



Pipeline to a Sustainable Workforce: A Report on Decentralized/ Onsite Wastewater Occupations

EPA Office of Wastewater Management

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Introduction

Everyday across America, dedicated workers design, install, and maintain the wastewater treatment systems that provide clean water services to communities. Broadly speaking, there are two types of wastewater treatment systems in the United States. The first is a “centralized” system, where wastewater is collected, treated, and dispersed at a central location and often operated by a city, municipality, or regional district. The second type of system, referred to as “onsite” or “decentralized,” is an onsite or clustered system used to collect, treat, and disperse or reclaim wastewater from a single residence, multiple residences, small community, or service area. In this report these systems are referred to as decentralized wastewater systems, or decentralized systems for short. In comparison to a centralized system, a decentralized system uses small pipes and treats small volumes of domestic wastewater.

The decentralized wastewater sector is an integral part of the nation’s wastewater infrastructure, with approximately 20 percent of all U.S. households (or 1 in 5 homes).¹ More recent studies indicate that one-third of new single-family homes built between 2016-2018 are served by individual decentralized systems.² Many of these homes and businesses are in rural communities and exist throughout every state, on tribal lands and U.S. territories. The U.S. Environmental Protection Agency (EPA) reports that decentralized systems treat roughly four billion gallons of water per day in the United States.³

Advancing Decentralized Wastewater Management through Partnerships

Since 2005, EPA and organizations involved in managing decentralized wastewater systems have worked in tandem to identify key objectives, share information, and promote decentralized systems as a viable means of wastewater treatment. In 2020, EPA and 20 partners signed the latest in a series of Memoranda of Understanding (MOU), representing a shared and continued commitment to the decentralized wastewater industry. Within this shared commitment was a goal to “improve decentralized wastewater treatment system performance through improved practitioner competency, management practices, research, and technology transfer.”

Source: <https://www.epa.gov/septic/decentralized-system-partners>

¹ According to the 2015 U.S. Census Bureau’s American Housing Survey (AHS).

² 2020 Onsite Wastewater Installation Assessment, National Environmental Services Center

³ EPA, “Case Studies of Individual and Clustered (Decentralized) Wastewater Management Programs,” 2012: <https://www.epa.gov/sites/production/files/2015-06/documents/decentralized-case-studies-2012.pdf>

Decentralized wastewater systems represent critical infrastructure; and decentralized workers play an important role in providing wastewater treatment and removal services to communities and in safeguarding the environment. In addition, jobs in the water sector provide stable employment, meaningful careers, useful technical skills (including the use of innovative technologies), and a chance to make a real difference in communities. While it is well understood that water jobs are central to healthy communities, clean environments, and strong economies, important information gaps exist about the “decentralized workforce” for policy makers, educators, decentralized businesses, and individual workers. These gaps include a common understanding of the occupations that align with the decentralized industry, information on the demographic characteristics of workers in these occupations, and strategies to improve linkages to education and training needed for jobs in the decentralized industry, among others. This report is intended to serve as a first step in addressing some of these gaps to better support communities, workers, educators, and the decentralized industry.

Project Background

EPA and its 20 Decentralized MOU partner organizations recognize there are significant needs and opportunities in supporting and growing the workforce that designs, installs, and maintains decentralized wastewater treatment systems.⁴ Starting in 2017, the MOU partners committed to advancing decentralized workforce growth and education with a focus on assisting community colleges and universities in training a future decentralized workforce and boosting competency and recruitment. The first step in this commitment was an EPA-hosted listening session on “Growing the Decentralized Wastewater Workforce” in October 2018 at the National Onsite Wastewater Recycling Association Onsite Wastewater Mega-Conference in Minneapolis, Minnesota to gain ideas for addressing industry workforce issues. As a result of the listening session, a steering group was formed to provide input and guidance and to identify concrete actions that could address employment, earnings, education, and the professionalism of the decentralized wastewater industry.

In July 2019, the steering group and EPA held a workforce development meeting as part of the National Environmental Health Association’s Annual Educational Conference in Nashville, Tennessee. This meeting was aimed at describing and building a shared understanding of the distinct challenges and workforce opportunities in the decentralized wastewater industry. The intent was also to define a series of actions that could be implemented by the MOU partners. The following key objectives served as the basis for discussion at the meeting:

- Advance decentralized education in community colleges and universities
- Explore options for workforce competency and recruitment more broadly
- Set the stage for sector partners to develop an action agenda/strategy in response to gaps and opportunities identified during the meeting

During the July 2019 meeting, participants identified a wide range of potential actions that could be taken to advance decentralized workforce practice. In a synthesis of the discussions from the workforce development meeting, potential actions were organized into four broad areas: (1) education and training, (2) recruitment and retention, (3) enabling conditions, and (4) partnerships. A set of activities was developed underneath each action area, which served as a step-by-step blueprint for progress toward meeting MOU partnership goals. Of these actions, the steering group identified a set of foundational, high-priority actions for immediate implementation. These priority actions include the development of this decentralized career pathways document and the identification of in-

⁴ <https://www.epa.gov/septic/decentralized-system-partners>

demand jobs, with the goal of bolstering recruitment and educational programming and market opportunities for young adults, students, and current workers.

Purpose and Contents of the Report

This report provides a foundational understanding of the career pathways and job clusters in the decentralized industry. It further expands upon occupational characteristics, including growth projections, as well as basic education and training requirements aligned with occupations in the industry, outlining challenges that have led to shortage in the supply of decentralized workers. This report is intended to be used by decentralized professionals looking to better understand the demand for and variety of decentralized occupations.

The first section provides an overview of key characteristics across the decentralized wastewater workforce. The second section organizes jobs into career pathways to explore characteristics and emergent themes for specific categories or clusters of jobs within the industry. The last section includes lessons learned and new understanding that have emerged from this research.

The four appendices include two types of information:

- **Reference Tables:** The first three appendices include: salary information across occupational profiles, a list of bright outlook jobs, and a list of all green jobs (defined below) within the decentralized sector.
- **Occupational Profiles:** Thirty-four occupational profiles are included as appendices. Each occupational profile provides a summary of the key information needed to understand each type of job, including key tasks, wage information, number of people employed in the occupation, and high-growth states for that specific occupation. These occupations are not exhaustive of the full spectrum of decentralized jobs, but rather focus on critical-needs jobs in the decentralized industry.

Methodology

To develop this career pathways report and the occupational profiles, the authors employed a data-driven approach using both quantitative and qualitative sources.

Quantitative sources include data collection and analysis using recognized federal government sources, namely the Occupational Information Network (ONET) Online and the Bureau of Labor Statistics (BLS). ONET Online was used to conduct a broad scan of federally recognized job titles based upon the Standard Occupation Classification (SOC) system. Once occupations were identified, they were sorted into job clusters and then grouped by roles, responsibilities, and required competencies. From there, the occupations within the career pathways and job clusters were analyzed, and occupational profiles were developed. Using BLS employment projections data, each occupational profile was enriched with basic information on future job growth, number of current employees, and state-level information on occupational growth. State-specific data introduced regionalism into the occupational analysis process.

Qualitative input consisted of nine interviews with steering group members and other professionals in the field. These interviewees represent a broad array of voices across the decentralized wastewater industry and include university and community college educators, business owners, and industry association representatives. Interviews were conducted using a standard questionnaire, and informal questions during the interviews were tailored to the individual interviewee based upon individual expertise and feedback.

The interviews provided context and perspective around the quantitative data, including the career pathways and job clusters. Interviews validated data collected and presented through the occupational identification process. Finally, concepts and terminology prevalent in the workforce development field were used to align decentralized efforts with opportunities for future actions, such as partnering with community colleges to expand training programs.

