The Water Workforce

Improving Regional Infrastructure and Promoting Economic Opportunity

BROOKINGS

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Washington, DC
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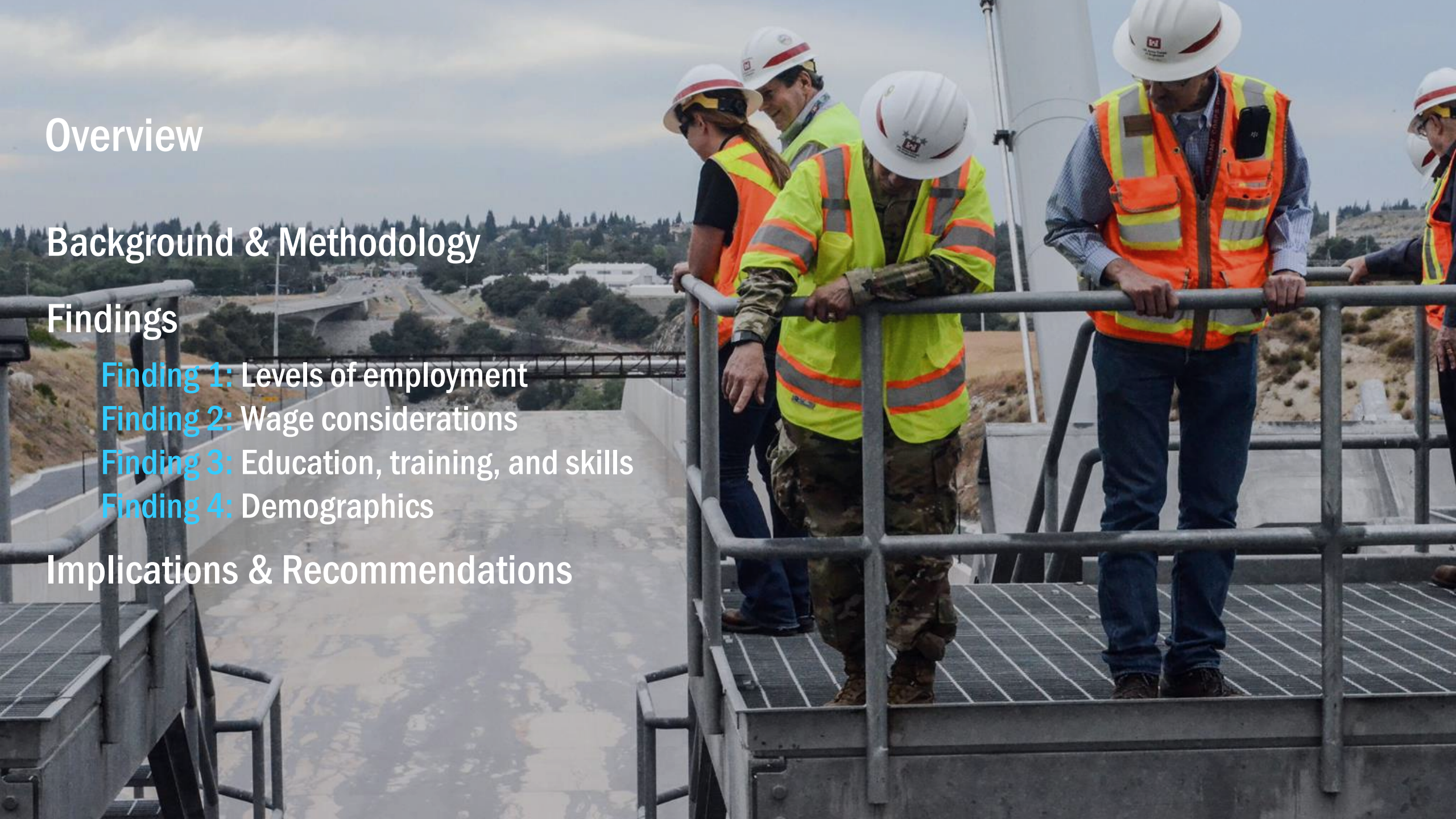


Overview

Background & Methodology

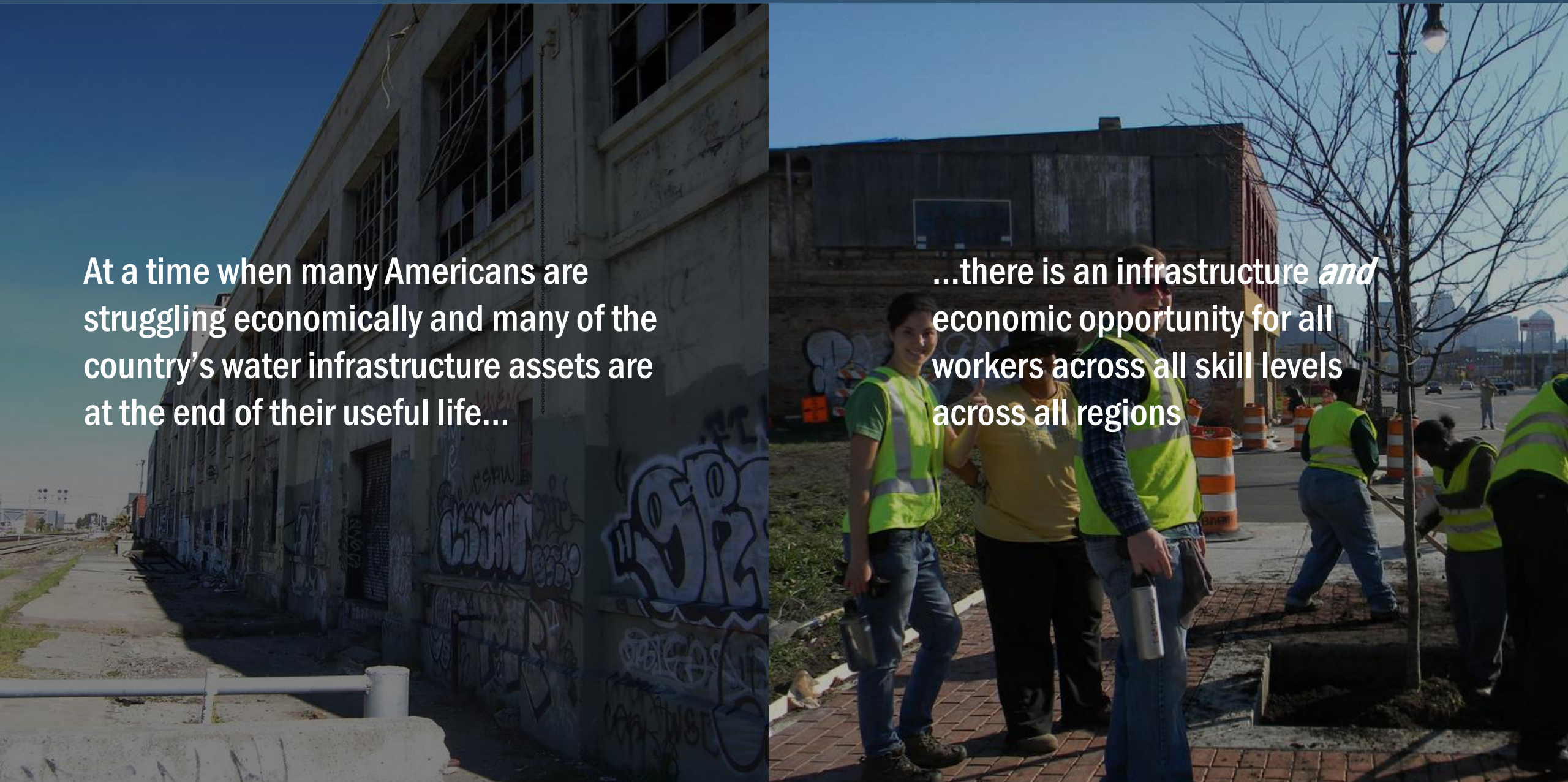
Findings

- Finding 1: Levels of employment
- Finding 2: Wage considerations
- Finding 3: Education, training, and skills
- Finding 4: Demographics

Implications & Recommendations

Background & Methodology

The water workforce opportunity



At a time when many Americans are struggling economically and many of the country's water infrastructure assets are at the end of their useful life...

...there is an infrastructure ***and*** economic opportunity for all workers across all skill levels across all regions

Who are water workers?

