

The Role of Infrastructure Stimulus in the COVID-19 Recovery and Beyond

Engineering and Construction Industry Response to the Coronavirus

In collaboration with the World Economic Forum

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This report grew out of Boston Consulting Group's work with the World Economic Forum on accelerating digital inclusion in the new normal. It builds on a WEF playbook developed in collaboration with BCG, *Accelerating Digital Inclusion in the New Normal* (July 2020), (<https://www.weforum.org/reports/accelerating-digitalinclusion-in-the-new-normal>), which presents the framework for a multiyear, cross-industry program to shape policymaking and accelerate action to close the digital divide.

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Foreword

The engineering and construction industry plays an important role in the world's economy, society, and environment, and therefore has the potential to be a critical contributor in the economic recovery from the COVID-19 pandemic.

For that purpose, it is crucial to define the role and scope of infrastructure in economic stimulus packages and have an open dialogue between the public and private sectors, as governments across the globe are now shaping their agendas.

Beyond supporting immediate short-term economic and social priorities, an effective infrastructure stimulus package should solve for long-term challenges that encompass a broader transformational response. Aligning infrastructure investment and climate policy will be a crucial prerequisite for decarbonization and a path to net zero; promoting resilience beyond mitigation will be key to strengthening communities and preparing for unforeseen climate events in the future; and preparing for a digital future is of paramount importance, since technology adoption will likely continue at an accelerated pace in the post-COVID-19 era. At the same time, stimulus can be used to test recent innovations in technology and infrastructure delivery.

We are pleased to share a framework for dialogue on potential infrastructure stimulus that has emerged from discussions with a group of engineering and construction industry leaders convened by the World Economic Forum. This report incorporates key lessons learned from past infrastructure recovery packages and highlights global best practices that an effective stimulus should include to help the infrastructure industry better absorb the shocks from COVID-19 and step up its response to long-term challenges.

On the basis of global lessons in infrastructure recovery packages, the report lays out an action agenda that focuses on three critical areas: sustaining construction that is already underway; creating a new project pipeline that is consistent with long-term goals; and developing mechanisms to provide immediate relief by simplifying and accelerating current procurement schemes, addressing infra-

structure funding issues, and supporting redeployment of portions of the workforce to construction from the most affected industries.

We hope that this action agenda will help governments successfully navigate the pandemic and emerge stronger in its aftermath, as well as setting a foundation for meaningful conversations between the private and public sectors.

We would like to acknowledge and thank the members of the steering and working committees, who have dedicated their expertise and time to this report, as well as the members of the World Economic Forum team for their extraordinary engagement, contributions, and support, and Boston Consulting Group for its critical insights and leadership in sharing these findings. We look forward to continuing this collaboration to transform our industry and contribute to a better global economy, society, and environment.



Steve Demetriou

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Executive Summary

Infrastructure is a powerful vector for social and economic development. It accounted for 6% of global GDP and the global workforce in 2019.¹ Infrastructure is also key to achieving long-term objectives in sustainability and resilience, and to embracing the use of digital technologies to foster new ways of working.

COVID-19 and Infrastructure

The COVID-19 crisis poses huge challenges for stakeholders in the infrastructure value chain. The COVID-19 crisis is already having a major impact on the industry, and its effects will be even more far-reaching in the years to come. Construction activity will drop by 10% to 25% in 2020 and decline by another 10% in 2021 compared with 2019, BCG estimates.

Although the effects of the pandemic vary widely from one country to another, project delays due to lockdowns or construction slowdowns have led to an overall plunge in activity of as much as 60%.² At the same time, productivity has fallen by 25% to 40%.³ New health and safety protocols have caused monthly costs to rise by €300 to €350 per worker.⁴ And border closures, mobility restrictions, and the fragile finances of engineering and construction companies have disrupted industry supply chains.

The Potential Impact of Government Stimulus

Infrastructure stimulus packages are a powerful lever that governments can use to support social and economic development. They are especially useful in challenging times because government investment in infrastructure has a multiplier effect of from 0.4 to 2.2 times GDP per year and can help create more than 10,000 total jobs for every \$1 billion invested.⁵

Infrastructure stimulus packages that balance short- and long-term goals for the country and for industry are more likely to secure the right returns. These goals include creating sustainable, high-quality jobs; contributing to the climate agenda; bolstering societies' long-term resilience; and giving impetus to new ways of working.⁶

A Balanced Framework

The World Economic Forum partnered with representatives from leading engineering and construction organizations to propose a framework for dialogue on potential infrastructure stimulus planning and for mitigating the fallout from COVID-19, while helping the engineering and construction industry meet its long-term objectives. The framework identified three key action areas that governments should address to achieve these goals.

First, governments can support and maintain construction activity, assessing and giving priority to shovel-ready and shovel-worthy projects, reducing delivery times, and contributing to long-term objectives. They can also launch building and infrastructure renovation programs to create short-term, high-quality jobs, while contributing to climate change abatement goals.

Second, governments can create a new pipeline of infrastructure projects that align with each country's specific needs and long-term objectives. That means analyzing how various infrastructure assets contribute to short- and medium-term government objectives, and assigning them priority in the new pipeline. Governments can also use unsolicited proposals to foster public-private collaboration on new projects.

Third, several factors can promote successful and sustained implementation of the infrastructure stimulus: opening a dialogue with industry organizations to discuss and acknowledge the costs stemming from COVID-19; designing faster, simpler infrastructure procurement models to accelerate project deliveries while extending procurement flexibility during the recovery period; deploying new financing models to boost private-sector involvement; and supporting workforce redeployment from other industries to engineering and construction.

This framework could help governments think beyond the short-term recovery and ensure successful delivery of sustainable, technologically advanced, and resilient infrastructure projects.



Introduction

A Framework for Dialogue

The infrastructure sector has wide-ranging social, economic, and environmental impacts and thus will play a critical role in helping countries and companies recover from the damaging effects of COVID-19, as well as in addressing the climate crisis:

- **Economic Impact.** Infrastructure has a large economic footprint, accounting for 6% of global GDP and global employment.⁷ Government investment in infrastructure has a powerful stimulus effect, producing an annual multiplier effect of from 0.4 to 2.2 times GDP.⁸
- **Social Impact.** Every \$1 billion invested in infrastructure creates more than 10,000 total jobs.⁹ In addition, the built environment improves everyday quality of life.
- **Environmental Impact.** Deploying new climate-friendly infrastructure—such as renewable energy, wastewater treatment, and climate-resistant infrastructure (for example, lightweight roads, climate-proof urban drainage systems, and smart bridges¹⁰)—and retrofitting existing assets boost infrastructure resilience and can help a country meet its net zero carbon targets.

COVID-19 and Construction Activity

The infrastructure sector is already suffering from the negative economic effects of COVID-19, and a swift and efficient response to the situation is crucial. Construction activity will drop by 10% to 25% this year, compared with 2019. Although the ripple effects on the industry vary from country to country, depending on the spread of the virus, activity everywhere shows signs of three knock-on effects:

- **Project Delays.** Lockdowns have caused a shuttering or slowing of construction-related work. Activity has fallen by as much as 60% amid restrictions.
- **Productivity Loss.** Productivity has fallen by 25% to 40%, according to BCG observations.
- **Supply Chain Disruptions.** Lockdowns, border closures, and the financial weakness of engineering and construction firms have rattled supply chains, threatening project viability.

These effects, together with rising costs associated with meeting newly promulgated health and safety protocols—such as enforcing social distancing, wearing personal protective material and equipment, and adopting other operational procedures—put huge financial pressure on these companies. Clients generally do not offer compensation for these higher costs.

Some countries are suffering from other aftereffects, which could hinder the recovery of regional construction activity. For instance, India's construction industry recovery faces added challenges related to the monsoon season and the reverse migration of construction workers.

Several governments have introduced fiscal stimulus measures to inject liquidity and help stabilize supply chains. These measures, which range from 1% of GDP in India to 30% of GDP in Germany, amount to around \$9 trillion worldwide.¹¹ But relatively few governments and institutions have announced measures to provide infrastructure-specific relief from COVID-19. Poland, the UK, Australia, Norway, New Zealand, the European Commission, New York State, South Korea, and China, among others, have released infrastructure investment measures to bolster construction and engineering activity and help the industry cope with the effects of COVID-19.

COVID-19 and Climate Change

The need to respond to COVID-19 offers an opportunity to address long-term infrastructure challenges that go beyond the outbreak, as part of a wider transformational response. Countries' efforts to decarbonize and to meet the commitments outlined in the Paris Agreement are likely to accelerate in the wake of COVID-19.¹²

This calls for a deep transformation of existing and future infrastructure systems to address the scale and urgency of climate action.¹³ Today, energy, transportation, buildings, and water infrastructure account for more than 60% of greenhouse gas emissions, but infrastructure upgrades and renovation worldwide have suffered from underinvestment for years. Aligning infrastructure investment and climate policy is a crucial condition for successfully following a decarbonization path and meeting the specific goals of the Paris Agreement.

One fruitful way for governments to respond to the COVID-19 crisis might be to put sustainability front and center, investing in high-potential opportunities that create jobs while lowering emissions, such as large-scale renewable energy projects, urban development (for example, building renovations), and efforts to improve industrial efficiency.

Resilience Beyond Mitigation

Promoting resilience beyond mitigation is key to being prepared to respond effectively to future unforeseen events and climate risks driven by the current global warming path.

