

Trillion Dollar Infrastructure Proposals Could Create Millions of Jobs

Will the New Jobs Lead to Sustainable Careers?

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President Donald Trump has proposed to spend up to \$1 trillion over the next 10 years on America's infrastructure, including transportation, energy, telecommunications, and border security.

The significant spending increase envisioned in President Trump's proposal raises concerns about inflation and interest rate hikes¹ but would also create millions of new jobs.² If enacted,³ the infrastructure program could put the United States back on a prerecession job growth path and create more than 11 million jobs.⁴

These jobs will consist of both those directly related to infrastructure – including jobs for tradesmen, construction workers, and material moving and transportation workers – as well as downstream jobs only somewhat related to infrastructure, such as in offices and retail services. Infrastructure-related jobs, which now comprise 12 percent of jobs in the U.S. economy, would increase temporarily to 14 percent of jobs.⁵

Moreover, the president's proposal would revive, at least temporarily,⁶ the blue-collar economy. This would be a marked shift in the recent trajectory of the workforce.⁷

In the peak years of the post-World War II blue-collar economy in the 1970s, 72 percent of jobs required no more than a high school education.⁸ Today, only 34 percent of jobs in the economy require a high school diploma or less. President Trump's proposal temporarily would increase the number of jobs that require high school or less by 6.3 million jobs.⁹

More than half (55%) of the new infrastructure jobs¹⁰ would go to high school graduates and high school dropouts, especially men in blue-collar occupations, who have been left behind due to economic changes over the past several decades.¹¹ Almost 60 percent of the new infrastructure jobs would require at most six months of formal and informal on-the-job training. A full 16 percent of new jobs likely would go to high school dropouts, who are disproportionately of Hispanic/Latino ethnicity. Eighteen percent of the new jobs likely would go to Associate's and Bachelor's degree-holders, who are disproportionately white.

Slightly less than half (45%) of the new infrastructure jobs would require at least some college education and training, including jobs for civil engineers and construction managers. These training and education requirements would create new opportunities and new challenges for the nation's secondary and postsecondary education and training system, especially for community colleges.

Senate Democrats have proposed their own \$1 trillion infrastructure bill, estimated to create 15 million jobs over a 10-year period. Some political analysts argue that this proposal would compel the Republican Party

1 Many argue that President Trump's infrastructure spending, especially in combination with tax cuts and other elements in his economic platform, would lead to inflationary pressure that would slow potential growth rates as well as reduce future ability to use fiscal stimulus in the event of another recession. Inflation expectations from such a large increase in spending at the currently low unemployment rate could lead to an overstimulated economy. Increased inflationary expectations or real increases in wage and price inflation could trigger a continued rise in interest rates by the Federal Reserve as a response, thus making it more expensive to borrow and invest in the long run, ultimately reducing potential growth rates. See Mark Zandi, *Moody's Analytics* (Zandi, 2016); Ben Herzon, *Macroeconomic Advisers* (Miu, 2016); Bill Gross, *Janus* (Gross, 2016).

2 Public infrastructure currently comprises 2 percent of GDP and 12 percent of jobs (Congressional Budget Office, 2015).

3 The restoration of deteriorating infrastructure, as a first priority for an incoming president, is not a new one. President Barak Obama's stimulus package in 2009, for example, allocated roughly \$146 billion out of the \$792 billion in total spending to infrastructure investments. Other federal agencies and numerous studies have recognized the job-creating potential of infrastructure projects. For example, the U.S. Department of Transportation estimated that the economy could create 13,000 jobs for every \$1 billion spent on highways. A Standard & Poor's study in 2015 estimated 29,000 direct jobs per \$1.3 billion in infrastructure spending.

4 This report analyzes only the impact of Trump's proposed 10-year public infrastructure spending on jobs and education. Other economists find an overall contraction of the economy when the analysis is expanded to include Trump's policies on taxes (Penn Wharton, 2016) and government spending, immigration, and international trade (Zandi et al., 2016).

5 In the long run, the share of infrastructure jobs would likely move back toward 12 percent, with an increasing share for maintenance operations.

6 Carnevale, *The New Good Jobs*, 2016.

7 Blue-collar jobs in which high school-educated workers, especially men, could work for good pay have been in decline since the 1970s.

8 Carnevale, Smith, and Strohl, *Recovery*, 2013.

9 These 6.3 million jobs will be created within the 10-year time frame of the infrastructure spending.

10 Infrastructure jobs as defined in this report include jobs in the following industries (industry codes are from the 2012 *American Community Survey*, U.S. Census Bureau): 770 Construction; 570-690 Utilities; 3080 Construction, and mining and oil and gas field machinery manufacturing; 3180 Engine, turbine, and power transmission equipment manufacturing; 6070-6380 Transportation; 6680 Wired telecommunications carriers; 6690 Telecommunications, except wired telecommunications carriers; and 7290 Architectural, engineering, and related services. Infrastructure occupations were considered to be those for which 50 percent or more of workers are employed in the industries that make up infrastructure jobs.

11 The Great Recession of the 2007-09 economy devastated America's least educated workers. During the recession, 5.6 million workers with a high school education or less lost their jobs, and collectively they have gained only 80,000 net jobs since the recovery began in 2010 (Carnevale, Jayasundera, and Gulish, *America's Divided Recovery*, 2016). Forty-nine percent of all unemployed workers have a high school education or less (*BLS Employment Situation Summary*, 2016).