The water workforce captures the wide range of workers who are directly involved in the construction, operation, design, and governance of the country's various water infrastructure systems

Infrastructure facilities

- Pipes, plants, and utility systems
- Other public and private facilities in need of repair and maintenance
- Gray and green infrastructure

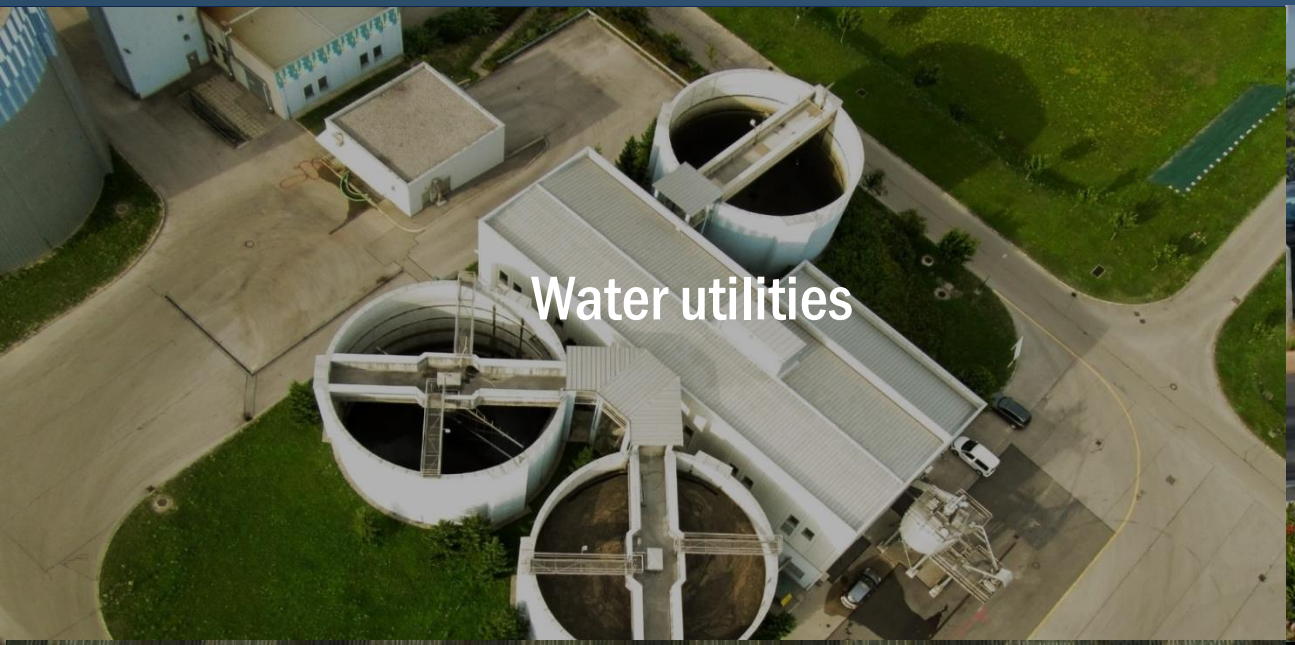
Infrastructure activities

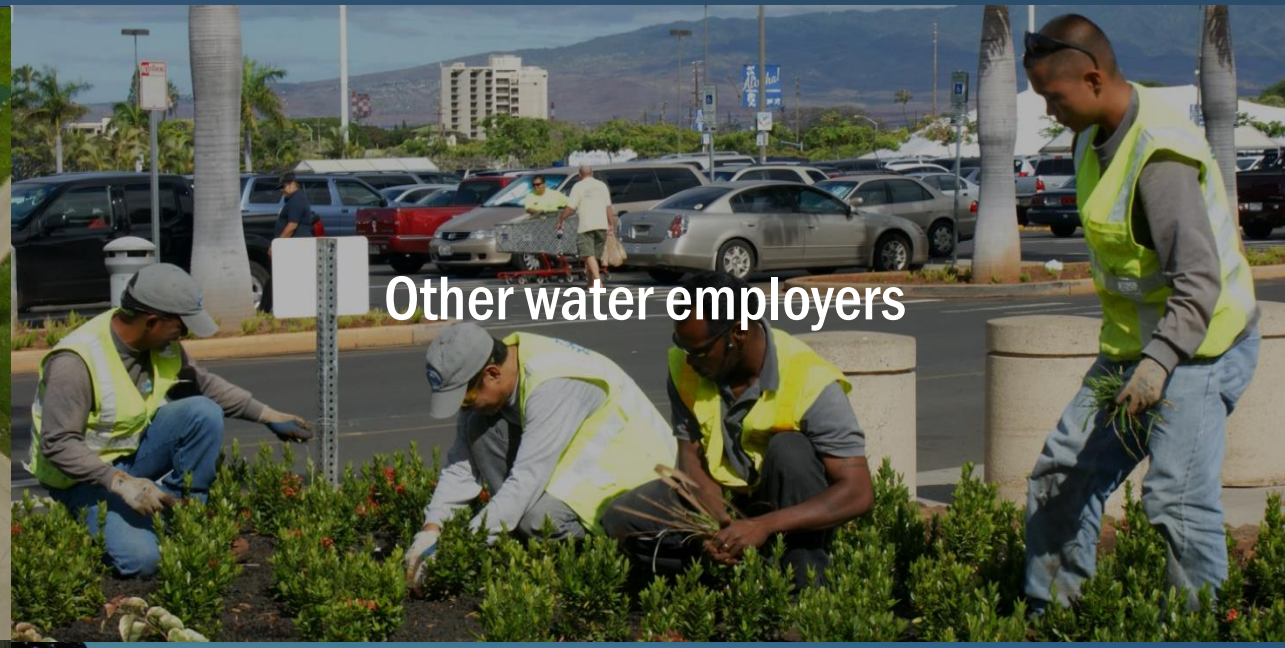
- Install, calibrate, and oversee utility equipment
- Draft plans, inspect pipes, and repair wiring
- Manage, analyze, and support operations






Who is responsible for hiring, training, and retaining water workers?

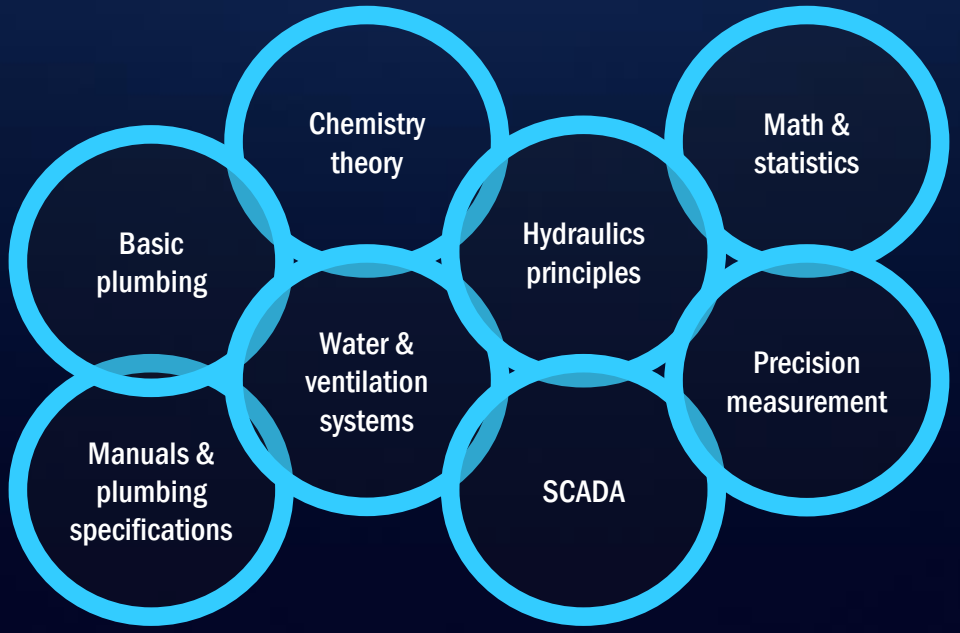




Recognizing barriers to hiring, training, and retraining water workers

An aging sector that lacks diversity and struggles to attract workers

Difficulties defining needed skills and creating portable, versatile credentials



Challenges onboarding prospective workers and developing talent

Methods: Defining the Water Workforce

The water workforce captures the wide range of workers who are directly involved in the construction, operation, design, and governance of the country's various water infrastructure systems

I. Consider previous analyses and other literature

- Brookings "infrastructure jobs" reports
- Utility surveys and other industry reports
- Expert interviews
- Academic literature
- Government reports and categorizations

II. Define the most relevant "water" industries

- Water, sewage, and other systems
- Utility system construction
- Other heavy and civil engineering construction
- Plumbing contractors
- Other specialty trade contractors
- Other waste management and support services
- Environmental consulting services
- Local government activities

III. Define the most relevant "water" occupations

- Focus on the biggest occupations in water, sewage, and other systems
- Then, consider the most common occupations across these 8 industries
- Finally, refine this list of occupations in light of other surveys and studies

Methods: Measuring the Water Workforce

- Major data sources:
  - *Bureau of Labor Statistics:* Occupational Employment Statistics (OES), Quarterly Census of Employment and Wages (QCEW), and Employment Projections (EP)
  - *Dept. of Labor:* Occupational Information Network (O*NET)
  - *Census:* Current Population Survey (CPS) and American Community Survey (ACS)
  - *EPA:* Facility Registry Service (FRS)
- Primary indicators (2016):
  - Employment
  - Wages
  - Educational attainment, training, and skills
  - Demographics (age, gender, and race)
- Geographies analyzed:
  - National, metropolitan, sub-metropolitan

Key Terms

- **Industries:** Groups of establishments that provide similar goods or services, as determined by the 2012 North American Industry Classification System (NAICS)
- **Occupations:** The activities that employees regularly carry out for pay, as outlined in the 2010 Standard Occupation Classification (SOC) system. In total, there are more than 800 detailed occupations nationally.
- **Employment:** The total number of full-time and part-time workers paid a wage or salary.
- **Wages:** Based on straight-time, gross pay over a standard work period, as defined in the OES survey. Wages include mean hourly pay and percentile wages (10th, 25th, 50th, 75th, and 90th).

Findings

Finding 1: In 2016, nearly 1.7 million workers in 212 different occupations were directly involved in designing, constructing, operating, and governing U.S. water infrastructure, spanning a variety of industries and regions.