Climate risks are among the most severe dangers that the world faces.¹⁴ The current global warming trajectory (which would result in an increase of 3°C to 4°C by 2100) will siphon off almost a third of global GDP by 2100. Since infrastructure systems will be disrupted by climate hazards in the current scenario, resilience is now a major topic in developed and developing countries alike.¹⁵ [Exhibit 1](#) identifies several of these major hazards:

- Around 60% of EU seaports may be at high risk of inundation by 2100, affecting roads, railways, and waterways, including freight traffic of coal, iron ore, and crude oil.¹⁶
- In the US, an average of 15 “billion-dollar” disasters per year have occurred over the past three years, compared with 6.2 per year from 1980 to 2018.¹⁷
- Major cities in developing countries in Southeast Asia are in serious jeopardy. Jakarta, Bangkok, and Dhaka may disappear due to rising sea levels by 2100.¹⁸

Beyond the current focus on climate change mitigation measures, making infrastructure more robust demands massive investment, ranging from \$100 billion to \$130 billion per year until 2050.¹⁹

Some local and global authorities are already investing in infrastructure resilience. A holistic strategy may be necessary to make these programs highly effective. Local initiatives have emerged, such as the Thames Estuary 2100 Plan in London, the Drainage Master Plan in Hong Kong, the Water Sensitive Program in Rotterdam, and the Metro Flood Management Master Plan in Manila.

Some global initiatives are underway, as well, led by the UN Development Program, the UN Framework Convention on Climate Change, the UN Office for Disaster Risk Reduction, the C40 City Solutions Platform, the Coalition for Disaster Resilient Infrastructure, the Asian Development Bank, and the Asian Cities Climate Change Resilience Network.

The Need to Prepare for a Digital Future

Preparing for a digital future is of paramount importance, since technology adoption is expected to accelerate post-COVID-19.

In the aftermath of the coronavirus, new technology infrastructure promises to become a major factor in helping economies recover. During lockdowns, an array of new internet infrastructure—including broadband, 5G, and data center infrastructure—has supported supply chains and remote working. It has become a top priority for some governments, notably in Taiwan, China, and South Korea. Companies in many sectors are considering how to accommodate safe distancing measures within new ways of working when operations restart with.

In coming years, technological changes will play a critical role in boosting productivity and enforcing new health and safety routines and protocols, and they will undoubtedly

Exhibit 1 - Global Climate Risk Index

US

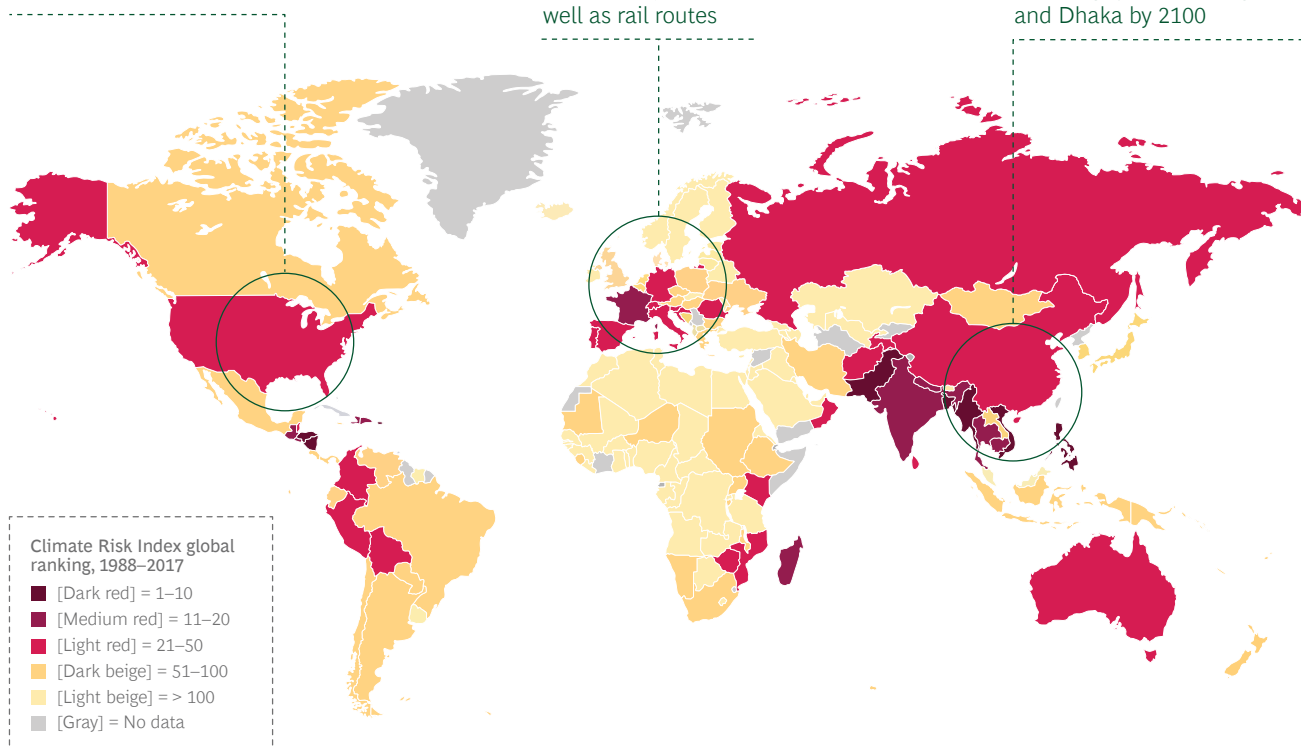
An average of 15 “billion dollar” disasters per year have occurred over the past three years, compared to 6.2 per year from 1980 to 2018

Europe

60% of EU seaports may be at high risk of inundation by 2100, affecting roads, waterways, including freight traffic of key commodities, as well as rail routes

Southeast Asia

Developing Southeast Asian countries with low resilience face a serious infrastructure threat: rising sea level may submerge Jakarta, Bangkok, and Dhaka by 2100



Sources: Munich Re NatCatService—data collected by Germanwatch observatory.

Note: The Global Climate Risk Index quantifies the impact of extreme weather events in terms of fatalities and economic losses incurred.

have a profound impact on how infrastructure is defined moving forward.²⁰

Industry consensus sees a pickup in the pace of Industry 4.0 and innovative use of technologies, such as accelerating adoption of building information modeling (BIM) in government tenders, artificial intelligence, and new materials and construction techniques.²¹ This suite of new technologies will be indispensable in enabling industry to meet the requirements of safe and efficient ways of working.

Some governments have made technology infrastructure the centerpiece of recent infrastructure investment efforts. Examples include China's \$1.4 trillion technology infrastructure master plan, Taiwan's DIGI+ 2025, and South Korea's "New Deal" infrastructure program.

As a result, the need for efficient infrastructure is urgent and unavoidable: stimulus could help the industry better absorb the shocks of COVID-19. Support packages can also embrace a number of the industry's long-term objectives:

- **Create sustainable, high-quality jobs.** Balance immediate job creation against the need for upskilled, high-quality workers in the long run.

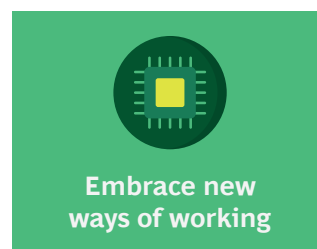
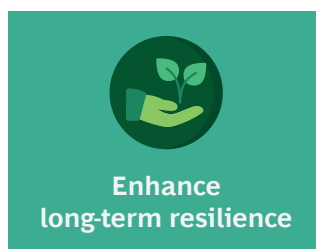
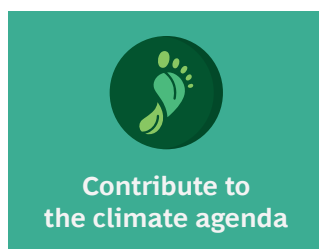
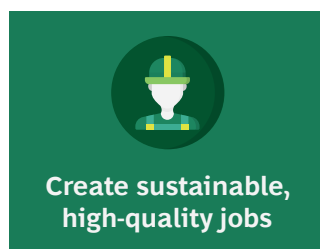
- **Contribute to the climate agenda.** Make sure that new infrastructure supports the clean energy transition and contributes to net zero carbon targets.
- **Build long-term resilience.** Deploy future-proof infrastructure, support economic and societal resilience, and sustain competitiveness.
- **Adopt digital technology to foster new ways of working.** Increase the efficiency of infrastructure itself by incorporating new technological capabilities related to greater connectivity, autonomy, digital information, and electrification.

The framework for dialogue explored in this report aims to support discussions between governments and industry stakeholders on infrastructure stimulus. (See Exhibit 2.) It focuses on meeting the objectives mentioned above and embeds an action agenda that addresses three critical areas: sustaining construction already underway; creating a new project pipeline consistent with long-term goals; and developing pathways for efficient and sustainable implementation.

Exhibit 2 - Action Agenda for an Effective Infrastructure Stimulus

FRAMEWORK FOR DIALOGUE TOWARD AN EFFECTIVE INFRASTRUCTURE STIMULUS

----- Short-term objectives ----- ----- Long-term objectives: Existing priorities to be refreshed ----- ----- New focus -----



Guidance for a set of stimulus actions



Maintain ongoing works, and accelerate shovel-ready and shovel-worthy projects



Create a new project pipeline aligned with long-term infrastructure priorities



Set up the right enablers to ensure efficient and sustained stimulus implementation, through government support and cooperation, and a new procurement and financing model

Sources: Discussions with industry leaders engaged with the World Economic Forum and its Engineering & Construction Industry Action Group; BCG analysis.