Limitations

As with any data-driven process, there are inherent limitations in the report findings. In compiling this report, authors acknowledge the following limitations:

- **Isolating Decentralized-Specific Data Resources:** The quantitative data in this report is based on data from recognized federal government sources, namely ONET Online and the BLS. These resources represent general occupational fields, not specifically representing the decentralized wastewater industry. For instance, Installation, Repair, and Maintenance Workers are the best fit to describe similar occupational roles in the decentralized industry, but also span many other industries. Although there are challenges specifically isolating jobs in the decentralized industry while maintaining data validity, each occupational profile contains a list of

Standard Occupation Classification

The 2018 Standard Occupational Classification (SOC) system is a federal statistical standard used by federal agencies to classify workers into occupational categories for the purpose of collecting, calculating, or disseminating data. All workers are classified into one of 867 detailed occupations according to their occupational definition. To facilitate classification, detailed occupations are combined to form 459 broad occupations, 98 minor groups, and 23 major groups. Detailed occupations in the SOC with similar job duties, and in some cases skills, education, and/or training, are grouped together.

Source: <https://www.bls.gov/soc/>

informal job titles. The authors have identified relevant decentralized job titles and highlighted them throughout the report so readers can understand the appropriate connections to the decentralized industry.

- **Full Spectrum of Decentralized Occupations:** Conversely, there may be jobs connected to the decentralized industry that are not included in this report. Throughout the data collection and interview process, the authors worked to extrapolate the wide diversity of jobs that contribute to the efficient functioning of the decentralized industry. Interviewees represented a variety of views, including college professor, community college program director, manufacturing business owner, installer, and industry association executive director. While trying to gain a full picture of the types of jobs and competencies needed throughout the decentralized industry, a wide net was cast, but due to limitations in how many interviews were held and the data available, all perspectives may not have been gained nor all occupational information included.
- **Qualitative Data from Interviews:** The findings and conclusions represent an understanding drawn from background research, data analysis, and interviews. Nine interviews were conducted with university and community college educators, business owners, and industry association representatives. However, in comparison to the wide variety of onsite professionals and backgrounds, authors recognize that these interviews may only represent a subset of the full range of perspectives and diversity of decentralized professionals.

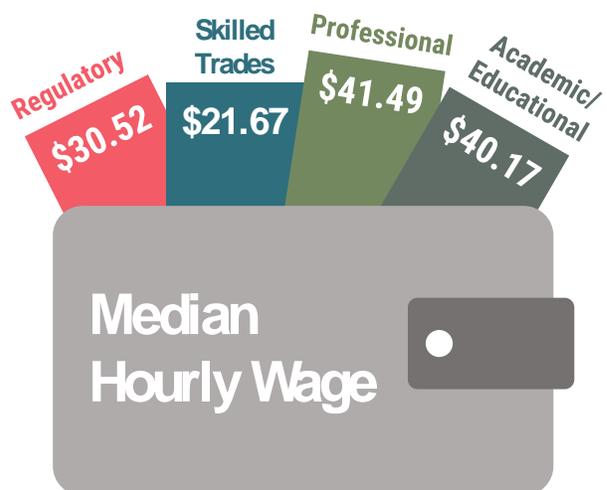


Section 1: The Decentralized Wastewater Workforce

Everyday across America, dedicated workers design, install, and maintain decentralized wastewater systems. Decentralized wastewater workers serve individual homeowners and businesses across all 50 states, tribal lands, and U.S. territories. The industry has evolved over decades and consists of many different components: manufacturers, installers, tank and pump operators, regulators, engineers, and university and college professors. Decentralized jobs provide stable employment, meaningful careers, useful technical skills, and a chance to make a real difference in neighborhoods and communities. Below are some of the key characteristics of decentralized wastewater occupations.

Decentralized Wastewater Careers: Wages

Decentralized jobs generally offer competitive wages, although small, rural, and tribal communities often face wage-related challenges that can inhibit recruitment and retention.⁵ While the occupations profiled here demonstrate that higher average salaries often correspond with higher educational attainment, many workers in skilled trades (private sector) jobs earn competitive wages and face lower educational barriers to entry. For public sector/regulatory workers, the average median hourly wage was \$30.52; for skilled trades it was \$21.67; for private sector/professional it was \$41.49; and for academic/university it was \$40.17. These four career pathways (regulatory, skilled trades, professional, and academic/educational) highlight the range of job



⁵ Based on research done for the centralized sector and explored in the 2018 Brookings Institute Report, “Renewing the Water Workforce: Improving water infrastructure and creating a pipeline to opportunity.”

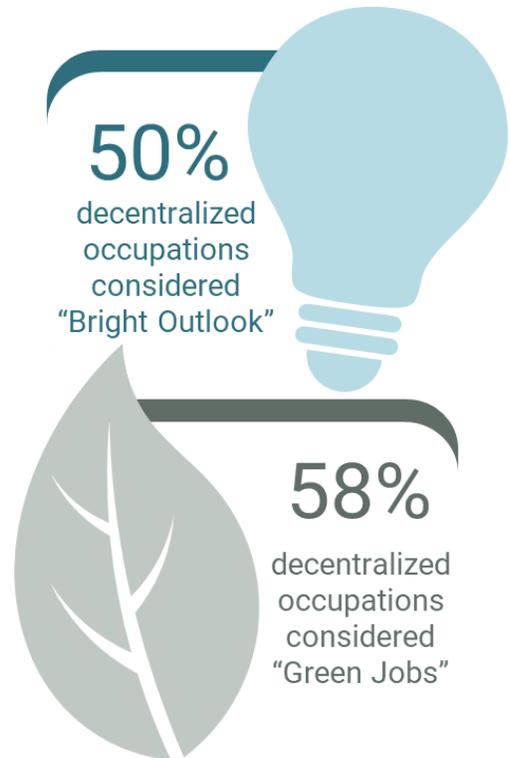
types in the decentralized industry and form the foundation of this report as detailed in Section 2. Appendix A provides a detailed list of wage information for all profiled decentralized occupations.

Bright Outlook Occupations

Decentralized wastewater systems provide critical wastewater treatment and removal services to families and communities across the nation, and the need for decentralized professionals is anticipated to grow in the future. Of the 34 jobs profiled in this report, 17 are designated by the federal government as “Bright Outlook” jobs ([ONET](#)). Bright outlook jobs are occupations expected to grow rapidly in the next several years or will have large numbers of job openings. Occupations qualify as “Bright Outlook” if they are growing at a rate of seven percent or higher. Half of the occupations included in this report are considered fast growing careers. Of the career pathways, occupations within the skilled trades (private sector) pathway are growing at an even faster rate, with many projected to grow at a rate of over 11 percent. Appendix B provides a full list of decentralized occupations designated as Bright Outlook.

Green Occupations

The technologies available for the design, installation, maintenance, and operation of decentralized systems continues to advance rapidly. Decentralized workers increasingly work with innovative technologies, such as smart systems and advanced treatment technologies. Over half of decentralized occupations are categorized by the federal government as “Green Jobs” ([ONET](#)). This designation denotes professions within wastewater that are likely to change due to the implementation of new technologies or environmentally focused practices. Appendix C provides a full list of decentralized occupations designated as Green Jobs.





Section 2: Career Pathways in the Decentralized Industry

The professionals that provide decentralized wastewater services work on a range of systems from traditional, gravity-type systems to advanced systems such as aerobic treatment units or constructed wetlands. Accordingly, workers who contribute to the decentralized industry represent a wide range of occupations and educational requirements. To allow for appropriate analysis and organization of these wide-ranging jobs, four distinct career pathways have been developed, each with identified job clusters and descriptive occupational profiles making up the pathway.

The organization of these career pathways is displayed in Figure 1 with four distinct groupings: regulatory jobs in the public sector, skilled trades jobs in the private sector, professional positions in the private sector, and academic/education jobs in public/private sectors. Under each career pathway are job clusters—occupations that are grouped due to similarities in job titles, tasks, and competencies. Figure 2 includes decentralized career pathways and their associated job clusters. Each occupation has an occupational profile describing the characteristics of the job, including information on education, earnings, and growth projections.

