

SAN DIEGO COUNTY LABOR MARKET ANALYSIS

BLUE ECONOMY

NOVEMBER 2016



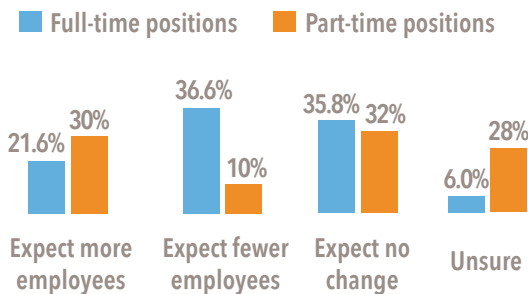
San Diego’s Blue Economy is a sector that encompasses a variety of industries, including Advanced Manufacturing, Information and Communication Technologies (ICT), innovation, military or defense and tourism. Within the Blue Economy are Blue Technology or “BlueTech” jobs, referring to technologically-advanced activities and methods to solve water-related issues, and traditional maritime occupations that increasingly incorporate BlueTech into their work. This study serves to inform the workforce development system on how to better prepare the future workforce by analyzing job growth, hiring challenges and skills in demand from Blue Economy employers.

OVERVIEW OF THE BLUE ECONOMY IN SAN DIEGO COUNTY

San Diego’s Blue Economy includes more than 1,400 local companies, supports over 45,000 jobs and generates over \$14 billion in direct sales. Businesses are primarily small- to medium-sized with approximately 72% of the employers surveyed employing 25 workers or fewer.

Overall, employers expect to have more part-time workers in the next two years than full-time workers: 30% of employers expect more part-time workers and 36.6% expect fewer full-time workers.

Employer Expectations of Full- and Part-Time Employees in Two Years

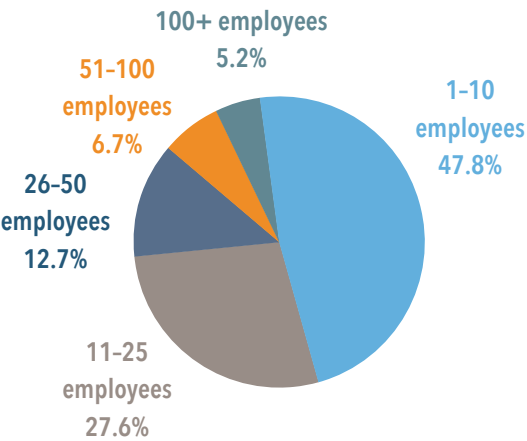


Blue Economy employers reported that their greatest challenge in the next two years is *employee recruitment and retention*.

Greatest Challenges in Two Years Cited by Number of Employers



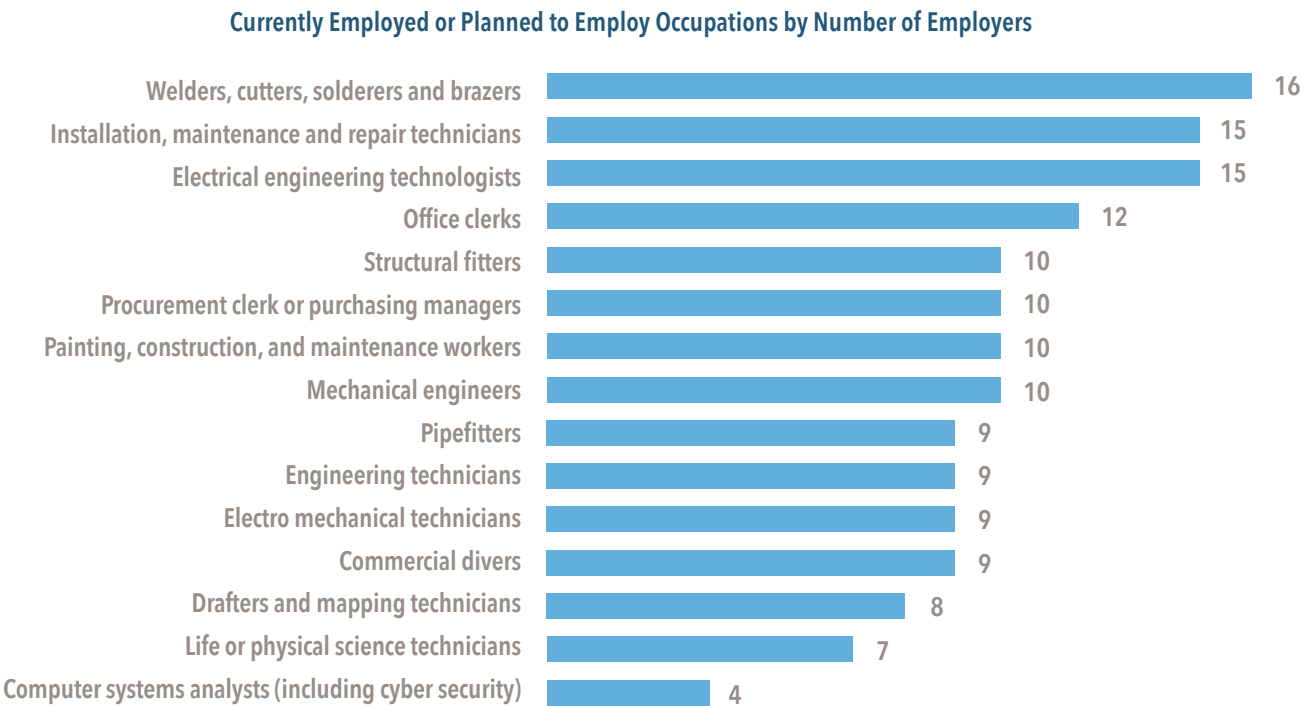
Breakdown of Surveyed Employers By Employment Size



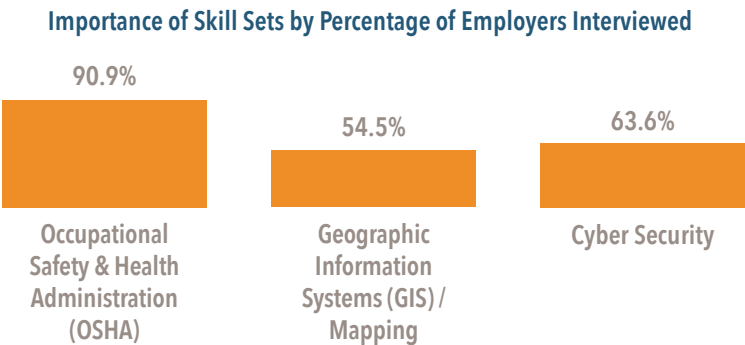
This study highlights 15 BlueTech and traditional maritime occupations that compose a majority of San Diego’s Blue Economy:

1. Commercial divers
2. Computer systems analysts (including cyber security specialists)
3. Drafters and mapping technicians
4. Electrical engineering technologists
5. Electro mechanical technicians (including robotics)
6. Engineering technicians
7. Installation, maintenance and repair technicians
8. Life or physical science technicians
9. Mechanical engineers
10. Office clerks
11. Painting, coating and decorating workers
12. Pipefitters
13. Procurement clerks or purchasing managers
14. Structural fitters (including aircraft, structures, surfaces, rigging and systems assemblers)
15. Welders, cutters, solderers and brazers

Welders, cutters, solderers and brazers was the top occupation that the majority of employers surveyed currently employ or plan to employ, followed by installation, maintenance and repair technicians, and electrical engineering technologists. Employers also indicated a number of important occupations in interviews and surveys that were not in this list, including surveyors, marine engineers, plumbers, sales positions, merchant mariners and more.



Knowledge of OSHA was an important skill set that approximately 90.9% of employers identified, followed by cyber security skills (63.6%), and GIS and mapping capabilities (54.5%).



