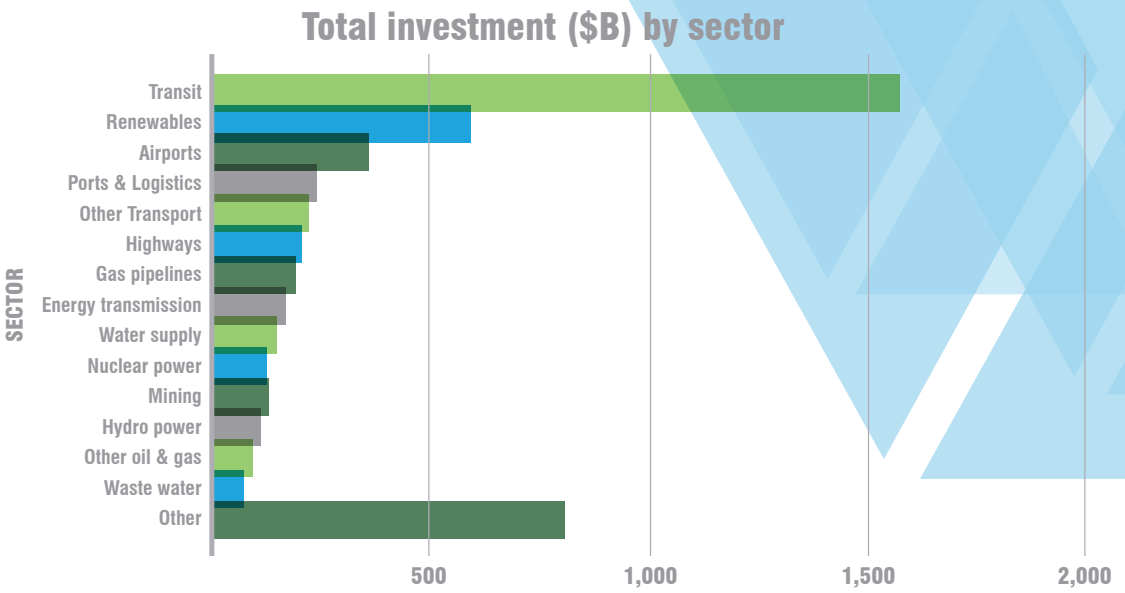
As such, GViP offers a rich treasure trove of data for exploring global infrastructure trends. In this piece, we shall highlight some of the most important perspectives generated by GViP.

PROJECT INSIGHTS

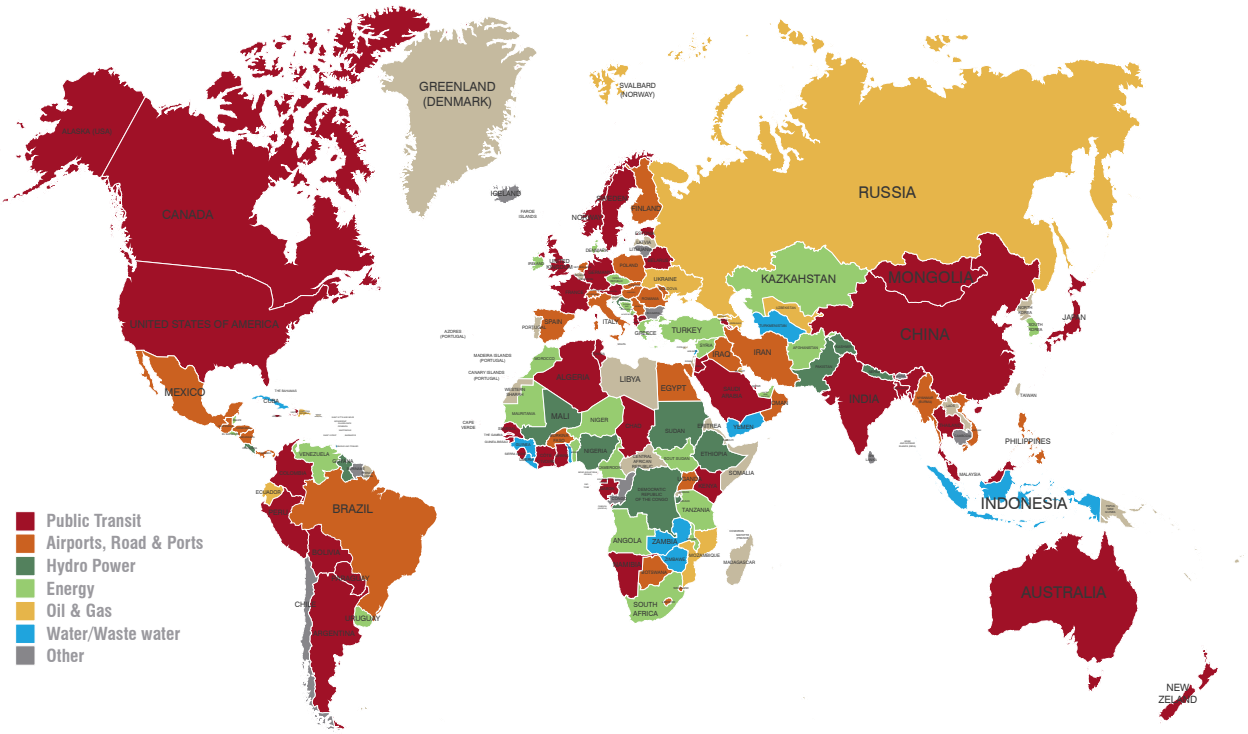
In GViP, transit projects dominate global infrastructure investment

At 31%, transit represents by far the largest sector of global infrastructure investment infrastructure investment catalogued in GViP. Fully 354 transit projects are currently in planning or construction, totaling almost $1.6 trillion in value. The projects include high-speed rail lines, new or extended metro lines and bus rapid transit (BRT) systems.