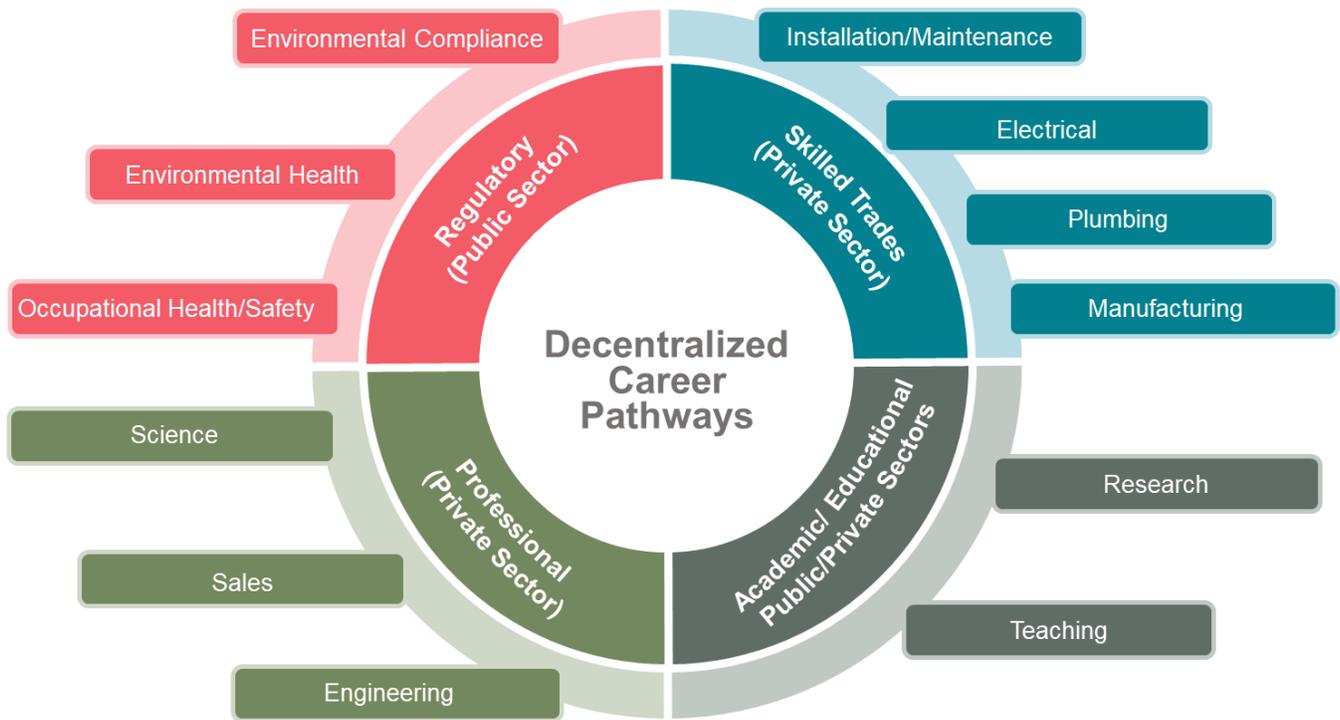
Figure 1: Decentralized Career Pathways



These career pathways were developed using U.S. Department of Labor guidance, which states, “Career pathway systems offer an effective approach to the development of a skilled workforce by increasing the number of workers in the U.S. who gain industry-recognized and academic credentials necessary to work in jobs that are in-demand. To align educational offerings with business needs, career pathways systems engage business in the development of

educational programs up front.”⁶ This overall career pathways approach provides a transparent and understandable means to focus strategic efforts on recruiting and retaining workers to bolster and grow the decentralized wastewater industry.

Figure 2: Decentralized Wastewater Career Pathways and Associated Job Clusters

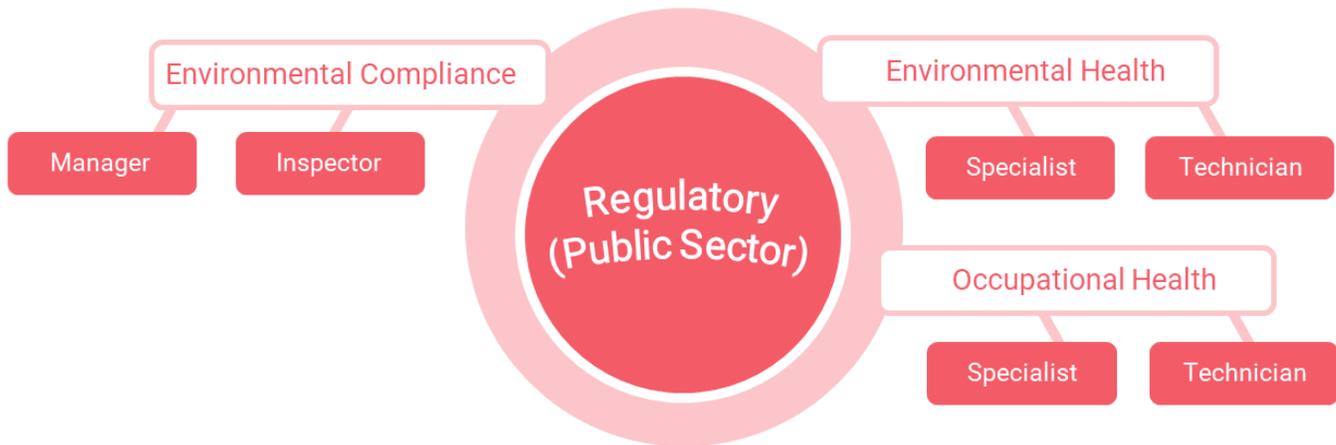


The following four sub-sections provide more details under each of the decentralized career pathways, including job clusters and associated occupations as well as a description of themes, including characteristics of the job such as information on education, earnings, and growth projections. Finally, each career pathway section includes pathway specific findings based on background research, feedback received during the 2018/2019 listening sessions, and perspectives provided by the industry experts that were interviewed.

⁶ U.S. Department of Labor. "Career Pathways Toolkit: A Guide for System Development." Washington, DC https://wdr.doleta.gov/directives/attach/TEN/TEN_17-15_Attachment_Acc.pdf

Career Pathway A: Regulatory (Public Sector)

Figure 3: Job Clusters and Occupations in the Regulatory Career Pathway



Overview of the Regulatory Career Pathway

The regulatory (public sector) occupations contained within this career pathway are generally characterized as professionals who participate in public health and safety, including wastewater and sanitation oversight. Many of these positions reside in county and city health and environmental departments. Within smaller counties and cities, these professions have multiple responsibilities including regulating food safety and handling, waste and garbage control, air quality, and water quality. Figure 3 includes a visual representation of the job clusters and occupations associated with the regulatory career pathway.

Four of the six occupations in this career pathway are Bright Outlook jobs, and five out of six are Green jobs. Specifics regarding Bright Outlook and Green jobs can be found in Appendix A and B. Growth projections within this career pathway indicate that more workers will be needed to conduct appropriate regulatory oversight of the decentralized industry. Additionally, workers in this pathway will need to continually learn as technologies change and public agencies try to stay aligned with private commerce. A regulatory (public sector) job that is closely linked to the wastewater industry is an Environmental Health Specialist, which is designated as both a Bright Outlook job and a Green job.

Within the public sector careers documented under the regulatory career pathway, the average median hourly wage is \$30.53. The two highest-paying and growing jobs are the same: Environmental Health Managers and Occupational Health and Safety Inspectors, each earning a median annual salary of approximately \$71,000 and \$73,000, respectively. The Environmental Health Managers and Environmental Health Specialists positions combined represent over 130,000 jobs in the U.S. and with a high level of job growth anticipated.

Example Informal Titles for Jobs in the Regulatory Pathway

- Public Health Specialist
- Environmental Health and Safety Specialist

Findings: Regulatory Career Pathway

The following findings concerning the regulatory (public sector) career pathway are based on background research, feedback received during the 2018/2019 listening sessions, and the views of individuals who were interviewed.