Other specialized skills and credentials employers valued include:

- Electro-mechanical assembly training
- LEED certification
- PPE for engineering occupations
- Project management certification
- Merchant mariner documentation
- SCUBA diving certification
- America Congress Survey & Mapping (ACSM) certified hydrographers

RECOMMENDATIONS

- Career counselors and educators who have job seekers or students interested in the Blue Economy should develop techniques on how to focus and conduct job search towards small companies
- Invest more funding in programs that provide youth with first-time exposure and training in the maritime industry
- In the follow up study to this report, identify specifically whether companies want to engage in international trade; some businesses may want to engage in international trade but lack the resources/guidance to start
- Focus on understanding why employers plan to have more part-time workers in the next two years instead of full-time workers to see if there are opportunities for full-time employment and develop workforce programs accordingly
- Since employers are looking to fill more part-time positions, connect Blue Economy employers with more internship opportunities as a type of “try before you buy” model in hiring

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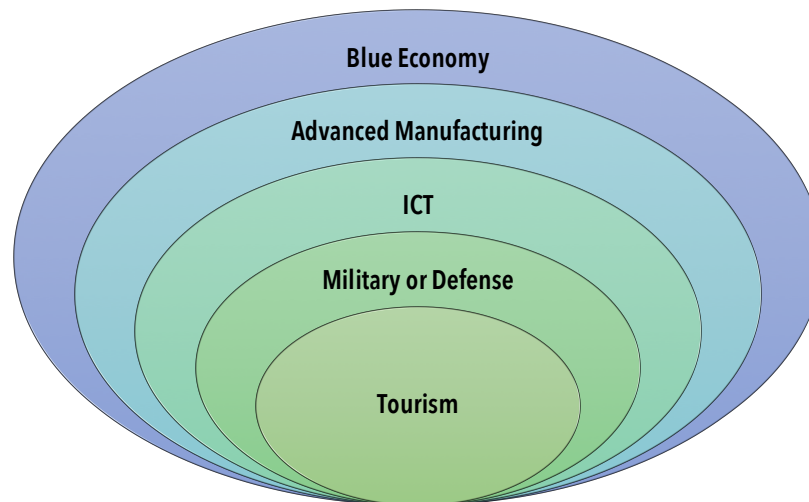
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INTRODUCTION

Vital to the economy, security and survival of mankind, oceans are one of the world's most valuable natural resources. Oceans account for approximately 97 percent of the world's water supply, provide one-sixth of the animal protein consumed and are valuable sources of minerals and crude oil,¹ yet the types of jobs and industries within this "blue economy" remain relatively unknown for job seekers in San Diego County. San Diego's Blue Economy encompasses innovative water-related products and services, internationally renowned academic institutions, an enormous Navy presence and technologies that range from small sensors to sophisticated maritime robotics. Blue Technologies are developed for academic, recreational, commercial, government and military uses. For example, SPAWAR Systems Center (SSC-Pacific) is the Navy's technical leader for integrated Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) solutions. San Diego also houses four of the six world leaders in manufacturing Acoustic Doppler Current Profilers (ADCPs) and develops Blue Technologies that are heavily export-oriented. The Paris-based Organization for Economic Cooperation and Development (OECD) projects that the global "Ocean Economy" will grow from \$1.5 trillion in 2010 to \$3.0 trillion by 2030. The Ocean Economy includes industries such as offshore wind, tidal and wave energy, oil and gas exploration, offshore aquaculture, seabed mining, cruise tourism, maritime surveillance and marine biotechnology.² As part of this Ocean Economy, San Diego is well-positioned to benefit from the economic and workforce growth generated in this industry sector.

With its strong naval history and presence, coastal location and reputation for technological innovation, San Diego is a prime location for water-related innovation and jobs. The Blue Economy is a diverse sector that encompasses various industries, including Advanced Manufacturing, Information and Communication Technologies (ICT), innovation, military/defense and tourism (Figure 1).

Figure 1: Blue Economy Ecosystem



Jobs within the Blue Economy are typically characterized as either "BlueTech" or traditional maritime occupations. Blue Technology or "BlueTech" refers to technologically-advanced activities and methods

¹ "Why protect our oceans?" Marine Conservation Institute. marine-conservation.org/what-we-do/advocate/why-we-protect-our-oceans.

² oecd.org/sti/the-ocean-economy-in-2030-9789264251724-en.htm

used to solve water-related issues. BlueTech innovations include clean water technologies, advanced conservation methods, maritime robotics and ocean science. Traditional maritime occupations include shipfitters, welders, drafters and pipefitters that fall in the shipbuilding, fishing and manufacturing industries. BlueTech is an increasingly important component of traditional maritime activities and is especially integral in San Diego where the U.S. Navy, military and other defense industries are in need of technological innovation.³ Consequently, traditional maritime jobs increasingly incorporate Blue Technologies, repurposing traditional occupations with technologically advanced equipment and skills. These repurposed traditional occupations are defined in this study as “BlueTech jobs.”

This study is intended to broaden public understanding of San Diego’s Blue Economy and its BlueTech jobs by highlighting workforce needs and opportunities, and educating policymakers, educators, job seekers and the public on the importance of the Blue Economy as an expanding industry sector with opportunities for meaningful employment.

This study was commissioned by the San Diego Workforce Partnership, in partnership with The Maritime Alliance (TMA),⁴ and will be used for industry-specific strategies to develop San Diego’s workforce as it relates to the Blue Economy. Data for this study was collected from online employment statistics and staffing patterns, and from more than 150 respondents to employer surveys and executive interviews, with help from ERISS Corporation and TMA.

INDUSTRY SECTOR OVERVIEW

San Diego’s Blue Economy is made up of over 1,400 local companies and organizations, supports more than 45,000 jobs and generates over \$14 billion in direct sales.⁵ California alone has 11 public ports — three mega ports and eight smaller niche ports, including San Diego.⁶ San Diego’s world-class port generates about \$7.6 billion for the region’s economy and is one of only 17 commercial “strategic ports,” designated to support cargo and vessel operations for the U.S. military’s Transportation Command and Military Sealift Command.⁷ The shipbuilding and repair industry, as well as its ripple effects, contributes \$1.75 billion to the region’s total Gross Regional Product (GRP).⁸ General Dynamics NASSCO, for example, secured enough contracts in 2014 to build 10 ships worth over \$1.3 billion, creating a need for 3,800 jobs. Their workers earned an average of \$80,000 a year in wages and benefits.⁹ These are just some examples of the Blue Economy’s diverse companies and industries.

To better understand this diversity, 1,747 employers were identified as the target population for this study’s survey. Of the 1,747 employers, 134 responded to online surveys and 15 responded to in-person interviews. Companies that self-identified as being a part of, a supplier to, or a customer of the Maritime Industry, Blue Economy or BlueTech Cluster (meaning any ocean- or water-related company) were included in this study as a Blue Economy company. This includes companies that fall under

³ “San Diego welcomes international maritime technology trade show,” 17 Mar 2016. sandiegobusiness.org/sites/default/files/Blue%20Tech%20Press%20Release.pdf.

⁴ themaritimealliance.org

⁵ “San Diego welcomes international maritime technology trade show.” The Maritime Alliance. sandiegobusiness.org/sites/default/files/Blue%20Tech%20Press%20Release.pdf.

⁶ Seaports, California Department of Transportation. 2007. dot.ca.gov/hq/tpp/offices/ogm/seaports.html.

⁷ “Ports bring home the goods.” Port of San Diego. portofsandiego.org/portals/working-waterfront.html.

⁸ Maritime Industry. San Diego Regional EDC. Jun 2016. sandiegobusiness.org/sites/default/files/Maritime%20Profile_1.pdf.

⁹ Maritime Industry, San Diego Regional EDC. Jun 2016. sandiegobusiness.org/sites/default/files/Maritime%20Profile_1.pdf.

traditional maritime, BlueTech, and/or related industries.¹⁰ Traditional maritime includes core industries such as fishing, ocean shipping, port activities and shipbuilding. Related industries include businesses that conduct maritime-related activities, but also provide goods and services to companies or customers outside of the maritime industry. BlueTech includes companies that focus on water-related technological services or goods, or companies that are traditionally maritime, but use high-tech equipment. Examples of BlueTech firms include research and development firms or institutions.¹¹

Additionally, San Diego's Blue Economy includes companies that:

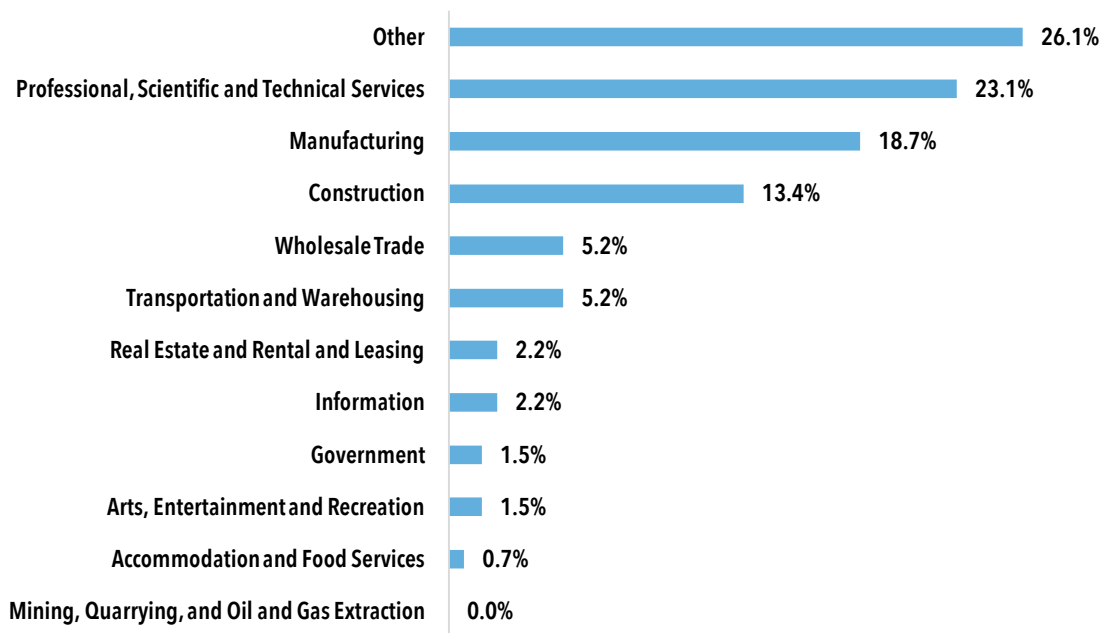
- Develop unmanned underwater vehicles and sensors that gather and monitor data from the surface to the ocean floor to provide insight into the ocean environment
- Specialize in development and production of reverse-osmosis membranes used in the desalination, industrial water, storm water and wastewater treatment process
- Produce underwater cables and connectors
- Develop new ways to raise fish, or aquafarming, and manufacture technologies to monitor the surrounding environment (the ability to recreate in a lab what took nature millennia to develop in the ocean, or biomimicry, is an emerging field that holds great potential for curing disease and enriching our lives)

