

Public Sector Practice

Will a labor crunch derail plans to upgrade US infrastructure?

There's a historic and widening labor shortfall in the US construction sector. Yet it extends far beyond jobsites and varies by location, demanding tailored solutions.

by Garo Hovnanian, Adi Kumar, and Ryan Luby



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The United States has a construction labor shortage that will likely get worse. In April, the US construction industry had roughly 440,000 job openings, and the US manufacturing industry had more than one million—the highest levels recorded since industry-level jobs data were first collected. This prompts the question: Who will fill the hundreds of thousands of additional jobs we estimate the Bipartisan Infrastructure Law (BIL) will create each year (peaking above 300,000 in 2027 and 2028) across the construction value chain in the next decade?¹

The answer to this question is critical, and not just for the construction sector. The BIL is poised to escalate labor demand, starting with outlays flowing to states, agencies, and authorities to fund portfolios of projects. Because each project relies on a chain of companies spanning engineering, materials fabrication, distribution, freight, and construction, any shortage of materials or labor at any point along the chain may cause delays, drive up costs, and result in projects being scaled back or scrapped.² In short, a labor shortage may affect much more than just the construction sector—it could have far-reaching economic ramifications.

Closing the widening gap between labor demand and supply is critical. Our latest research shows that labor strains are expected to manifest differently across US states, sectors, and occupations, arguing for a comprehensive strategy filled with solutions that can scale to address this wave of labor demand. Without such a strategy, the United States may not only be deprived of urgent upgrades to aging infrastructure but also miss the opportunity to set itself up for increased economic success over the balance of the 21st century.

A persistent labor shortfall

Today's labor mismatch has multiple root causes,³ from baby boomers leaving the workforce to record quit rates as workers reevaluate priorities to a shrinking pipeline of new construction workers amid stalled training and low net migration.⁴

But whatever the reasons, the net result is the same: there are too few workers for the jobs currently available, and certainly not enough for the jobs expected to be created in the years ahead.

In the current constrained environment, industry wages are growing at the fastest rates since the run-up to the 2008 financial crisis.⁵ And demand is unlikely to materially slacken irrespective of economic conditions, in large part because private- and public-sector infrastructure investment is locking in multiyear capital outlays (Exhibit 1). These outlays are less sensitive to cyclical pressures than the residential and business-to-consumer commercial sectors (such as retail and hospitality).

Getting granular: Insights by sector, occupation, and geography

The disconnect between jobs available today—and those set to be created in the years ahead—and the number of qualified people to fill them is significant. But when we looked beneath those top-level numbers, we found the strain varies by geography, sector, and occupation (for more on our methodology, see sidebar, “Model scope and assumptions”).

The challenges introduced by the BIL and their possible solutions require a local, nuanced perspective. Industries that hold their collective

¹ “The US Bipartisan Infrastructure Law: Breaking it down,” McKinsey, November 12, 2021.

² Garo Hovnanian, Ryan Luby, and Shannon Peloquin, “Bridging the labor mismatch in US construction,” McKinsey, March 28, 2022.

³ Ibid.