Set the Agenda for an Effective Government Stimulus

The framework for dialogue presented in this document incorporates lessons from past infrastructure recovery packages. That retrospective exercise identified five main success factors:

- **Boldness and Long-Term Transformational Purpose.**

A crisis offers an opportunity to address long-standing structural issues and meet immediate demands at the same time. Packages that are clearly articulated and aligned with long-term objectives will have a sustained and lasting impact and will help change national trajectories. The infrastructure recovery package used as a reference example here is Taiwan's 2017 DIGI+ 2025—a \$3.3 billion (0.6% of GDP) stimulus package designed to position the country as a world leader in Industry 4.0 technology. The program focuses on investing in broadband as a starting point for creating an ecosystem for digital innovation and a connected and inclusive society, and on setting out a regulatory framework to speed up deployment of new technologies.

- **Budget and Commitment That Support the Vision.** Funding that matches the scale of the transformational purpose (historically averaging from 0.5% to 2.0% of GDP) and is guaranteed over a reasonable time frame tends to mobilize the private sector most effectively. For example, in 2019, the EU launched its €1 trillion Green Deal (4.9% of GDP), which aims to make Europe the first climate-neutral continent by 2050.
- **Innovative Procurement Models for Accelerating Deliveries.** Planners can avoid stumbling blocks by setting up new procurement schemes, with specific deadlines for cash outlays and project completion, ranging from 6 to 24 months for shovel-ready projects.²² For example, in 2012, the US Department of Transportation released \$470 million to states for transportation projects, attaching “use it or lose it” conditions to the funding.²³
- **Comprehensive Scope That Includes Strategic Priorities.** The scope should be sufficiently inclusive to address complex, multifaceted problems and define clear funding priorities. For example, in 2009, Australia

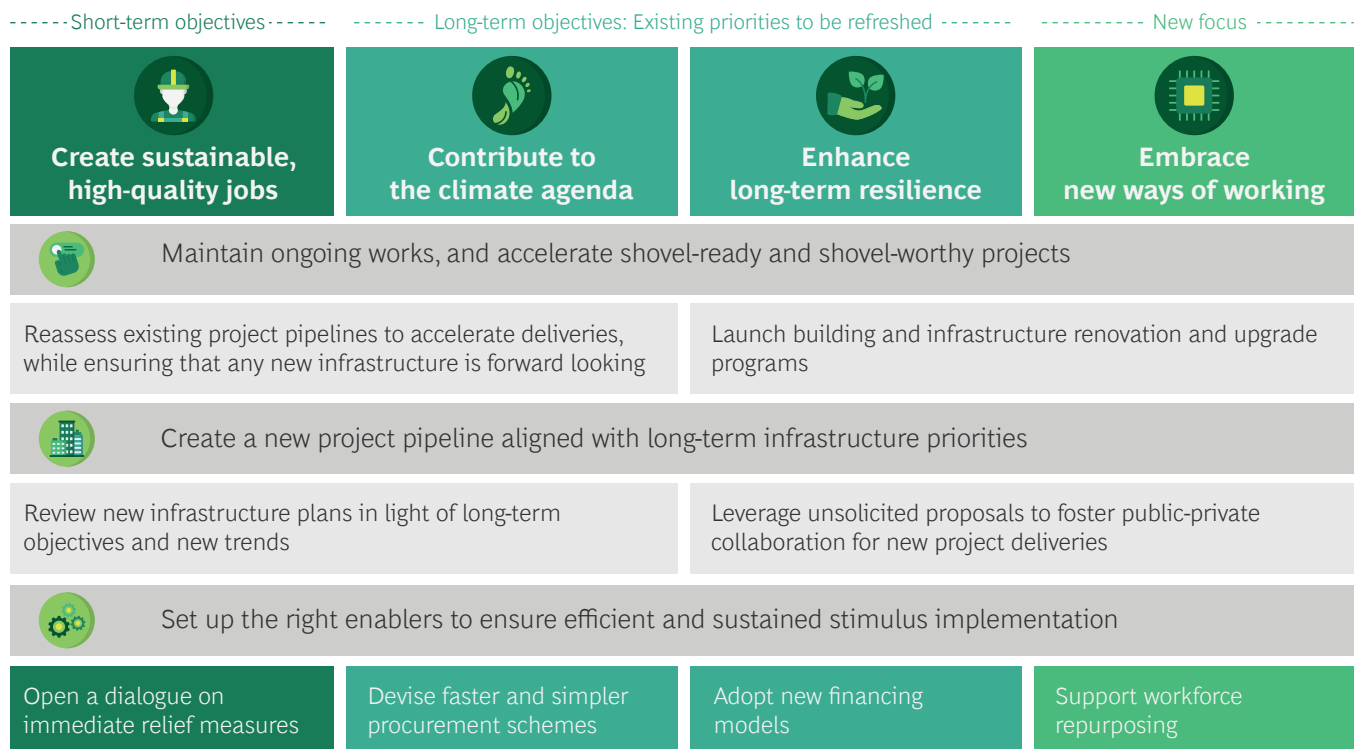
released its Nation Building and Jobs Program, a \$72 billion (7.7% of GDP) plan over 10 years, including a 30-year infrastructure plan to meet economic, social, and sustainability needs, with specific themes for infrastructure development such as a national freight network.

- **Partnerships with the Private Sector Across All Levels of Government.** Encouragement in this direction creates meaningful incentives for partnerships to foster private involvement in infrastructure development. For example, in Australia’s 2009 Nation Building and Jobs Program, the central government provided incentives for states to make brownfield assets available to private investors while incorporating fund-matching conditions to prevent federal funds from substituting for other sources of funding.

The framework for dialogue developed in light of the preceding five success factors not only provides support for an efficient and sustained industry recovery, but also aligns with the industry’s long-term objectives. This framework covers three main stimulus actions (see Exhibit 3):

Exhibit 3 - Detailed Action Agenda for an Effective Infrastructure Stimulus

FRAMEWORK FOR DIALOGUE TOWARD AN EFFECTIVE INFRASTRUCTURE STIMULUS



Sources: Discussions with industry leaders engaged with the World Economic Forum and its Engineering & Construction Industry Action Group; BCG analysis.

- Maintain ongoing works, and accelerate shovel-ready and shovel-worthy projects.²⁴
- Create a new project pipeline compatible with long-term infrastructure goals.
- Develop key enablers to ensure an effective and sustainable implementation.

Such a dialogue on potential infrastructure stimulus planning is essential to identifying necessary and urgent measures that will have a major impact on society and the economy. Such measures must address budget constraints by promoting public-private financing and self-funded initiatives.



Pursue Ongoing, Shovel-Ready, and Shovel-Worthy Projects

Infrastructure plays a vital role in keeping the engine of the economy running smoothly. It follows that, in a time of economic crisis, infrastructure projects that are already underway should be continued, if possible. This may entail taking action to support projects endangered by a liquidity shortfall or other knock-on effects of the COVID-19 pandemic, while also reviewing them to ensure that they align with long-term criteria.

For similar reasons, “shovel-ready” projects that are as yet still on the drawing board but could boost the economy immediately—such as building roads—should receive the green light. And “shovel-worthy” projects that help address long-term issues, such as climate change should be identified and brought forward.

For that purpose, two main actions are needed. The first is a reassessment of infrastructure projects in the pipeline with the aim of speeding up deliveries while ensuring that the resulting infrastructure meets government priorities and suits a post-COVID-19 world. The second is to undertake renovation programs by upgrading buildings and infrastructure—a proven strategy that can embrace and help achieve sustainability and resilience targets.

Reassess Existing Project Pipelines to Accelerate Deliveries, While Ensuring That Any New Infrastructure Is Forward Looking

Projects already underway should continue, with as little disruption as possible. Many projects around the world face a liquidity crunch, higher costs, or unstable supply chains. It makes sense to review the risk profile of these projects, including assessing their vulnerability to climate hazards, and to consider taking immediate action, as required, to support projects that are in danger of stalling or failing.

For example, the Australian government is reviewing several projects at risk, including the landmark Melbourne Metro extension, which will require financially restructuring as a result of COVID-19 force majeure and supply chain disruptions.

Assessing and prioritizing shovel-ready projects in the existing pipeline can help boost industry activity. Such projects need not sacrifice a forward-looking orientation toward achieving long-term industry objectives in order to have an immediate benefit. These two aims are compatible.

Projects that meet the criteria for shovel-readiness include the following:

- Small projects (budgeted at less than \$400 million) that can begin quickly, such as roads
- Projects whose engineering and design phases are complete, so that construction can commence at once
- Projects that do not require extended building permit approval processes, such as environmental assessments
- New projects that are nearly shovel-ready and will create a positive stimulus, such as reconstruction of infrastructure after a forest fire

Several governments have launched initiatives to accelerate deliveries by identifying shovel-ready projects. For example, in January 2020, the government of New Zealand announced the NZ Upgrade Programme, a NZ\$12 billion infrastructure stimulus plan for transportation, health, and education. The country's Infrastructure Industry Reference Group identified projects with budgets of more than NZ\$10 million and a public or regional benefit that could start within 12 months. The initiative has already attracted more than 1,900 applications in 40 sectors, totaling more than NZ\$136 billion.²⁵

Similarly, in April 2020, Australia requested all of the country's 537 councils to nominate road infrastructure projects that could be undertaken rapidly. This new federal stimulus program is on top of the AU\$100 billion included in the country's infrastructure plan, and aims to fast-track spending on transportation infrastructure to stabilize construction jobs for the next six months.