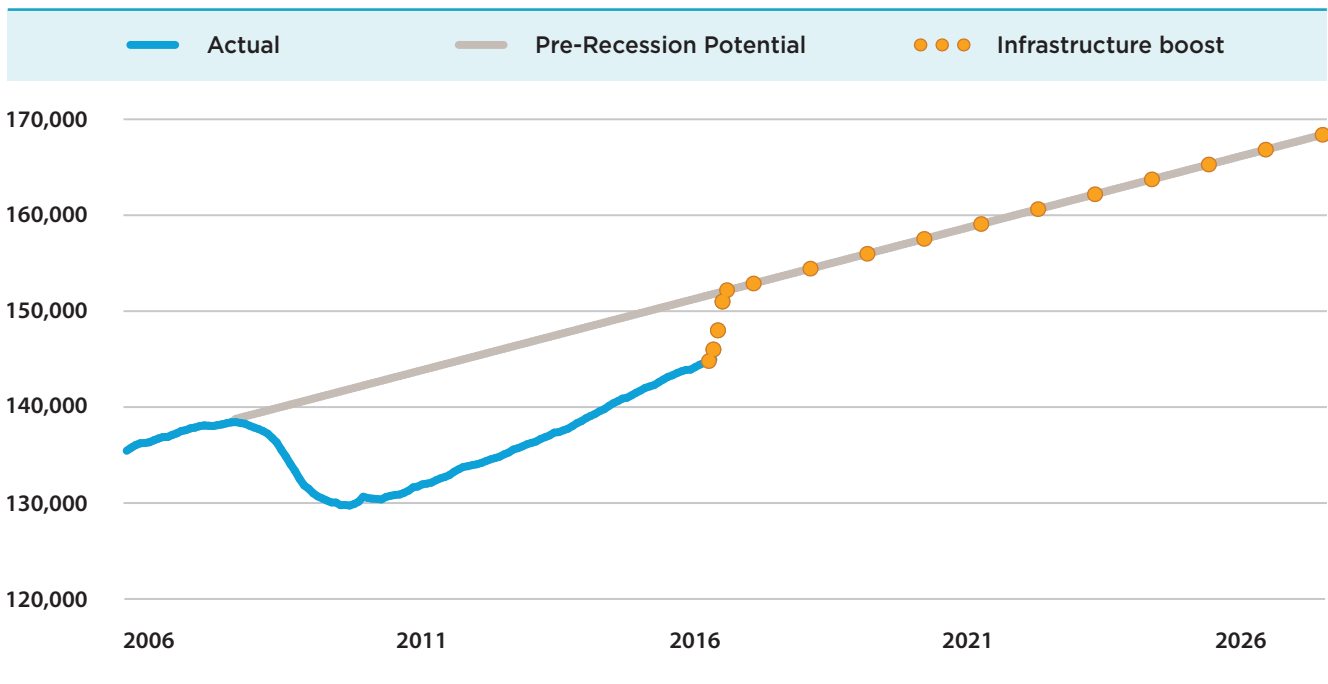
to uphold the campaign promises made by President Trump, in order to maintain support from blue-collar workers, who helped elect him. This bill proposes financing infrastructure investment through direct stimulus rather than tax incentives and public-private partnerships as offered by the Republicans. The Republican plan has been heavily criticized as an incentive program primarily benefiting large metropolitan areas. Infrastructure projects in large metropolitan areas could earn tolls or user fees to pay off investors, which is not the case for smaller towns and rural areas.

This report is agnostic as to whether the trillion-dollar investment is funded through appropriations or tax cuts. Infrastructure jobs are good jobs that pay well and potentially can reboot Middle America, restoring the economic growth to the pace it was on before being derailed by the Great Recession. In the following sections, we discuss the jobs, education, training, and skills implications of implementing major infrastructure overhaul.

Here is what a \$1 trillion investment in infrastructure might mean for the job picture overall:

- The creation of more than 11 million jobs over the next 10 years. These jobs would be a combination of the 6.4 million missing jobs¹² that were not created as a result of the Great Recession (2007-09) and 5 million more jobs in related industries created as a result of the stimulus effect of the new infrastructure.¹³

FIGURE 1: A \$1 trillion investment in infrastructure spending would create as many as 11 million jobs through 2027. This stimulus will restore the growth path of job creation that was derailed by the Great Recession.



Source: Georgetown University Center on Education and the Workforce analysis of BLS nonfarm payroll employment data, various years.

- Wiping away the aggregate job losses of the Great Recession and putting the United States back on the job growth trajectory that existed before the recession (Figure 1).

¹² Carnevale, Jayasundera, and Gulish, *Six Million Missing Jobs*, 2015.

¹³ The 5 million additional jobs projection is based on comparison of a projected increase in nonfarm employment with no stimulus of infrastructure spending and current rates of growth (the control) with simulated increase in nonfarm employment due to a \$1 trillion investment in infrastructure based on the impact of infrastructure spending estimates in Council of Economic Advisers, 2009, and Bovino, 2014 (the treatment).