- **Workers entering the public and environmental health field at the state or local level often lack exposure to the decentralized industry as part of their formal education.** New workers who take jobs in the regulatory (public sector) arena rarely have any academic or educational exposure to onsite/decentralized systems. Specifically, as part of their formal education, students who become environmental health specialists or technicians often are not exposed to how decentralized systems work, the biology and chemistry of systems, and how water is treated before re-entering the soil and the water table. As a result, there may be a large void of expertise at the local regulatory (public sector) department level, which inhibits expansion and promotion of these systems as a viable water treatment solution. Furthermore, interviewees pointed to consistent turnover in the regulatory (public sector) pathway, which poses additional challenges in maintaining institutional knowledge.
- **Public health workers typically do not train for or receive the same industry-recognized credentials or licenses as private sector workers.** Often, new and incumbent regulatory workers do not have experience or background in the decentralized field, thus requiring on-the-job training and learning. After employment with a state or local regulatory agency, many of these workers will test for and receive a National Environmental Health Association (NEHA) Registered Environmental Health Specialist (REHS)/Registered Sanitarian (RS) credential. However, these credentials are offered after a worker has received a college degree and has been employed for a certain duration. Therefore, many workers in the regulatory (public sector) pathway lack opportunities to receive focused and up-front training on decentralized systems and the commensurate credentials to recognize competency in decentralized concepts. Some interviewees indicated that environmental and health workers, who lack exposure to decentralized principles and do not have the same credentials and licenses required by the private sector, are in a position where they must apply regulations to companies and people who have significantly more experience and competency in the decentralized industry.
- **Challenges exist in developing partnerships between the public and private sectors.** Due to the lack of experience and exposure to decentralized systems by regulatory workers, private sector manufacturers and installers identified challenges, including potential delays in approval of projects or understanding of new and innovative technologies. Interviewees expressed a desire to see constructive partnerships between operators and regulators as the use of decentralized systems continues to grow.

Figure 4: Regulatory Career Pathway by the Numbers



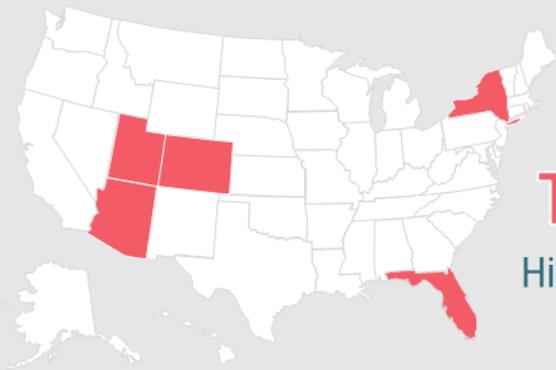
4 Bright Outlook Jobs



5 Green Jobs



6 Occupations Profiled



Top 5
Highest Need States



Highest Paying Career
Occupational Health and Safety (\$73K)

All data sourced from O*NET Online (2018) <https://www.onetonline.org/>

Career Pathway B: Skilled Trades (Private Sector)

Figure 5: Job Clusters and Occupations in the Skilled Trade Career Pathway



Overview of the Skilled Trades Career Pathway

The skilled trades (private sector) occupations represent a wide and varied array of job clusters that focus on the manufacturing, installation, and maintenance of decentralized wastewater systems. Individuals working in these occupations are often “customer facing,” as they assist homeowners and business owners with installing/replacing their systems or working with general contractors who are building residential or commercial developments. Job clusters range from electricians and plumbers to manufacturers and installers. Many of these occupations require some form of postsecondary training and credentials and often a state license. However, many of these occupations do not require a traditional bachelor’s degree. Of the skilled trades (private sector) documented in this report, the average median hourly wage was \$21.67 and the average annual salary was \$45,000

A challenge of identifying occupations and job clusters in the decentralized skilled trades (private sector) pathway is that the data does not typically distinguish between workers in the decentralized industry and workers with the same occupation in other industries. As mentioned in the “limitations” to the methodology, there are decentralized installers and maintenance workers for septic systems, but the federal data does not isolate these workers from others who do installation and maintenance. However, including these job titles is important, so the focus turns to addressing the specific competencies workers in skilled trades (private sector) occupations need to be successful in the decentralized wastewater industry.

Example Informal Titles for Jobs in the Skilled Trades Pathway

- Wastewater Operator
- Service Technician
- Onsite Installer
- Backhoe Operator
- Septic Cleaner/Inspector

Nine of the thirteen occupations in this career pathway are Bright Outlook jobs, and five out of thirteen are Green jobs. Skilled trades (private sector) jobs are in high-demand, and the decentralized industry will need broad approaches to attract workers of all types in plumbing, electrical, and installation and maintenance.

Many of the jobs in the skilled trades (private sector) pathway earn between \$30,000 to \$45,000 annually. The highest paying jobs are in manufacturing, plumbing, and electrical and the highest-paying job in the skilled trades career pathway is Manufacturing Engineer Technologist, earning an average of \$63,000 annually. Drillers and Excavation Operators earn roughly \$45,000 per year. These jobs also represent a need for large numbers of employees and many new workers who need to be recruited. For instance, there are approximately 402,000 Equipment Operators in the U.S., with another 52,500 needed through 2028.⁷ There are roughly 715,000 Electricians, with just under 95,000 more needed by 2028. Of the four career pathways, skilled trades (private sector) have been shown to be growing the fastest, at a rate of seven percent or higher, with four of the occupations growing at a rate of greater than 11 percent. By all accounts, skilled trades (private sector) jobs needed in the decentralized wastewater industry are going to grow, and pressure to find solutions and compete for talent will become more pronounced.

Findings: Skilled Trades Career Pathway

The following findings concerning the skilled trades (private sector) career pathway are based on background research, feedback received during the 2018/2019 listening sessions, and the views of individuals who were interviewed.

- **Workers are needed in skilled trades (private sector), and they need access to good training programs that expose them to the decentralized industry.** Both the data and interviews affirmed that formal education is not the likely pathway for many of these workers. Well-grounded job-training programs are needed. Delaware Technical Community College has a model for this approach in which they have aligned curriculum for decentralized installation and maintenance workers with Delaware licensing requirements. This means that upon completion of their training program, Delaware Technical Community College students can enter employment in the decentralized field immediately because their competencies align with employer needs.
- **Gaining exposure to decentralized concepts earlier would benefit the industry.** Skilled trades (private sector) workers would benefit from exposure to decentralized concepts while training in their respective fields. As it stands currently, workers hired by decentralized firms typically need to be taught on the job, which takes time for employers who need trained employees. Some interviewees identified math and blueprint reading as essential competencies needed by workers in the skilled trades (private sector) pathway because of new technologies and the need for enhanced productivity.
- **Employers in the Skilled Trades pathway are often small business.** With the exception of the manufacturing area, the employers in the Skilled Trades career pathway are often small businesses with fewer than 10 employees. These businesses often have a local footprint and employees are likely to be local. This factor may make it difficult for educational and training programs to provide trained employees to these small businesses. For this reason, it may be beneficial to provide employers with a list of decentralized-specific knowledge categories that can help get new employees up to speed more quickly.