In June, UK Prime Minister Boris Johnson announced that his government would bring forward £5 billion in capital investment projects to support jobs and economic recovery, including hospital maintenance, school repairs, road improvement, and a range of shovel-ready local growth projects over the next 18 months. The government also proposed a regulatory reform of its construction permitting process, to promote faster procurement processes.

And in March 2020, Qatar agreed to relocate its workforce to new shovel-ready projects, so that people could go back to work instead of waiting under lockdown in construction camps for projects to restart and thereby posing an even bigger danger of spreading the coronavirus.

Governments can help projects in a country's current pipeline meet the criteria for shovel-ready status by streamlining existing procurement methods—for example, by reducing certain approval requirements in order to grant construction permits more quickly. One such requirement is an environmental assessment, which can take up to two years. A less cumbersome process could substantially accelerate project delivery. Moreover, identifying bankable projects with committed funding, even in cases where the engineering and design phases are not complete, could help ramp up immediate project delivery.

For example, the provincial government of Ontario, Canada, is reviewing the possibility of separating enabling works from the main scope of large projects in procurement processes to achieve faster delivery of large, complex projects and to kick-start economic activity.²⁶ This could help stabilize the supply chains of large projects, which depend to a considerable extent on small and medium-size enterprises (SMEs).

Although shovel-worthy projects are not as immediate as shovel-ready projects, flagging and prioritizing them could still help address long-term priorities, such as climate change. Setting minimum standards—such as for energy performance—could help ensure that the infrastructure addresses climate change concerns and meets long-term sustainability objectives, either by achieving decarbonization and climate resilience targets or by including circular project requirements (such as eco-design, waste prevention, and on-site processing or recycling) in a “green public procurement” standard.²⁷ For example, the Paris 2024 Olympics is aiming to decrease the games’ carbon footprint by 55% in comparison with London 2012 and Rio 2016, or to use 100% bio-based materials, green energy, food resources, and clean transportation.

Several countries have a backlog of infrastructure projects—such as flood mitigation programs or energy-critical infrastructure projects—that are connected with climate change and societal resilience but have not yet become a top priority.²⁸ By fast-tracking these projects and making them shovel-ready, planners can have an immediate positive impact and help societies become more resilient in response to unforeseeable threats.

Reevaluating existing infrastructure project pipelines helps planners ensure that a feasible pipeline exists, and it keeps them mindful of government priorities in the aftermath of COVID-19, so that investments are well focused. After the US Recovery Act passed in 2009, making new infrastructure investment funding available, several states could not deploy all of the committed funding because they lacked enough immediately feasible projects.

The private sector can support governments in evaluating short-term critical infrastructure needs—such as devising a plan to build temporary hospitals—if there is a flare-up in COVID-19 infections later in the year. This would make societies more resilient and help industry return to normal more quickly.

Launch Programs to Renovate and Upgrade Buildings and Infrastructure

Renovation and upgrade plans can immediately boost employment and economic activity, and they have proven to be crucial in past infrastructure recovery programs. For example, after the global financial crisis of 2008, Australia released a AU\$72 billion stimulus package that relied heavily on infrastructure to speed its recovery. Renovating and recycling assets were key drivers—including federal initiatives such as a 15% top-up on all infrastructure assets recycled by states.

Since governments own large portfolios of buildings and infrastructure, they can lead by example, launching initiatives for their portfolios and giving the private sector an incentive to follow suit. Some governments are mulling using stimulus planning to bundle state-of-good-repair projects, including airports, roads, and bridges. Advancing these works will help stabilize the infrastructure supply chain until activity returns to normal.

Renovation plans are likely to be more effective if they encompass everything from public-sector buildings (such as offices, schools, and hospitals) to corporate and commercial buildings to residential buildings to infrastructure. This would involve not only retrofitting but also updating old assets, to help the industry meet its sustainability targets and other long-term goals.

RENOVATION AND UPGRADE PROJECTS FOR SUSTAINABILITY

Energy efficiency projects involve redesigning infrastructure and buildings to meet net zero carbon objectives and thus support the energy transition. Besides contributing to long-term objectives, they can generate an immediate positive economic impact, creating from 9 to 30 jobs for every \$1 million invested.²⁹ Many energy efficiency projects can be self-funded by private organizations that are willing to invest in such projects under an agreement to share the resulting energy savings with the asset owners.

ENERGY EFFICIENCY PROJECTS FOR BUILDINGS

By 2030, existing buildings will make up 80% of stock in developed countries, but only a tiny proportion of them—about 1% to 2%—are renovated in any given year.³⁰ (See [Exhibit 4.](#)) Even so, renovations represent 55% of total construction. Any increase in renovations would significantly lift overall activity.

Thorough energy retrofits of old buildings could cut energy demand for space heating by two-thirds or more, and would reduce or eliminate CO₂ emissions by switching to renewables or decarbonized electricity.³¹

Improving insulation and installing heat pumps are other potential source of big cost savings. For instance, in the Netherlands, the government—together with the construction sector, social housing associations, and other major stakeholders—is developing and experimenting with innovative net zero carbon build retrofitting. These solutions will help the Netherlands upgrade outdated and energy-inefficient housing stock. Increasing the proportion of efficient buildings would make energy systems more secure and robust by saving energy and encouraging electrification and the use of smart energy management systems.

ENERGY EFFICIENCY PROJECTS FOR INDUSTRY

Investing in industrial energy efficiency is another way to create jobs rapidly, particularly if implemented in the SME segment, which has huge untapped energy efficiency potential. On average, every \$1 million invested in industrial energy efficiency creates ten jobs.³⁴ These projects would help lift companies' productivity, cut emissions, and improve crisis resilience.

Industrial renovation and upgrades commonly include investments in energy-efficient industrial electric motors, heat pumps, or agricultural irrigation pumps. Such projects usually have attractive payback periods and could quickly generate savings to help relieve financial stress and expand business operations.³⁵

RENOVATION AND UPGRADE PROJECTS FOR LONG-TERM RESILIENCE

Other renovation efforts could increase support for long-term resilience—such as rewilding schemes to mitigate the likelihood of floods, updating water infrastructure, and making utility grids more robust—or they could help countries reach their net zero carbon targets by reconfiguring transportation networks to include expanded walking and cycling paths.

For example, the Danish government is reviewing a plan for cleaner and more efficient water infrastructure. The project would have immediate economic benefits, help fight climate change and boost resilience. It would allow greater urbanization in selected regions, as well as more efficient and sanitary water infrastructure, increasing the system's sustainability.

Exhibit 4 - Relevance of Renovation and Upgrade Programs in Infrastructure Stimulus Packages

Renovation represents ~**55%** of total construction activity

By 2030, up to **80%** of stock in developed countries will take the form of existing buildings

Very low building renovation rates: ~**1% to 2%** of building stock is renovated each year



Any increase in renovation rates would significantly increase overall activity

Governments could lead by example, launching initiatives for their portfolios and giving the private sector an incentive to follow suit



Renovation plans are likely to be more effective if they involve all-encompassing assets, and if they go beyond retrofitting old assets to include updating them, to help the industry meet its long-term goals



Public-sector buildings
(offices, schools, hospitals, etc.)



Corporate and commercial buildings



Residential buildings



Infrastructure assets

Sources: “Boosting Building Renovation: What Potential and Value for Europe?” European Parliament; “Sustainable Recovery,” International Energy Agency, world energy outlook special report in collaboration with the International Monetary Fund; BCG analysis.



EU Case Study

In the EU, buildings consume 40% of the bloc's energy, use 55% of its electricity, and account for 36% of its CO₂ emissions.³² Reducing emissions and saving energy in this sector are central to meeting the EU's climate and energy targets. The European market for energy renovation in 2015 was around €109 billion and employed 883,000 workers. If Europe adopted a target to slash energy consump-

tion by 40% by 2030, the energy renovation market could increase to almost half again its current size, creating around 988,000 jobs.³³ This would require the annual renovation rate to increase to almost 3%; the current 27% energy savings target requires an annual renovation rate of about 1%.



Align the New Project Pipeline with Long-Term Priorities

As they chart a recovery from COVID-19, governments and the engineering and construction industry need to develop a pipeline for new projects. One key step in establishing such a pipeline is to review new infrastructure plans in light of both well-defined long-term objectives and emerging trends. For that purpose, fostering public-private collaboration will be key, and governments should consider effective ways to use the power of unsolicited proposals.

Review New Infrastructure Plans in Light of Long-Term Objectives and New Trends

There is a strong case for reviewing infrastructure needs and economic models in the midst of the COVID-19 crisis. Governments are likely to benefit from reshaping new infrastructure plans to fit long-term objectives and new trends. For example, traffic and transit patterns may shift in many urban areas long after the COVID-19 crisis eases, as more people work remotely. Governments could re-evaluate whether expansions in capacity or changes in service are necessary and whether it might make sense to shift capacity modes, such as redirecting investment to rapid bus transit instead of to rail, since bus lines respond more flexibly to changes in mobility patterns.³⁶

Such a review would help government bodies set clear objectives for new infrastructure projects—such as sustainable job creation, contribution to the climate agenda, or long-term resilience—and ensure that new project pipelines reflect these priorities. (See Exhibit 5.)