- A temporary increase in the proportion of infrastructure jobs, from 12 percent to 14 percent of all jobs in the U.S. economy.
- An emphasis on occupations in construction and extraction and transportation and material moving, which will make up the vast majority of new infrastructure jobs (Table 1).
- A disproportionate jobs advantage for men, since the majority (92%) of new infrastructure jobs would likely be filled by men (Figure 5), given the historically male-dominated employment in infrastructure occupations, especially in transportation and construction (Table 1).
- The creation of new jobs in management and white-collar office occupations, particularly for workers with an Associate’s degree or higher (Figure 3).
- A potential surge in jobs for less-educated Hispanic/Latino workers. They are disproportionately working in infrastructure jobs that require a high school diploma or less, while white workers are disproportionately concentrated in infrastructure jobs that require an Associate’s degree or higher (Figure 7).
- A possible increase in formal and informal training opportunities for Hispanics/Latinos and blacks/African Americans working in infrastructure. As a group, they have relatively lower levels of educational attainment, so they stand to benefit from increased training (Figure 7).
- High demand for certifications for welders, concrete strength-testing technicians, construction managers, and construction health and safety technicians, all of which are in-demand credentials (Table 3).

TABLE 1. Construction, extraction, and transportation occupations will account for more than 75 percent of the projected infrastructure jobs, but some of the jobs will be for managerial and office workers.¹⁴

OCCUPATION GROUP	Total number of infrastructure jobs projected	Subset of projected infrastructure jobs with a certification or license ¹⁴
Construction and extraction	5.1 million	1 million
Transportation and material moving	3.6 million	784,000
Installation, maintenance, and equipment repair	838,000	213,000
Office and administrative support	632,000	65,000
Management	496,000	115,000
Architects and technicians	322,000	86,000
Engineers and technicians	260,000	69,000
Production	116,000	13,000
Business operations specialty	100,000	24,000
Total	11.4 million	2.4 million

Note: Projections are estimated over a ten-year time period.
 Source: Georgetown University Center on Education and the Workforce analysis of BLS nonfarm payroll employment data, *American Community Survey* micro data, 2009-2013 and *Current Population Survey*, 2015.

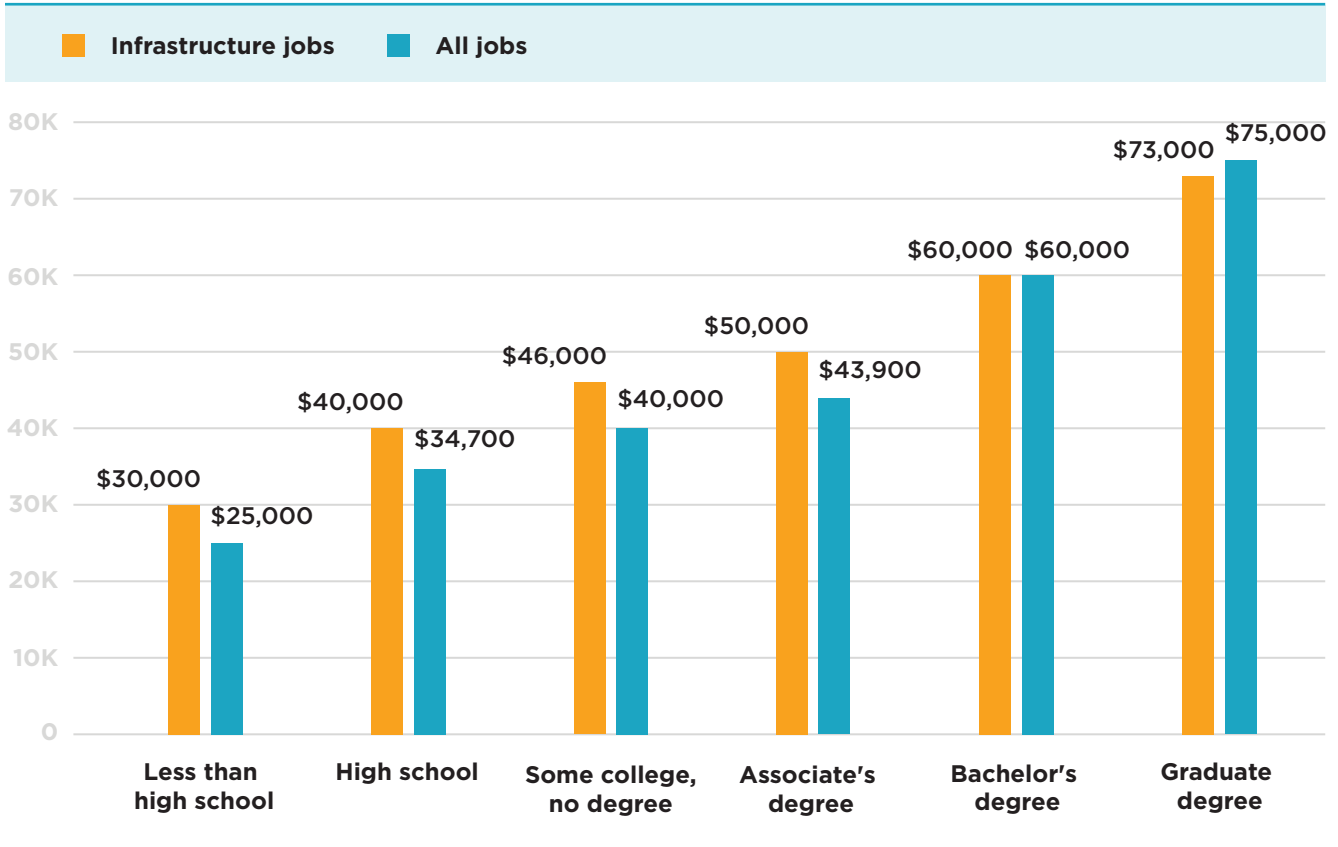
¹⁴ Certifications are issued by a nongovernmental certification body and convey that an individual has the knowledge or skill to perform a specific job. A license is awarded by a government agency and conveys a legal authority to work in an occupation.