Source: Brookings analysis of BLS OES data

Water utilities represent one of the single biggest employers in the water sector, but multiple other industries and establishments are crucial to consider as well

Water utilities employed 298,000 workers in 2016, representing about 17.7 percent of the total water workforce

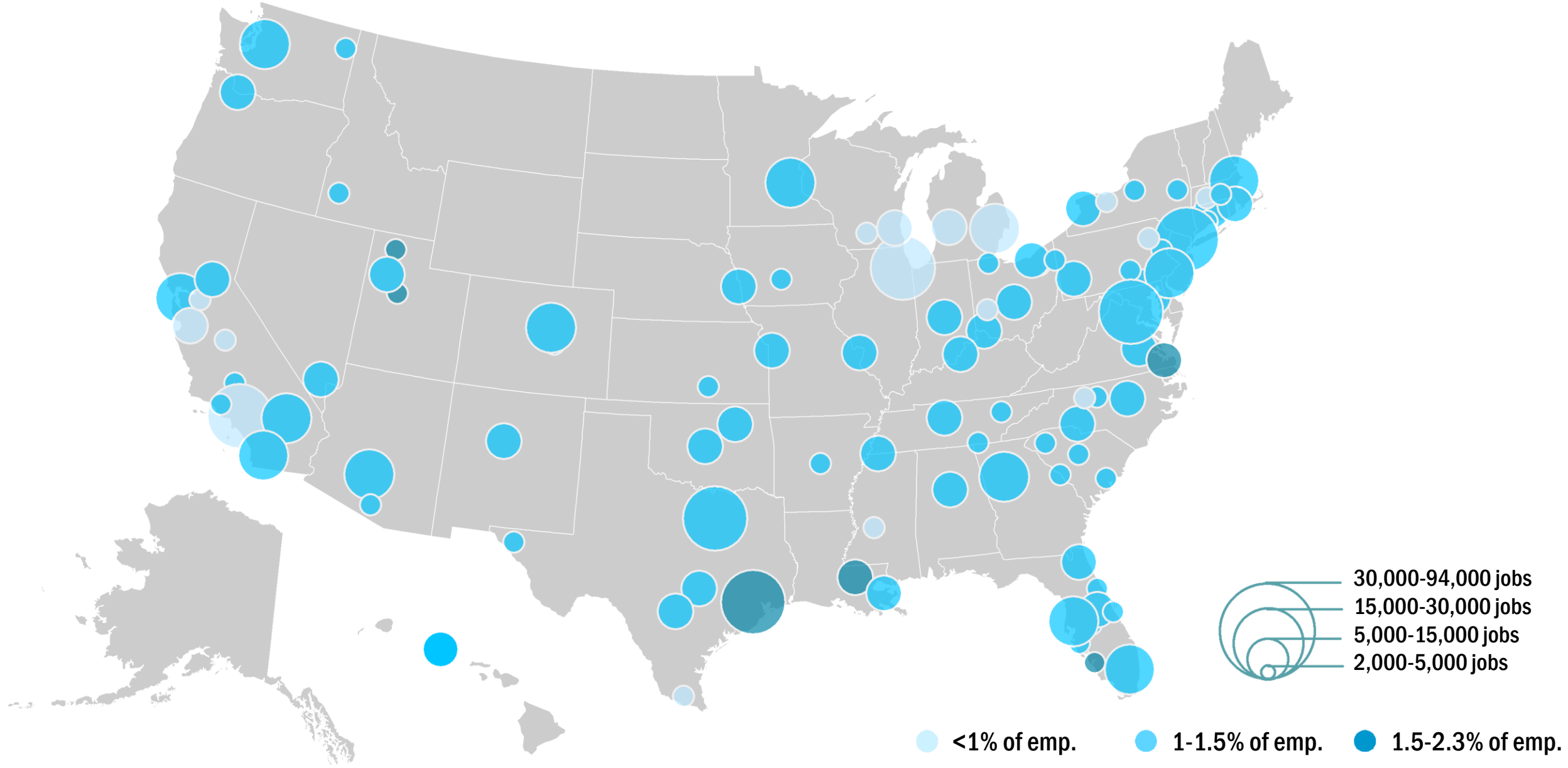
Source: Brookings analysis of BLS OES data

The 10 largest occupations across the entire water sector versus water utilities, 2016

Top 10 water occupations	Overall share	Top 10 water utility occupations	Utility share
Plumbers, Pipefitters, and Steamfitters	19.3%	Water and Wastewater Treatment Plant and System Operators	34.4%
Construction Laborers	8.9%	Meter Readers, Utilities	5.9%
Water and Wastewater Treatment Plant and System Operators	6.9%	Electricians	5.0%
Operating Engineers and Other Construction Equipment Operators	4.8%	Plumbers, Pipefitters, and Steamfitters	4.3%
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	4.2%	Pipelayers	3.3%
First-Line Supervisors of Construction Trades and Extraction Workers	3.3%	Industrial Machinery Mechanics	3.3%
Office Clerks, General	2.8%	Office Clerks, General	3.2%
Helpers--Pipelayers, Plumbers, Pipefitters, and Steamfitters	2.8%	Maintenance and Repair Workers, General	2.6%
Heavy and Tractor-Trailer Truck Drivers	2.3%	Septic Tank Servicers and Sewer Pipe Cleaners	2.5%
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	2.1%	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	2.4%

Source: Brookings analysis of BLS OES data

Water workers are found in every market across the country, including 1.1 million workers in the 100 largest metro areas in 2016

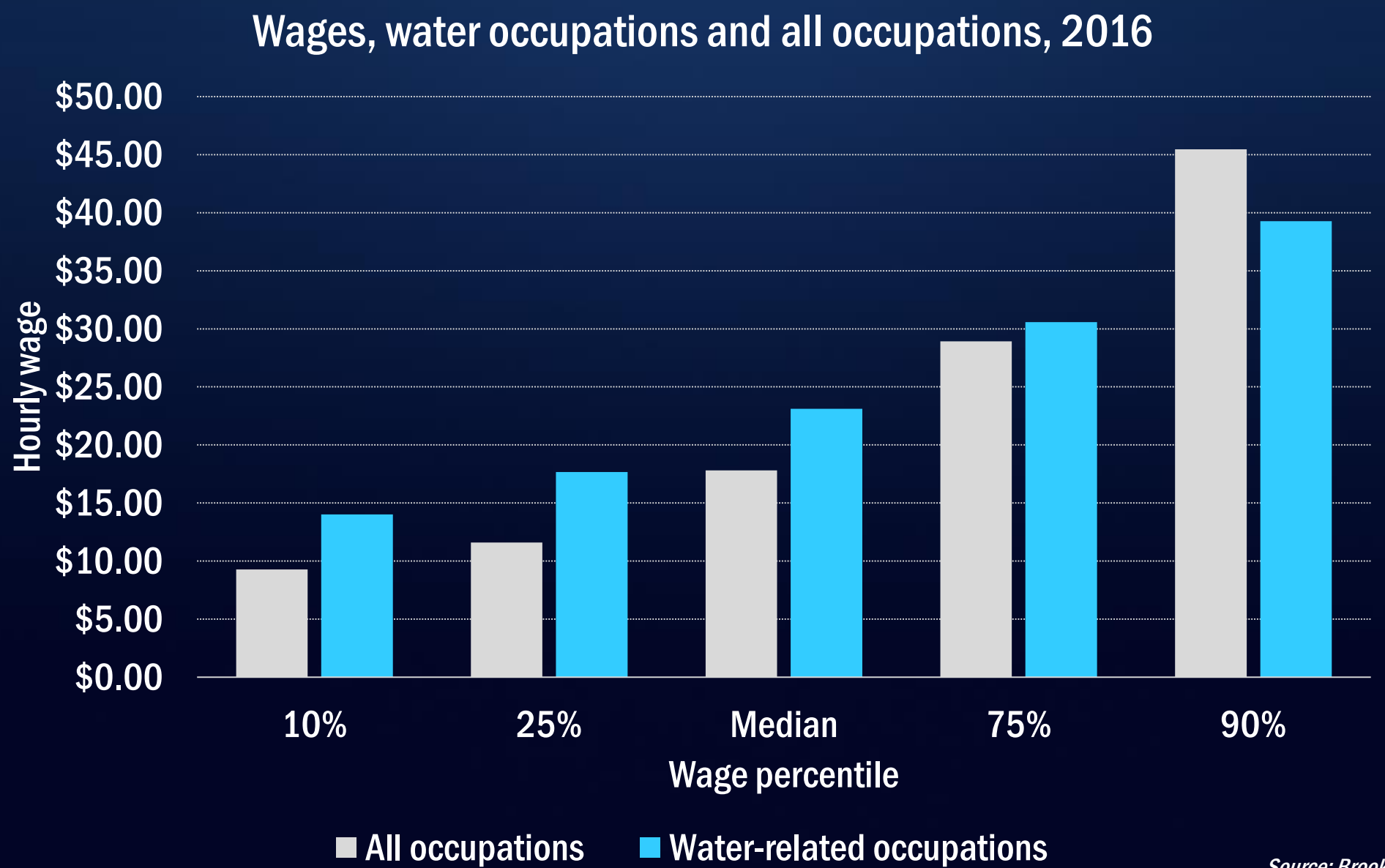


Source: Brookings analysis of BLS OES data

Finding 2: Water-related occupations not only tend to pay more on average compared to all occupations nationally, but they also tend to offer more equitable wages. In particular, they pay **up to 50 percent more** to workers at lower ends of the income scale.