For instance, the European Commission’s Green Deal, which launched in December 2019, has a clear objective: to make Europe the first climate-neutral continent. To achieve this goal, the EC has established €1 trillion of funding through 2050, with a target of reducing CO₂ emissions by as much as 55% by 2030, and reaching net zero emissions by 2050. The plan covers regulatory and tax reform, as well as infrastructure investment across sectors.

Exhibit 5 - Recent Announcements on Infrastructure Government Stimulus

Packages in which infrastructure investments are partially or fully addressed

Non-exhaustive



Sources: Press releases; BCG analysis.

“By using the European Green Deal as our compass, we can turn the crisis of this pandemic into an opportunity to rebuild our economies differently and make them more resilient,” Ursula von der Leyen, president of the European Commission, said in April 2020.

RECENT BROAD INFRASTRUCTURE STIMULUS PACKAGES

Several European governments have already announced new project investment measures to supercharge the industry’s recovery. For example:

- In May 2020, the European Commission adopted a revamped EU budget—boosted by the Next Generation EU stimulus package, a €750 billion emergency recovery instrument for 2021 to 2024, and targeted reinforcement of the long-term 2021–2027 budget—that will bring the total financial firepower of the budget to €1.85 trillion. The reinforced EU budget will help repair the immediate economic and social damage caused by the coronavirus pandemic, kickstart the recovery, and prepare for a better future for the next generation by investing in a green, digital, and resilient Europe.³⁷ This package focuses on restoring value chains and deploying key infrastructure assets to support rural development, the energy transition, and technology, such as the rollout of 5G.
- In June, Germany’s government announced a €130 billion coronavirus recovery package that establishes a €50 billion fund for an array of projects addressing climate change, innovation, solar and wind power, and digitization. The projects include EV charging infrastructure, rail maintenance and upgrades, 5G networks, and hydrogen infrastructure.³⁸

Other large transformational infrastructure-focused stimulus packages are still under consideration: For example:

- In June 2020, the UK government committed to increase its total infrastructure spending across the next five years to a total of £600 billion, focused on putting jobs and infrastructure at the center of the government’s economic growth strategy. This autumn, to support its ambition to “build build build,” the government is expected to publish a national infrastructure strategy that will set a clear direction on core economic infrastructure, including energy networks, road and rail, flood defense, and waste.
- In June 2020, US President Trump announced that his administration was considering an infrastructure plan worth \$1 trillion to help revive the economy from the fallout of COVID-19 and to push ahead with his long-standing goal of spending big on US infrastructure. Under the plan, most of the money would be earmarked for infrastructure work on roads and bridges, with the rest of the funds devoted to building the US’s 5G network and improving internet services in rural areas of

the country. In September, the US Department of Transportation released the National Freight Strategic Plan to help the government invest strategically for the future by improving the safety of the freight system, modernizing infrastructure, and supporting the development of data and technologies as primary goals.

CLIMATE-CHANGE-FOCUSED INFRASTRUCTURE STIMULUS PACKAGES

Some governments that have released new infrastructure stimulus packages as part of their COVID-19 economic recovery have made climate change control and sustainability the main objective. For example, in April 2020, New York State announced the Accelerated Renewable Energy Growth and Community Benefit Act, designed to speed up siting and construction of clean energy infrastructure as part of the state’s climate change efforts and to support its economic recovery from the COVID-19 crisis. This act creates the first office of renewable energy siting in the US, to streamline the process for constructing large-scale renewable energy projects in New York.

“The Accelerated Renewable Energy Growth and Community Benefit Act shows how forward-thinking policy can boost the state economy and create jobs while bringing abundant, clean, renewable energy to all New Yorkers,” Rossana Rosado, New York Secretary of State, said on April 3, 2020, regarding the state’s new legislation for green recovery.

In June 2020, Norway announced a \$385 million green transition package to help lift the country’s economy and productivity post-COVID-19, by investing in sustainable power and infrastructure. The fund will support hydrogen power and battery storage technology, build offshore wind infrastructure, and renovate buildings.

TECHNOLOGY-FOCUSED INFRASTRUCTURE STIMULUS PACKAGES

Other governments, especially in Asia, are emphasizing technology in their infrastructure stimulus packages. For example, in May 2020, China unveiled an estimated \$1.4 trillion infrastructure master plan to invest in technology infrastructure through 2025. The plan includes rollout of the latest technology, such as 5G wireless networks, urban Internet of Things (IoT) sensors, ultra-high-voltage lines, and new high-speed rail. The plan supports technology development, such as for AI software to underpin autonomous driving in China.

Also in May 2020, South Korea announced its New Deal stimulus package to create jobs and boost economic growth once the COVID-19 pandemic is under control. Infrastructure technology promoting AI and 5G is the centerpiece of the package.

OTHER INITIATIVES FOR FORWARD-LOOKING INFRASTRUCTURE PLANS

Initiatives already in place could help public authorities incorporate lessons from other geographic areas to accelerate the transition to more forward-looking infrastructure. For example, the C40 initiative, a global network of city working groups, helps cities replicate, better understand, and step up climate action, by exchanging knowledge and connecting public officials with technical partners.³⁹

Meanwhile, in China, the Sponge City initiative, led by central and state governments and the private sector, has committed about \$12 billion to building and expanding water infrastructure, to fight water scarcity and strengthen flood defenses.

Leverage Unsolicited Proposals to Foster Public-Private Collaboration for New Project Deliveries

An unsolicited proposal does not arise in response to a public tender or an official government request.⁴⁰ Instead, it is initiated by a private-sector organization, which develops and submits the infrastructure proposal directly to the government. If properly structured, such proposals can hasten deployment of new, forward-looking infrastructure projects.

Unsolicited proposals can sidestep the constraints sometimes encountered in the public sector on identifying, prioritizing, and procuring financial and technical resources for infrastructure projects. Often, the private sector makes these proposals when governments are under stress, due to a natural disaster or an unforeseen domestic or global event, such as the COVID-19 crisis. In these situations, public-sector officials may be short-staffed and under time pressure, and drawing on unsolicited proposals can quicken procurement of critical infrastructure.

In addition, because project requisites in unsolicited proposals typically are not predefined, the private-sector entity can have strong motivation to introduce innovation and knowledge to solve infrastructure-specific needs. A government body could, for example, outline the need to connect two cities by a paved road, but leave it to project developers to estimate traffic flows and lanes needed, and to develop commercial facilities along the route.

In projects where new techniques or technologies are highly relevant, governments may infringe on the project proponent's rights by disclosing proprietary techniques in a competitive process.⁴¹ To protect proprietary knowledge, several countries' procurement laws authorize the government to bypass a competitive process and instead engage in exclusive negotiation if a superior good or service is available from just one supplier, or if there is no comparable alternative.⁴²

To improve the transparency and competitiveness of unsolicited proposals, some governments create a revolving process. When the government receives an unsolicited proposal, it opens the process to other bidders. In this second stage of competitive bidding, the unsolicited proposal's initial proponent enjoys a benefit or advantage, so companies still have an incentive to pursue such proposals. The government provides the benefit, which is typically structured under one of three systems⁴³:

- **Bonus System.** In the formal bidding procedure, the government awards a bonus to the original project proponent, which it applies to the proponent's technical or financial offer for bidding purposes. This system is used in Chile and South Korea.
- **Swiss Challenge System.** Third parties bid during a limited time, and the original proponent can counter by matching higher offers. India, Italy, and the Philippines follow this system.
- **Best and Final Offer.** As in the Swiss Challenge System, the government issues a tender to receive competitive bids, and then selects a few candidates for a final bidding round. The initial proponent, even if outranked, is invited to the final round and has a chance to submit the best and final offer. South Africa, Argentina, and Costa Rica use this system.

The effectiveness of such unsolicited infrastructure proposals depends to a large extent on how open the dialogue is between public and private sectors. Open and frank dialogue allows governments to define infrastructure priorities and draw on the experience of the private sector to assess their infrastructure gaps. For example, Chile, Costa Rica, and Italy usually allow unsolicited proposals only if those proposals fall under their strategic infrastructure investment plans. They define the priorities in broad terms and leave the project details to the interested parties.⁴⁴

Another example is the privatization of Djibouti's main port, Port Autonome International de Djibouti in East Africa, which came about after direct negotiations between the government of Djibouti and Dubai Ports International (DPI). DPI approached the government of Djibouti with a proposal to set up a partnership that would take advantage of DPI's experience and technical capabilities. In response, the government negotiated a 20-year management contract with DPI instead of issuing an open tender.⁴⁵

To make the most of unsolicited proposals, governments need to structure a process that ensures quick receipt and processing, which would help reactivate investments and stimulate job demand. Several initiatives could support government readiness:

- Set up internal capabilities and resources for rapid review and approval of projects.
- Define more agile procurement schemes to speed up the process.
- Leverage international cooperation where public-private partnership (PPP) units from countries with extensive PPP experience and resources to help governments that have limited capacity assess these proposals for free, as official development assistance.⁴⁶
- Short-list organizations that have a proven track record in successfully pursuing unsolicited proposals.

If executed well and transparently, unsolicited proposals can contribute to a country's overall infrastructure goals. Setting up the right capabilities and systems could be critical to promoting infrastructure development.



Create Enablers for Efficient and Sustained Implementation

There is an inherent tension between on the one hand achieving faster delivery and on the other realigning strategy to support industry goals and a long-term transformation agenda. Several key enablers can make the process more efficient and the impact more sustainable. In particular, efforts to simplify and accelerate the procurement process, secure infrastructure funding, and redeploy the workforce from severely affected industries to suitable construction projects are critically important.