⁷ O*NET Online (2018) www.onetonline.org

Figure 6: The Skilled Trades Career Pathway by the Numbers



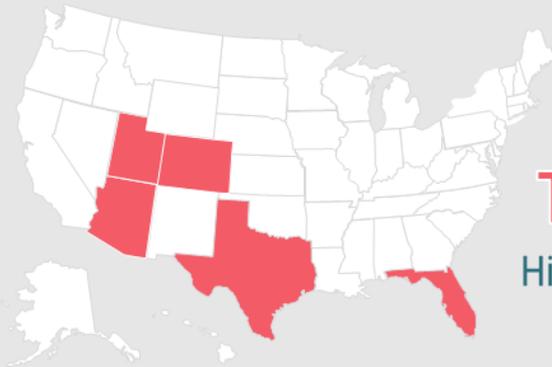
9 Bright Outlook Jobs



5 Green Jobs

Occupations Profiled

13



Top 5
Highest Need States

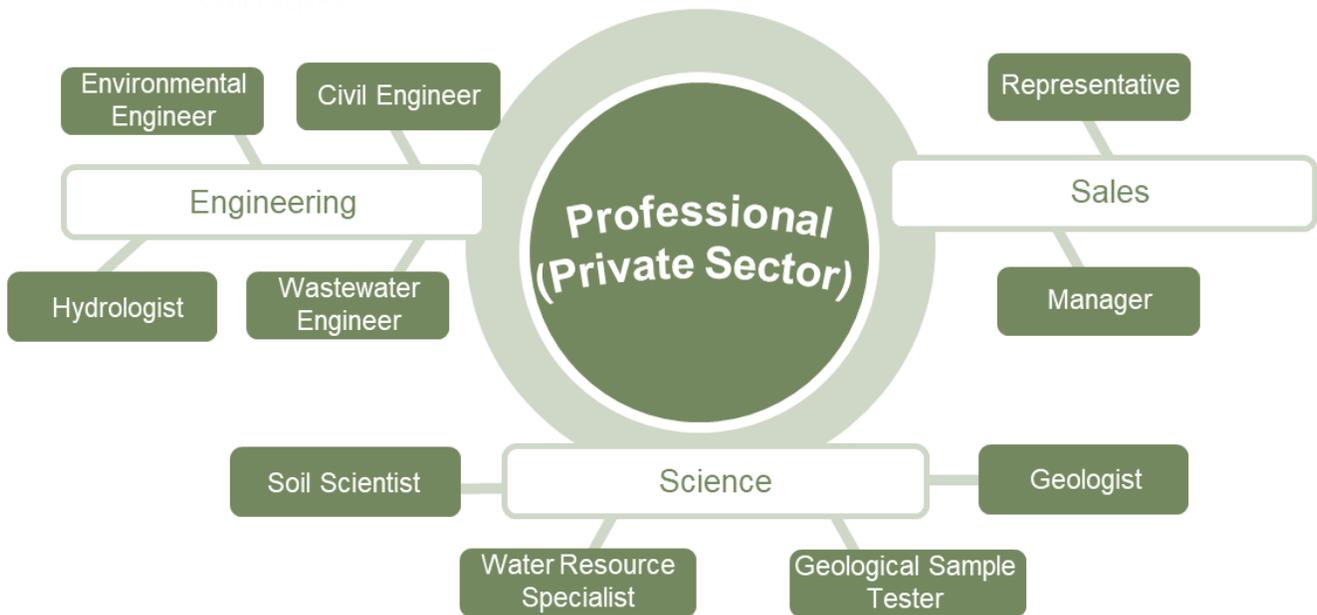


Highest Paying Career
Manufacturing Engineer Technologist (\$63K)

All data sourced from O*NET Online (2018) <https://www.onetonline.org/>

Career Pathway C: Professional (Private Sector)

Figure 7: Job Clusters and Occupations in the Professional Career Pathway



Overview of the Professional Career Pathway

The professional (private sector) occupations are typically university-educated individuals who have a bachelor's or graduate degree in environmental science, chemistry, or biology. Positions include engineers who design decentralized systems and experts on soil and groundwater. Soil Scientists are critical positions in this career pathway, as these workers inform installers and others as to the soil composition and the parameters for proper installation and long-term viability of a system. The Sales job cluster is also important, as decentralized businesses rely on representatives who can speak the “decentralized language” to interface with homeowners, contractors, and businesses.

Three of the eleven occupations in this career pathway are Bright Outlook jobs, and nine out of eleven are Green jobs. While these jobs do have strong job growth, they are not growing as fast as skilled trades (private sector) or regulatory (public sector) jobs. However, the Green jobs designation suggests rapidly changing requirements and the need to understand environmental impacts and the ability to design and oversee projects where new environmental practices or techniques are prevalent.

One important characteristic of this career pathway is that while these jobs do not employ as many people as other jobs, the occupations are highly skilled and often specialized. Soil Scientists and Water Resource Specialists are examples of critical positions to the decentralized industry that are highly specialized and require unique skills and analysis capabilities. Also, many of these jobs pay higher wages, as might be expected for jobs requiring at least a

Example Informal Titles for Jobs in the Professional Pathway

- Onsite Soil Evaluator
- Groundwater Consultant
- Environmental Consultant
- Water Reuse Manager

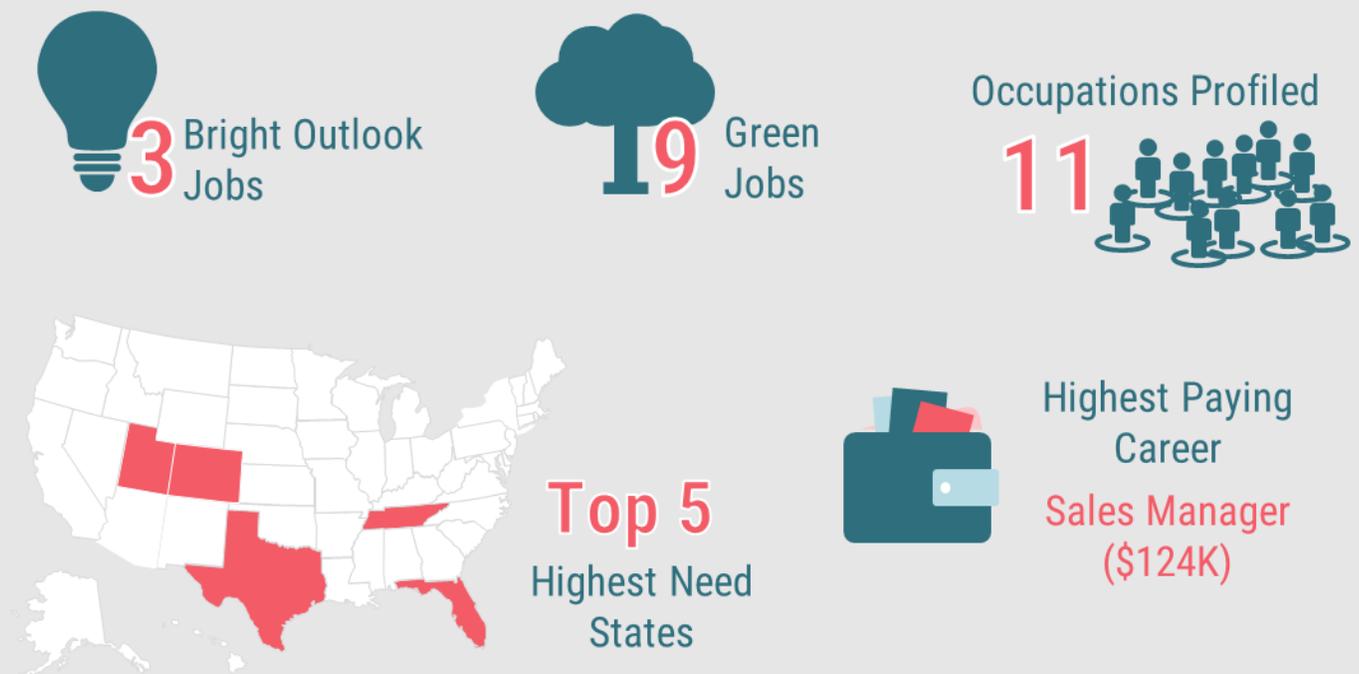
bachelor's degree. Within the professional (private sector) careers documented in this report, the average median hourly wage is \$41.49. This career pathway has a higher average annual wage than other career pathways at \$86,000. The highest-paying job in the professional career pathway is Sales Manager, earning an average of \$124,000 annually.

Findings: Professional Career Pathway

The following findings concerning the professional (private sector) career pathway are based on background research, feedback received during the 2018/2019 listening sessions, and the views of individuals who were interviewed.