Source: Brookings analysis of BLS OES data

Water occupations pay higher wages, particularly to workers at the 10th and 25th percentile



Source: Brookings analysis of BLS OES data

Workers with little formal education can earn high starting salaries in many water jobs

Selected occupations that pay well at the 10th and 25th percentile, 2016

Occupation	Water employment	10th percentile wage	25th percentile wage	Percent with HS diploma or less
Construction Managers	21,558	$25.84	$32.72	32.2%
Administrative Services Managers	2,259	$23.69	$31.82	20.0%
General and Operations Managers	33,788	$21.29	$31.20	19.7%
First-Line Supervisors of Construction Trades and Extraction Workers	56,021	$19.23	$24.13	56.3%
Purchasing Agents, Except Wholesale, Retail, and Farm Products	2,749	$18.56	$23.39	18.4%
First-Line Supervisors of Mechanics, Installers, and Repairers	11,651	$18.49	$23.74	42.0%
Boilermakers	2,599	$18.12	$23.85	62.2%
Construction and Building Inspectors	2,852	$16.75	$21.64	26.0%
First-Line Supervisors of Production and Operating Workers	3,996	$16.49	$21.14	48.1%
Mobile Heavy Equipment Mechanics, Except Engines	8,584	$15.68	$19.11	57.8%
Industrial Machinery Mechanics	13,100	$15.52	$19.10	52.2%
Electricians	34,800	$15.29	$19.02	45.0%
Crane and Tower Operators	6,189	$15.18	$18.80	66.8%
Control and Valve Installers and Repairers, Except Mechanical Door	2,481	$14.99	$19.01	51.1%
U.S. Average		$14.01	$17.67	32.5%

Source: Brookings analysis of BLS OES and EP data

In some metro areas, water occupations can pay almost $9 more per hour to workers at the 10th and 25th percentile compared to all occupations

Water wages in selected metro areas, 2016

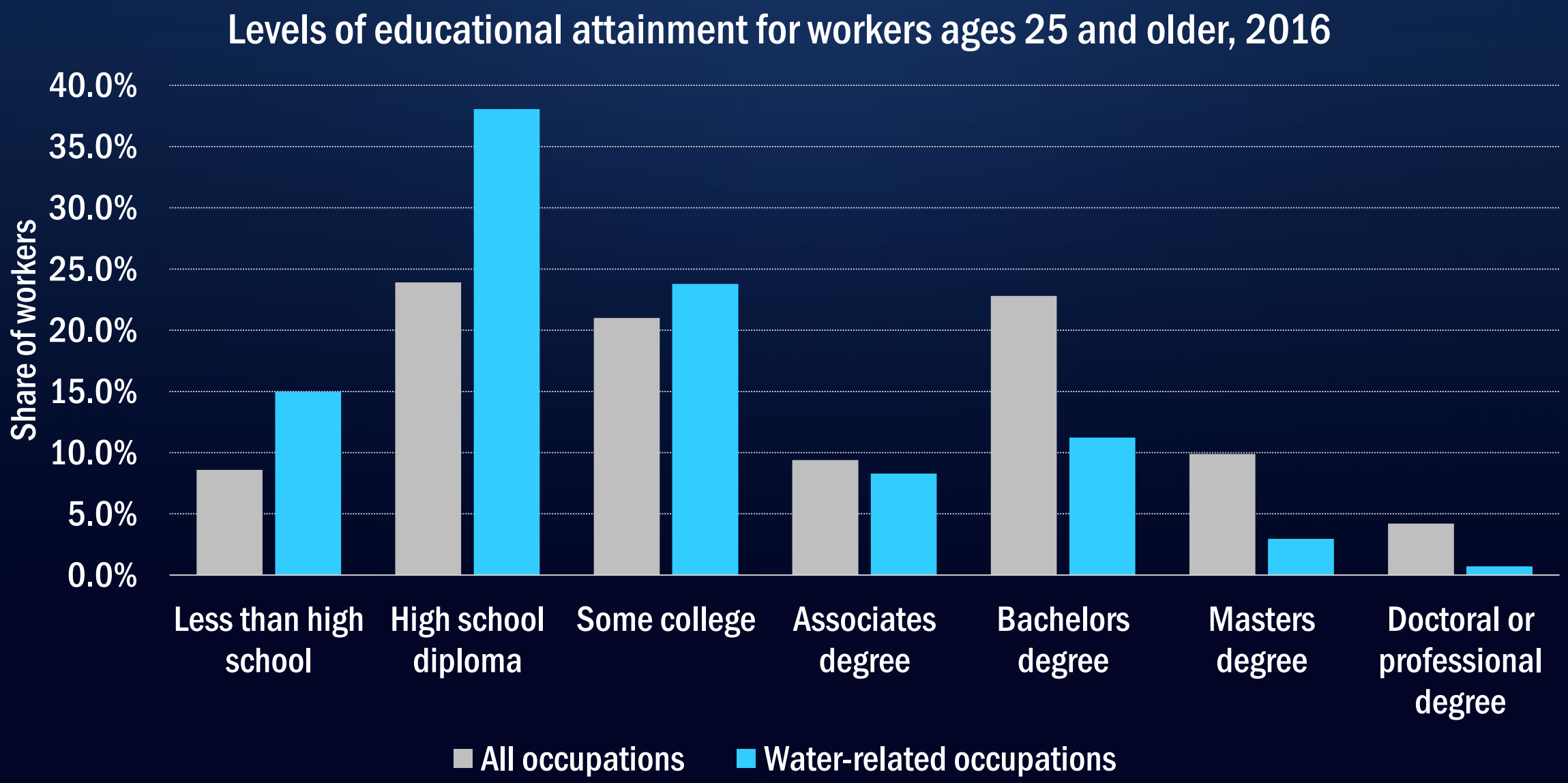
	Water workers		All workers			
Metro area	10th percentile wage	25th percentile wage	10th percentile wage	25th percentile wage	10th percentile difference	25th percentile difference
Minneapolis-St. Paul-Bloomington, MN-WI	$18.53	$23.87	$9.81	$13.33	+$8.72	+$10.54
Milwaukee-Waukesha-West Allis, WI	$17.70	$22.07	$9.05	$12.00	+$8.65	+$10.07
Madison, WI	$17.98	$21.96	$9.44	$12.94	+$8.54	+$9.02
San Jose-Sunnyvale-Santa Clara, CA	$19.81	$25.81	$11.46	$16.08	+$8.35	+$9.73
New Haven, CT	$18.33	$22.31	$10.27	$13.52	+$8.06	+$8.79

Source: Brookings analysis of BLS OES data

Finding 3: Most water workers need less formal education to qualify for their jobs, including **53 percent** having a high school diploma or less. Instead, they require more extensive on-the-job training and familiarity with a variety of tools and technologies.

Source: Brookings analysis of BLS OES data

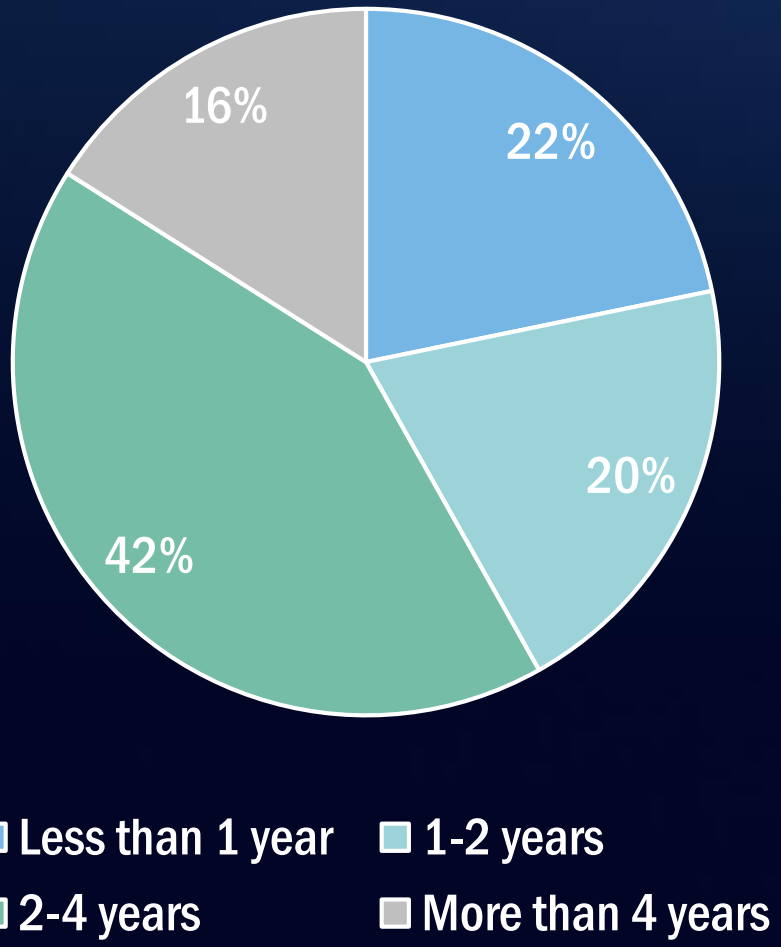
Water workers tend to need less formal education than all workers nationally