Of the 1,747 employers, 134 companies selected their primary industry from a list of 12 industries in response to surveys for this labor market report. More than twenty-three percent of employers surveyed identified *Professional, Scientific and Technical Services* as their businesses' primary industry, followed by *Manufacturing* (18.7 percent) and *Construction* (13.4 percent). More than 26 percent of employers selected *Other* as their primary industry, listing industries such as metal fabrication, retail, electrical work, ship repair, glass work and more (Figure 2).

¹⁰ Traditional maritime industries: Industries that deal with maritime activity (e.g. fishing, ocean shipping, ports, etc.). Blue technology or "BlueTech": industries with businesses central to maritime technology.

¹¹ Maritime Industry. San Diego Workforce Partnership, The Maritime Alliance, EDC and ERISS. 2012.

Figure 2: Primary Industry Identified by Blue Economy Employers¹²



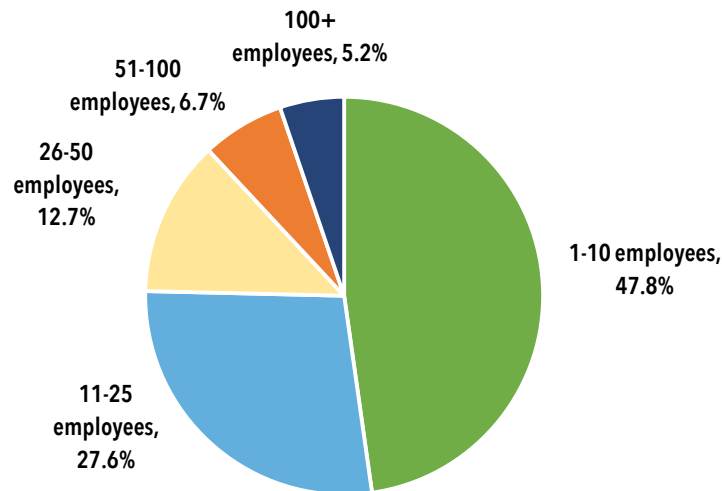
Employers identified with a variety of *other* industries, which is indicative of the diverse nature of the Blue Economy. Employers who identified their primary industry as “other,” listed the following categories:

- Metal fabrication
- Water diving
- Industrial
- Utility locating underground and consulting
- Boat rentals
- Retail
- Recreation
- Boats
- Yacht and boat repair
- Upholstery
- Tourism
- Unmanned marine systems
- Maritime
- Glass installation
- Electrical
- Payroll management
- Water company
- Glass
- Ship repair
- Underground utilities
- Yacht sales
- Marina management
- Sell parts for boats
- Electrical engineering
- Shipyards

Ninety-five percent of all San Diego County’s businesses are known to employ less than 50 employees, and the Blue Economy follows this trend.¹³ The majority of businesses surveyed reported employing 25 employees or less, while 5.2 percent of businesses employ more than 100 workers (Figure 3).

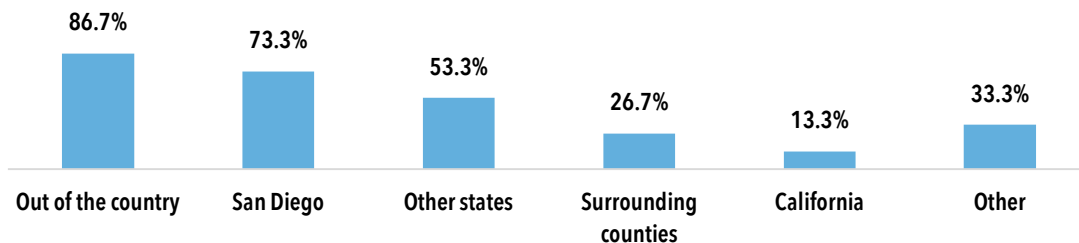
¹² n = 134

¹³ Workforce Needs of Small Businesses. San Diego Workforce Partnership. Center of Excellence. Nov 2015.

Figure 3: Employers Surveyed By Employee Size¹⁴

Industry Supply Chain

San Diego's shipping industry encompasses a significant portion of the Blue Economy and affects the rest of the world. Because nearly 90 percent of all freight travels across the ocean in ships,¹⁵ employers indicated that the Blue Economy's supply chain network impacts all aspects of the local and international economies. While the majority of employers interviewed (73.3 percent) reported procuring their supplies locally in San Diego County, more than 86 percent of Blue Economy employers reported procuring supplies and goods out of the country (Figure 4).

Figure 4: Percent of Employers Identifying Locations of Suppliers in San Diego's Blue Economy¹⁶

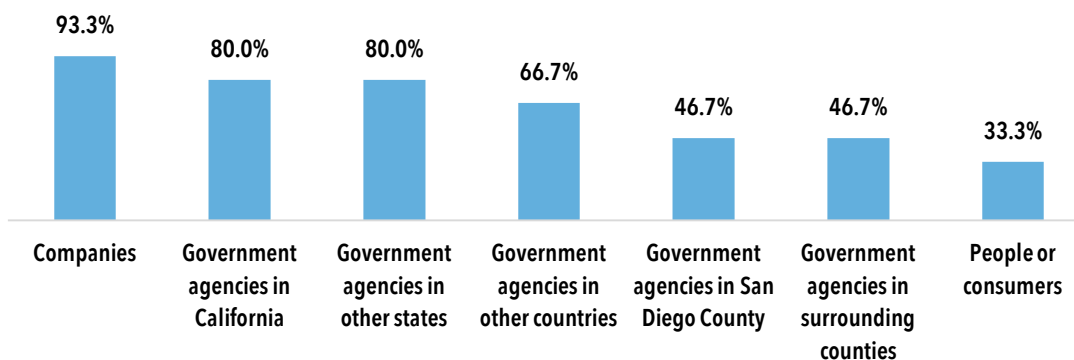
In addition to suppliers, the employers surveyed reported a variety of buyer types. Key buyers in the Blue Economy include private industry companies (93.3 percent), as well as a variety of governmental entities in California (80 percent), in other states (80 percent) and in other countries (66.7 percent). Two-thirds of employers identify foreign governments as customers, and almost half sell to San Diego County or to neighboring counties. Perhaps the most surprising result is the number of companies who are final producers in a consumer supply chain: one-third of respondents sell their goods or services to final consumers (Figure 5).

¹⁴ n = 134

¹⁵ theatlantic.com/international/archive/2013/08/shipping-industry-bigger-you-can-imagine/312253

¹⁶ n = 134

Figure 5: Percent of Employers Identifying the Types of Buyers in San Diego's Blue Economy¹⁷



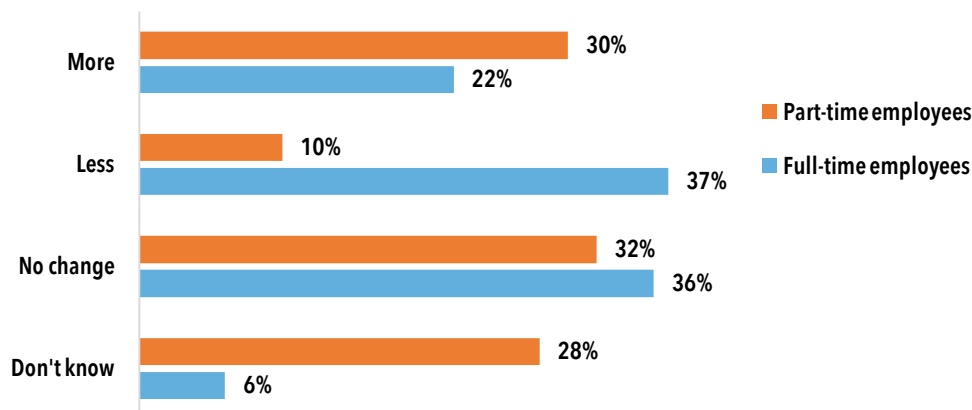
This simple analysis of Blue Economy suppliers and buyers provides an opportunity for the workforce development system to better understand the dynamics of the supply chain, its employment opportunities and connections to various jobs. Not only are there employment opportunities within the Blue Economy companies themselves, but also in the companies' supply chain as there are 93.3 percent of companies that reported selling directly to other businesses. Any economic or workforce development efforts that directly impact Blue Economy businesses may indirectly affect the companies in the supply chain as well.