Renewables are also an important sector, garnering $583 billion in investment. Note that this category is distinct from hydro, which represents an additional $122 billion in project value. Instead, our Renewables category covers projects such as wind, solar, and geothermal energy generation.

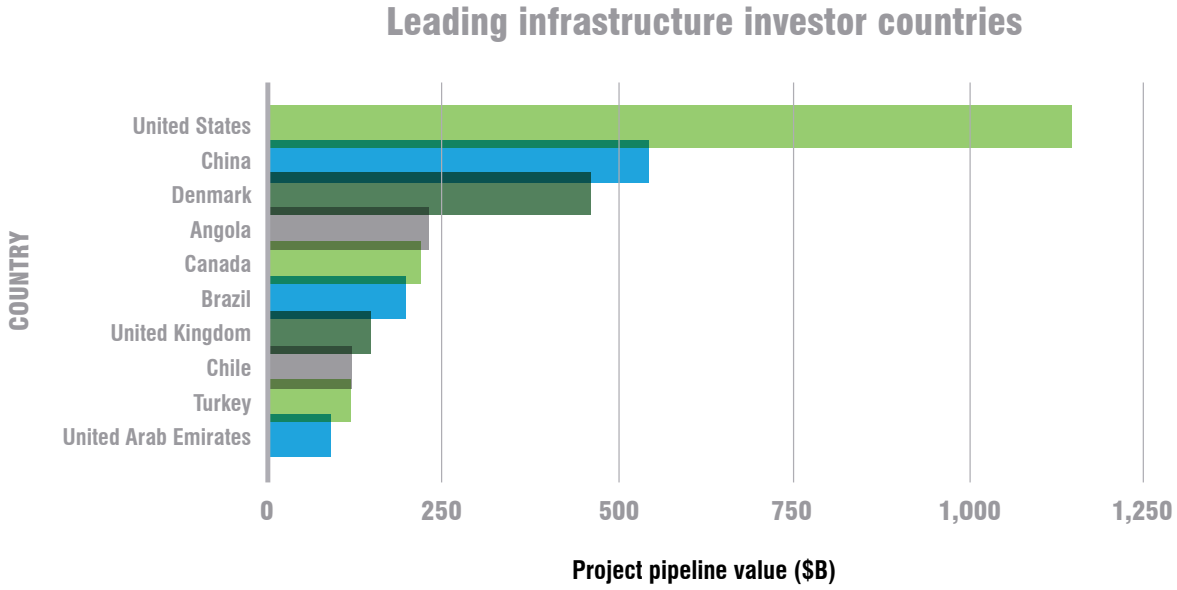


While the developed world prizes transportation, energy is the priority for developing nations



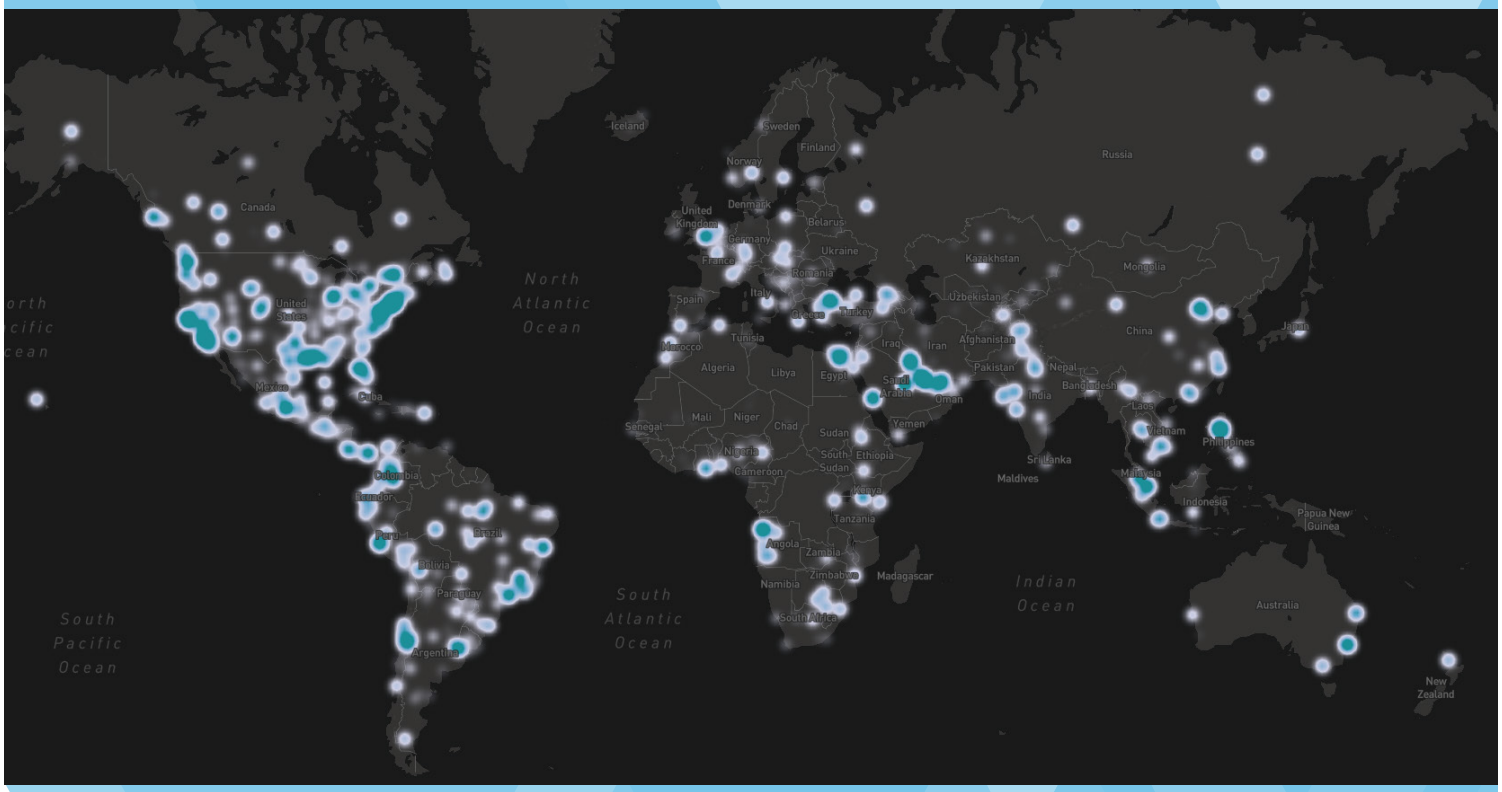
Given limited funds to invest in infrastructure improvements, different countries allocate their budgets to different types of projects. The map above shows, for each country, the type of project currently receiving the greatest investment. Transportation projects, shown in shades of red, dominate investment across much of the world, including western Europe, the Americas and south-east Asia. In Africa, meanwhile, greater priority is placed on energy projects, shown in green (often hydro power projects, shown in dark green). Russia, meanwhile, is the only major nation in which oil and gas projects take the lion's share of investment.