Infrastructure Jobs Are Well-Paying Jobs, Especially for Workers without a Four-Year College Degree.

- For workers with less than a Bachelor’s degree, infrastructure jobs tend to have higher median wages than other jobs (Figure 2).

FIGURE 2. For workers with less than a Bachelor’s degree, infrastructure jobs pay better than other jobs.



Note: Figure shows median annual earnings for prime-age (25-59) full-time, full-year workers.
 Source: Georgetown University Center on Education and the Workforce analysis of U.S. Census Bureau, *American Community Survey*, 2015.

- Infrastructure jobs in occupations that are expected to grow under Trump’s \$1 trillion investment plan pay more than typical wages for high school graduates. Engineering (\$84,000) and management (\$65,000) jobs, which usually require higher levels of education, pay especially well, but even construction (\$40,000) and transportation (\$42,000) jobs provide higher earnings than an average job for high school graduates (Table 2).



TABLE 2. Infrastructure jobs created under President Trump’s plan would pay more than the typical earnings for high school graduates.

Occupation Group	Annual median earnings
Engineers and technicians	\$84,000
Management	\$65,000
Business operations specialty	\$61,000
Architects and technicians	\$60,000
Production	\$60,000
Installation, maintenance, and equipment repair	\$51,000
Office and administrative support	\$50,000
Transportation and material moving	\$42,000
Construction and extraction	\$40,000
All high school graduates	\$35,000

Note: Table shows median annual earnings for prime-age (25-59) full-time, full-year workers in infrastructure jobs within the listed occupations groups.

Source: Georgetown University Center on Education and the Workforce analysis of U.S. Census Bureau, *American Community Survey*, 2015.



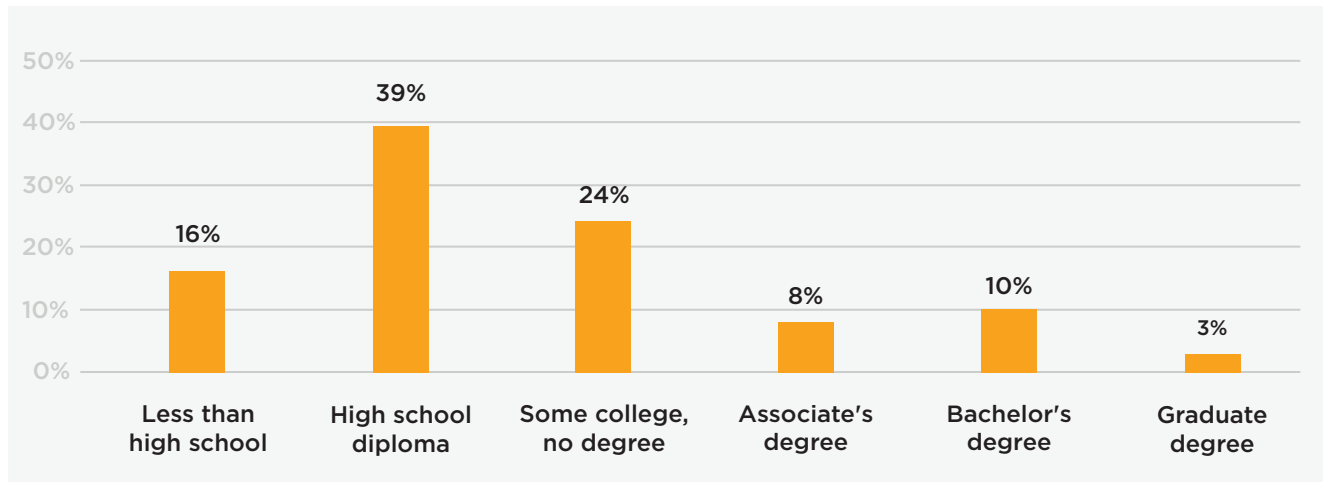
Will the Workforce Be Ready?

Unlike the Works Progress Administration (WPA) infrastructure programs of the 1930s, infrastructure projects today are not “shovel-ready.” The technology and resultant skill requirements in infrastructure jobs have moved well beyond shovels. Modern infrastructure jobs likely will have at least some on-the-job or pre-employment training and skill requirements, even among those workers with formal college attainment.

President Trump’s infrastructure plan would create jobs for workers at every education level. Of the 11 million new infrastructure jobs (Figure 3):

- 55 percent would go to workers with a high school education or less.
- 24 percent would go to workers with a postsecondary vocational certificate or some college education but no degree.
- 8 percent would go to workers with an Associate’s degree.
- 13 percent would go to workers with a Bachelor’s or advanced degree.