FULL-TIME VS. PART-TIME EMPLOYMENT

Many companies in the Blue Economy are cyclical in nature and depend significantly on the oil and gas industry as a major buyer. "With most of the developing world in an economic slowdown, prices for coal, iron ore and crude oil are all likely to remain depressed for the next few years."¹⁸ This can affect Blue Economy employers who have customers that rely on oil and gas revenue to fund projects. As a result, hiring may also be cyclical or seasonal, with more part-time workers than full-time workers. This is representative in the employer survey responses: Overall, employers surveyed expect to have more part-time workers in the next two years rather than full-time workers. Just 22 percent of employers expect to have more full-time workers two years from now as opposed to 37 percent that expect fewer full-time workers and 36 percent that expect no change in their number of workers (Figure 6).

¹⁷ n = 134

¹⁸ "IHS identifies top five trends in 2016 that will shape the global maritime industry for the coming decade." HIS Markit. 18 Nov 2015. press.ihs.com/press-release/maritime-trade/ihs-identifies-top-five-trends-2016-will-shape-global-maritime-industry.

Figure 6: Percent of Employers who Anticipate Growth or Decline in Part- or Full-Time Employees in the Next Two Years¹⁹

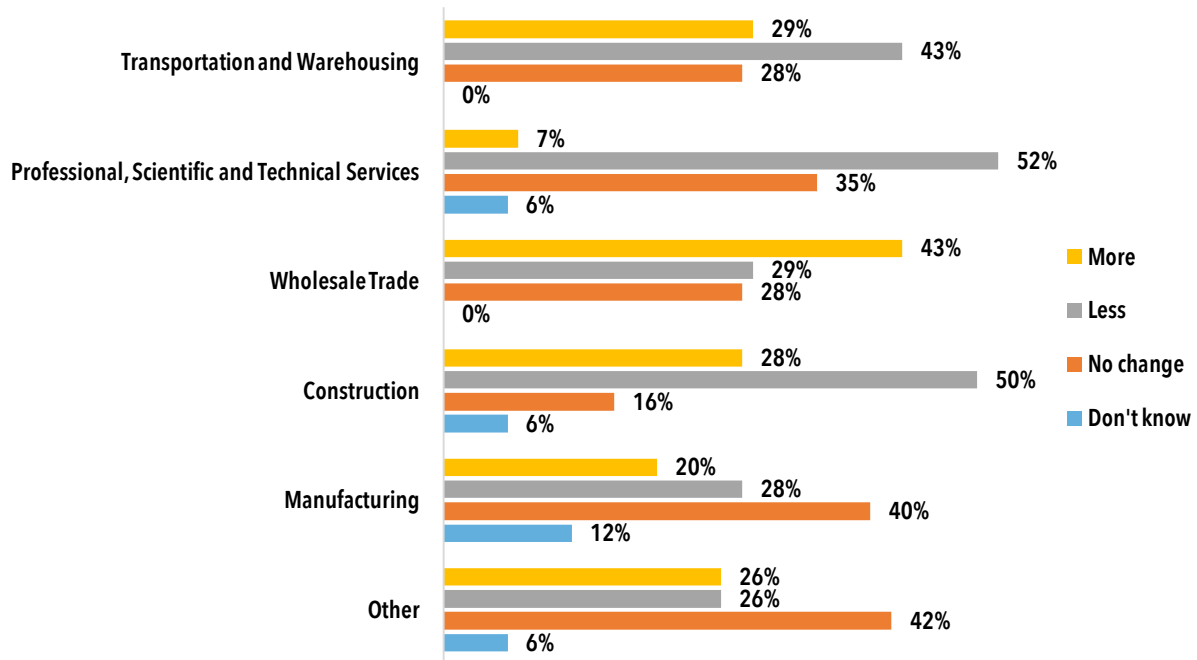
It is important to note that a combined 72 percent of employers anticipate having no change in their full-time employees in the next two years. However, this does not necessarily signify that the employers will not be hiring. Current employment may be affected by turnover or other attrition. As a result, Blue Economy employers may need *replacement* hires. When asked, “How many [full-time or part-time employees] do you expect to hire over the next two years?” employers surveyed expected to hire a combined total of 1,761 full- and part-time employees (Figure 7). In other words, while Blue Economy employers do not expect a change in their total employment, they do expect to hire 1004 new full-time and 757 part-time employees.

Figure 7: Employers' Expected Number of Full- or Part-time New Hires 2 Years from Now²⁰

Employers expect stable employment within specific industries as well. Approximately one-third of employers within each industry surveyed expect to have no change to their full-time employees in the next two years (Figure 8). However, *Wholesale Trade* has the highest percentage of employers (43 percent) who expect to have more full-time employers, while *Construction* (50 percent) and *Professional, Scientific and Technical Services* (52 percent) expect to have fewer full-time employees in the next two years.

¹⁹ n = 134²⁰ n = 134

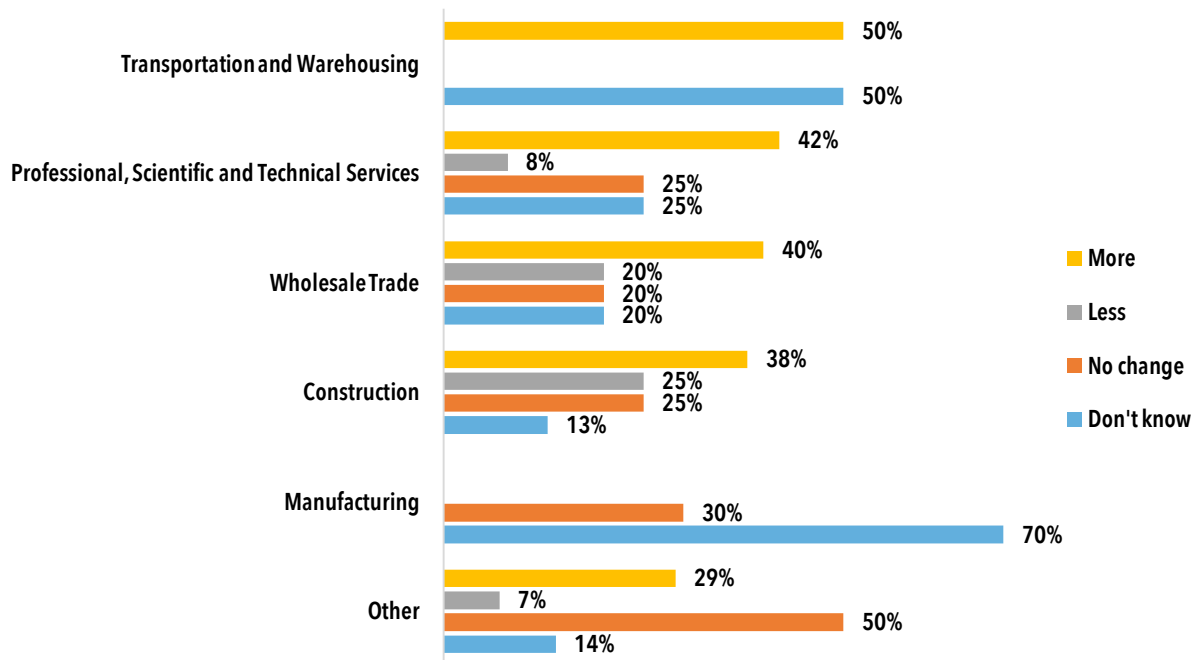
Figure 8: Percent of Employers who Anticipate Growth or Decline in Full-Time Employees in the Next Two Years by Industry²¹



Employers in the *Professional, Scientific and Technical Services* industry, as well as *Transportation and Warehousing*, were most likely to anticipate growth in their number of part-time workers over the next two years, while employers in the Blue Economy's *Manufacturing* industry had the highest rate of employers unable to anticipate their change in part-time workers (Figure 9).