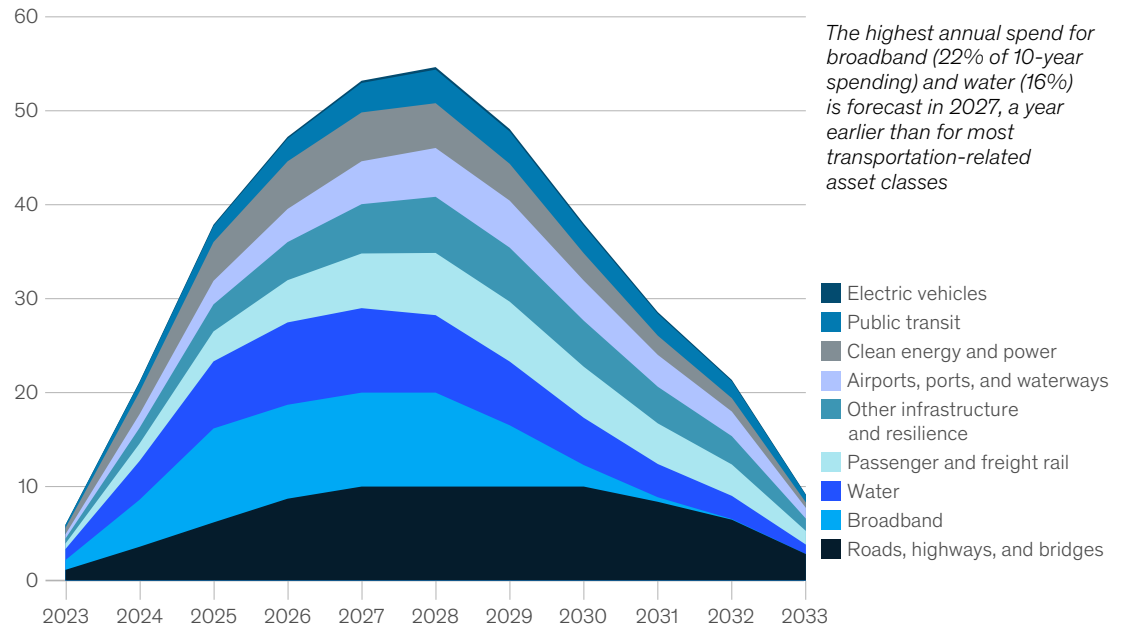
⁴ Aaron De Smet, Bonnie Dowling, Marino Mugayar-Baldocchi, and Bill Schaninger, “‘Great Attrition’ or ‘Great Attraction’? The choice is yours,” *McKinsey Quarterly*, September 8, 2021.

⁵ “Job openings: Construction,” US Bureau of Labor Statistics, accessed from Federal Reserve Bank of St. Louis (FRED) on August 30, 2022.

Exhibit 1

Incremental Bipartisan Infrastructure Law spending and subsequent workforce needs could peak around 2027–28.

Estimated new capital construction expenditures, by year and asset class, \$ billions



Source: Expert interviews; Lightcast, 2022; US Bureau of Economic Analysis; Bernard Yaros and Mark Zandi, "Macroeconomic consequences of the Infrastructure Investment and Jobs Act and Build Back Better framework," Moody's Analytics, November 4, 2021; McKinsey preliminary estimates based on Bipartisan Infrastructure Law, H.R. 3684, and White House state-specific information

breath to see what happens do so at their peril, because this is unlikely to be a transient, near-term issue. BIL spending is expected to start in 2023 and persist through 2033, with funding peaking across asset classes in 2027 and 2028. For example, in the year of peak demand, we estimate a shortfall attributable to the BIL of more than 160,000 workers in the contractor and subcontractor sector, 145,000 workers in the materials sector, and 40,000 workers in the engineering and technical-services sector. Again, that's a shortfall just for the year in which demand peaks, not over the lifetime of the BIL's effect.

In addition, the risks of the labor shortage are more acute in the short term. In the run-up to those peaks

in 2027 and 2028, every year in which the market fails to meet demand for labor creates a backlog that will both extend and delay the peak while driving up costs and eroding the BIL's purchasing power. At the same time, BIL investment is occurring alongside other public-sector outlays (such as the Creating Helpful Incentives to Produce Semiconductors and Science Act of 2022 [CHIPS Act] and the Inflation Reduction Act) and as the private sector makes generational bets on the future of the economy. In that sense, our modeling should be treated as a lower bound of the collective strain facing the construction value chain over the next decade.

The sector view

The \$383 billion in BIL expenditure—comprising \$90 billion in competitive funding and \$292 billion

Model scope and assumptions

Our economic modeling covers \$383 billion in expenditure from the US Bipartisan Infrastructure Law (BIL). We arrived at this figure by examining only the \$1.2 trillion in BIL funds (private-sector spending is not included), and then excluding expenditure already in the pipeline, nonconstruction capital expenditure (for example, rolling stock), and funds that may not clearly translate into a representative set of construction projects, such as safety and environmental-remediation funding and competitive energy grants (exhibit).