Forward-thinking countries invest a disproportionate share of their wealth in infrastructure



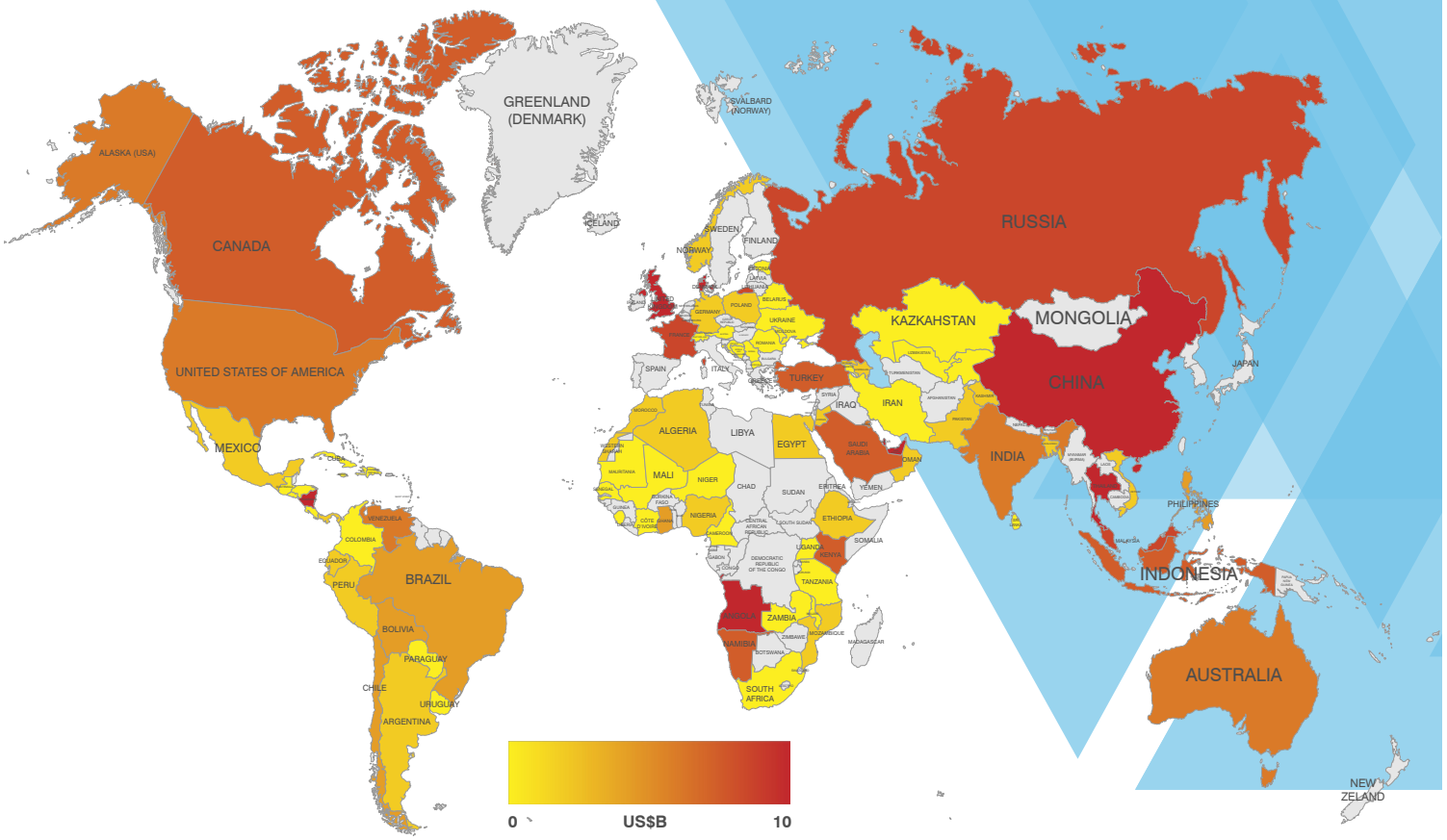
Infrastructure investment is increasingly recognized as one of the most effective uses of public funds, given its potential to create jobs, foster long-term economic benefits, and improve people's quality of life. Of the ten countries with an infrastructure project pipeline whose value exceeds $100B, many are also in the top ten countries by GDP. However, others stand out as impressively dedicated to prioritizing infrastructure investment: Denmark, for example, has a pipeline of $462B, equivalent to 151% of its GDP. The U.S., by comparison, has a pipeline of $1.1 trillion, equivalent to just 6% of GDP.

The Middle East and the U.S. are global centers of infrastructure investment



The heatmap above shows where in the world infrastructure investment, measured in dollars, is greatest. The U.S. and the Middle East stand out as two regions into which outsized global project investment is currently being channeled.