- **Newly educated engineers have little exposure to decentralized wastewater systems and often rely on manufacturers to receive “informal” training experience.** A number of interviewees highlighted the lack of educational exposure to decentralized systems by engineers as a problem that impacts the workforce and the industry. In addition to a lack of functional knowledge of decentralized systems, engineers also lack exposure to soil science and the impacts of a system's design on soil and treated wastewater. Universities generally lack specific curricula and classes to address this issue. Many consulting engineers and small engineering firms provide informal training to their employees in the field.
- **Recruitment and replacement of soil scientists is critical, given the longer time required to educate and onboard.** An educated and trained soil scientist requires a background in chemistry, microbiology, geology and hydrology. Often, a new soil scientist requires 2-3 years of journey-level work to become well-versed in the decentralized field. Therefore, replacing and upskilling enough soil scientists is a time-intensive effort, and

Figure 8: The Professional Career Pathway by the Numbers

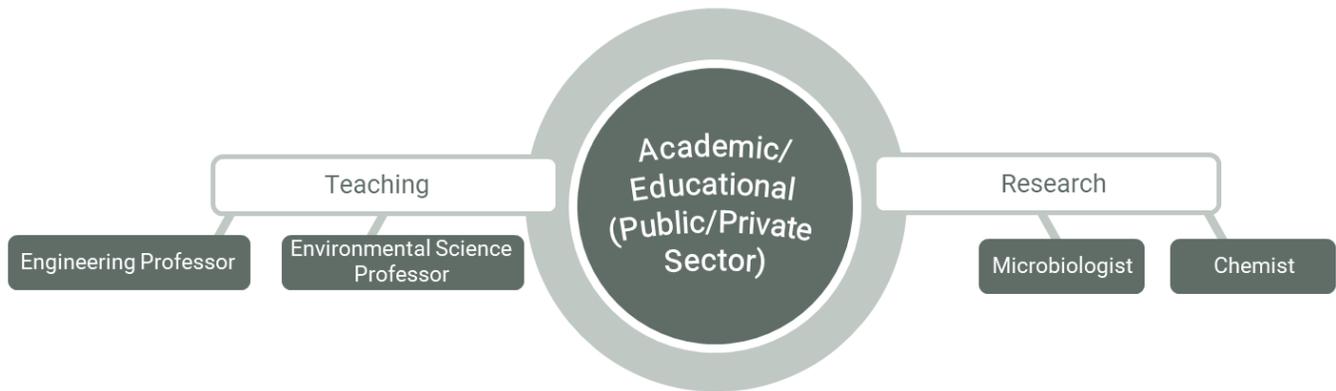


All data sourced from O*NET Online (2018) <https://www.onetonline.org/>

current shortages will only be exacerbated by the lack of individuals entering the field. Further, universities lack soil scientist programs, so there is a talent pipeline issue, as well.

Career Pathway D: Academic/Educational (Public/Private Sectors)

Figure 9: Job Clusters and Occupations in the Academic/Educational Career Pathway



Overview of Academic/Educational Career Pathway

The academic/educational career (public/private sectors) pathway is a hybrid discussion between jobs in academia and the research in decentralized topics and technologies that support the decentralized industry. Engineering Professor is the one occupation designated as Bright Outlook, but the larger issue is the small number of faculty who have experience to teach and conduct research in decentralized wastewater topics.

Interviewees within academia indicated a need for meaningful investment in research to create a foundation for graduate student involvement, courses and curriculum development, and student exposure to the decentralized wastewater industry. This fosters an ecosystem where research and teaching leads to more students exposed to the decentralized industry. Over time, this exposure bolsters the overall workforce as more people throughout several occupational areas have an understanding of, and grounding in, the decentralized industry. Within the academic/educational (public/private sectors) careers documented in this report, the average median hourly wage was \$40.17 and an annual average salary was \$82,500.

The academic/educational (public/private sectors) career pathway is characterized by a need for people in academia with expertise around decentralized concepts, combined with a research ecosystem that builds a foundational knowledge base among future decentralized industry employees.

Academic/Educational Pathway Informal Job Title Examples

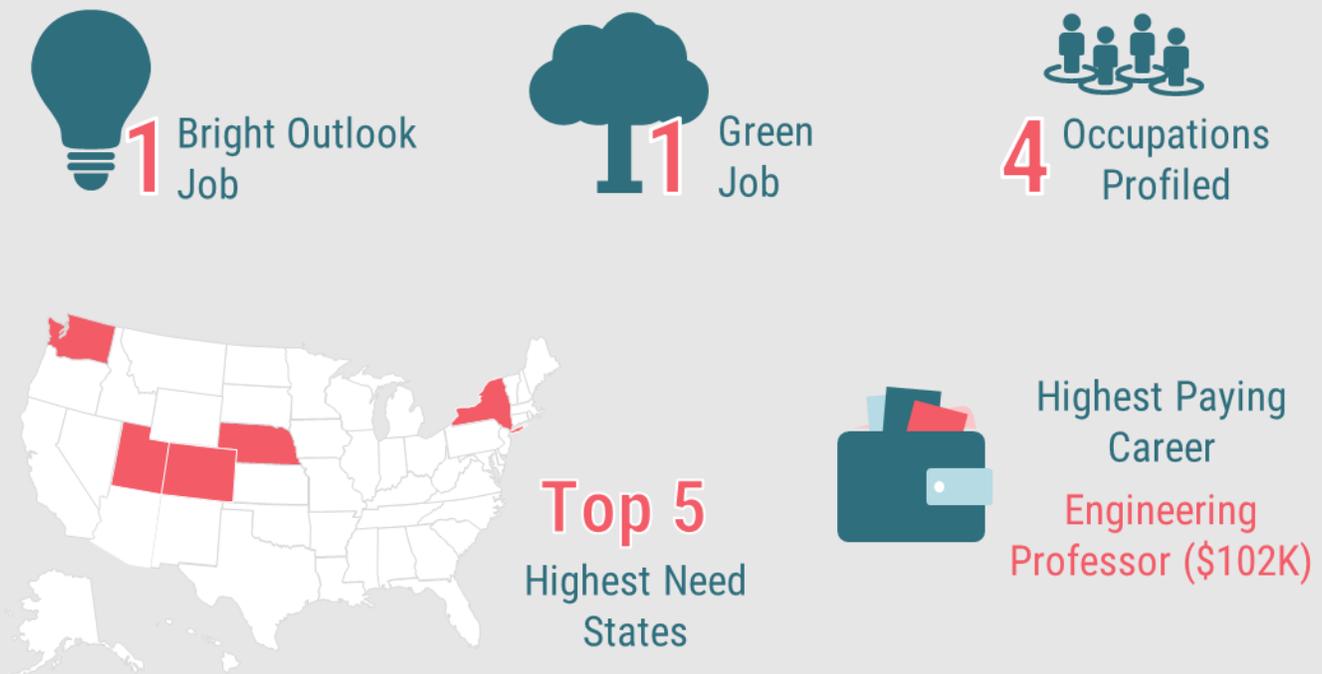
- Assistant Professor
- Associate Professor
- Instructor
- Faculty Member
- Chemical Engineering Professor

Findings: Academic/Educational Career Pathway

Based on research conducted and views of individuals who were interviewed, findings concerning the academic/educational (public/private sectors) career pathway include the following:

- **The decentralized wastewater industry's worker knowledge and skill base will stabilize and grow by building a strong research landscape that promotes both expertise and research opportunities in academia.** A number of interviewees with academia and related backgrounds indicated that expertise and research in the decentralized industry builds an educational environment where more students are exposed to the decentralized industry and enter employment with a knowledge set already in place. This decentralized educational environment includes student projects, graduate student teaching and research assistance, and a participatory academic setting that fosters experience and enthusiasm of decentralized wastewater topics.
- **Opportunities to conduct more decentralized wastewater research addresses workforce challenges in the academic settings themselves.** Having research in decentralized wastewater topics encourages students pursuing their Ph.D. degrees to focus dissertations on decentralized wastewater and gain exposure to the industry prior to employment or tenure. Thus, the environment bolsters experience and understanding within academic institutions themselves.

Figure 10: The Academic/Educational Career Pathway by the Numbers



All data sourced from O*NET Online (2018) <https://www.onetonline.org/>



Section 3: Lessons Learned and New Understanding

The following section includes an overview of the lessons learned and new understanding that emerged through research and interviews. These items are meant to provide a starting point for additional efforts to advance workforce practice for the decentralized sector. Key lessons learned and new understanding are organized into six categories:

- Decentralized Workforce Needs Exist and Are Growing
- Worker Competencies in Decentralized Occupations
- Decentralized Nature of the Industry
- Awareness of Opportunity
- Educational Materials
- Licensing Requirements

Decentralized Workforce Needs Exist and Are Growing

Research demonstrates and validates the need for strategies and outreach to fill workforce opportunities in the onsite/decentralized wastewater industry.

Discussions prior to the formation of the Steering Group and at the National Meeting in July 2019 centered around an urgent and pressing need to address decentralized/onsite workforce issues. However, examples of workforce shortages and a lack of public awareness of job opportunities in the decentralized industry were primarily anecdotal, where evidence and a need for defining “the problem” came into focus.