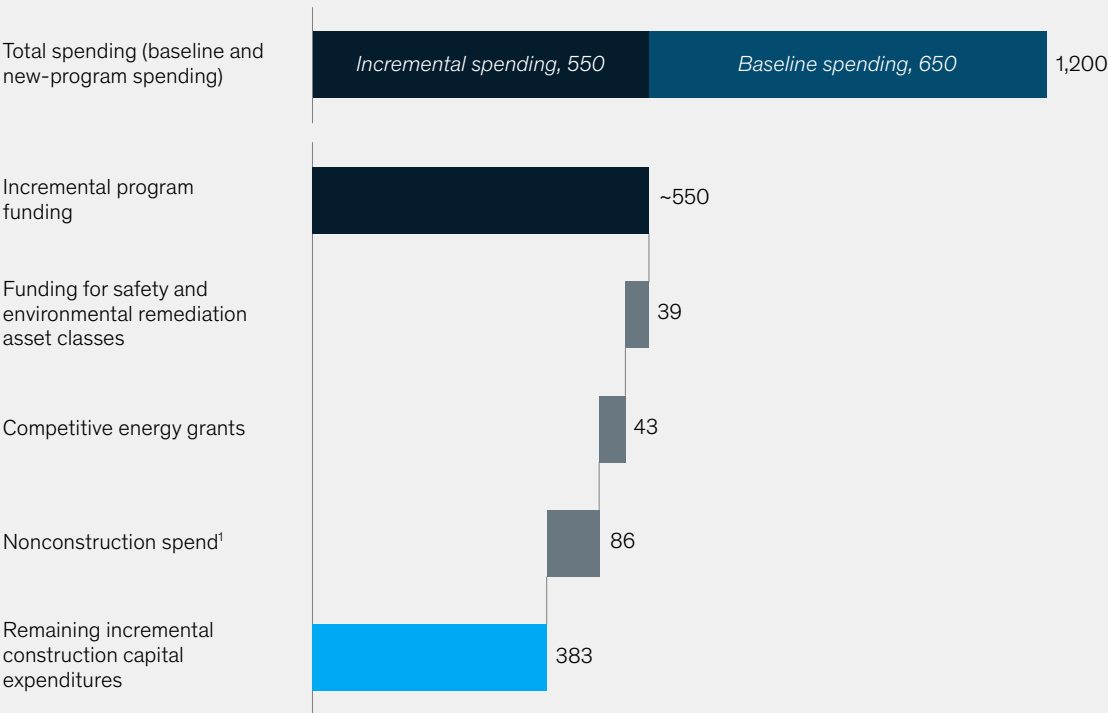
The analysis is grounded in a multiplier model, in which BIL dollars across asset classes are mapped to sectors at the state level. Sector-specific job multipliers—which are taken from Lightcast, a labor economics data provider—are applied to BIL dollars to estimate the number of jobs created by sector and by state due to incremental BIL expenditure (examples of sectors include highway, street, and bridge construction and ready-mix concrete manufacturing). Generated jobs by sector are then distributed across occupations using Lightcast’s state-level staffing-patterns matrices (including, for example, civil engineers and electricians).

This economic analysis—which spans all 50 states and nine asset classes within a set of roughly 900 occupational codes—helps identify the occupations most likely to present workforce challenges from incremental construction capital expenditure and the timing of these challenges. It does not include all funds that can increase demand for workers from the BIL, nor is it tied to granular job titles at a level of specificity below 900 occupational codes. Our analysis is also not fully adjusted to reflect the specific nature of BIL investments that may differ from historic construction infrastructure.

Exhibit

Modeling job gains from the Bipartisan Infrastructure Law focuses on \$383 billion of incremental construction capital expenditures.

Analyzed funding, \$ billions



¹Nonconstruction spend includes operating expenses, nonconstruction capital expenditures, and funds allocated to territories or Tribal Nations.
Source: Expert interviews; McKinsey preliminary estimates based on Bipartisan Infrastructure Law, H.R. 3684, and White House state-specific information

in formula-driven investment—will engage the entire construction value chain, including engineering, design, manufacturing, distribution, and construction. This means labor strains will be felt in areas other than jobsites, which aligns with what we heard prior to the outlay of BIL funds. In a November 2021 McKinsey survey, for example, executives cited a labor shortage of 80–83 percent in distribution roles, compared with a shortage of 50–64 percent in contracting.