Countries vary tremendously in their capacity and appetite for large projects

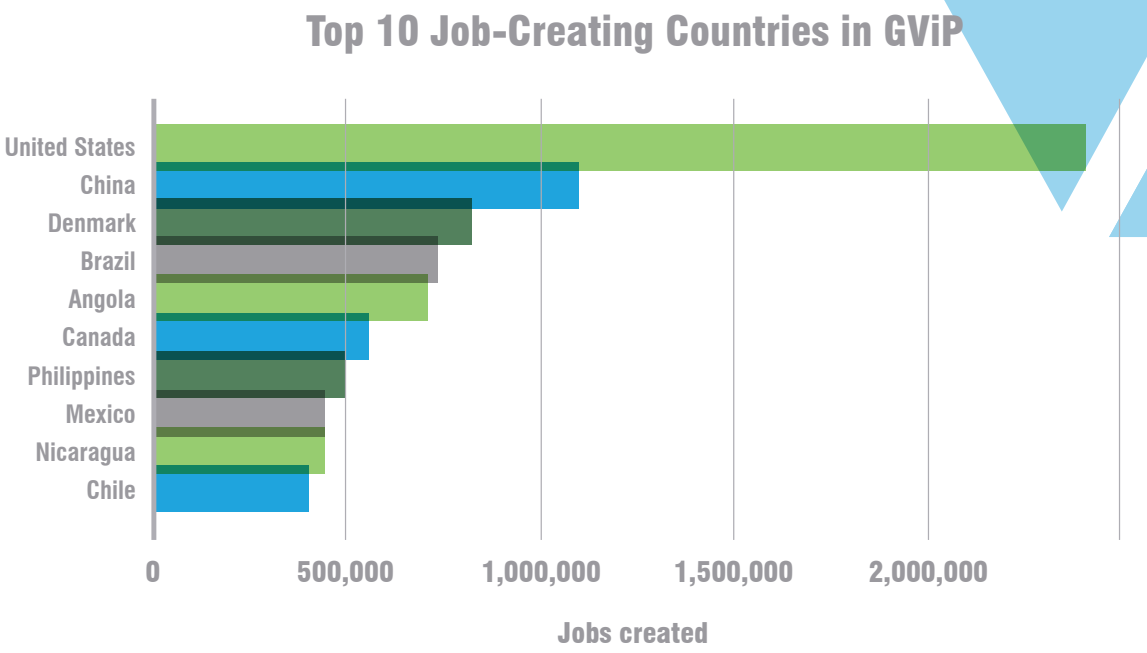


Average project size varies tremendously between countries, perhaps pointing to variations in their appetite for, and capacity to execute, megaprojects. The average project budget ranges from as low as $17M in countries such as Kyrgyzstan and Armenia through to $17.4B in the United Kingdom, which is currently planning the $68B High Speed 2 rail project, and $18.4B in Angola. The median country has an average project value of $1.03B.

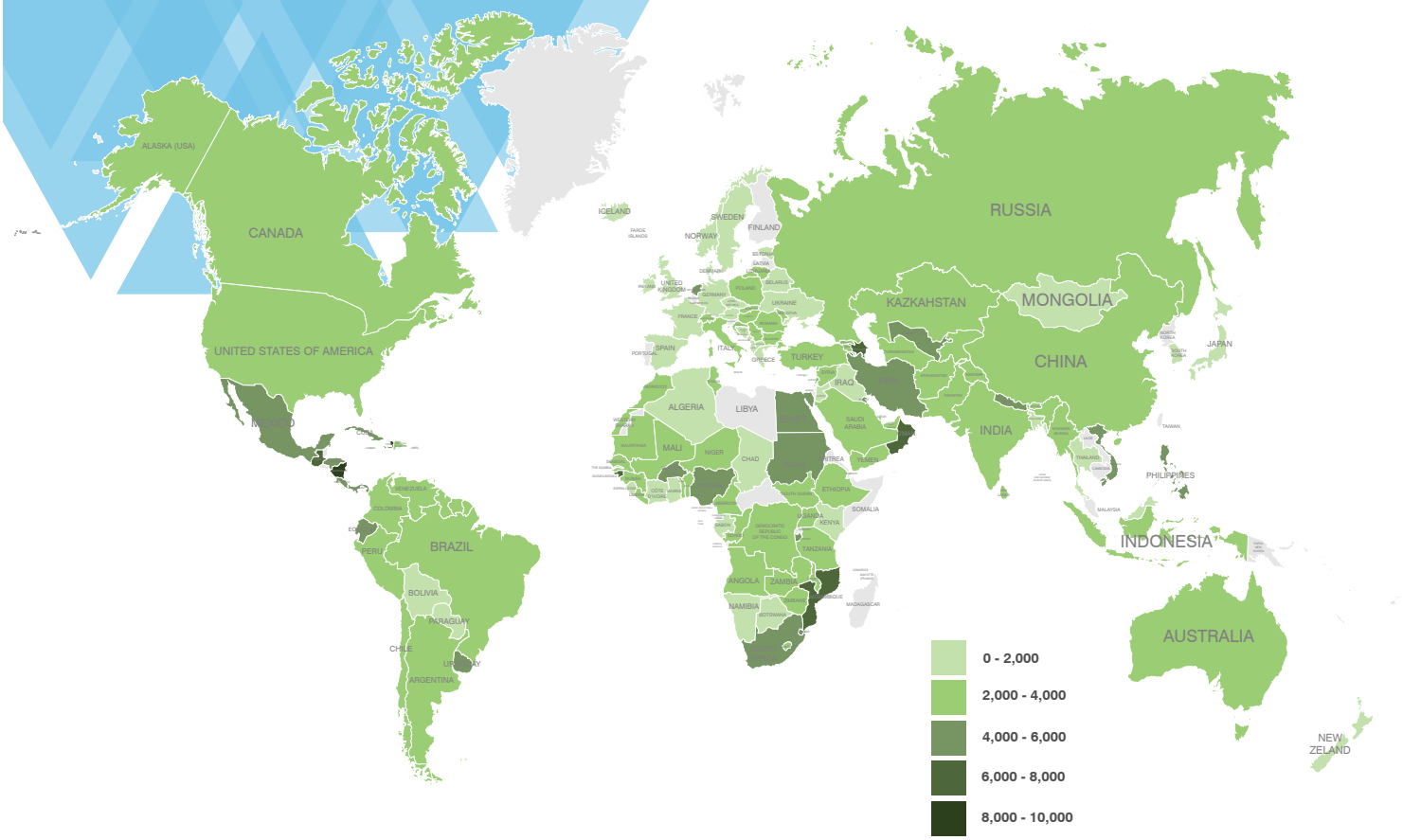
Meanwhile, Denmark's vast average project size of $154B illustrates the difficulty of performing analysis at the country level in a region as interconnected as the European Union. While Denmark is at the core of a $460B EU project to create a pan-European transmission network by 2050, these funds are being allocated at the European level, not the national level, and will only be partially invested in Denmark. Excluding this project, Denmark's average investment size comes down to a more modest $975M.