Open a Dialogue on Immediate Relief Measures

A lot of uncertainty surrounds the questions of how long the COVID-19 crisis will last and how severe its long-term impact will be, but the need for a stimulus package to support an economic rebound is not in doubt.

Already countries are releasing support schemes to minimize the immediate negative consequences of the crisis on the wider economy. The scope, orientation, and duration of emergency policy responses vary widely by country, depending on the local severity of the coronavirus's spread and the prevailing economic and fiscal structures, and they will continue to evolve in response to COVID-19. Existing fiscal stimulus schemes currently range from 1% to 36% of GDP, or around \$7 trillion in total for G20 countries. Globally, research indicates that total fiscal spending on stimulus measures is about \$9 trillion.⁴⁷

Apart from authorizing fiscal stimulus to support the liquidity of firms and adopting measures to stabilize supply chains, few government support packages contain specific measures for construction. The industry urgently needs new schemes that help distribute the risk burden and costs of current COVID-19 disruptions.

In response, governments and the private sector should discuss and acknowledge the incremental costs that the industry faces due to the pandemic. Together with investment and initiatives to boost activity, this would help sustain the industry until activity rebounds to normal. In the meantime, the focus should be on preserving and creating jobs, and stabilizing the supply chain.

Infrastructure authorities could provide support to deal with the fixed costs of delays and activity shutdowns in contracts already underway. These extra costs jeopardize the financial viability of suppliers and construction companies. For example, the Canadian Construction Association has called upon the federal government to create an emergency COVID-19 cost relief fund designed to make immediate payments to ongoing projects. The payments could target eligible costs for reimbursement up to a certain percentage—such as 5%—of the total contract value.

Transition support packages could defray the cost overruns for ongoing projects attributable to new health and safety protocols—notably, costs related to social distancing, workforce prescreening, increased sanitization, and greater transportation capacity to reduce workforce density during

travel to and from the worksite.⁴⁸ For instance, the Canadian government is reviewing the possibility of accepting a 5% to 10% budget increase in new projects to help contractors cover incremental costs associated with COVID-19, such as for personal protective equipment, training, and extra shifts.

Governments can also consider a number of alternative measures that are less investment heavy to ease financial stress on companies:

- **Early Release of Cash Holdbacks.** Freeing up contract provisions that require project owners to withhold a certain percentage of services and materials project costs could help relieve liquidity shortages. Governments could introduce this measure progressively or by mandating the release of holdbacks secured by surety bonds or other low-cost security instruments.
- **Advance Material Supply Payments.** Setting up a standard legislative framework for advance payments by clients to support purchase of materials could help stabilize SME cash flows, since SMEs are major participants in industry supply chains. This arrangement could take the form of a contractor guarantee or of a transfer of ownership of the materials.
- **Accelerating Payments.** Easing payment terms in ongoing projects—for instance, from over 30 days to 15 days during the COVID-19 period—would reduce much of the financial stress on industry players. Firms would immediately benefit without incurring any additional administrative burden or financial outlay.
- **Quick Settlement of Change Requests.** Demanding the fast settlement of change requests (such as by setting short time frames for them) could further ease the financial burden that industry organizations now face.

The economic sense of these relief measures aside, it is important to note the leading role that the construction industry plays in providing critical services for public safety and welfare, and in guaranteeing the infrastructure needs of transportation and utilities during the COVID-19 crisis.

Full governmental recognition of the construction industry's essential contribution to keeping a country's critical infrastructure secure and resilient is an important aspect of post-crisis recovery, and indeed of living with the coronavirus for an indeterminate period.

Define Faster and Simpler Infrastructure Procurement Models

During the COVID-19 crisis, governments have shown they can introduce faster approval processes and rapidly mobilize capital. Extending flexibility in coming years would help ensure a sustained industry recovery as the economy rebounds.

Historically, the US, for example, has been fast and flexible with procurement schemes during crises. After the global financial crisis of 2008, the federal government enacted the \$800 billion Recovery Act, which prioritized infrastructure delivery. Authorities used existing programs to distribute funds, and adopted “use it or lose it” clauses, among other initiatives, to incentivize states to allocate the funding without delay.⁴⁹ In June 2020, President Trump signed an executive order titled “Accelerating the Nation’s Economic Recovery from the COVID-19 Emergency by Expediting Infrastructure Investments and Other Activities.” This order expedited federal permitting for infrastructure projects—including new mines, highways, and pipelines—to boost economic recovery. The executive order instructed the agencies involved to fast-track the permitting required under the National Environmental Policy Act, the Endangered Species Act, and the Clean Water Act.

Some governments are now turning to industry for advice on the best options for faster project delivery. For instance, as part of its NZ\$12 billion NZ Upgrade Programme, the government of New Zealand set up an Infrastructure Industry Reference Group, composed of private-sector representatives, to advise the government on legislative changes that would speed up infrastructure projects and fast-track consent processes and procurement options for infrastructure development.⁵⁰

In general, simpler procurement structures can help accelerate ongoing projects and expedite new ones. For example, establishing single-stage evaluations and transparent, criteria-based shortlists of prequalified bidders, or—as the province of Alberta, Canada, did—setting up single-point-of-contact structures can spark public-private dialogue on infrastructure development.

Furthermore, new procurement models could offer alternatives to purely lump-sum contracts, making procurement more flexible and helping align project owners with main contractors.

For example, planners could advance project deliveries by adopting more advanced procurement models, such as progressive design-build (PDB) or construction manager at risk.⁵¹ Under such schemes, government, contractor, and operations and maintenance teams collaborate more closely at the design stage, reducing change orders and making the process more timely and efficient. For instance, the government of British Columbia tendered several PDB procurement bids that cut the time required for approvals from 18 to 20 months to 8 to 10 months.

Using the alternative technical concepts approach in the design phase enables contractors to provide value-added services and technical solutions to solve infrastructure needs. This approach gives infrastructure clients some flexibility in defining project requirements, permitting contractors to offer technical options. On the New Mississippi River Bridge Project, for example, alternative technical concepts helped the Missouri Department of Transportation save about \$7.5 million on installing drilled shafts for bridge foundations.⁵²

Project bundling is another efficient way to scale and stabilize supply chains in the midst of the COVID-19 crisis. Tendering multiproject contracts makes contracting more efficient, and enables crews to keep working while the design phase for the next project is being finished. An example would be a situation where several countries have small infrastructure projects—such as bridges—that need to be rehabilitated. Bundling these projects would enable them to achieve critical mass and trigger efficiencies, making the combined projects more attractive for third parties. This is essentially what happened when the US Department of Transportation awarded a \$1 billion contract to replace 558 bridges in Pennsylvania as part of a design-build-finance-maintain bundled project. The bundling created efficiencies through economies of scale and eased the application of asset management best practices during the concession period.⁵³

Governments can also hasten investments in digitization capabilities to increase their preparedness in the event of further coronavirus outbreaks, and to ensure faster and more efficient project processing under COVID-19 conditions. During the initial outbreak of the coronavirus, many governments struggled to move essential services online quickly. It would make sense for governments to look critically at planned investments in digitizing key functions and to accelerate them where possible—especially in customer-facing functions such as permits—as well as to examine internal structures, such as working from home, or the use of scaling technologies for off-site inspections, such as drones or augmented reality/virtual reality.

Understanding risk imbalances in current procurement schemes, and backing the definition of new contract standards adapted to today's fast-evolving circumstances, will be key for a sustained rebound.

Contract clauses, such as force majeure, could be adapted to recalibrate risk along the value chain—for example, for time delays or cost overruns related to workforce safety. If all stakeholders came together to define and carry out best practices that deal with working as safely and productively as possible, they could minimize these extra costs.⁵⁴ Ongoing projects face productivity losses of 25% to 40% from the imposition of new operational restrictions and health and safety requirements. If contracts currently in place do not reflect such declines in productivity, new COVID-19 operating requirements will make projects economically unsustainable.

Several governments and organizations have already reviewed risk allocation in contracts and designed innovative arrangements to deal with the imbalances. For example, Project 13 in the UK is an industry-led initiative to improve the delivery and management of high-performing infrastructure.⁵⁵ It is sponsored by the Infrastructure Client Group of industry figures, academics, and infrastructure owners, consisting of 19 members from 16 organizations in the public, private, and regulated infrastructure sectors. Project 13 seeks to define a new approach based on the enterprise, rather than on traditional transactional arrangements. This could prove to be more effective in bringing suitable skills and new technologies to infrastructure and delivering the right outcomes to customers. A Project 13 arrangement differs from a traditional construction program model in three main ways:

- Reward/profit in the enterprise is based on value added to overall outcomes, not on services provided.
- Project participants understand cost drivers and risk across all organizations in the enterprise, and commercial incentives for collaboration mitigate risks jointly, rather than transferring them.
- Planners redefine the leadership, governance, behavior, and skills needed for project success, and depend on organizations' having more diverse skills and backgrounds.

In 2015, the Australian government launched the National Alliance Contracting Guidelines to standardize alliance contracting as a new collaborative procurement and project delivery method.⁵⁶ The guidelines reflect insights gleaned from Australian government and industry public-sector alliances worth about AU\$30 billion that have been completed or are being planned or implemented. Under an alliance contract, the project owner, the public-sector client, non-owner participants, contractors, subcontractors, and suppliers work together to determine the best project solutions.

Deploy New Financing Models to Incentivize Private-Sector Involvement

COVID-19 is forcing investors to reduce risk and debt in infrastructure portfolios at a time when extra resources are limited. Multilateral development banks are already stepping into PPPs to offer liquidity and safeguard viability.