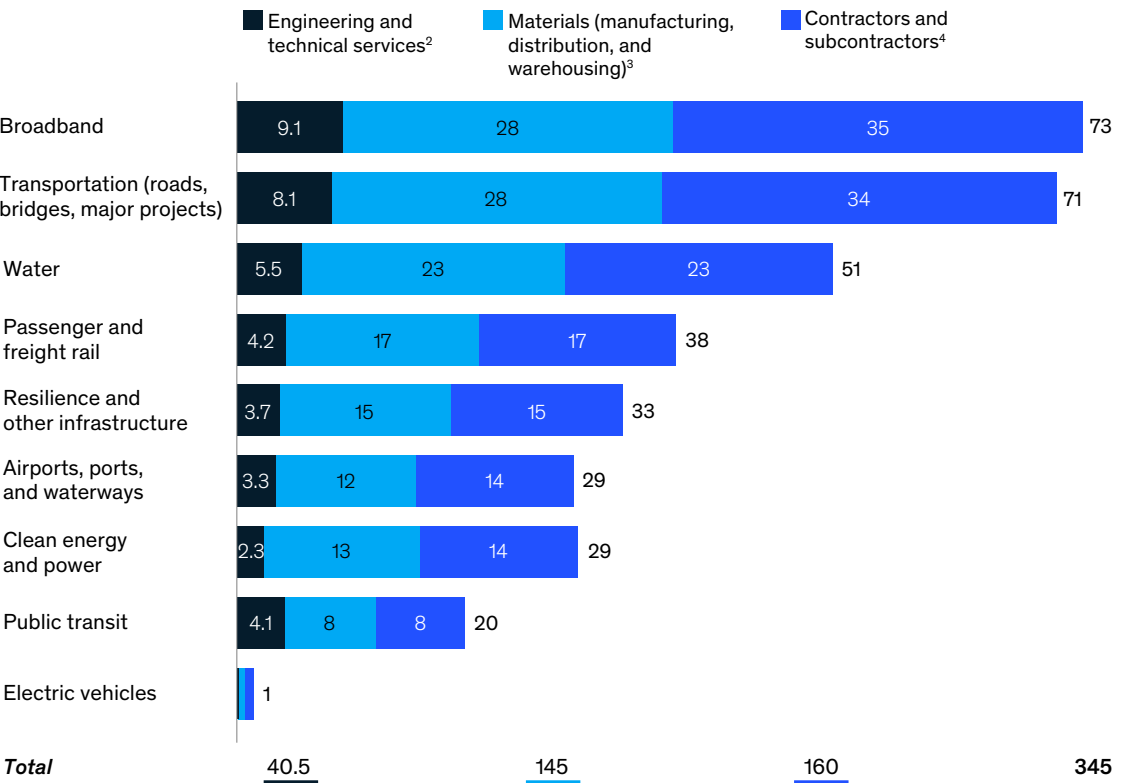
Indeed, of the estimated 345,000 jobs created in that year of peak demand, only 46 percent will come from contractor roles within the construction industry (Exhibit 2). About 42 percent of the jobs will be concentrated in the materials sector, which combines manufacturing, distribution, and warehousing.

Each of these areas poses sector-specific challenges. In materials manufacturing, new

Exhibit 2

Jobs from new Bipartisan Infrastructure Law capital expenditures for construction will span sectors across the construction value chain.

Jobs created in year of peak demand across construction value chain,¹ thousands



Note: Figures may not sum, because of rounding. Does not include safety and environmental remediation asset classes or competitive energy grants, collectively accounting for \$82 billion in new spending.
¹Peak demand is defined as the year between 2023 and 2033 in which an asset class has the highest number of jobs required from spending (typically, 2027 or 2028); estimates above do not include the ~78,000 jobs generated during peak demand through supply chain effects outside of the construction value chain.
²Eg, civil engineer, architectural drafter, electrical engineer.
³Eg, welder, truck driver, supervisor of production workers.
⁴Eg, construction laborer, operating engineers, supervisor of trades workers.
Source: Expert interviews; Lightcast, 2022; US Bureau of Economic Analysis; Bernard Yaros and Mark Zandi, "Macroeconomic consequences of the Infrastructure Investment and Jobs Act and Build Back Better framework," Moody's Analytics, November 4, 2021; McKinsey preliminary estimates based on Bipartisan Infrastructure Law, H.R. 3684, and White House state-specific information