FIGURE 3. Though the largest proportion of infrastructure jobs is for workers with high school diplomas or some college but no degree, more than 20 percent of these jobs require an Associate’s degree or higher.



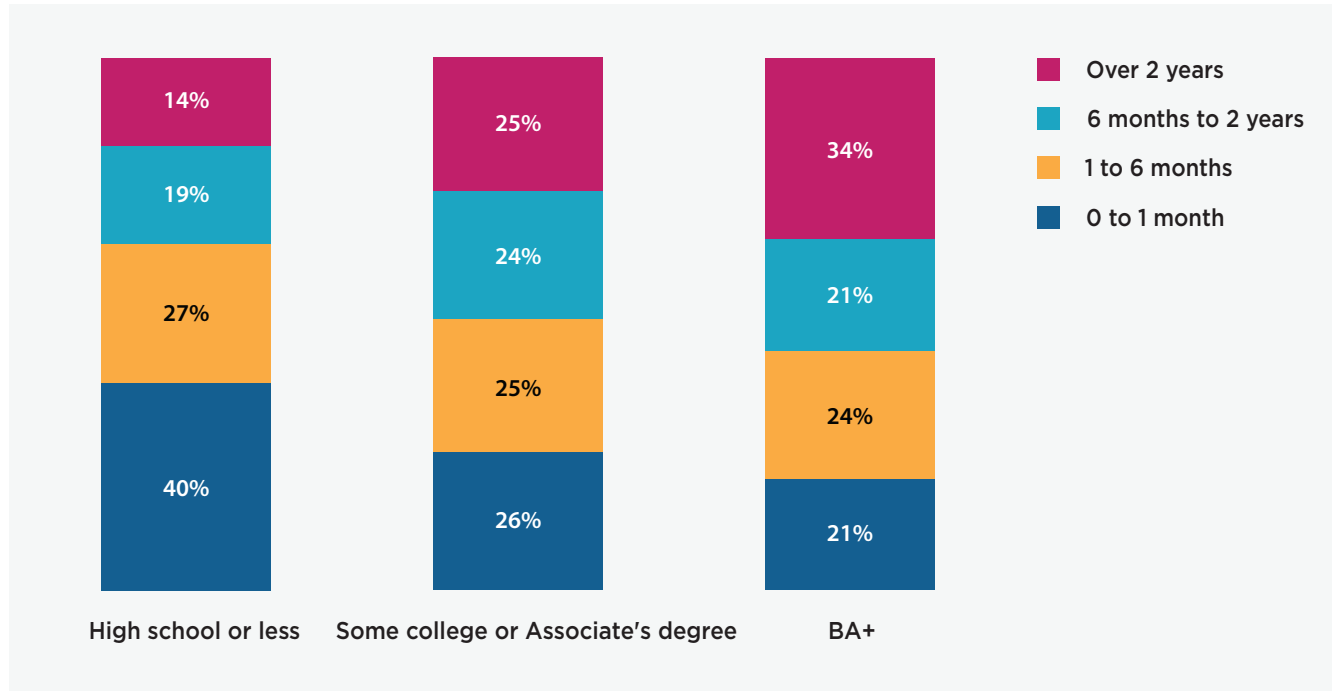
Source: Georgetown University Center on Education and the Workforce analysis of U.S. Census Bureau, *American Community Survey*, 2015.

Long-term investments in infrastructure have the potential to revitalize the blue-collar economy by creating jobs for welders, electricians, technicians, and truck drivers. The vast majority of jobs would be in male-dominated career fields (Figure 5), with the construction and transportation industries leading the way in job creation.

One-third of these jobs would require postsecondary degrees, certificates, licenses, or more than six months of training, but the good news is that the other two-thirds would require six months of training or less (Figure 4). This would require high schools, community colleges, and other postsecondary institutions to create programs to train workers for these jobs.



FIGURE 4: The longest training¹⁵ in infrastructure jobs is required of workers with a Bachelor’s degree or higher.



Source: Georgetown University Center on Education and the Workforce analysis of O*NET data, version O*NET 21.1; *American Community Survey* micro data, 2015.

An infrastructure program could be slowed because of labor shortages, as well as marginal shortages in skill. First, the growth in the size of the U.S. labor force has slowed dramatically with baby boomer retirements and a flattening of female participation after decades of growth. The Bureau of Labor Statistics (BLS) projects the civilian labor force to grow by only half a percentage point per year through 2024, compared with the average annual growth of 1.2 percent from 1994 to 2004.¹⁶

With the tightening labor market, there is no large pool of unemployed workers ready to take these jobs, and there likely will be no natural transition to these jobs for currently short- and long-term unemployed workers.¹⁷ In addition, labor force participation will certainly need to recover from its 40-year slump¹⁸ if the nation is going to meet the workforce needs that these infrastructure jobs will create.¹⁹ However, many people who have already left the labor force might be enticed to reenter if the labor market conditions became favorable.²⁰

¹⁵ Includes both formal in-classroom training and informal on-the-job training separate and apart from educational attainment.

¹⁶ U.S. Bureau of Labor Statics, 2015.