²¹ n = 134

Figure 9: Percent of Employers who Anticipate Growth or Decline in Part-Time Employees in the Next Two Years by Industry²²

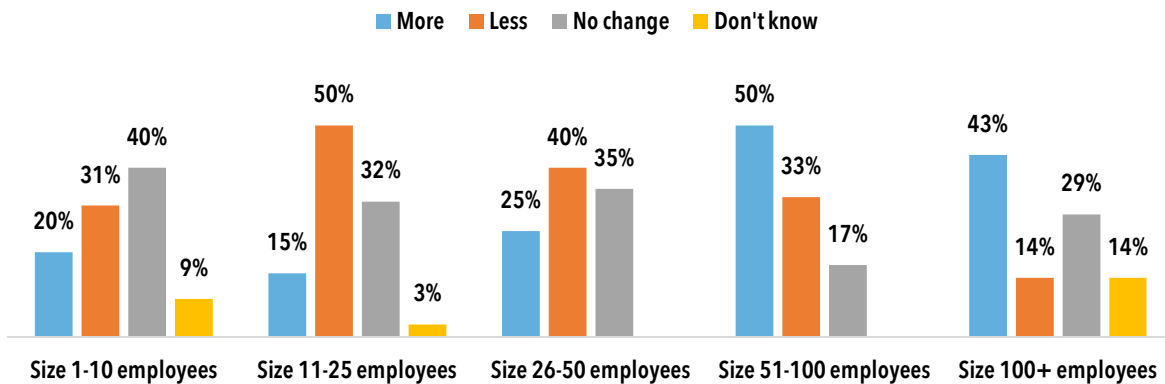


The majority of employers that have part-time workers are small businesses (10 employees or fewer). Smaller companies that expect to see an increase in their number of part-time workers, which could be an opportunity for the workforce development system to focus on transitory, part-time or internships employment opportunities in the Blue Economy, especially with small businesses employing 10 or fewer workers or with companies in the *Professional, Scientific and Technical Services*, and *Transportation and Warehousing* industries.

Of the businesses that expect to have more full-time workers two years from now, the majority are larger companies. Fifty percent of companies that employ 51-100 employees expect to have more full-time workers in the next two years, and 43 percent of companies employing over 100 employees also expect more full-time workers. On the other hand, smaller companies (50 employees or fewer) generally expect fewer full-time employees two years from now, or no change to their current number of employees (Figure 10).

²² n = 134

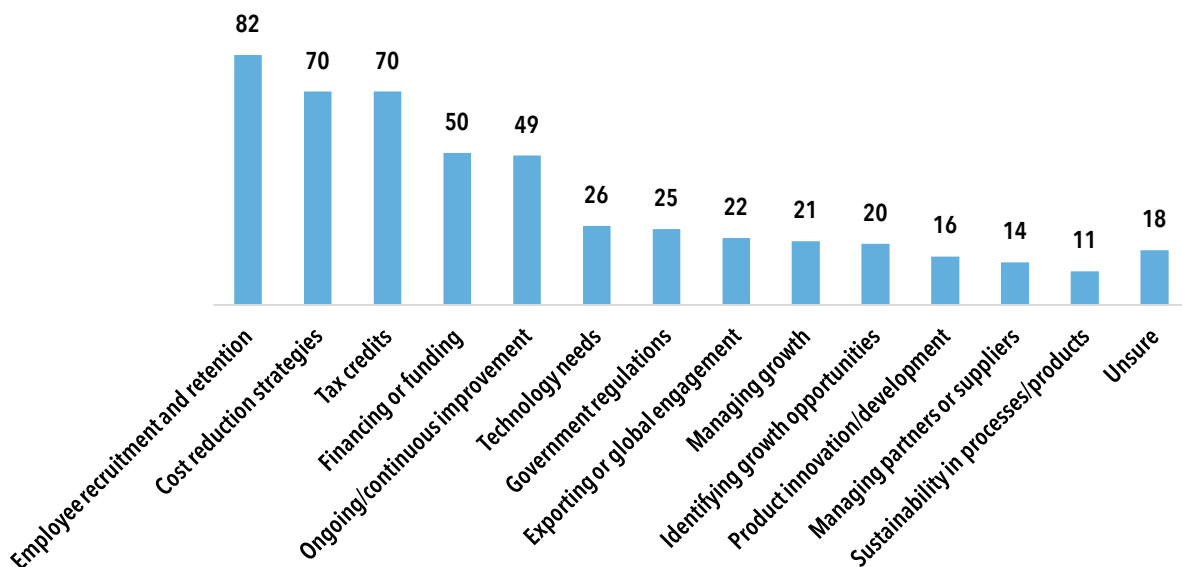
Figure 10: Percent of Employers who Anticipate Growth or Decline in Full-Time Employees in the Next Two Years by Size²³



Challenges to Employment Growth

In online and phone surveys, employers surveyed cited employee recruitment and retention as their greatest challenge to growth over the next two years (Figure 11).

Figure 11: Number of Employers Identifying Challenges to Employment Growth²⁴



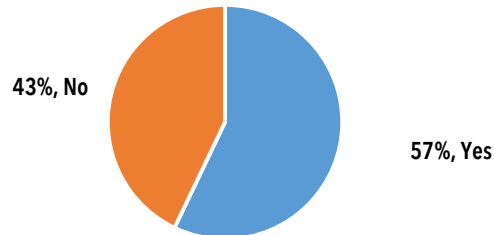
To further understand these challenges, interviews were conducted with 15 employers to elaborate on and provide more context as to why these challenges exist. In addition to the challenges identified by employers surveyed (Figure 12), the 15 employers interviewed also cited regulatory complexity, port strategy and zoning restrictions as challenges to growth. Regulatory complexity is the dominant challenge that constrains companies' growth prospects. Interviewees were approximately four times more likely to cite it than any other particular challenge. The employers interviewed described

²³ n = 134

²⁴ n = 134

problematic city zoning and state regulatory hurdles, as well as the need for additional office and building space as challenges to growth. Forty-three percent of the employers interviewed stated that they did not have room to accommodate growth (Figure 12). As a port city with famously high real estate costs, capital expansion can be a tremendous challenge for employers in San Diego's Blue Economy.

Figure 12: Employer Interviewed Responses to "Does Your Existing Plant or Location Have Room to Accomodate Growth?"



When asked to explain why these challenges constrain growth prospects, interviewees offered a number of reasons. While there were some unique reasons given, employers' answers tended to group into four general issues:

- High cost of doing business
- Human capital issues
- Dynamics associated with oil and gas
- Environmental issues and sustainability

High cost of doing business and human capital issues:

Per employer interviews, the cost of doing business in California is extremely high, making it difficult for companies to grow. Coupled with the increased cost of living and minimum wage, businesses feel more pressure to be selective in hiring, thus leading to slower employee recruitment.

Dynamics associated with oil and gas:

Depressed commodity prices over the next decade due to an overall lower demand in oil can lead to depressed shipping rates. This can potentially cause ripple effects throughout the industry such as decreased fleet capacities. Despite lower prices causing more oil consumption, the gradual shift to alternative energy and vehicle fuel efficiency will weaken the link between economic growth and oil demand.

Environmental issues and sustainability:

Being able to balance economic growth and environmental sustainability is a challenge for businesses. For example, meeting demand for fish while properly managing the fishery can be conflicting, especially when demand outpaces supply

Then, in association with those challenges and reasons, interviewees were offered a chance to suggest solutions. Common themes were as follows:

- Political activity
- Move operations
- HR-based solutions

It is important to note, however, that these responses come from a small sample of 15 employers in Blue the Blue Economy. For specific employer interview responses, view Appendix A – Methodology.