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jobs are often far from the jobsite, meaning local demand may strain labor markets in other parts of the country. This lack of visibility may create a price pressure that feels disconnected from local labor markets where manufacturing is concentrated. For example, North Carolina is likely to see a jump in demand for the manufacturing workforce needed to produce fiber-optic cable that will be laid across the United States. In the warehousing and transportation space, on the other hand, the construction value chain will compete with other sectors that are driving the expansion of short- and long-haul logistics networks. While just 12 percent of the project job gap is in engineering and technical services, these positions can bottleneck project- and industry-wide growth because of the upstream gating role they play in individual projects. In addition, due to the education and licensing requirements for this segment (for example, civil engineers), the lead time required to address shortages in these sectors is particularly long.

The occupation view

The influx of investment and corresponding shortage of qualified labor are expected to strain a specific set of occupations across each sector. These “crucible” occupations may vary across sectors, influenced by two core drivers: the “momentum” rate at which jobs were expected to grow (or decline) without the BIL and what’s expected to happen as a result of the BIL.

Several occupations required for metal and plastic manufacturing are expected to shrink but are needed to propel implementation of the BIL (Exhibit 3). Within construction contracting, line installers—who are driving the buildout of broadband internet access—are poised to be in particular demand, along with construction laborers, construction managers, equipment operators, and electricians. Within engineering and technical services, civil engineers are the crucible occupation.

If left unaddressed, several occupational-demand challenges could spur inflation. For instance, most construction companies are competing for the same talent. Welders, for example, will be required at scale for manufacturing in addition to their role in the construction process—meaning without cooperation, manufacturers will compete with contractors for the same limited set of welders.

And indeed, people with skills crucial to the construction industry aren’t beholden to working in the industry. The distribution sector could feel this strain severely, as truck drivers and freight movers, who were already in short supply, are drawn to short- and long-haul logistics companies driving B2C and B2B transformation across the economy. And regardless of their place in the value chain, construction companies eyeing digital transformation will need software developers, which is an entirely new capability for many small and midsize firms.

Exhibit 3

Overall, the occupations that contractors typically employ are likely to face the most strain, but there are crucial roles across the value chain.

Jobs generated vs employment growth



Note: BIL stands for Bipartisan Infrastructure Law; occupations are limited to those requiring at least 1,000 new workers based on BIL spending in the year of peak demand within a given sector.
¹Calculated as the number of jobs generated in year of peak demand from new BIL construction capital expenditures spending, divided by 2027 employment based on momentum growth that excludes BIL.
Source: Expert interviews; Lightcast, 2022; US Bureau of Economic Analysis; Bernard Yaros and Mark Zandi, "Macroeconomic consequences of the Infrastructure Investment and Jobs Act and Build Back Better framework," Moody's Analytics, November 4, 2021; McKinsey preliminary estimates based on Bipartisan Infrastructure Law, H.R. 3684, and White House state-specific information

The geographic view

A few occupations, such as operating engineers, truck drivers, and freight movers, are in high demand across most US states—and construction laborers are the most in-demand jobs across the value chain in every US state except South Dakota. But the mix of sector and occupation constraints manifests differently across states.

The potential labor strain caused by the BIL could be disproportionately concentrated in states that