When it comes to creating jobs, not all projects are alike

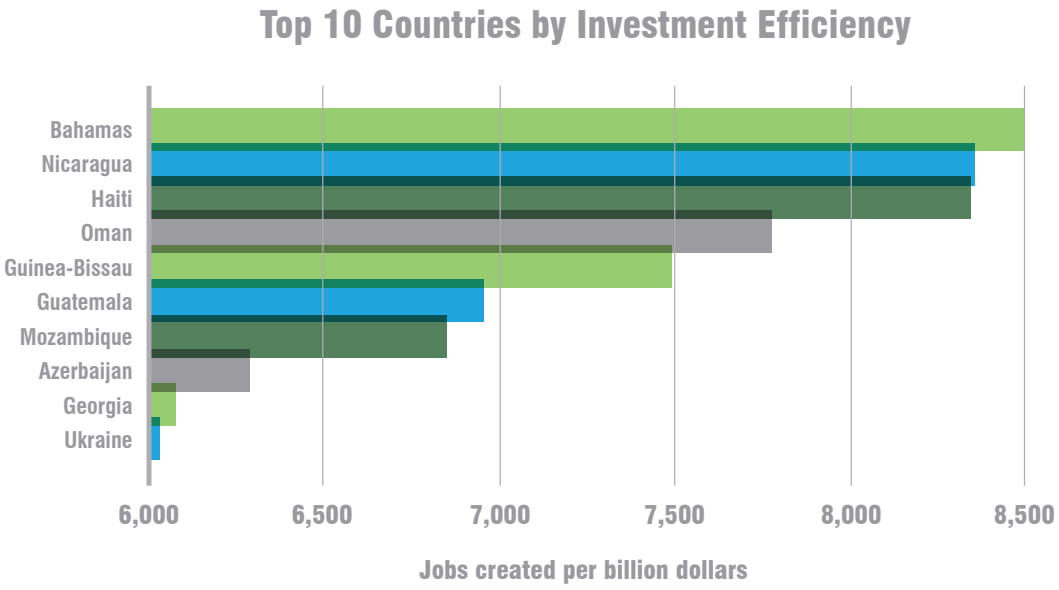
Recent analysis performed by CG/LA, in partnership with the Boston Consulting Group, quantified the number of jobs (both direct and indirect) created by different types of infrastructure project. The results were dramatic: while $1B can create 5,100 jobs when invested in a port project in the United States, and up to 8,500 in developing economies, the same investment in an inland waterways project creates just 800 jobs.



It may not be surprising to see that the U.S. and China are the two countries currently creating the most infrastructure jobs, as measured by projects on GViP. However, the list of the top ten job-creating countries (see chart above) also tells a story about the fragility of small economies. Take Nicaragua, for example, a country with a population of 6 million people and a low per-capita GDP of just $5,500. The 425,000 jobs created by the $50B Interoceanic Grand Canal project would, theoretically, be enough to end unemployment in the country twice over. However, the project is currently stalled and faces an uncertain future, demonstrating the risks of overdependence on megaprojects and foreign investment.



By prioritizing investment in high-job sectors over others, countries can maximize the number of jobs they create. As the chart above illustrates, the differences in outcomes are substantial. While much of Western and Northern Europe creates fewer than 2,000 jobs for each $1B invested, others are able to create upwards of 8,000 jobs with the same money. The Bahamas, for instance, is currently investing solely in a port expansion project, creating the equivalent of 8,500 jobs per billion dollars invested. Oman, meanwhile, is investing almost as efficiently, creating a total of 126,000 jobs with investment of $16.2B. Kenya, by way of contrast, is spending almost four times as much ($60.8B) and yet creating fewer jobs (116,000), since it is investing primarily in lower-job sectors such as highways and rail.