Research using recognized federal sources—ONET Online and the Bureau of Labor Statistics Occupational Projections—shows that the decentralized industry is facing a lack of workforce supply for many critical occupations across a span of public and private organizations and businesses. In particular, the regulatory (public sector) and skilled trades (private sector) career pathways have 13 out of 19 occupations profiled that are designated as Bright Outlook jobs and many of these jobs have projected 9–13 percent growth through the year 2028. For a full list of Bright Outlook jobs, visit Appendix B.

With “Green” technologies driving the decentralized industry, new systems being installed, and evolving public demands for clean water and environmental stewardship, the need for engineers, soil scientists, and university professors with decentralized wastewater expertise is critical. These occupations often have opportunities for mentoring and educating the next generation of workers contributing to a continuous and growing workforce.

Worker Competencies in Decentralized Wastewater Occupations

Workers with the potential to enter the sector often lack exposure to decentralized knowledge and skills. Basic skills, such as math and customer service, are a prerequisite for most decentralized jobs.

While more research conducted on specific decentralized-related competencies is needed at an individual occupation level, there is a universal lack of exposure to decentralized competencies across occupations. Although the U.S. Department of Labor has a larger, comprehensive [Water and Wastewater Competency Model](#), it does not address specific competencies needed by workers in the decentralized industry. However, as occupations were being profiled and developed, the issue of specific job competencies was examined, and interviewees were asked about aspects of competencies needed by workers.

A clear theme emerged around competencies that has important impact for future work—the decentralized industry faces a lack of exposure across numerous occupations and job clusters. Potential recruits often lack knowledge and skills concerning decentralized principles, approaches, and systems. Particularly, new, younger workers starting jobs as environmental health specialists or engineers receive little to no exposure to decentralized industry concepts in their formal education. Nevertheless, these employees’ responsibilities include regulating the decentralized industry or working on a decentralized system design.

Throughout conversations, interviewees expressed the need to prepare decentralized workers with educational basics, such as math, and noted that many positions require customer service and back-office skills, such as familiarity with computers, bookkeeping, communications, and other administrative functions.

- **Math is a critical skill needed by workers in the decentralized field.** A number of interviewees identified math as a critical skill needed in decentralized jobs. While basic chemistry and biology are important for understanding how decentralized systems work, math is needed throughout all jobs, from blueprint reading to calculations used when digging a trench for a system. Math is a skill that workers apply in the skilled trades (private sector) jobs throughout all job clusters.
- **Customer relations and communication skills are overlooked but remain critical.** Beyond the technical and quantitative skills of math, chemistry, and biology, the decentralized industry needs training on customer relations and communications. One interviewee shared, “Entry-level skilled trades should require customer relations skills. These are essential, but there is no opportunity to learn them.” Familiarity with customer-facing services, bookkeeping, and general communications are all necessary parts of the skilled trade workforce.

Future research addressing occupational shortages in the decentralized industry should incorporate development of education and training to address competency development on a wide-scale basis.

Decentralized Nature of the Industry

The “decentralized” nature of the decentralized wastewater industry presents challenges in addressing workforce needs and issues with a unified voice.

The decentralized wastewater industry is spread throughout all states, tribal lands, and U.S. territories, with business owners and employees scattered among many different occupations and lines of business. Given the disparate nature of the decentralized industry, it is challenging to develop a unified voice around an issue like workforce development. People connected to the industry understand there is a problem but are uncertain how to define and address it.

The Steering Group was an initial attempt to convene various stakeholders with a wide array of views and perspectives and develop one voice with consistent messaging. This report begins to identify and validate decentralized workforce issues, but, going forward, there will be competing demands across the career pathways. Decentralized participants and stakeholders will need to continue working together to address the workforce supply across several occupations.

Awareness of Opportunity

There is a need to increase community awareness on the availability and attractiveness of decentralized industry employment.

Decentralized wastewater jobs provide competitive wages, reliable employment, and a way to truly make a difference in communities by protecting public health and the environment. Many potential industry recruits are unaware of the value and opportunities for a decentralized career. Developing the next generation of water protection specialists requires early engagement of America’s youth to promote awareness of the promising career opportunities available in the water sector.

This challenge is one that is faced by both the decentralized and centralized water industries, but the very “decentralized” nature of the former is an additional barrier to large-scale recruitment and messaging to potential employees. This often means that workers with the necessary skills are unaware of the availability of decentralized jobs and may be exposed to jobs with a more centralized recruitment process, such as drinking water and wastewater utilities, environmental remediation, centralized system design, or the oil and gas industries.

Effective and modern communication to promote the attractiveness and availability of decentralized wastewater workforce employment will be integral to raising community awareness and increasing recruitment opportunities for decentralized employers. A career in decentralized work can provide an individual with a sense of mission and contribute to safeguarding public health and the environment. Beyond raising awareness about the value and contribution of the decentralized industry broadly, specific efforts should be made to increase collaboration and partnership at the regional and grassroots level with emphasis on targeted outreach to high schools, community colleges, and universities.

Educational Materials

Although decentralized wastewater educational materials exist, much of it requires updating and customization to match location-specific needs or reflect new technologies.

Many stakeholders expressed concern regarding the lack of updated and relevant curriculum. As it stands, college students receive little exposure to decentralized concepts, as the topic remains a small component of college courses. Where there is interest in incorporating decentralized content, educators often face the challenge of outdated curriculum and materials. To build a robust decentralized workforce, more strategic focus on developing “demand-driven” course content through partnerships between the decentralized industry private sector and educators should occur. This way, the private sector continually provides feedback on needed skills and competencies, new technologies, and emerging changes that can be adopted into curriculum, courses, and college programs.

Licensing Requirements

The decentralized industry is primarily regulated at the state level, which impacts the approach to training the decentralized workforce.

Research on decentralized occupations and how to attract, recruit, and retain new workers highlighted a critical challenge: variations in state requirements for individual jobs. Sometimes the state-by-state inconsistencies manifests in what is required for certain workers, particularly in skilled trades (private sector). For example, to install a septic system in one state requires a general contractor’s license, while in another state farmers can install systems for their own facilities. In certain states and jurisdictions, the decentralized industry is highly regulated and structured; for other states it is not.

This creates potential tension between the regulators and the private sector. Manufacturers, installers, and servicers may feel they have advanced systems and processes, and the regulators are behind. Regulators may be constrained by outdated legislative statutes. For states that have less stringent regulations, environmental proponents fear issues, such as tanks being placed too close to water bodies or drinking water sources.

These state-by-state and jurisdictional differences cause knowledge and skill disparities among workers in various states holding the same, or similar, occupations. In a state with rigorous licensing requirements, a worker must learn more and demonstrate competency before working on a decentralized project or system. Meanwhile in a less stringent state, employers are going to employ people who meet the more basic requirements of that state, and those workers may lack the skills needed to do work in a different state or jurisdiction.

Opportunities exist to build a skilled and knowledgeable decentralized workforce across states by developing peer networks, online and virtual training environments, and state-by-state data. While technical expertise can be very localized depending on wastewater needs across states and different geographies (e.g. soil types), there is similarity in the basic science and practical applications that can be shared.

Conclusion

Jobs in the water sector provide stable employment, meaningful careers, useful technical skills, and a chance to make a real difference in communities. Even so, many stakeholders have expressed concern that the decentralized wastewater industry is facing shortages of skilled workers for many jobs and that the expected wave of retirements will exacerbate this already critical shortage. In response, industry stakeholders have supported the development of a strategic framework to ensure the availability and preparedness of a decentralized workforce now and in the future.

This report provides an important first step in the strategic framework. It collects, organizes, and presents data to inform and create a basis for a shared understanding of the nature of the problem and what steps can be taken to rectify it. Most importantly, through the data collected using federal government labor market information and interviews of various decentralized industry experts, this report validates there is a workforce shortage and provides specifics and details on high-need occupations and job characteristics. With this foundation, concrete steps can be taken to build the decentralized workforce and support continued growth and well-paying jobs in each of the career pathways.