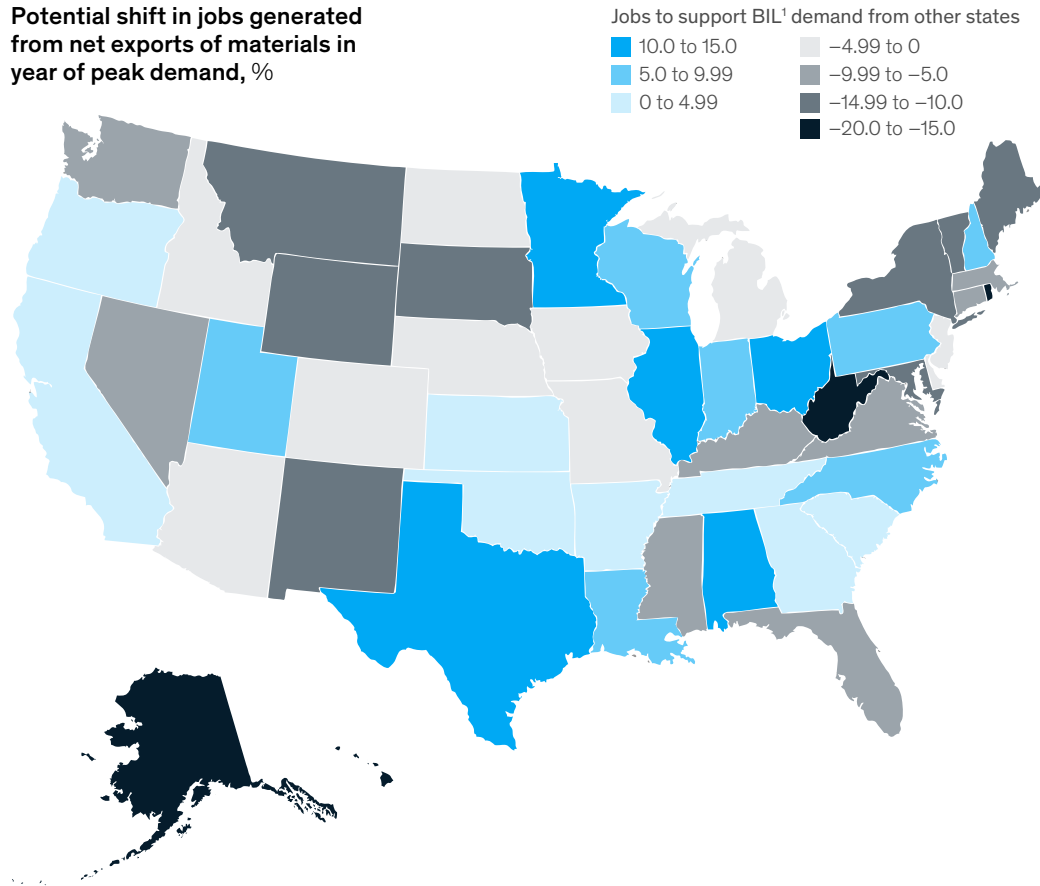
manufacture and export materials to states with limited manufacturing capacity (Exhibit 4). These manufacturing-heavy states will likely see demand for more jobs (and thus face additional labor strain) than those required to build out their own infrastructure.

In North Carolina and Pennsylvania, for example, 46 percent of projected jobs are in the materials value chain, including manufacturing and distribution—in part reflecting the concentration of fiber-optic cable and steel-manufacturing

Exhibit 4

Twenty-one states that are net exporters of materials may see incremental labor market strain.

Potential shift in jobs generated from net exports of materials in year of peak demand, %



¹Bipartisan Infrastructure Law.

Source: Expert interviews; Lightcast, 2022; US Bureau of Economic Analysis; Bernard Yaros and Mark Zandi, "Macroeconomic consequences of the Infrastructure Investment and Jobs Act and Build Back Better framework," Moody's Analytics, November 4, 2021; McKinsey preliminary estimates based on Bipartisan Infrastructure Law, H.R. 3684, and White House state-specific information

production capacity in those states, respectively. In contrast, just 31 percent of projected jobs in Rhode Island are generated in the materials value chain.

This dynamic could have three diverse implications: projects in states with limited manufacturing capacity may have increased risks associated with getting materials from other states, driving further price increases; companies in states with concentrated production capacity may feel incremental pressure to create capacity to address potential shortages; and

states with less capacity may feel pressure to develop in-state manufacturing capacity to reduce potential delivery risks for their public projects.

Four actions to address the potential labor shortage

The potential labor challenge created by the BIL's historic investment transcends any individual sector, occupation, and geography. Delivering on this generational opportunity to drive national and

global economic growth would benefit from the combined and coordinated efforts of the private, public, and social sectors working across the entire construction value chain.

Given the cross-cutting nature of the challenge, some of the most interesting solutions to date have involved partnerships across groups of stakeholders. We've identified four broad actions that may help the United States capitalize on this transformational moment.

1. Increase the supply of construction labor

To address the need for labor both in the aggregate and for a targeted set of bottleneck roles, companies could focus on reskilling and upskilling existing workers, attracting new people, and pulling people currently on the sidelines back into the labor force.