Source: Brookings analysis of ACS and EP data

Instead, water workers often need more work experience and on-the-job training

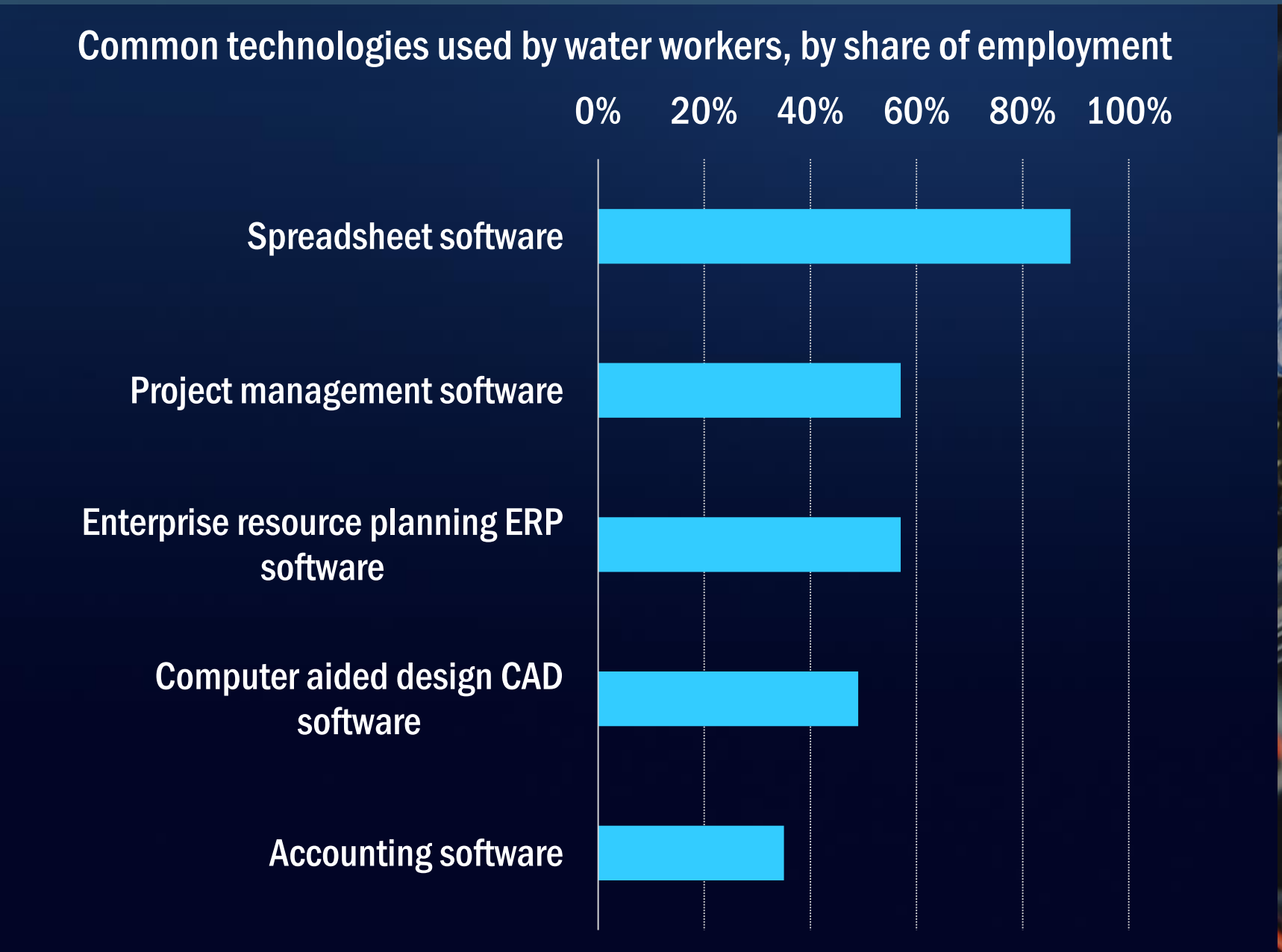
Related experience often required in water occupations, 2016

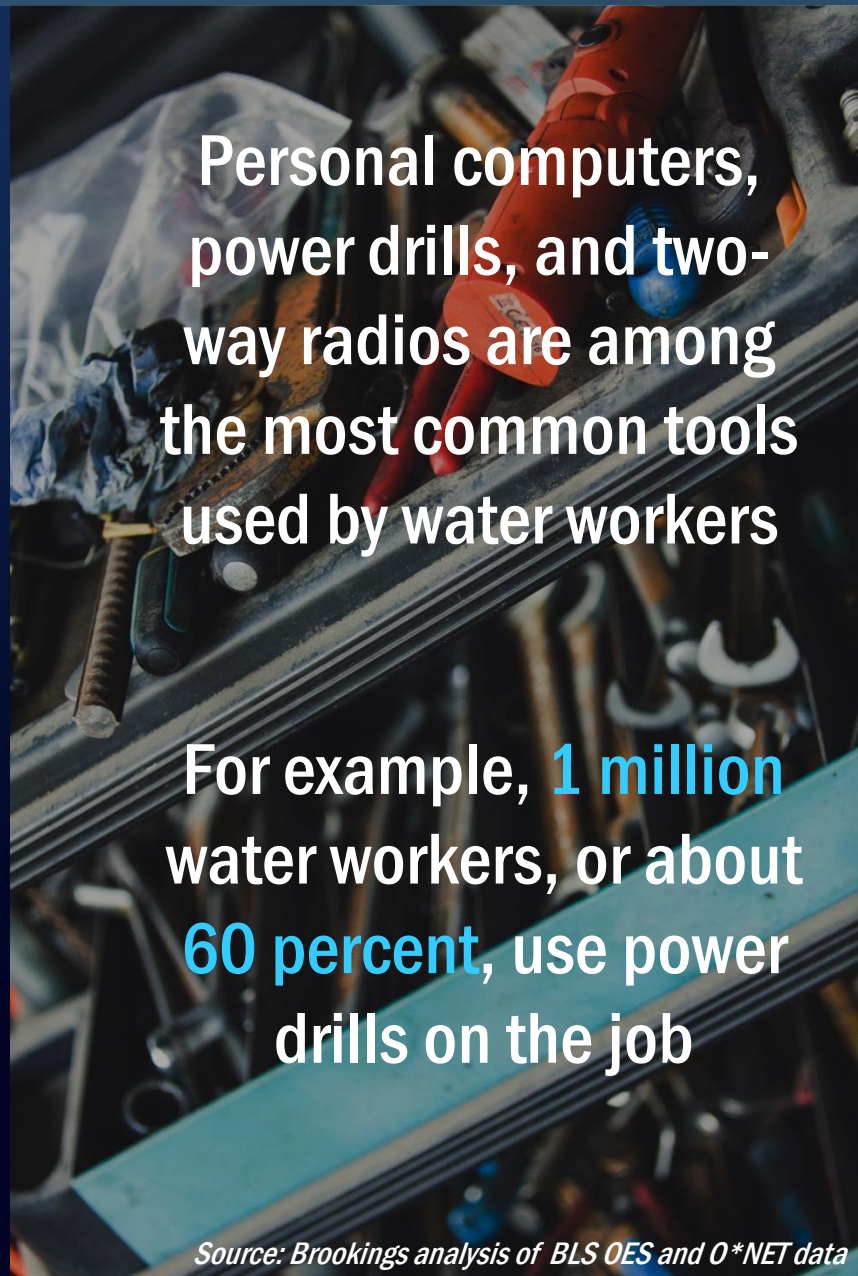


At the same time, almost 580,000 water workers, or about 34 percent, need 2-4 years of on-the-job training

*Source: Brookings analysis of BLS OES and O*NET data*

Water workers often need familiarity with a variety of technologies and tools





Personal computers, power drills, and two-way radios are among the most common tools used by water workers

For example, 1 million water workers, or about 60 percent, use power drills on the job

*Source: Brookings analysis of BLS OES and O*NET data*

Water workers often possess high levels of knowledge in 11 different content areas, shared by workers employed in other infrastructure sectors

Law & Government

Telecommunications

Physics

Mechanical

Engineering

Building & Construction

Design

Geography

Chemistry

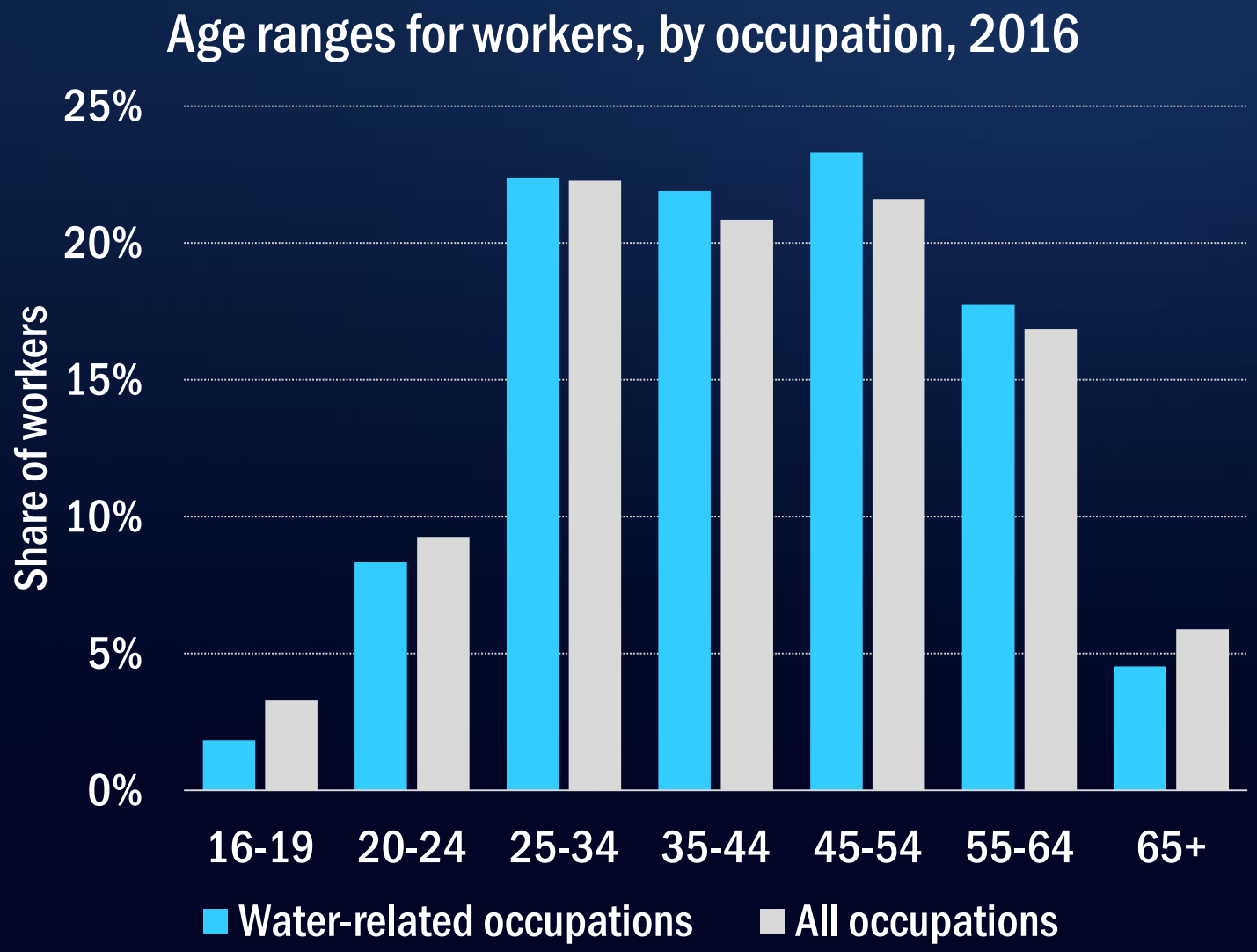
Public Safety & Security

Transportation

*Source: Brookings analysis of BLS OES and O*NET data*

Finding 4: Water workers tend to be older and lack diversity; in 2016, nearly **85 percent** of them were male and **two-thirds** were white.