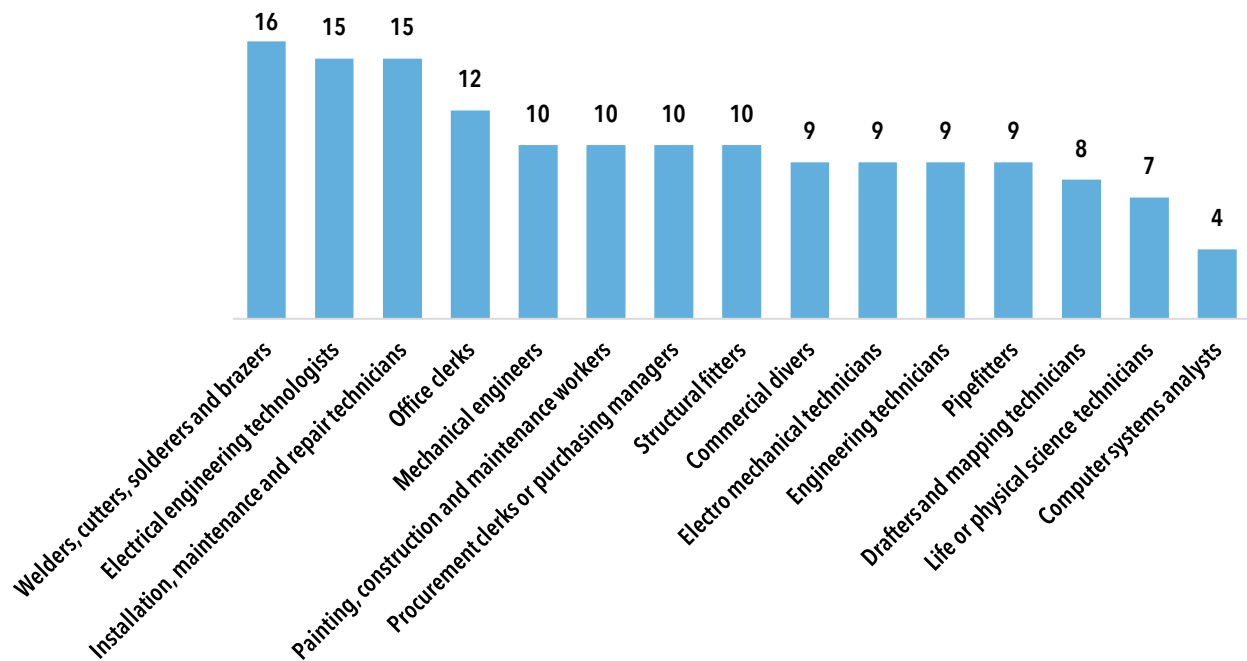
OCCUPATIONAL OVERVIEW

Occupations within the Blue Economy are as diverse as its industries. This study began with a list of 25 different occupations to be analyzed, but was reduced to a list of 15 occupations due to the small sample size of employer responses per occupation. For the purpose of this study, occupations were broken down into two categories: primary occupations and secondary occupations. Primary occupations were the focus of survey and interview questions; however, employers had the option to provide additional information for secondary occupations. This secondary list was created after attempting contact with all known employers in the Blue Economy; these secondary occupations were initially on the primary occupations list, but moved to this secondary list because a majority of employers did not employ them. While these occupations have a small sample size of employer responses, they were included in the surveys to capture some labor market data about lesser-known Blue Economy jobs. For more information about the occupational lists, view Appendix B – Blue Economy Occupations.

Primary occupations include:	Secondary occupations include:
1. Commercial divers	1. Chemical engineers
2. Computer systems analysts (including cyber security)	2. Computer hardware engineers
3. Drafters and mapping technicians	3. Computer network support specialists
4. Electrical engineering technologists	4. Computer programmers
5. Electro-mechanical technicians	5. Computer systems analysts
6. Engineering technicians	6. Computer user support specialists
7. Installation, maintenance and repair technicians	7. Database administrators
8. Life or physical science technicians	8. Electrical engineers
9. Mechanical engineers	9. Materials engineers
10. Office clerks	10. Network and computer systems administrators
11. Painters, construction and maintenance	11. Robotics engineers
12. Pipefitters	12. Software developers, applications
13. Procurement clerks or purchasing managers	13. Software developers, systems software
14. Structural fitters (including aircraft structure, surfaces, rigging and systems assemblers)	
15. Welders solderers, cutters and brazers	

To understand which of these primary occupations have opportunities for growth, surveyed employers indicated the ones they currently employ or plan to employ in the next two years (Figure 13).

Figure 13: Number of Employers Indicating Occupations that they Currently Have or Plan to Have



While not listed in Figure 13, the occupation with the most number of employer survey responses was “Other,” with 35 employers listing other occupations that they plan to employ, including:

- Business development specialists
- Civil engineers
- Decking technicians
- Engineering firm workers
- Equipment or rental sales persons
- Field supervisors
- Fishing manufacturing (tackle) workers
- Footing repairers (preparing land for concrete)
- Government workers
- In-house IT workers or specialists
- Land surveyors
- Maintenance and/or marina repairers
- Maintenance workers
- Marine engineers
- Maritime workers
- Merchant mariners
- Navy ship electrical repairers
- Office assistants
- Operator engineers
- Payroll management workers
- Plumbers
- Project managers
- Sail boat instructors
- Sales persons
- Sensor manufacturing workers
- Solar panel installers, maintenance workers
- Structural and civil engineers
- Surveyors
- Traders
- Tube and pipe fabricators
- Unskilled laborers
- Water meters manufacturing workers

From the in-depth, in-person interviews, employers also cited occupations that were not in the primary occupations list, but should be recognized as important for this industry sector:

- Regulatory affairs specialists or managers
- Merchant mariners (e.g., sailors, marine oilers)
- Electro-mechanical occupations
- Environmental positions

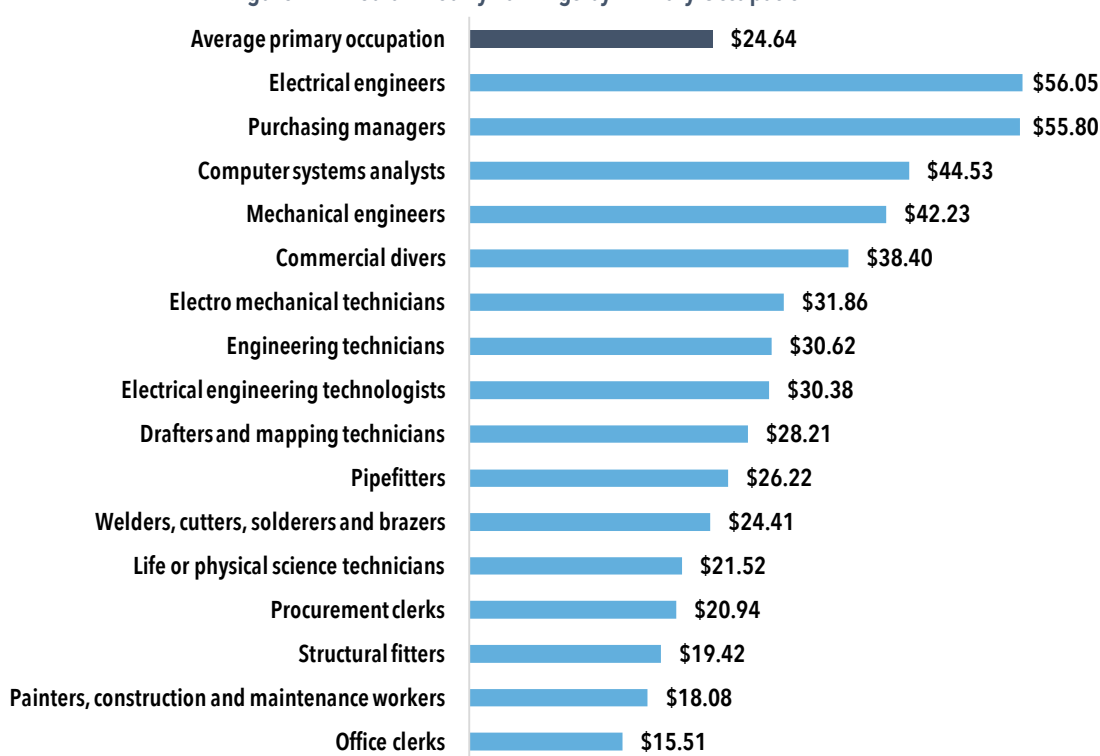
- Geospatial professions
- Robotics-related occupations
- Engineers, technicians, technologists and scientists in specialty areas: computer, electrical, engineering, and mechanical

Per the employer interviews, technology, particularly data-driven analytics, is transforming the maritime industry by improving capabilities and decision-making. Digital innovation will be key in attracting new talent as well, as the industry is confronted with an aging workforce.²⁵ Technologies such as process automation, integration, content management and security are increasingly important. Additionally, drought consequences and the growing scarcity of fresh water are spurring a growing number of companies to invest in water reuse, desalination and other innovative technologies surrounding water consumption.

Wages and Hiring Expectations

On average, the primary occupations in this study have median hourly earnings of \$24.64, with electrical engineers having the greatest median hourly wages (Figure 14).