Upskill and reskill the workforce to fill targeted roles. McKinsey's recent American Opportunity Survey underscores the depth of appetite for reskilling in the industry.⁶ Fifty-eight percent of workers across the construction value chain plan to pursue future training, education, or credentialing opportunities, 17 percentage points higher than the national average. Three examples illustrate the breadth and diversity of partnership approaches available to meet this demand, which involve a combination of employers, educational institutions, and the public sector. First, the Departments of Transportation (DOT) in Arizona and California require that DOT-funded projects meet minimum targets for on-the-job training. Second, UpSkill Houston links employers, educators, and applicants by providing a platform that connects candidates with potential job opportunities.⁷ Third, shifting to a skills-based rather than credential-based view of hiring will provide further relief. The

Rework America Alliance, a Markle-led coalition that includes McKinsey, has demonstrated the power of this approach, particularly for those without college degrees.⁸

Hire workers from nontraditional segments. These can include formerly incarcerated individuals, veterans, and others. Homeboy Industries provides an example of the local impact, effectiveness, and potential of working with formerly incarcerated individuals.⁹ Stable employment is especially critical for this segment. Our American Opportunity Survey found 53 percent of previously incarcerated workers reported concern about the stability of their current employment, 1.4 times higher than those not previously incarcerated.¹⁰ Helmets to Hardhats supports veterans transitioning into civilian roles.¹¹

Attract new workers through a variety of approaches. First, nonwage benefits could open segments of the labor market. For example, some employers have started to offer housing and other benefits,¹² and Oregon introduced a \$100 million childcare investment package to encourage entry into the workforce.¹³

Second, taking a more expansive view of the nonwage value proposition could also help employers access younger, more diverse talent. McKinsey's research emphasizes the importance of supportive management, purpose and values, and a flexible working schedule.¹⁴ In a sector that is critical for building out the next-generation infrastructure required to propel American and global economic growth, there's an opportunity to frame such employment as deeply meaningful and compelling.

Third, apprenticeships can start at younger ages, and the time between completion of school and

⁶ McKinsey American Opportunity Survey, 2022.

⁷ For more, see the UpSkill Houston website.

⁸ For more, see the Markle website.

⁹ For more, see the Homeboy Industries website.

¹⁰ McKinsey American Opportunity Survey, 2022.

¹¹ For more, see the Helmets to Hardhats website.

¹² Chip Cutter and Lauren Weber, "In battle for workers, companies build houses," *Wall Street Journal*, May 22, 2022.

¹³ "House Bill 4005," Oregon Legislative Assembly, March 9, 2022.

¹⁴ Aaron De Smet, Bonnie Dowling, Marino Mugayar-Baldocchi, and Bill Schaninger, "Gone for now, or gone for good? How to play the new talent game and win back workers," *McKinsey Quarterly*, March 9, 2022.

integration into industry can be reduced. Ohio's High School Tech Internship Pilot program, for example, brings awareness to priority industries by allowing employers to hire high school interns.¹⁵

Finally, the industry could band together to showcase its wide variety of job opportunities. For people who want to work in an office, construction and manufacturing companies offer engineering and office jobs. For those who prefer operating machinery, roles are available on jobsites, in factories, and in distribution centers. And for individuals who like variety and want to work outside, construction laborers are in demand everywhere. The industry has an opportunity to redefine what it means to be a construction worker.

2. Improve productivity across the entire value chain

Improving productivity will involve upstream design, manufacturing, and distribution and downstream activities at the jobsite. While technology enablement is a core pillar of these activities, it's not a silver bullet to solve all problems.

Upstream productivity. Construction has been slow to adopt technology, despite its promise of productivity gains and proven value. When McKinsey surveyed construction executives in 2022 about the trends they expect to have the most impact over the next five to ten years, two of the top three trends involved upstream technological adoption: digital design (for example, digital twins) and automation of material production processes.¹⁶ The industry could accelerate its slow adoption to offset the workforce challenge, and modernizing the industry's tech stack would have the added benefit of attracting a new demographic of skilled talent. In addition to technology, executives also cited transparency of material performance, earlier decision making, and professionalization of procurement among trends with the most impact. Past McKinsey research has highlighted the productivity and project cost gains available from

off-site manufacturing.¹⁷ Uptake in US markets has been limited, particularly compared with the Nordic countries, where there is a virtuous cycle among consumer preferences, demand, and the industry's supply chain.