Governments and organizations can use innovative funding and financing models to attract investments from private third parties that share the same goals, without forgoing profitability. Governments can improve project financing availability by channeling equity and debt tranches into securitized products, and by making local-currency loans from multilateral development banks and public infrastructure banks more readily available.⁵⁷ They can also review all sources of value linked to infrastructure, and help asset operators capture revenue from different sources (such as tax-based revenue, user-based revenue, ancillary revenues, and data monetization).⁵⁸

A number of projects and institutions have found innovative ways to successfully reassess financing and revenue streams.

INNOVATIVE MECHANISMS TO RAISE DEBT AND EQUITY

Some governments are using financial products, such as green bonds, to great effect to structure their needs for infrastructure development financing. For example, the Washington, DC water authority issued \$250 million in Environmental Impact Bonds in 2016 to finance green infrastructure, such as permeable pavement and green roofs.⁵⁹ Returns on the bonds are tied to environmental impact. These bonds provide a large source of financing and give investors greater assurance about project performance, since returns will reflect infrastructure performance.

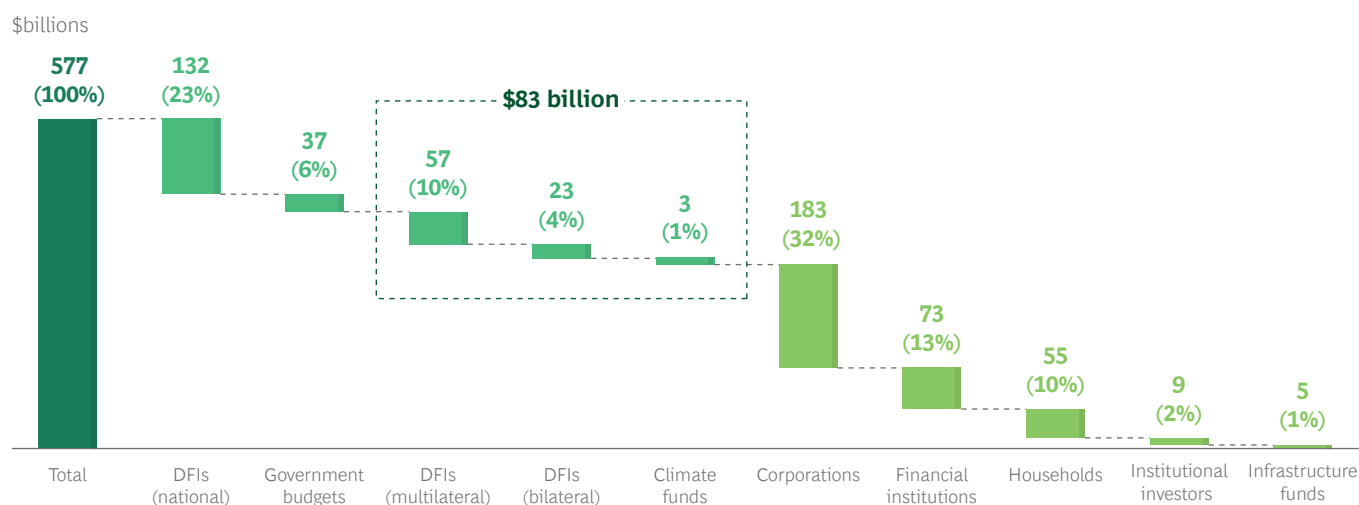
In 2018, the African Development Bank (AfDB) performed a synthetic securitization of a \$1 billion portfolio comprising 45 nonsovereign loans in 16 African nations. This securitization transferred risk from the AfDB to investors, creating a risk capital reduction for AfDB and increasing its lending capacity by \$650 million.

Governments can also set incentives to attract private capital for specific infrastructure needs, such as for green projects. To qualify as green, infrastructure projects must contribute to at least one of the following six objectives: climate change mitigation, climate change adaptation, sustainable use and protection of water resources, the transition to a circular economy, pollution prevention and control, or protection of healthy ecosystems. In 2018, \$83 billion in additional funding for green projects became available through multilateral development banks, bilateral development financing institutions, and climate funds, on top of other already-available funds, such as corporations and governments. (See Exhibit 6.)

INNOVATIVE MECHANISMS TO FUND INFRASTRUCTURE ACROSS SECTORS

Several governments use value-sharing revenue models, provided through special taxes on residential and commercial development, to enable the connected municipalities to benefit from economic development. For example, the Australian government financed the AU\$3.0 billion Parra-matta Light Rail in 2013 through a special annual levy of around AU\$72 on residential and commercial development projects within 800 meters of a railway stop (for 30 years) and a 3% land tax on the value of properties in the same areas.

Exhibit 6 - Sources of Financing for Green Projects (2018)



Source: World Bank.

Note: DFI = Development financing institution.

The government of Vancouver, British Columbia, in Canada used property taxes collected in 21 municipalities in the Vancouver metropolitan area to support transit infrastructure development, such as TransLink's rail extension project of CA\$2.1 billion. This funding effort included an additional property tax of CA\$4.1 per average household, and other measures, such as a development cost charge and motor fuel taxes.

Other private organizations are using innovative models to increase and create new revenue streams for infrastructure:

- Sunseap Leasing in Singapore was awarded a SA\$3.7 billion rooftop leasing contract with the Port of Singapore. The Port leases the rooftop warehouse to Sunseap Leasing, which finances, installs, operates, and maintains the solar panels. Sunseap sells the electricity generated by the solar panels to the Port, and sells any excess electricity to the electricity distributor.
- The Carlyle Group and Schneider Electric created a partnership to deliver new and innovative infrastructure projects in the US similar to the energy-as-a-service model used for digitally enabled and efficient critical energy assets.⁶⁰
- Various private organizations are launching product-as-a-service energy efficiency projects to invest in energy efficiency renovation projects and later share profits from the energy savings achieved through lower energy consumption.⁶¹

Support Workforce Redeployment to Construction from Other Industries

COVID-19 has affected different global industries differently, with some sectors seeing their highest rate of unemployment in 30 years. For example, the retail sector is not expected to return to 2019 employment rates until 2022.

The infrastructure industry could help reduce COVID-19's negative impact on employment, as greater infrastructure investment will boost immediate demand for workers. If governments put the right support schemes in place, they can promote redeployment of the unemployed workforce from other hard-hit industries to infrastructure. A regional gap analysis of unemployed labor in affected industries and of the labor needs of other sectors, such as construction, shows that travel restrictions due to COVID-19 could stymie the movement of labor in the short term.

Another area where suitable government policies may be helpful is in support for training programs to redeploy the workforce, such as public-private training academies. After the financial crisis of 2008, Australia released a \$72 billion stimulus that relied heavily on infrastructure investment to accelerate economic recovery. One of its key pillars was a youth skills program, which provided twofold support: immediate financial support to under-25 youth to study or train, and an effort to address longer-term workforce issues, such as low graduation rates for high school or university.

In April 2020, the government of Western Australia released a AU\$25 million support package to help the building and construction industry maintain a skilled workforce during the COVID-19 crisis. The package focuses on helping employers maintain existing traineeships and support the creation of 5,000 additional traineeships to complete short construction training courses.

In the US, NCCER is a leading nonprofit organization for training, assessment, and certification in the construction industry. It develops curricula—and management and safety training materials—for more than 70 craft areas, and aims to standardize training and credentials for the industry. In the past, NCCER has successfully redirected workers to construction, such as veterans through its Hard Hat Heroes credentialing program, and it could help governments scale up such workforce repurposing programs.⁶²

Governments can also consider developing dedicated tax schemes to support redeployment of unemployed workers from hard-hit industries to construction.

On yet another front, public-private forums can help identify skills that the construction workforce will need in the future—such as digital, data analytics, and renewables—and refocus training accordingly. For example, Construction Skills Queensland (CSQ), a nonprofit organization funded by the government of Queensland in Australia, supports construction firms in creating a more skilled workforce.⁶³ CSQ collaborates yearly with industry stakeholders to create new workforce development and skills- and capability-building opportunities. CSQ's roles include funding research to identify trends in skills development and workforce planning, reviewing skills needed in the future, and identifying and promoting best practices to support improvements in attracting and retaining workers, and in safety, productivity, and innovation.



The Way Forward

Open Dialogue Between Public and Private Sectors

The challenge of crafting a vigorous economic recovery from the COVID-19 crisis is also an opportunity to rethink national and international infrastructure needs in light of emerging technologies and pressing environmental and social concerns. This is a task for government and industry to undertake collaboratively, starting with open, wide-ranging, and creative dialogue between the public and private sectors.

The discussion should of course fully address immediate short-term economic and social priorities. But an effective infrastructure stimulus package should also aim to respond to longer-term infrastructure challenges, enlisting the engineering and construction industry's ever-increasing ability to devise and apply up-to-date methods to solve long-standing problems.

In these difficult times, the world needs leadership and decisive action at every level to move forward. The present crisis gives governments and industry the chance to build a more technologically advanced, efficient, competitive, resilient, and sustainable future.