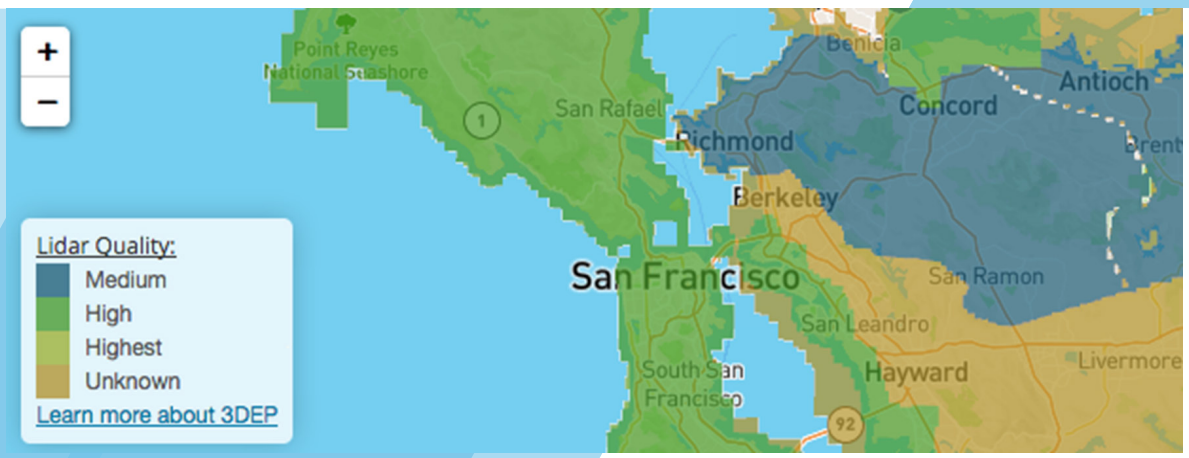


Visualizing infrastructure projects, globally

Did you know that the V in GViP originally stood for visualizing? Mapping features are in GViP's DNA. The platform's Map page lets users browse a region for people and projects, filtering by sector, stage and project budget. And now, new mapping features let you switch between maps that show streets, terrain or a satellite view. Compare these two views of the Solar Reserve Sandstone project in Nevada, for example:

While the default view contains useful information about nearby roads and the boundaries of government-managed land, the satellite view tells a much richer story about the level of development and the amount of solar energy falling on the land.

What's more, GViP's partnership with the United States Geological Survey allows users to explore the availability of the public-domain Lidar data curated by USGS. Take a look at the San Francisco Bay Area, for example:



Last but not least, GViP's geometry features have been enhanced, letting users see at a glance the planned alignment of a new road or railway line. For example, visiting the profile of the High Speed 2 rail link project in the UK gives an excellent overview of the way in which the project's ambition — to connect London to the north of England and Scotland — translates into a route across the country:

To join GViP today, visit www.gvip.io and click Join for Free

05 STRATEGIC 100 GLOBAL INFRASTRUCTURE LIST

	Sector	Project Name	Sponsor	Status	Country	Value (USD $B)
			Energy			
1	Energy - Generation	Asian Renewable Energy Hub	Asian Renewable Energy Hub	Planning	Australia	10.0
2	Energy - Generation	Kennedy Energy Park Phase I (Wind+Solar+Storage)	Windlab (with Vestas)	Planning	Australia	0.16
3	Energy - Generation	Patuakhali Combined Cycle Gas Power Project	North-West Power Generation Company Limited	Procurement	Bangladesh	2.8
4	Energy - Generation	Reliance LNG + Gas Generating Station	Reliance Power	Planning	Bangladesh	1.0
5	Energy - Generation	Angra III Nuclear Plant (Completion + O&M)	Eletronuclear	Tender Expected 2018	Brazil	5.6
6	Energy - Generation	Tulu Moye Geothermal Power Project	Tulu Moye Geothermal	Procurement	Ethiopia	4.0
7	Energy - Generation	NOORM I & II Solar Power Plants	Moroccan Agency for Sustainable Energy	Planning	Morocco	2.4
8	Energy - Generation	Budhi Gandaki Hydropower Project	Ministry of Energy (Nepal)	Planning	Nepal	2.5
9	Energy - Generation	Mambilla Hydropower Project	Nigerian Ministry of Power, Works, and Housing	Pre-construction	Nigeria	5.8
10	Energy - Generation	Diamer-Bhasha Hydropower Project	Pakistan Water and Power Development Authority	Planning	Pakistan	14.0
11	Energy - Generation	Greater Changhua Offshore Wind Project	Ørsted	Planning	Taiwan	4.0
12	Energy - Generation	TuNur Solar	Nur Energie	Planning	Tunisia	6.0
13	Energy - Generation	Wind Catcher Wind Farm/Energy Connection	Invenergy/AEP	Planning	United States	4.5
14	Energy - Generation	Batoka Gorge Hydropower Project	Governments of Zambia & Zimbabwe (with African Development Bank)	Planning	Zambia & Zimbabwe	6.0
15	Energy - Oil & Gas	Alaska LNG	Alaska Gasline Development Corporation	Planning (FERC Review)	United States	43.0
16	Energy - Oil & Gas	SeaOne Puerto Rico	SeaOne Holdings	Planning	United States	2.0
17	Energy - Transmission	CASA-1000 Transmission Corridor	CASA-1000 Intergovernmental Council	Phased Procurement	Afghanistan	1.2
18	Energy - Transmission	Sao Paulo Municipal Lighting PPPs	State of Sao Paulo	Planning (Feasibility Studies)	Brazil	1.0
19	Energy - Transmission	Ontario East-West Tie Line	Province of Ontario (Nextbridge Infrastructure)	Procurement	Canada	0.8
20	Energy - Transmission	Baja California-National System Interconnection HVDC Line	Ministry of Energy (SENER)	Procurement	Mexico	1.1
21	Energy - Transmission	Nepal Compact - Electricity Transmission Upgrades	Millennium Challenge Corporation	Planning	Nepal	0.63
22	Energy - Transmission	Champlain Hudson Power Express	Transmission Developers, Inc.	Planning	United States	2.5
23	Energy - Transmission	Empire State Connector	OneGRID LLC & Forum Equity Partners (formally, Empire State Connector Corp.)	Planning	United States	1.5
24	Energy - Transmission	Grain Belt Express Clean Line	Clean Line Energy Partners	Planning	United States	2.5
25	Energy - Transmission	Puerto Rico Grid Restoration (Long-term)	Puerto Rico Electric Power Authority & U.S. Army Corps of Engineers	Planning	United States	17.0
26	Energy - Transmission	SOO Green Renewable Rail - A Wind Energy Delivery Project	Direct Connect Development Company	Proposed	United States	2.5
27	Energy - Transmission	Zambia-Tanzania-Kenya Interconnector Project	Governments of Zambia, Tanzania and Kenya	Planning (Securing Financing)	Zambia, Tanzania, & Kenya	1.1