Figure 14: Median Hourly Earnings by Primary Occupation²⁶

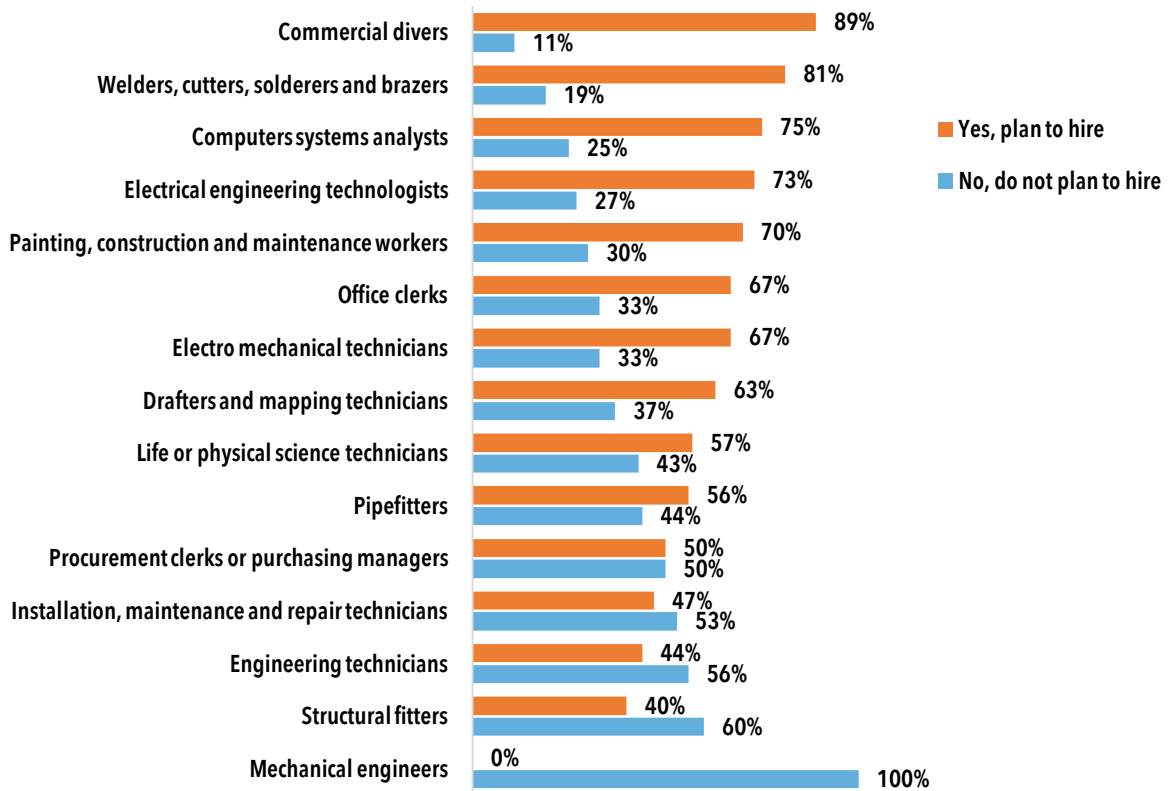


²⁵ "5 big trends shaping the global maritime industry." Crew Connect. 20 Jul 2016. crewconnectblog.com/5-biggest-trends-shaping-global-maritime-industry.

²⁶ Economic Modeling Specialists, Int'l (EMS). Quarterly Census of Employment and Wages (QCEW) and Non-QCEW datasets. Nov 2016.

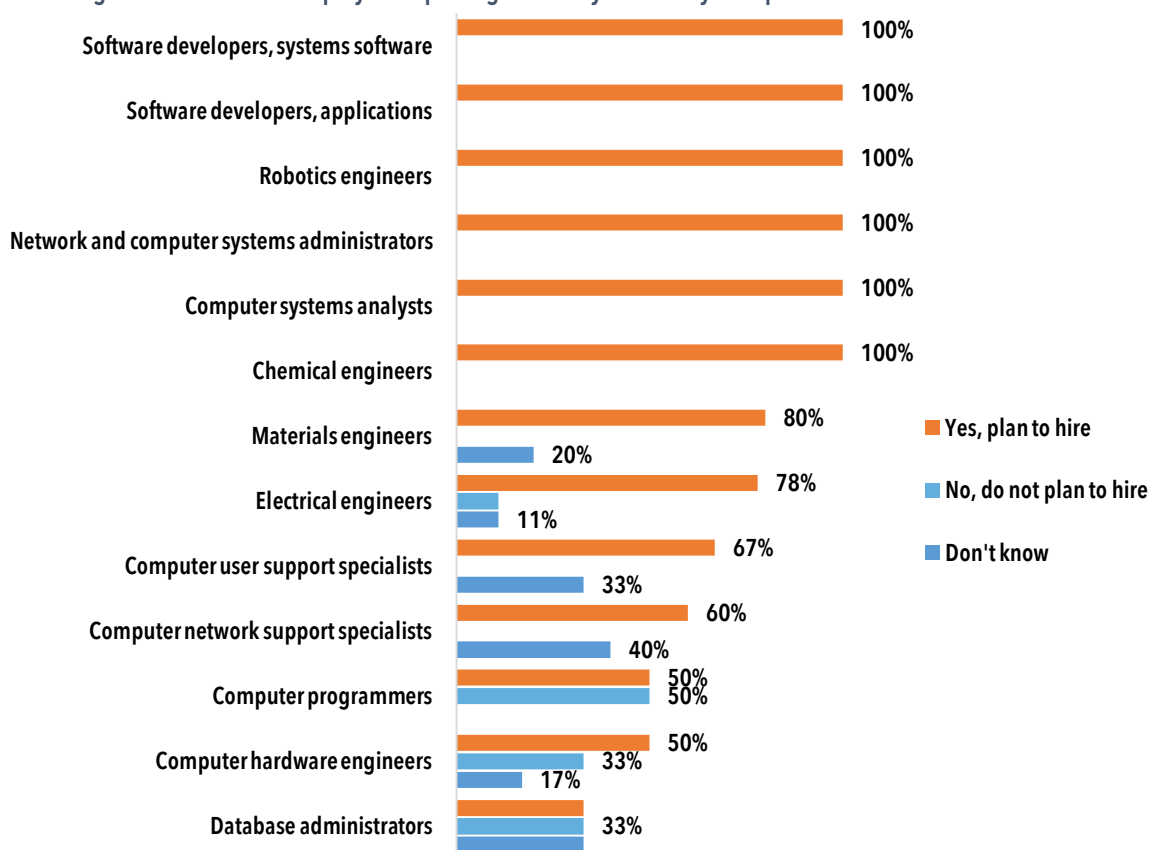
For each primary occupation, employers were asked whether or not they planned to hire any more of each occupation in the next two years. With the exception of mechanical engineers, 40 percent or more employers plan to hire for each occupation in the next two years (Figure 15).

Figure 15: Percent of Employers Expecting to Hire by Primary Occupation in the Next 2 Years



Similarly, for each secondary occupation employers were asked whether or not they planned to hire new workers in the next two years (Figure 16). As previously mentioned, secondary occupations are lesser-known positions and thus targeted with a reduced set of questions in surveys.

Figure 16: Percent of Employers Expecting to Hire by Secondary Occupation in the Next 2 Years



Please note that when asking about very specialized occupations (such as robotics engineers) in a localized survey, the resulting sample sizes tend to be very small. Ninety-percent of the 134 employers surveyed indicated not having these specific positions in their companies. While these secondary occupations have small sample sizes, those who did express interest in these occupations expected to hire the following “BlueTech” jobs in the next two years:

- Chemical engineers
- Computer systems analysts
- Network and computer systems administrators
- Robotics engineers
- Software developers, applications
- Software developers, systems software

Small businesses, unless they are small highly-specialized firms BlueTech firms, generally do not have these types of occupations in their company, but they are important to note nonetheless due to the difficulty in finding qualified candidates for these positions.

Education and Work Experience Expectations

Minimum educational requirements desired by employers differed by each primary occupation. The majority of employers who employ the occupations below indicated that they require a high school diploma or less:

- Welders, cutters, solderers and brazers

- Pipefitters
- Structural fitters
- Installation, maintenance, and repair technicians
- Electromechanical technicians
- Office clerks

Alternatively, the majority of employers who employ the following occupations indicated that they require a bachelor's degree or higher:

- Electrical engineering technologists
- Engineering technicians
- Life or physical science technicians
- Drafters and mapping technicians
- Electromechanical technicians
- Mechanical engineers
- Procurement clerks or purchasing managers
- Computer systems analysts

Table 1 provides a breakdown of the specific education and work experience requirements of the employers surveyed.

Table 1: Employer Reported Minimum Education and Work Experience by Occupation

Occupation	Minimum Education Required	Certificates or Technical Certifications Required	Work Experience Required
Commercial divers	HS diploma or less: 33% Certificate/technical certification: 67%	Commercial driver's license: 50% Diving certification: 33% State certification: 17%	Less than 1 year (similar position): 22% 1-3 years (similar position): 67% >3 years (similar position): 11%
Computers systems analysts (including cyber security)	Associate degree: 25% Bachelor's degree: 75%	n/a	No experience: 25% Less than 1 year (similar position): 25% 1-3 years (similar position): 25% >3 years (similar position): 25%
Drafters and mapping technicians	HS diploma or less: 13% Certificate/technical certification: 13% Associate degree: 13% Bachelor's degree: 50% Master's degree: 11%	Vocational certificate: 100% 2 years of experience: 100%	Less than 1 year (similar position): 25% 1-3 years (similar position): 50% >3 years (similar position): 25%
Electrical engineering technologists	HS diploma or less: 20% Certificate/technical certification: 27% Associate degree: 7% Bachelor's degree: 46%	Electrician certificate: 50% Don't know: 50%	Less than 1 year (similar position): 20% 1-3 years (similar position): 60% >3 years (similar position): 20%
Electro mechanical technicians	HS diploma or less: 56% Certificate/technical certification: 11% Associate degree: 22%	Certification: 100%	No experience: 22% Less than 1 year (similar position): 11% 1-3 years (similar position): 22%