Downstream productivity. The second most influential trend cited by executives in our 2022 survey involved downstream digital construction tools, including jobsite management. This is part of the lean construction ecosystem, which we described in a March 2022 article as "another proven way to drive significant and sustainable productivity improvements."¹⁸ For instance, establishing a centralized continuous-improvement engine may enhance on-site execution through integrated planning, performance management, and waste elimination. Because key stakeholders across the project work with a common, agreed-upon set of KPIs, they can address issues in real time and better collaborate to reduce waste and variability of work. In addition, capability building across the planning and construction teams may help team members understand and adopt lean construction practices.

3. Revisit how owners work with contractors and suppliers

Most statutes that govern state and local agency procurement rely on lump-sum, fixed-price contracting in which the lowest price wins. In a world of rising inflation and increased macroeconomic uncertainty, this approach has already caused many agencies to receive inflated bids grounded in risk falling entirely on contractors that price for uncertain scenarios of inflation linked to material and labor shortages. A handful of alternative contracting options may reduce the burdens of the lump-sum, fixed-price status quo:

- At a strategic level, engage procurement, legal, and capital-programs departments in listening sessions with contractors in their market to understand the risks they are currently bearing and how existing procurement guidelines could

¹⁵ "High School Tech Internship," Ohio Department of Education, updated April 5, 2022.

¹⁶ "Building products in the digital age: It's hard to 'get smart,'" McKinsey, June 6, 2022.

¹⁷ "Modular construction: From projects to products," McKinsey, June 18, 2019.

¹⁸ "Bridging the labor mismatch in US construction," McKinsey, March 28, 2022.

be adapted to share those risks in a labor-scarce environment.

- Adopt models that allow contractors to execute over a flexible time horizon and optimize their resources accordingly, as some DOTs have done.
- Scale up the use of full collaborative contracting, especially on larger, complex projects, early in the design phase.¹⁹
- Revisit other terms and conditions affecting how much risk the market bears (for example, bonding requirements, payment terms, and change-order processes) to make contracts as appealing as possible to the market.
- Add room in the project procurement process to take feedback from the market on scope, bundling, timing expectations, and other elements that could improve the cost, schedule, and risk equation of a project. This approach—in which owners actively solicit feedback to determine ways to make a project better—is typically not accounted for in hard-bid procurement processes.

4. Coordinate more effectively

BIL projects across asset classes that are not coordinated and effectively compete are likely to inflate the cost of materials and reduce the real volume of infrastructure delivered. A variety of different types of coordination might address this issue.

First, across infrastructure projects and geographies, there's a need to prioritize and sequence spending across asset classes to smooth the flow of demand, with a link to centralized procurement planning (many states, including Michigan and New Jersey, are establishing infrastructure coordinator offices for this purpose²⁰). In the same vein, there are potential benefits to coordinating at the regional or federal level.

Second, there's an opportunity to introduce efficiencies by combining particular types of investments to only "dig once."²¹ For example, agencies that are installing fiber and repairing water mains in the same municipality could tackle both projects at once if they had visibility into each other's planning and sequencing of their broader capital programs.

We've noted before that the US construction sector could power inclusive growth and set up the country's economy for success in the 21st century.²² Yet the labor challenges are not easing. Thoroughly assessing the mismatch between worker demand and supply and implementing collaborative, creative approaches could help us embrace this generational opportunity to the fullest. Failing to do so may rob the United States of tens of thousands of miles of roads, thousands of bridges, and miles of water and electrical infrastructure that could have been funded by this bipartisan investment and made our lives better for years to come.

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¹⁹ "Collaborative contracting: Moving from pilot to scale-up," McKinsey, January 17, 2020.

²⁰ "Impact officer in chief: The state infrastructure coordinator's role," McKinsey, April 20, 2022.

²¹ "Dig once' could help states manage material and worker shortages," McKinsey, August 24, 2022.

²² "Bridging the labor mismatch in US construction," March 28, 2022.