	Sector	Project Name	Sponsor	Status	Country	Value (USD $B)
			Transportation			
28	Rail - Heavy (Freight)	Ferrogrão Railroad (EF 170 – MT/PA)	Ministry of Transport, Ports & Civil Aviation	Bidding	Brazil	4.0
29	Rail - Heavy (Freight)	Western Dedicated Freight Corridor	Indian Railways	Phased Procurement	India	5.0
30	Rail - Heavy (Freight)	Saudi Landbridge	Saudi Railway Company	Planning	Saudi Arabia	7.0
31	Rail - Heavy (Mixed Use)	North-South Transport Corridor Project - Azerbaijan Section (Baku-Yalama)	Azerbaijan Railways CJSC	Planning	Azerbaijan	0.575
32	Rail - Heavy (Mixed Use)	Tehran-Mashhad Railroad Electrification	Islamic Republic of Iran Railways	Planning (Financing Secured)	Iran	1.7
33	Rail - Heavy (Mixed Use)	Kuwait National Railroad	Kuwait Authority for Partnerships Projects	Planning	Kuwait	10.0
34	Rail - Heavy (Mixed Use)	Budapest-Belgrade Railway Modernization	Government of Serbia, Government of Hungary	Procurement (Hungarian section) and Construction (Serbian section)	Serbia & Hungary	3.8
35	Rail - Heavy (Mixed Use)	Ferrocarril Central Uruguay	Ministerio de Transporte y Obras Publicas	Procurement	Uruguay	0.8
36	Rail - Heavy (Passenger)	Regional Express Rail, Ontario	Metrolinx (GO Transit)	Planning (Studies & Civil Works Procurement)	Canada	10.5
37	Rail - Heavy (Passenger)	VIA Rail High-Frequency Plan	VIA Rail	Planning (Studies & Seeking Public Funding)	Canada	4.67
38	Rail - HSR	Toronto-Windsor High-speed Rail (Ontario)	Government of Ontario	Planning (Environmental Assessment)	Canada	16.5
39	Rail - HSR	Pacific Northwest Corridor (Vancouver-Seattle-Portland) HSR	Washington State DOT & partners	Planning (Feasibility Studies)	Canada & United States	24.0
40	Rail - HSR	Turin-Lyon High-speed Rail Line	Tunnel Euralpin Lyon-Turin (TELT-SAS)	Planning	Italy	29.4
41	Rail - HSR	Kuala Lumpur - Singapore High-speed Rail	MyHSR Corp. (Malaysia), Land Transport Authority (Singapore)	Planning	Malaysia	14.0
42	Rail - HSR	Halkalı-Kapıkule High Speed Rail	Transport, Maritime Affairs and Communications Ministry	Planning	Turkey	1.2
43	Rail - HSR	HS2 (High Speed Two) Phase 1	UK Department for Transport	Phased Construction	United Kingdom	8.8
44	Rail - HSR	Texas Central Railway	Texas Central Partners	Planning	United States	12.0
45	Rail - Transit/LRT	Cross River Rail (Brisbane)	Cross River Rail Delivery Authority	Planning	Australia	4.1
46	Rail - Transit/LRT	Sao Paulo - Trem Intercidades (Intercity Train) PPP	State of Sao Paulo, CPTM	Planning	Brazil	1.5
47	Rail - Transit/LRT	Hamilton Light Rail	Infrastructure Ontario/Metrolinx	Approved	Canada	1.0
48	Rail - Transit/LRT	Montreal Pink Line (Ligne Rose)	Mayor of Montreal - l'Autorité régionale de transport métropolitain (ARTM)	Planning (Feasibility Studies)	Canada	5.0
49	Rail - Transit/LRT	Réseau électrique métropolitain (REM, Montreal)	CDPQ Infra	Procurement	Canada	4.67
50	Rail - Transit/LRT	Bogotá Metro	Ministry of Finance (Colombia) and District of Bogotá	Planning	Colombia	4.7
51	Rail - Transit/LRT	Grand Paris Express	Paris Metro	Phased Procurement	France	25.0
52	Rail - Transit/LRT	MetroRiel	Government of Guatemala; ANADIE	Planning	Guatemala	0.75
53	Rail - Transit/LRT	Bangalore Metro Rail Project - Line 6	Bangalore Metro Rail Corporation Limited	Planning (Financing Secured)	India	1.0
54	Rail - Transit/LRT	Delhi Metro Rail - Phase IV	Delhi Metro Rail Corporation	Planning	India	7.9
55	Rail - Transit/LRT	Mumbai Metro Lines 5 & 6	Mumbai Metropolitan Region Development Authority	Planning	India	2.3
56	Rail - Transit/LRT	Dublin Metro North Project	Transport Infrastructure Ireland	Planning & Preliminary Design	Ireland	2.8
57	Rail - Transit/LRT	Mexico City - Toluca New Airport Express Train	Sistema de Transporte Colectivo	Design (through July 2018)	Mexico	0.9
58	Rail - Transit/LRT	Lima Metro - Line 4	Ministry of Transportation and Communications	Planning (Feasibility Studies)	Peru	4.2
59	Rail - Transit/LRT	Metro Manila Subway - Phase I	Philippine Department of Transport	Planning	Philippines	7.0
60	Rail - Transit/LRT	Istanbul Metro Expansion	Istanbul Metropolitan Municipality	Construction	Turkey	3.4
61	Rail - Transit/LRT	Dubai Metro Green Line Extension PPP	Roads and Transport Authority (Dubai)	Planning	United Arab Emirates	3.0
62	Rail - Transit/LRT	Crossrail 2	Transport for London	Proposed	United Kingdom	30.0