While water workers are slightly older than the national median, there are lower shares of younger workers, in particular



The median age of water operators: **46** years old

The median age in all occupations: **42** years old

Source: Brookings analysis of CPS data

The water industry is also predominantly male, with most female workers concentrated in administrative and service occupations instead

Selected occupations with high and low shares of female workers, 2016

Occupation	Water employment	Share of female workers
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	35,141	94.6%
Executive Secretaries and Executive Administrative Assistants	5,883	94.6%
Receptionists and Information Clerks	4,150	90.1%
Bookkeeping, Accounting, and Auditing Clerks	22,308	88.5%
Office Clerks, General	47,602	82.8%
Plumbers, Pipefitters, and Steamfitters	324,500	1.4%
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	70,811	1.4%
Pipelayers	33,810	1.4%
Crane and Tower Operators	6,189	0.8%
Mobile Heavy Equipment Mechanics, Except Engines	8,584	0.5%

The average gender composition of water occupations:

15% female

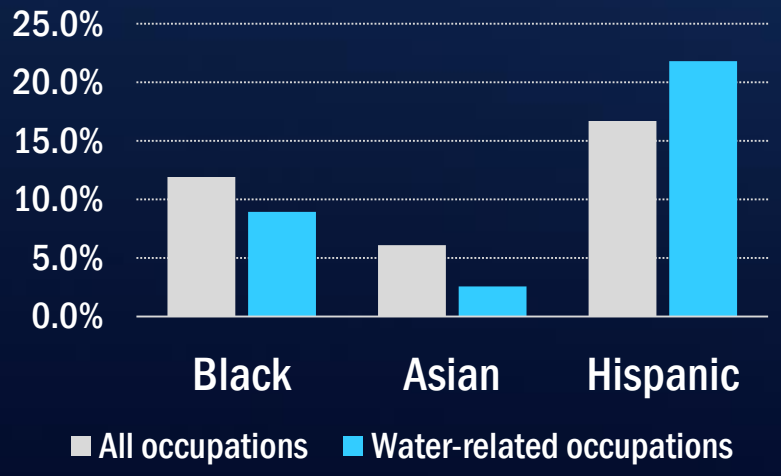
The average gender composition of all occupations:

47% female

Source: Brookings analysis of CPS data

Black and Asian workers tend to be under-represented across the water sector, while Hispanic workers tend to be over-represented, particularly in construction

Racial diversity in water occupations compared to all occupations, 2016



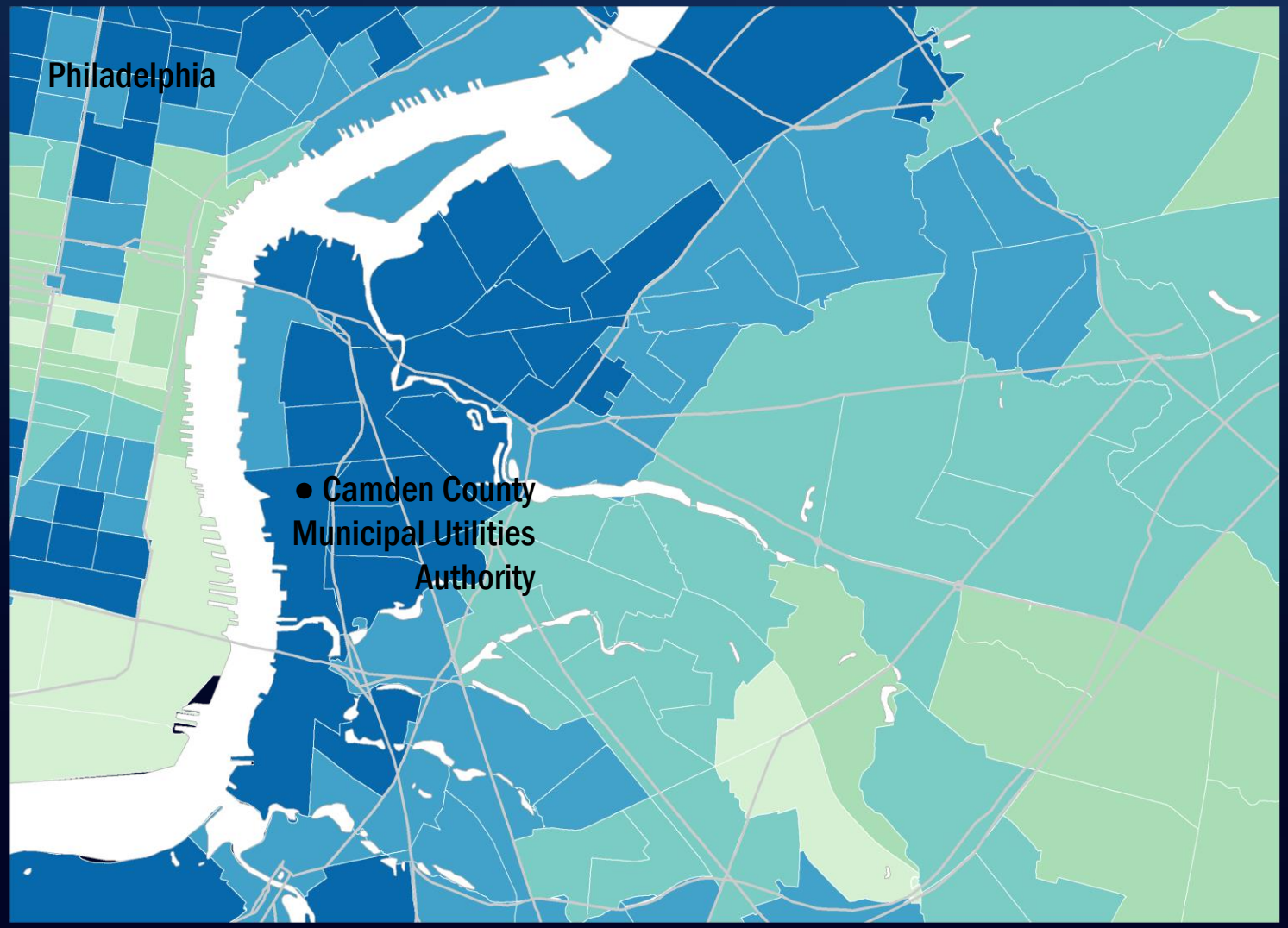
Selected water occupations, by race, 2016

Occupation	Water employment	Share of Black/ Asian/Hispanic workers
Cement Masons and Concrete Finishers	17,858	60.9%
Painters, Construction and Maintenance	3,124	60.0%
Industrial Truck and Tractor Operators	2,938	56.3%
Construction Laborers	149,513	55.8%
Landscaping and Groundskeeping Workers	7,766	52.6%
Helpers--Pipelayers, Plumbers, Pipefitters, and Steamfitters	46,510	52.6%
Helpers--Electricians	2,930	52.6%
Civil Engineers	6,188	21.7%
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	5,604	19.8%
Hydrologists	6,300	17.0%
Construction Managers	21,558	16.8%
Chief Executives	2,645	15.0%
Lawyers	2,559	14.7%
Cost Estimators	15,609	14.4%

Source: Brookings analysis of CPS data

However, water utilities are often uniquely positioned to address these economic and demographic divides. Camden, NJ, offers one example.

Share of Camden workers with a high school diploma or less, 2016



Across the U.S., water treatment plants tend to be physically located in tracts with lower levels of educational attainment.