One immediate next step is capturing best practices in decentralized education and training and working to expand these practices to other states and postsecondary institutions. Specifically, job growth opportunities in the public health/regulatory (public sector) pathway and the skilled trades (private sector) pathway provide a symbiotic opportunity to expose and train workers in these fields. By doing so, as public and private sector workers become more knowledgeable and experienced in the decentralized field, they can work together to improve the oversight processes of decentralized systems in local communities.

Another step is to develop regional and collaborative state approaches to licensing and the decentralized workforce. Regionalism is an important concept in economic and workforce development, and this framework provides an opportunity for states to share standards and work together to support clean water initiatives using decentralized wastewater solutions as a strategy.

Finally, this report validates the passion and belief among various stakeholders on the value of the decentralized industry as an important part of providing wastewater treatment and removal services. Opportunities exist to “think out of the box” about how to continually educate students and attract workers to the decentralized industry. Creative thinking and messaging and using tools that reach diverse segments of the U.S. population are needed to solve the decentralized workforce challenge. Decentralized workers are wanted and needed. The diversity of jobs in the decentralized industry is also a strength, and there are many voices and talents needed. Continued strategic thinking and action will build and foster a robust decentralized workforce.



Appendix A: Wage Information for Decentralized Occupations

Job Name	Annual Median Wage
Academic/Educational	
Chemist	\$76,890
Engineering Teachers, Postsecondary	\$101,720
Environmental Science Teachers, Postsecondary	\$79,910
Microbiologist	\$71,650
Private Sector/Professional Positions	
Civil Engineer	\$86,640
Civil Engineering Technician	\$71,130
Environmental Engineer	\$87,620
Geological Sample Test Technician	\$53,620
Geoscientist	\$92,040
Hydrologist	\$79,370
Sales Manager	\$124,220
Sales Representative	\$79,680
Soil and Plant Scientist	\$63,950
Wastewater Engineer	\$87,620
Water Resource Specialist	\$123,860

Job Name	Annual Median Wage
Public Sector/Regulatory	
Compliance Manager	\$71,130
Environmental Compliance Inspector	\$68,860
Environmental Health Specialist	\$71,130
Environmental Health Technician	\$46,170
Occupational Health and Safety Specialist	\$73,020
Occupational Health and Safety Technician	\$50,780
Skilled Trades	
Earth Driller	\$44,430
Electrician	\$55,190
Electrician Apprentice	\$31,410
Equipment Operator	\$35,800
Excavating and Loading Machine Dragline Operator	\$44,270
Installation, Maintenance, and Repair Worker	\$39,320
Licensed Plumber	\$53,910
Plumbing Technician	\$30,980
Manufacturing Engineering Technologist	\$63,200
Manufacturing Production Technician	\$63,200
Pipelayer	\$38,560
Tank Servicer/Sewer Pipe Cleaner	\$38,970
Water and Wastewater Treatment Plant System Operator	\$46,780



Appendix B: Bright Outlook Jobs

Decentralized systems provide critical clean water services to families and communities across the nation. The need for decentralized professionals is anticipated to grow in the future. Of the 34 jobs profiled, 17 are designated by the federal government as “Bright Outlook” jobs ([ONET](#)). Bright outlook jobs are occupations expected to grow rapidly in the next several years or to have large numbers of job openings. Over 55 percent of professions within wastewater are considered fast-growing careers.



Bright Outlook Jobs Organized by Career Pathway
Academic/Educational (Public and Private Sectors)
Engineering Teacher, Post-Secondary
Professional (Private Sector)
Hydrologist
Geological Sample Test Technician
Soil and Plant Scientist
Regulatory (Public Sector)
Compliance Manager
Environmental Health Technician
Environmental Health Specialist
Occupational Health and Safety Technician
Skilled Trades (Private Sector)
Earth Driller
Electrician Apprentice

Bright Outlook Jobs Organized by Career Pathway

Electrician

Equipment Operator

Excavating and Loading Machine Dragline Operator

Pipelayer

Tank Servicer/Sewer Pipe Cleaner

Licensed Plumber

Plumbing Technician



Appendix C: Green Jobs

The technologies available for the design, installation, maintenance, and operation of decentralized systems continues to advance at a fast pace. Decentralized workers are increasingly working with innovative technologies, such as smart systems and advanced treatment technologies. Over half of decentralized occupations are categorized by the federal government as “Green Jobs” ([ONET](#)). Of the 34 occupations profiled, 20 fall into this category. This designation denotes professions within wastewater that are likely to change due to the implementation of new technologies or environmentally-focused practices. Below is a list of decentralized “Green Jobs.”



Green Jobs Organized by Career Pathway

Academic/Educational (Public/Private Sectors)

Chemist

Professional (Private Sector)

Sales Representative

Civil Engineer

Environmental Engineer

Geological Sample Test Technician

Geoscientist

Hydrologist

Soil and Plant Scientist

Water/Wastewater Engineer

Water Resource Specialist

Green Jobs Organized by Career Pathway

Regulatory (Public Sector)

Compliance Manager

Environmental Health Technician

Environmental Health Specialist

Occupational Health and Safety Specialist

Occupational Health and Safety Technician

Skilled Trades (Private Sector)

Electrician

Equipment Operator

Licensed Plumber

Manufacturing Engineering Technologist

Manufacturing Production Technician

Appendix D: Occupational Profiles

Figures 11 and 12 provide a key to reading these occupational profiles. All data sourced from O*NET Online (2018) <https://www.onetonline.org/>

Figure 11: Key Information Included in on Occupational Profiles Page 1

Green Jobs: “Green” occupations are ones that will likely change due to environmentally-friendly practices and implementation of new technologies. (ONET Online designation)

Bright Outlook: “Bright Outlook” jobs are occupations expected to grow rapidly in the next several years or will have large numbers of job openings. (ONET Online designation)

Sample Job Titles: These are the various job titles used by employers that the occupational profile covers.

Key Tasks: This list is not exhaustive but represents many of the key tasks identified by employers for workers in the occupation.

OCCUPATIONAL PROFILE

Environmental Health Specialist (19-2041.00)

At-a-Glance Statistics  

Sample Job Titles

Environmental Analyst, Environmental Health and Safety Specialist, Environmental Programs Specialist, Environmental Protection Specialist, Environmental Scientist, Environmental Specialist, Hazardous Substances Scientist, Registered Environmental Health Specialist (REHS), Research Environmental Scientist, Senior Environmental Scientist

Key Tasks

- Provide scientific or technical guidance, support, coordination, or oversight to governmental agencies, environmental programs, industry, or the public
- Review and implement environmental technical standards, guidelines, policies, and formal regulations
- Collect, synthesize, analyze, manage, and report environmental data
- Communicate scientific or technical information
- Provide advice on proper standards and regulations or the development of policies, strategies, or codes of practice for environmental management
- Conduct environmental audits or inspections or investigations of violations
- Monitor effects of pollution or land degradation and recommend means of prevention or control
- Design or direct studies to obtain technical environmental information about planned projects
- Analyze data to determine validity, quality, and scientific significance and to interpret correlations between human activities and environmental effects
- Evaluate violations or problems discovered during inspections to determine appropriate regulatory actions or to provide advice on the development and prosecution of regulatory cases
- Process and review environmental permits, licenses, or related materials
- Supervise or train students, environmental technologists, technicians, or other related staff
- Investigate and report on accidents affecting the environment
- Conduct applied research on environmental topics, such as waste control or treatment or pollution abatement methods

All data sourced from O*NET OnLine (2018) <https://www.onetonline.org/>.

Figure 12: Key Information Included in on Occupational Profiles Page 2

Education and Training: This represents the level of education and training required for the occupation. For instance, if it states “70% Bachelor’s Degree,” then 70% of employer respondents stated that a Bachelor’s Degree is needed for the identified position.

Median Wages: Median wages (half of workers in this occupation work below this wage and half work above this wage) are listed by hourly wage and annual salary.

Top Industries: These are the primary industries that workers in this occupation are employed.

Number Employed: List current number employed in the occupation and projected number employed in the occupation.

Projected Job Openings: Provides most recent information on projected openings and any designation or ranking.

Occupational Growth by State: Provides a snapshot of what the occupational demand will be for the top states ranked by percentage growth.