¹⁷ The number of long-term unemployed (those jobless for 27 weeks or more) was 1.8 million in December 2016, accounting for 24.2 percent of the unemployed. The total number of unemployed workers held steady at 7.5 million.

¹⁸ The labor force participation rate was 62.7 percent in December 2016, down from an all-time high of 67.3 percent in January 2000.

¹⁹ A combination of new entrants, unemployed and underemployed workers, and discouraged workers who had previously dropped out of the labor force will most likely fill the jobs.

²⁰ Kane and Puentes, *Expanding Opportunity*, 2015, estimate 2.7 million infrastructure workers are expected to retire over the next decade, thus opening capacity.



FIGURE 5. The majority of infrastructure jobs are filled by men.

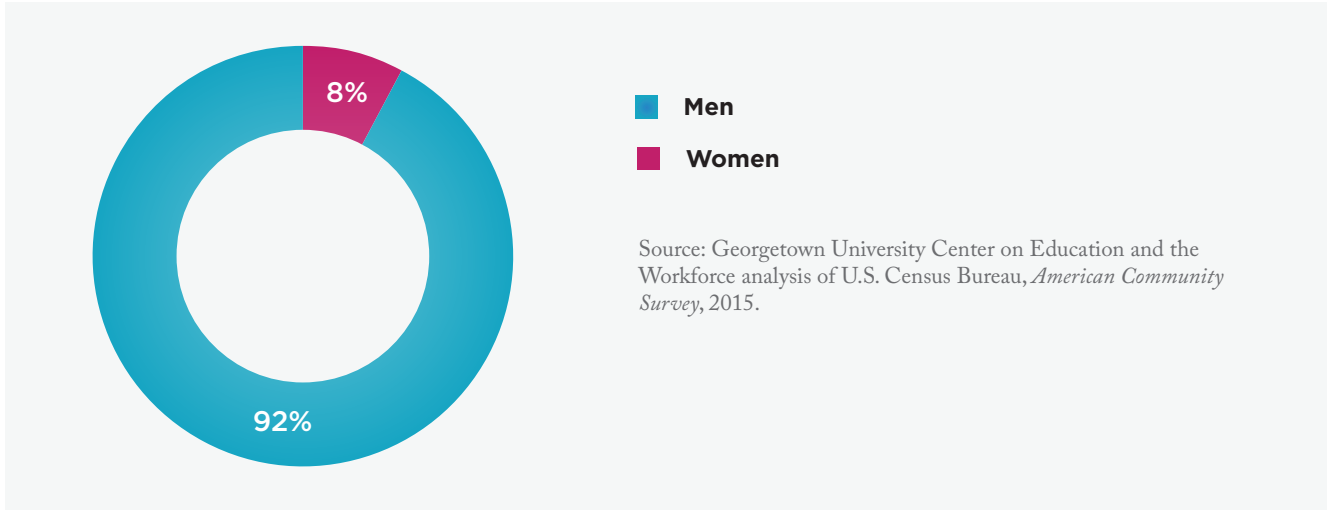
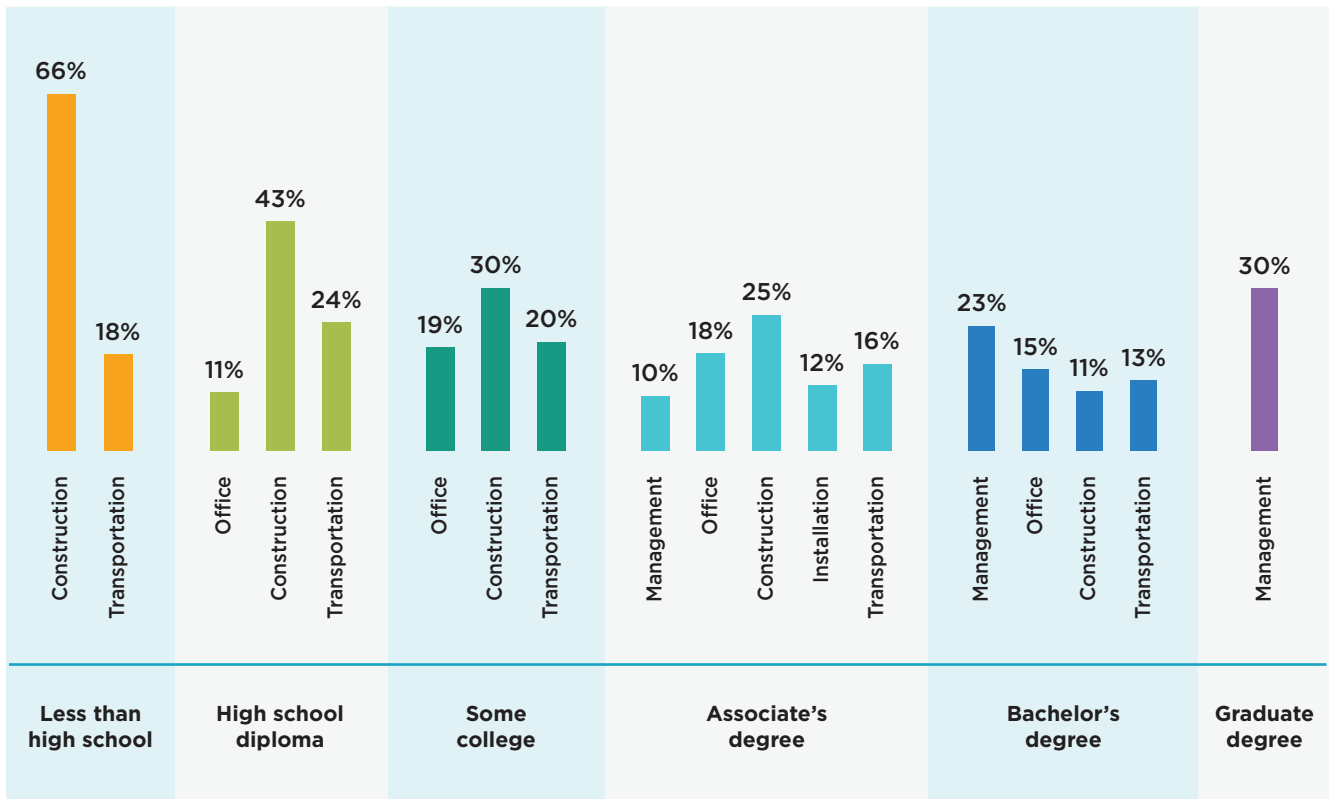