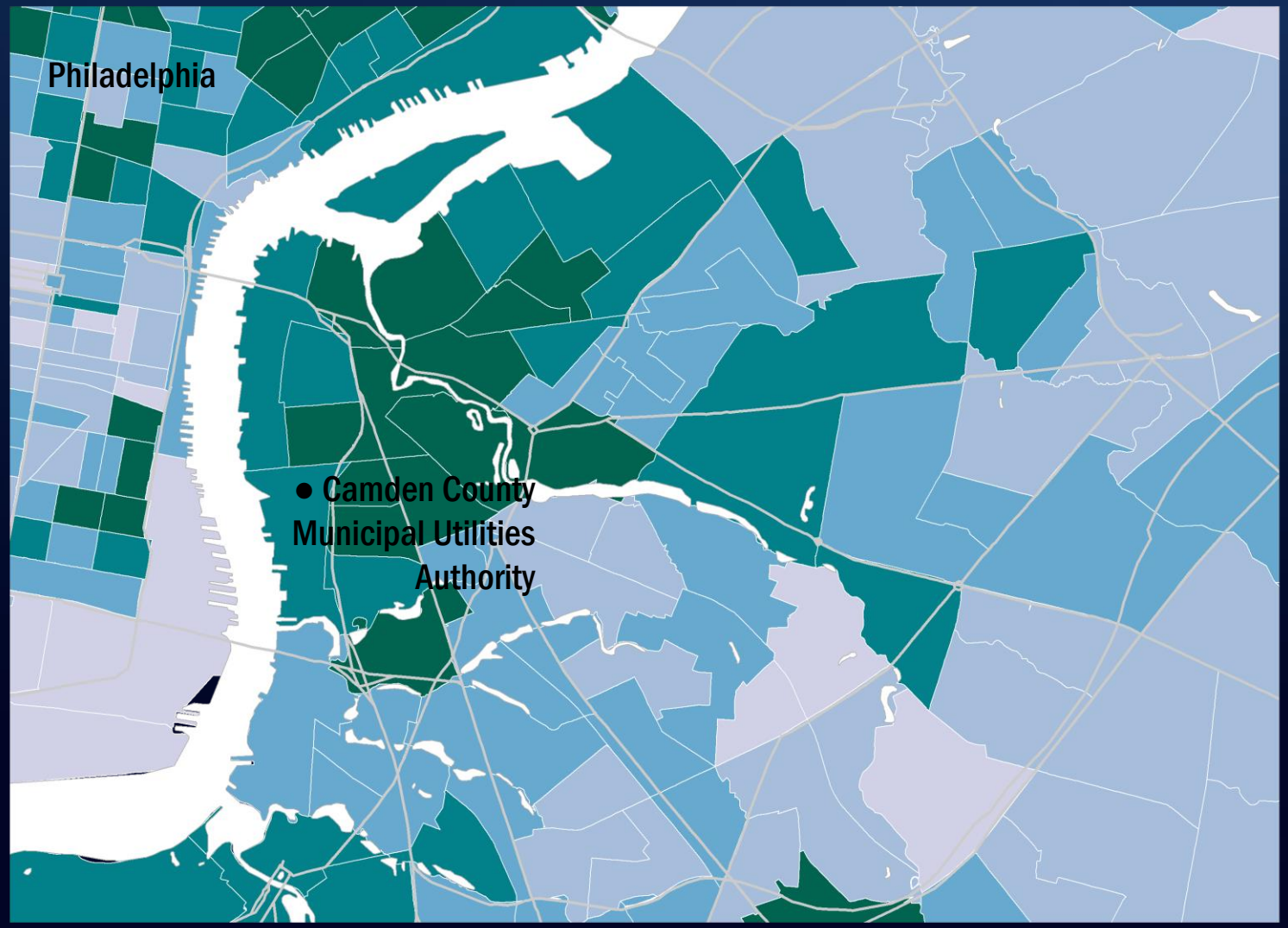
In these tracts, approximately 43.6 percent of workers have a high school diploma or less, compared to 32.5 percent of all workers nationally in 2016.

In Camden, for instance, the wastewater plant is located in a tract where 69.3 percent of workers have a high school diploma or less.

Source: Brookings analysis of FRS and ACS data

Likewise, many water treatment plants are located in areas experiencing joblessness

Unemployment rates in Camden, 2016



Across the U.S., water treatment plants tend to be physically located in tracts with higher unemployment rates.

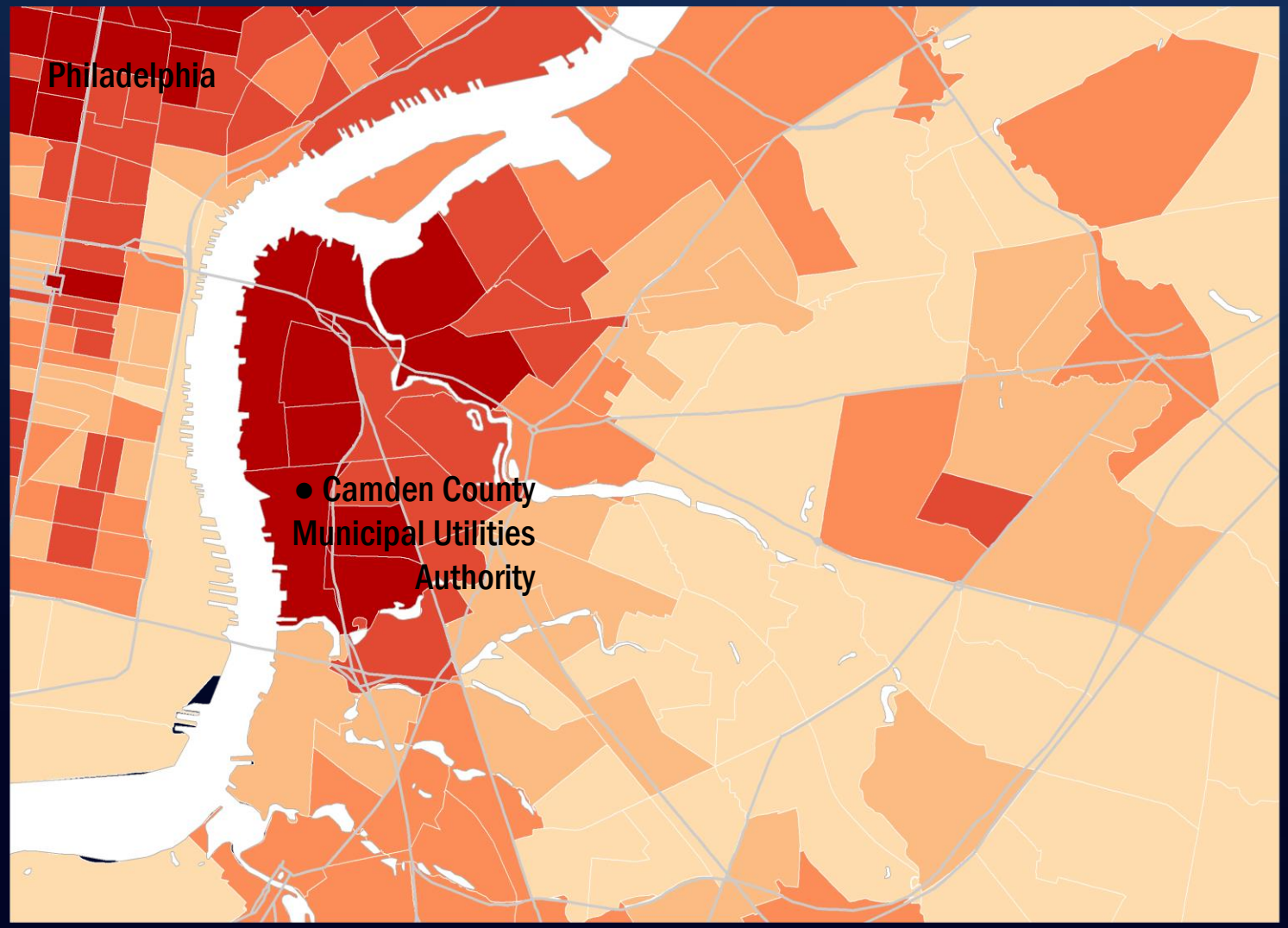
In these tracts, unemployment rates typically exceed 5 percent, compared to the 4.5 percent unemployment rates seen nationally in 2016.

In Camden, for instance, the water treatment plant is located in a tract where the unemployment rate stands at nearly 10 percent.

Source: Brookings analysis of FRS and ACS data

Finally, many water treatment plants are located in areas experiencing widespread poverty

Poverty rates in Camden, 2016



Across the U.S., water treatment plants tend to be physically located in tracts with higher levels of poverty.

In these tracts, approximately 15 percent of residents live below poverty, slightly more than the 14 percent poverty rate seen nationally.

In Camden, for instance, the water treatment plant is located in a tract where the poverty rate stands at 57.5 percent.