Notes

1. Based on the Organization for Economic Cooperation and Development's 2019 statistics for employment, by activity.
2. Based on data reported by national construction associations and key stakeholders during the first month after lockdown (in accordance with national government measures to contain the pandemic's spread); includes overall impact of activity stoppage and productivity losses.
3. Expected decrease in performance standards due to the impossibility of carrying out certain types of work simultaneously, the decreased number of workers working simultaneously to guarantee social distancing, delays in delivery and reception of materials and tools at warehouses, and breaks for workforce testing and hygiene—as estimated by BCG.
4. BCG estimates that introduction of these standards will cost €300 to €350 per worker per month in obligatory direct costs, including disinfection of facilities, daily material and equipment, general testing, and leasing of additional transportation.
5. Includes direct, indirect, and induced jobs. Direct jobs involve designing, constructing, operating, and maintaining infrastructure assets. Indirect jobs involve providing goods and services to such assets across their lifetime, excluding trade and logistics. Induced jobs are those created as a broader result of increased economic activity attributable to the infrastructure assets.
6. The Global Climate Action Agenda is a series of initiatives launched to spur rapid climate action; boost cooperation between governments, local authorities, the business community, investors, and civil society; and support adoption and implementation of the Paris Agreement.
7. Based on the Organization for Economic Cooperation and Development's 2019 statistics for employment, by activity. In this report, dollar values are given in the dollar currency of the country under discussion (US, Australia, Canada, New Zealand, or Singapore). In cases where no specific country is named—as here—the figures are expressed in US dollars.
8. BCG analysis based on US Congressional Budget Office analysis.
9. Source: Boston Consulting Group.
10. "Smart bridges," generally speaking, are bridges provided with Internet of Things sensors, which provide information in real time to engineers and to operating and maintenance service providers, to ensure that they are performing correctly. For instance, some bridges have sensors that can detect abnormal vibrations in the cables holding the bridge, prompting engineers to install additional weight to dampen the cables.
11. See "Generating the Right Returns from Stimulus Packages: Beyond the Curve," BCG article, May 2020. For further information, see B. Battersby, W. Lam, and E. Ture, "Tracking the \$9 Trillion Global Fiscal Support to Fight COVID-19," International Monetary Fund blog, 2020.
12. The Paris Agreement is an agreement within the United Nations Framework Convention on Climate Change, signed in 2016 and dealing with greenhouse gas emissions mitigation, adaptation, and finance. For further information, see "The COVID-19 Recovery Can Be the Vaccine for Climate Change," World Economic Forum, 2020.
13. See "Climate, Infrastructure and Finance: An Agenda for Transformation," OECD/ World Bank/UN Environment Program, 2018.
14. Based on the World Economic Forum Global Risk Report 2020 and BCG analysis. Includes water crises, natural disasters, failure of climate-change mitigation, and extreme weather events.
15. Four main infrastructure systems are at risk given that they are major climate drivers: road, maritime, railway, and cities. Main climate hazards include sea level rises, extreme temperatures, and storms or floods. For instance, the World Resource Institute forecasts that sea levels will rise by more than a meter at coastal cities by 2080, assuming continuation of the current rate of +3.5°C global warming the world is on course for.
16. "Climate Change Impacts and Adaptation for International Transport Networks," UNECE, February 2020.
17. "Billion dollar" disaster: A disaster involving damage valued at no less than \$1 billion. Source: World Economic Forum.
18. <https://www.cnbc.com/2019/07/10/billion-dollar-natural-disasters-rising-these-states-better-prepare.htm>.
19. Inflation adjusted. Source: *Economics of Adaptation to Climate Change: Synthesis Report*, World Bank, 2010.
20. See "Engineering and Construction Industry Response to COVID-19: Restarting Work Safely and Efficiently," World Economic Forum, 2020.
21. Industry 4.0, also known as the Fourth Industrial Revolution, is the trend toward automation and data exchange in manufacturing technologies and processes, including cyber-physical systems, the Internet of Things, the Industrial Internet of Things, cloud computing, cognitive computing, and artificial intelligence.
22. "Shovel-ready" refers to projects at a stage where contractors can employ workers, and construction can begin.
23. "Obama Administration on Idle Earmark Projects: Use It or Lose It 'We Can't Wait' Action Helps States Put People to Work, Improve Infrastructure," August 17, 2012..
24. "Shovel-worthy" refers to projects that do not yet meet the criteria for "shovel-ready" but are still worth accelerating as they bring together the interests of city councils, state governments, and national governments to meet long-term industry objectives.
25. The Infrastructure Industry Reference Group is a group of private organizations representing New Zealand's infrastructure and construction industry that advises the government in connection with infrastructure development. Application data is as of June 2020. For further details, see "Budget 2020: Infrastructure to Support a COVID-19 Recovery," Deloitte perspectives, June 2020.
26. "Enabling works" are preparations to ready a worksite for construction—for instance, site conditioning, creation of access routes, and installation of facilities such as security fencing, ramps, and signage.
27. In construction, circularity is becoming a required practice for companies, in order for them to remain acceptable to their key stakeholders (investors, regulators, and public and private clients).

28. “Backlog” refers to the accumulation of uncompleted work, projects, or matters that need to be dealt with.
29. See “Sustainable Recovery, World Energy Outlook Special report in collaboration with the International Monetary Fund,” International Energy Agency, June 2020.
30. See “Boosting Building Renovation: What Potential and Value for Europe?” European Parliament, IP/A/ITRE/2013-046.
31. See “Sustainable Recovery, World Energy Outlook Special Report in Collaboration with the International Monetary Fund,” International Energy Agency, June 2020.
32. See “Boosting Building Renovation: What Potential and Value for Europe?” European Parliament, IP/A/ITRE/2013-046.
33. See Y. Saheb, “Energy Transition of the EU Building Stock. Unleashing the 4th Industrial Revolution in Europe,” 2016.
34. See “Sustainable Recovery, World Energy Outlook Special Report in Collaboration with the International Monetary Fund,” International Energy Agency, June 2020.
35. See “Sustainable Recovery, World Energy Outlook Special Report in Collaboration with the International Monetary Fund,” International Energy Agency, June 2020.
36. See “How COVID-19 Will Shape Urban Mobility,” BCG perspective, 2020.
37. See “2021-2027 long-term EU budget & Next Generation EU,” European Commission, May 2020.
38. See “Budget 2020: Infrastructure to Support a COVID-19 Recovery,” Deloitte perspectives, June 2020.
39. See “C40 Cities.”
40. See “Unsolicited Proposals in Infrastructure Procurement: A Growing Reality for Governments, Requiring Robust Management Frameworks,” International Institute for Sustainable Development, 2015.
41. See “Unsolicited Infrastructure Proposals: How Some Countries Introduce Competition and Transparency,” PPIAF, 2007.
42. See “UNCITRAL Legislative Guide on Privately Financed Infrastructure Projects,” 2001 (PDF).
43. See “Unsolicited Infrastructure Proposals: How Some Countries Introduce Competition and Transparency,” PPIAF, 2007.
44. See “Unsolicited Infrastructure Proposals: How Some Countries Introduce Competition and Transparency,” PPIAF, 2007.
45. Case study developed by “Unsolicited Proposals in Infrastructure Procurement: A Growing Reality for Governments, Requiring Robust Management Frameworks,” International Institute for Sustainable Development, 2015.
46. A public-private partnership is an arrangement whereby a private company partially finances or runs a public project or service. Official development assistance is commonly defined as intergovernmental support designed to promote the economic development and welfare of developing countries. The term was coined by the OECD’s Development Assistance Committee to measure aid between governments.
47. See B. Battersby, W. Lam, and E. Ture, “Tracking the \$9 Trillion Global Fiscal Support to Fight COVID-19,” International Monetary Fund blog, 2020.
48. See “Engineering & Construction Industry Response to COVID-19: Restarting Work Safely and Efficiently,” BCG, July 2020.
49. See “EO on Accelerating the Nation’s Economic Recovery from the COVID-19 Emergency by Expediting Infrastructure Investments and Other Activities,” June 4, 2020.
50. See “Budget 2020: Infrastructure to Support a COVID-19 Recovery,” Deloitte perspectives, June 2020.
51. See the Design-Build Institute of America: www.dbia.org. “Construction manager at risk,” also known as the “construction manager/general contractor model,” is an alternative procurement method to PDB, in which the project owner hires a contractor to provide feedback during the design phase, before the start of construction.
52. See the US Department of Transportation’s Federal Highway Administration.
53. See the US Department of Transportation’s Federal Highway Administration.
54. See “Engineering & Construction Industry Response to COVID-19: Restarting Work Safely and Efficiently,” BCG, July 2020.
55. See “About Project 13.”
56. See “National Alliance Contracting Guidelines: Guide to Alliance Contracting,” Australian Government - Department of Infrastructure and Regional Development, 2015.
57. These are securities backed by pools of underlying financial assets.
58. See Global Infrastructure Hub’s [infrastructure financing toolkit](#).
59. Permeable pavement is porous pavement that can catch precipitation and surface runoff, and allow water infiltration into soil or discharge into drains. Green roofs are building roofs partially or completely covered by vegetation and a growing medium, planted over a waterproofing membrane.
60. See “The Carlisle Group and Schneider Electric extend partnership to develop Critical Infrastructure projects,” April 12, 2019. “Energy as a service” (EaaS) is a business model in which customers pay for an energy service without having to make any upfront capital investment. EaaS models usually take the form of a subscription for electrical devices owned by a service company or management of energy usage to deliver the desired energy service.
61. “Product as a service” is a business model that allows customers to purchase a desired result rather than the equipment that delivers that result.
62. See “Addressing the Workforce Skills Gap in Construction and CRE-Related Trades,” NAIOP Research Foundation, 2019.
63. See “Annual Training Plan, 2020–21,” Construction Skills Queensland.

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