FIGURE 6: Managerial positions in infrastructure industries are available only to those with an Associate’s degree or higher. Construction jobs usually require some training but are most often taken by workers with a high school diploma or less.



Source: Georgetown University Center on Education and the Workforce analysis of U.S. Census Bureau, *American Community Survey* micro data, 2009-2013.



FIGURE 7: Hispanics/Latinos working in infrastructure have by far the lowest levels of educational attainment.

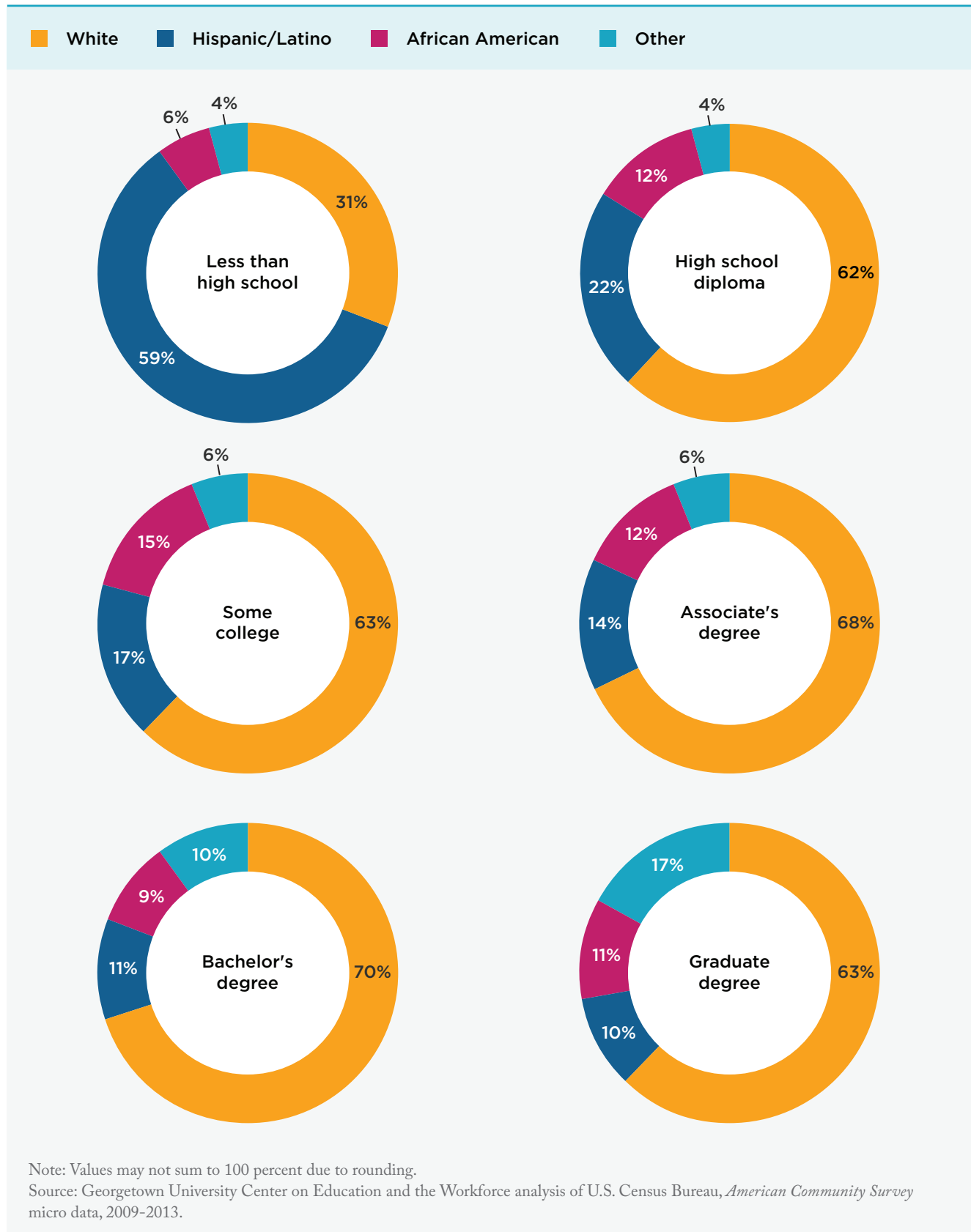




TABLE 3. Welders and concrete strength testing technicians are among in-demand certifications in the infrastructure industry.²¹