Source: Brookings analysis of FRS and ACS data

Implications & Recommendations

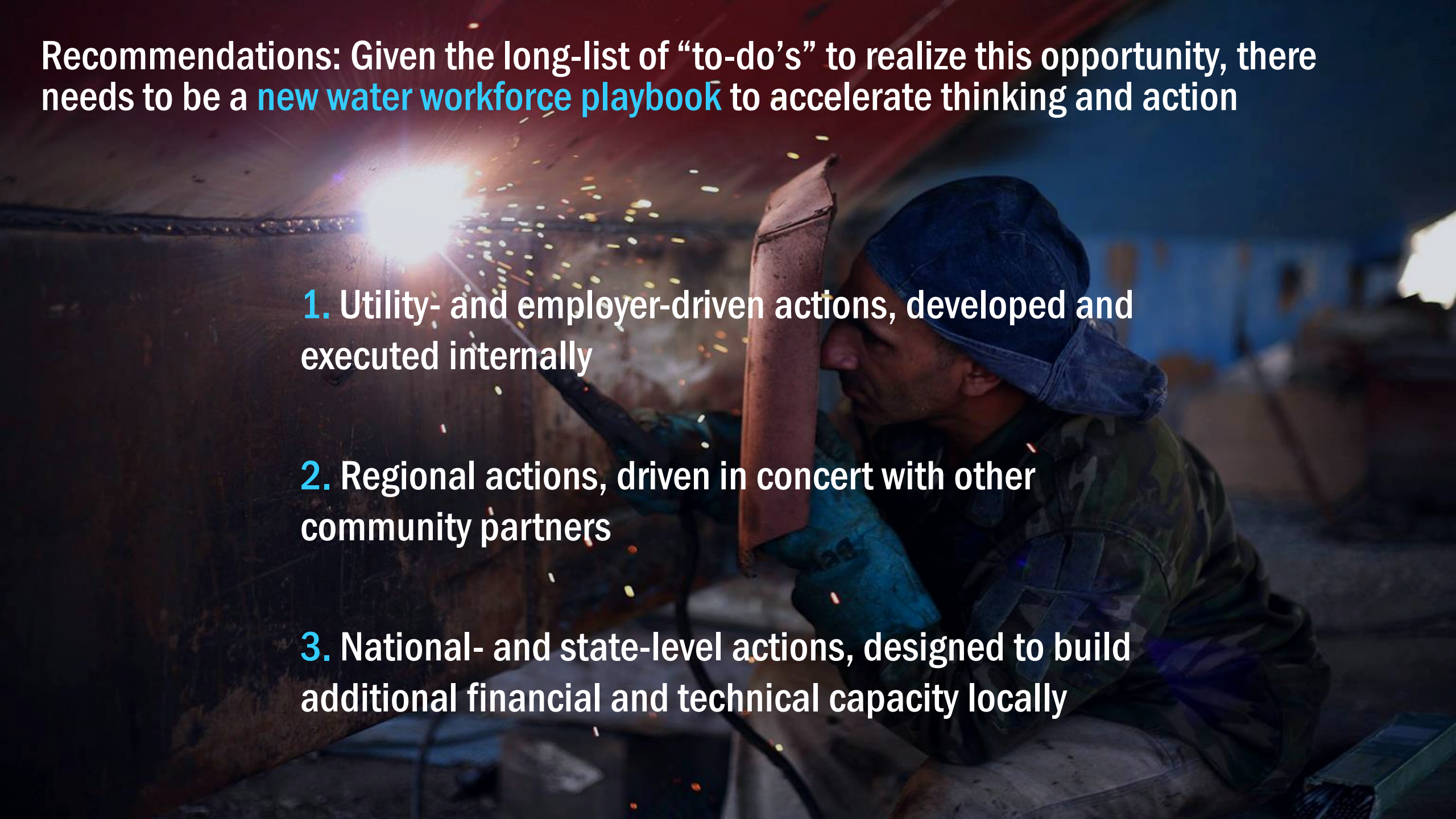
Implications: The water sector offers opportunity, but there are still clear gaps to address

Opportunities offered:

- Broad range of industries and occupations
- Jobs found in every market
- Higher and more equitable wages
- Lower educational barriers to entry
- Emphasis on valued, transferable skillsets
- Potential for long-term careers and lifelong learning
- Utilities = economic anchors in some of the country's most disadvantaged neighborhoods

Gaps to address:

- Aging workforce, with notably lower shares of younger workers
- Lack of gender and racial diversity
- Need for more extensive experience and on-the-job training
- Difficulties creating portable, versatile credentials
- Limited public awareness, visibility, and prioritization
- Challenges hiring and training workers quickly and affordably
- Struggles retaining skilled workers



Recommendations: Given the long-list of “to-do’s” to realize this opportunity, there needs to be a new water workforce playbook to accelerate thinking and action

1. Utility- and employer-driven actions, developed and executed internally

2. Regional actions, driven in concert with other community partners

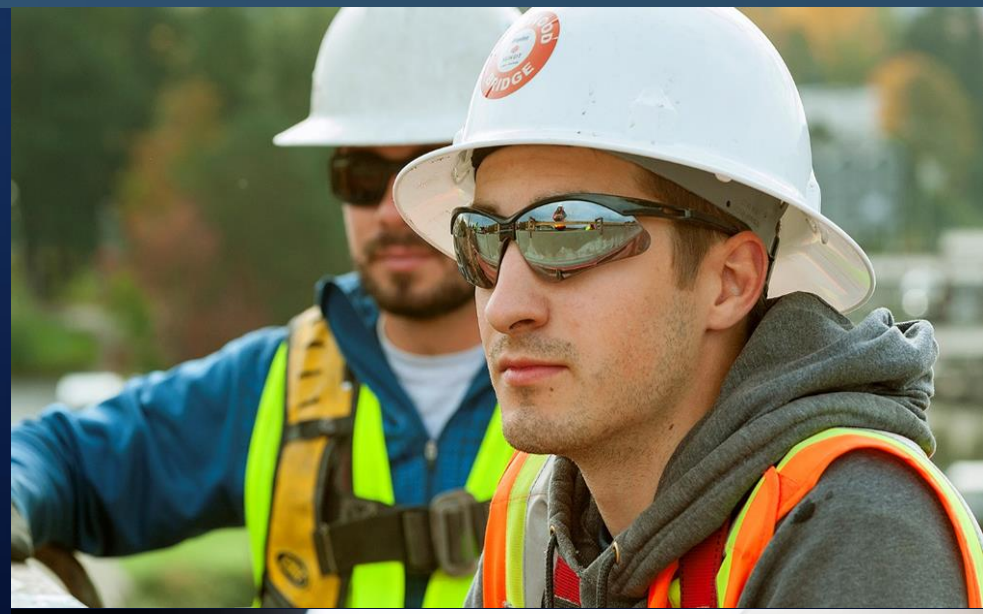
3. National- and state-level actions, designed to build additional financial and technical capacity locally

Recommendation 1: Utilities and other water employers need to empower staff, adjust existing procedures, and pilot new efforts in support of the water workforce

- ✓ Hire and train dedicated human resources staff to meet with younger students, connect with more diverse prospective workers, and explore alternative recruitment strategies
- ✓ Create a new branding strategy to more effectively market the utility or organization to younger students and a broader pool of prospective workers
- ✓ Account for workforce needs as part of the budget and capital planning process, while creating more detailed and consistent labor metrics
- ✓ Update or create new job categories to provide greater flexibility for potential applicants
- ✓ Develop competency models – or customize existing models – to promote continued learning and skills development among staff
- ✓ Design and launch new bridge programs, including "water bootcamps," to provide ways for younger workers and other non-traditional workers to explore water careers and gain needed experience
- ✓ Implement a formalized mentorship program to provide a point of contact for interns and to better monitor their career progression

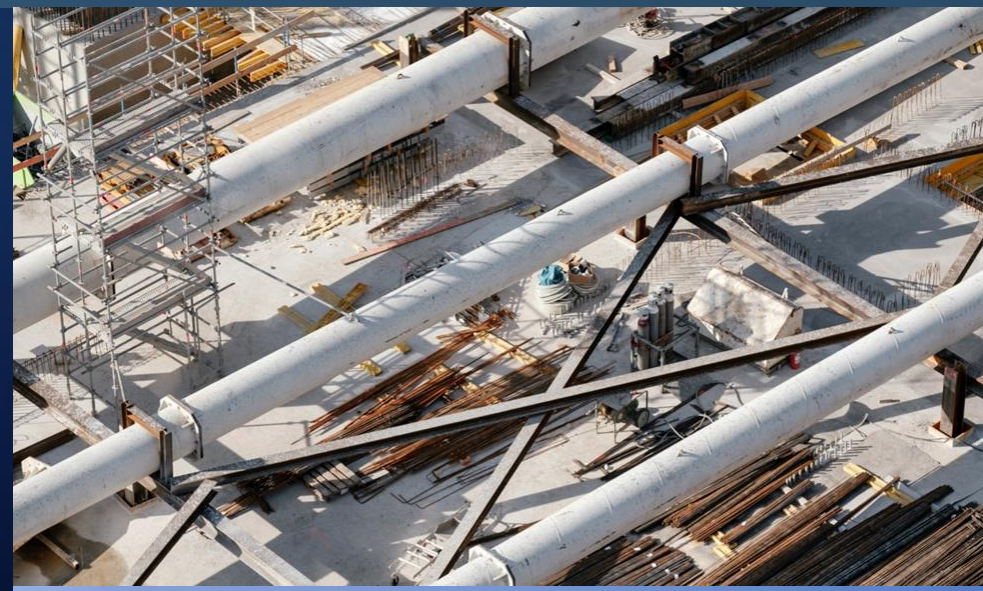
Recommendation 2: A broad range of employers and community partners need to hold consistent dialogues, pool resources, and develop platforms focused on water workers

- ✓ Identify a common regional "point person" – or organization – to schedule and steward consistent meetings among a broad range of community partners
- ✓ Hold an annual water summit/meet-and-greet where prospective workers, employers, and community partners can connect with one another regionally
- ✓ Out of these dialogues, develop a comprehensive water workforce plan, highlighting regional training needs and avenues for additional collaboration
- ✓ Develop a more predictable, durable channel of funding to support these efforts, driven by public fees and private-sector support
- ✓ Strengthen local hiring preferences in support of more minority and women business enterprises
- ✓ Create a new web platform to connect water workers and employers, serving as a simple, consolidated site for regional job postings
- ✓ Launch a new regional "academy" – designed and run by employers and community partners – in support of more portable infrastructure education, training, and credentials



Recommendation 3: National and state leaders need to provide clearer technical guidance, more robust programmatic support, and targeted investments in water workforce development

- ✓ Hire or assign specific program staff to serve as common points of contact across relevant federal agencies, with a focus on water workforce development
- ✓ Supported by federal agencies or other national organizations, conduct a series of dialogues and learning sessions in a broad range of markets to assess water workforce needs and priorities
- ✓ Develop a common landing page – or repository – that highlights regional best practices and other innovative water workforce development strategies
- ✓ At a national level, form a "water workforce council" among leading groups in this space to serve as an advisory body, with an eye toward future priorities
- ✓ With guidance from employers, industry associations, and other stakeholders, establish more versatile and streamlined water certifications nationally
- ✓ Expand federal and state funding via existing workforce development programs and educational initiatives, including apprenticeships
- ✓ Expand federal and state funding via newly targeted and competitive grant programs, in support of alternative bridge programs and other innovative efforts



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