	Sector	Project Name	Sponsor	Status	Country	Value (USD $B)
			Transportation			
63	Rail - Transit/LRT	CTA Red & Purple Modernization Program	Chicago Transit Authority	Procurement	United States	2.1
64	Rail - Transit/LRT	LA Metro - West Santa Ana Branch	LA Metro	Planning	United States	4.5
65	Transport - Airports	Jorge Chavez International Airport Expansion	Lima Airport Partners (LAP) and the Government of Peru	Planning	Peru	1.5
66	Transport - Airports	Changi Airport Terminal 5	Changi Airport Group	Planning	Singapore	10.0
67	Transport - Airports	Istanbul Grand Airport	Transport, Maritime & Communications Ministry	Phased Construction	Turkey	15.0
68	Transport - Airports	JFK Airport Modernization	Port Authority of New York & New Jersey	Planning	United States	10.0
69	Transport - Airports	LAX Terminal 2 and 3 Modernization Project	Los Angeles World Airports	Planning	United States	2.0
70	Transport - Airports	Long Thanh International Airport	Airports Corporation of Vietnam	Planning (Feasibility Studies)	Vietnam	16.0
71	Transport - Fixed Links	Agua Negra Tunnel	Government of Argentina, Government of Chile	Execution	Argentina & Chile	1.5
72	Transport - Fixed Links	King Hamad Causeway	Bahrain & Saudi Arabia	Planning	Bahrain & Saudi Arabia	5.0
73	Transport - Fixed Links	Salvador - Itaparica Bridge	Government of the State of Bahia	Planning	Brazil	4.0
74	Transport - Fixed Links	FinEst Link (Rail Baltica - Helsinki-Tallinn Tunnel)	Helsinki-Uusimaa Regional Council, Liikennevirasto, Estonian Ministry of Economic Affairs	Planning (Feasibility Studies)	Estonia & Finland	10.67
75	Transport - Fixed Links	Sognefjord Tunnel	Government of Norway	Proposed	Norway	25.0
76	Transport - Fixed Links	Stockholm Bypass Project	Swedish Transport Administration	Proposed	Sweden	4.0
77	Transport - Fixed Links	Great Istanbul Tunnel (Three-Layer Tunnel)	Transport Ministry, Directorate-General of Infrastructure Investments	Phased Construction	Turkey	3.5
78	Transport - Fixed Links	Gateway Program (Hudson River Tunnels & Portal North Bridge)	Amtrak	Planning	United States	14.5
79	Transport - Fixed Links	Gordie Howe Bridge	Windsor-Detroit Bridge Authority	Procurement	United States	2.1
80	Transport - Fixed Links	Hampton Roads Bridge-Tunnel Expansion	Virginia Department of Transportation	Procurement (RFQ)	United States	3.5
81	Transport - Highways	Argentina National Highway Plan PPPs	Transport Ministry of Argentina	Tendering 2018	Argentina	16.7
82	Transport - Highways	North East Link Toll Road	North East Link Authority (Government of Victoria)	Planning (Corridor Selected)	Australia	12.5
83	Transport - Highways	Abidjan-Lagos Corridor Highway Development Programme	Abidjan-Lagos Management Authority (ECOWAS)	Planning (Feasibility Studies)	Côte d'Ivoire, Ghana, Togo, Benin, & Nigeria	3.0
84	Transport - Highways	Guayaquil Southern Viaduct Highway PPP	Government of Ecuador	Planning (Tender 2018)	Ecuador	1.1
85	Transport - Highways	Maryland I-495 Capital Beltway & I-270 Express Lanes	Maryland Department of Transportation	Planning	United States	7.6
86	Transport - Highways	North-South Expressway	Highway Corporation of Vietnam	Planning	Vietnam	5,0
87	Transport - Other	Toronto Pearson Airport Regional Transit Hub	Greater Toronto Airports Authority	Planning (Phase 1 Design Procurement)	Canada	8.8
88	Transport - Other	Kansas City to St. Louis Hyperloop Route	Hyperloop One & Missouri Dept. of Transportation	Conceptual (Feasibility Studies)	United States	3.0
89	Transport - Ports & Logistics	6th of October Dry Port PPP	Ministry of Transportation, General Authority for Land and Dry Ports	Planning (Seeking Investment)	Egypt	0.1
90	Transport - Ports & Logistics	Anaklia Deepwater Port	Republic of Georgia (Anaklia Development Consortium)	Planning	Georgia	2.5
91	Transport - Ports & Logistics	Sagarmala Project (Tajpur & Sagar Island)	Ministry of Shipping (Government of India)	Planning (Phased Implementation)	India	15.0
92	Transport - Ports & Logistics	Multi-Purpose Container Port and Logistics Hub, Susah	Guidry Group	Approved	Libya	1.1
93	Transport - Ports & Logistics	Port of Lambayeque	Autoridad Portuaria Regional Lambayeque	Planning (Seeking Funding)	Peru	0.6
94	Transport - Ports & Logistics	Port Olvia	Ministry of Infrastructure	Plannign (Feasibility Study)	Ukraine	0.3
			Water & Wastewater			
95	Water	Ain Sokhna Integrated Water and Power Plant	Government of Egypt (Hyflux)	Procurement	Egypt	0.5
96	Water	Red Sea - Dead Sea Water Conveyance Project - Phase I	Ministry of Water & Irrigation, Kingdom of Jordan	Planning	Jordan & Israel	1.1
97	Water	Az-Zour North Phase II & III IWPP	Kuwait Authority for Partnerships Projects	Procurement	Kuwait	1.8
98	Water	Dubai Strategic Sewer Tunnel Project	Dubai Municipality	Planning	United Arab Emirates	3.4
99	Water	Cadiz Water Conveyance Project	Cadiz, Inc.	Planning	United States	0.5
100	Water	California WaterFix	California Natural Resources Agency	Planning	United States	16.0