CERTIFICATION NAME	CERTIFYING ORGANIZATION	TYPE
Certified welder	American Welding Society	Core
Concrete strength testing technician	American Concrete Institute International	Core
Articulating boom loader	National Commission for the Certification of Crane Operators	Core
Certified construction manager	Construction Manager Certification Institute	Core
Highway construction - level II	National Institute for Certification in Engineering Technologies	Advanced
Construction health and safety technician	International Board for Certification of Safety Managers	Specialty

Source: U.S. Department of Labor, Career OneStop Certification Finder data for NAICS 237300 (Highway, Street, and Bridge Construction industry), 2016.

Will the New Infrastructure Jobs Lead to Sustainable Careers?

Notwithstanding macroeconomic concerns,²² President Trump’s infrastructure proposal considered by itself would benefit workers directly. It also seems likely that the program would create new opportunities and challenges for the nation’s education and training system, especially the career and technical education (CTE) system in our high schools and in sub-baccalaureate postsecondary education.

The inherently temporary nature of an infrastructure boom also raises a longer-term set of opportunities and challenges for creating sustainable career pathways for infrastructure workers, especially for workers at the high school and sub-baccalaureate level.

There is no doubt that the infrastructure boom would result in upskilling for workers involved. While a majority of the jobs would go to workers with only high school and short-term training, their limited formal preparation would give them access to highly valuable work experience and state-of-the-art technology as well as the formal and informal training available on the job. As a general rule, this employer-based learning system is roughly equivalent in scale to the entire postsecondary education system and has positive impacts on career sustainability.²³ After all, each of us learns job-related skills in secondary and postsecondary schools for months or years but we learn on the job for decades.

The longer-term challenge will be whether those skills learned on and off the job are transferable to careers available when the infrastructure boom is over. The high school-educated workers left behind in the shift from

21 NCCER (The National Center for Construction Education and Research) credentials are also in demand. See “NCCER Credentials,” <http://www.nccer.org/credentials-national-registry>

22 We sketch and reference some of the widely discussed macroeconomic concerns in note 1 above.

23 Carnevale, Jayasundera, and Gulish, *Six Million Missing Jobs*, 2015.



a manufacturing to a service-based economy were not highly educated, but they were highly skilled as a result of years of learning on the job and technological change. Ultimately, technology eliminated their jobs, and their skills, although considerable, were not transferable to the new high-tech service economy.

Infrastructure jobs would likely boom and then decline, except for a growth in the share of workers necessary to maintain, repair, and update infrastructure. Our historical experience, especially in manufacturing, suggests that many of the skills obtained in the boom would not be transferable to the modern high-tech service-dominated economy.²⁴

As in our manufacturing past, future dislocation and wage losses after an infrastructure boom would be concentrated in the male workforce, given the dominance of males in infrastructure occupations. Here the historical evidence suggests further caution. Male high school graduates have always been more likely to forgo postsecondary education or training to get jobs with good entry-level wages, oftentimes in occupations without strong long-term career pathways. As much as 20 percent of the male high school class can still get decent entry wages in the blue-collar economy.^{25,26} With an infrastructure boom, that percentage would likely increase for a time, with greater risk for flat or declining real wages and job losses at mid-career.

The long-term problem is not necessarily a lack of jobs for experienced infrastructure workers but a mismatch between the skills of dislocated infrastructure workers and the jobs available, especially at the sub-baccalaureate level. Over the next decade, there will be lots of good jobs that require less than a baccalaureate degree but will require some education or training beyond high school. Many of these jobs are unlikely to be in blue-collar infrastructure occupations. Most of these good sub-baccalaureate jobs are in occupations like white-collar office jobs, accounting and finance, healthcare, and information technology. Through 2024, the economy will create more than 16 million middle-skill job openings, including 3 million openings from newly created jobs and 13 million openings from baby boomer retirements. Many of these jobs pay well: 40 percent pay more than \$55,000 annually and 14 percent pay more than \$80,000 annually. By comparison, the average Bachelor's degree-holder earns \$61,000 annually.²⁷

In conclusion, it seems reasonably clear that infrastructure jobs are good jobs for those who get them and bring long-term economic and social gains for the rest of us. But we do not want this infrastructure boom to be a false dawn for American workers. The challenge we face is building an effective education and training system to prepare workers for them and an effective retraining system to provide for successful labor market transitions when the boom in infrastructure jobs is over.

²⁴ Carnevale and Rose, *The Economy Goes to College*, 2015.

²⁵ Carnevale et. al., *Career Clusters. Forecasting Demand for High School through College Jobs 2008-2018*, 2011.

²⁶ By way of contrast, the high school economy for women has all but disappeared. This seems to be one of the major reasons why women have overtaken men in postsecondary completions – as an opportunity to tighten the wage gap by improving attainment levels (Carnevale and Smith, *Women Can't Win*, 2017, forthcoming).

²⁷ Carnevale et. al., *Five Ways That Pay*, 2012.



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