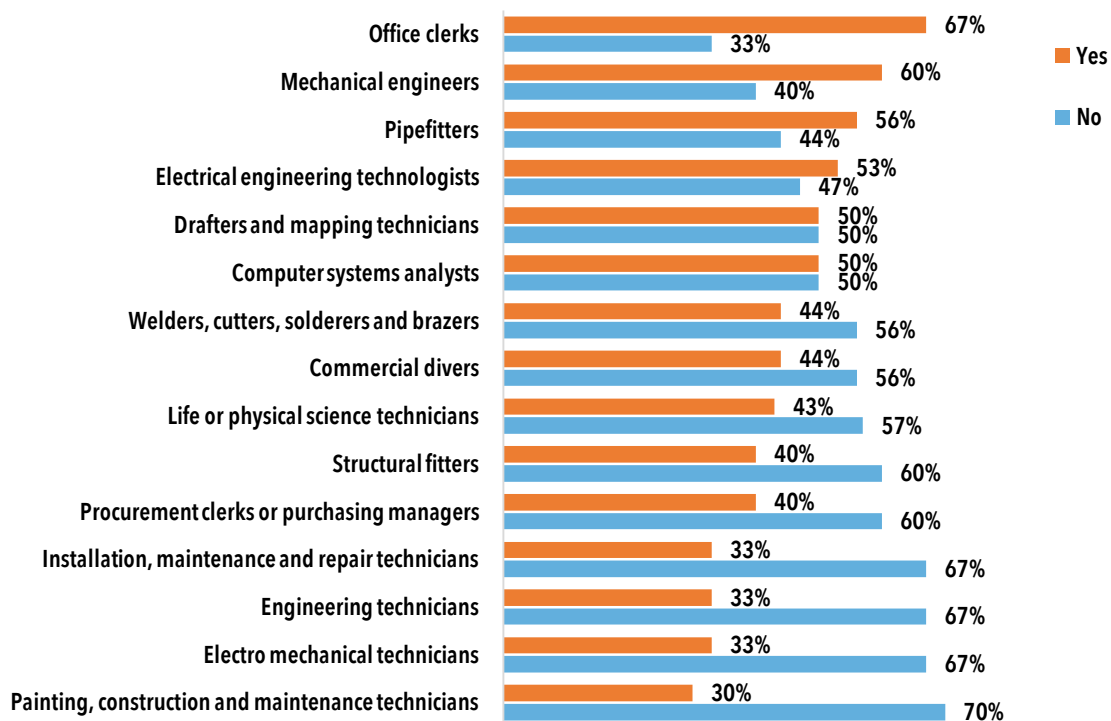
	Bachelor's degree: 11%		>3 years (similar position): 44%
Engineering technicians	Certificate/technical certification: 11% Associate degree: 22% Bachelor's degree: 67%	Engineering state license: 100%	1-3 years (similar position): 100%
Installation, maintenance and repair technicians	HS diploma or less: 80% Certificate/technical certificate: 7% Associate degree: 13%	Basic certified tech school: 100%	No experience: 20% Less than 1 year (similar position): 40% 1-3 years (similar position): 40%
Life or physical science technicians	HS diploma or less: 29% Certificate/technical certification: 29% Bachelor's degree: 29% Master's degree: 13%	Industry standards: 100% Safety courses: 100%	No experience: 14% Less than 1 year (similar position): 14% 1-3 years (similar position): 29% >3 years (similar position): 43%
Mechanical engineers	HS diploma or less: 30% Associate degree: 10% Bachelor's degree: 60%	n/a	No experience: 20% Less than 1 year (similar position): 40% 1-3 years (similar position): 20% >3 years (similar position): 20%
Office clerks	HS diploma or less: 92% Associate degree: 8%		Less than 1 year (similar position): 50% 1-3 years (similar position): 33% >3 years (similar position): 8% Other: 9% (depends on position)
Painters, construction and maintenance technicians	HS diploma or less: 100%	n/a	No experience: 10% Less than 1 year (similar position): 30% 1-3 years (similar position): 40% >3 years (similar position): 20%
Pipefitters	HS diploma or less: 89% Certificate/technical certification: 11%	Certification: 100%	No experience: 22% Less than 1 year (similar position): 44% 1-3 years (similar position): 22% >3 years (similar position): 12%
Procurement clerks or purchasing managers	HS diploma or less: 50% Associate degree: 40% Bachelor's degree: 10%	n/a	No experience: 10% Less than 1 year (similar position): 30% 1-3 years (similar position): 40% >3 years (similar position): 20%
Structural fitters (including aircraft structure, surfaces, rigging and systems assemblers)	HS diploma or less: 90% Certificate/technical certificate: 10%	Electrical certification: 100%	No experience: 20% Less than 1 year (similar position): 10% 1-3 years (similar position): 60% >3 years (similar position): 10%
Welders, cutters, solderers and brazers	HS diploma or less: 69% Certificate/technical certification: 31%	Welding certificate: 60% American Welding Society certification: 20% Don't know: 20%	No experience: 19% Less than 1 year (similar position): 25% 1-3 years (similar position): 44% >3 years (similar position): 6% Other: 6% (as much as possible)

Similar to educational requirements, work experience differed by occupation and by company as seen in Table 1. For example, two different companies may employ the same occupation, but have different education and work experience requirements. At least one employer indicated that they require no experience for 10 of the 15 occupations, and another employer reported that they require three or more years of related experience for 13 of the 15 occupations. Again, the Blue Economy is very diverse in its industries, occupations and employers. One employer reported requiring no degree for mechanical engineers as long as the applicant has five or more years of work experience and on-the-job training. After hiring an individual with relevant work experience, employers may *then* require that the new hires meet the educational requirement. In the same example, mechanical engineers may become managers if they obtained the bachelor's degree or additional education as required by the employer. This industry sector has potential for workers to "rise through the ranks," by developing skills on-the-job without having the formal educational credentials required in today's job market.

Employer Difficulty in Finding Qualified Candidates

To better understand the hiring needs of employers, the survey also asked employers whether or not they had difficulty finding qualified applicants. The greatest percent of employers had difficulty in finding qualified applicants for office clerks, mechanical engineers, pipefitters, and electrical engineering technologists (Figure 17).

Figure 17: Percent of Employers Reporting Difficulty in Finding Qualified Applicants by Occupation



Employers who reported having difficulty in finding qualified applicants cited the following reasons:

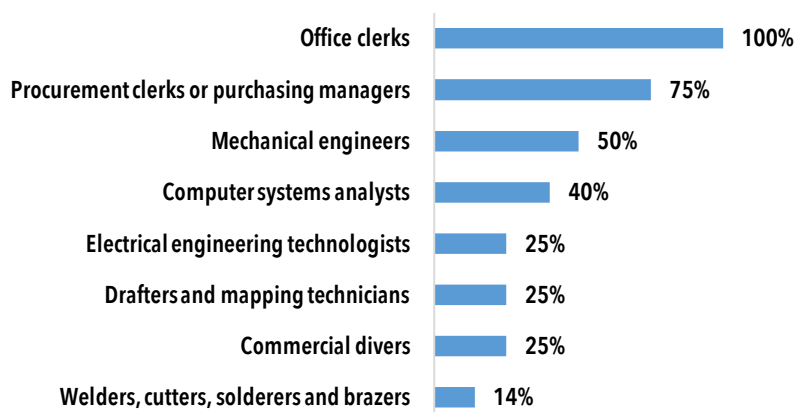
- Not enough worker supply or applicants
- Wages or benefits were too low to attract quality candidates
- Candidates that submitted applications lack experience

- Small size of company could not compete with larger companies (larger companies are generally more economically competitive, have more marketing or community presence, etc.)
- Unqualified applicant pools
- Mismatch in what education or skills that employers need and what education or skills candidates actually have
- Employer lacks candidate networks
- Company reputation

The most cited reasons were lack of relevant work experience, technical skills related to the position or industry, and education level (Table 2). Based on the in-person interviews, “relevant work experience” tended to mean “relevant work experience in the maritime industry” although that distinction was not given as an option in the survey.

In surveys, employers reported that applicants for the following occupations lacked social and interpersonal skills (Figure 18).

Figure 18: Percent of Employers Reporting Lack of Applicants with Social and Interpersonal Skills



Similarly, employers from the in-person interviews were asked to qualify the nature of the skills deficiencies they perceived in their job applicants and employees: *job-specific* or *general skills*. The general answer was “both.” Thirteen employers cited job-specific skills as a deficit. Twelve employers cited general skills as a deficit.

The most common types of knowledge, skills and abilities desired by the employers interviewed included Occupational Safety & Health Administration (OSHA), mapping-related skills such as Geographic Information Systems (GIS), and cyber security. Approximately 90 percent of the employers interviewed mentioned that OSHA is an important skill, followed by cyber security (63.6 percent) and GIS/mapping capabilities (54.5 percent). Most employers who identified GIS/mapping capabilities as an important skill clarified that they did not employ any workers specifically as a GIS technician or specialist. Rather, their employees needed to be knowledgeable in GIS as a supplemental skill to their actual profession. However, as GIS and mapping capabilities become an increasingly common and important skill in the Blue Economy, GIS-specific occupations may become a more common trend.

Table 2 provides more detail about surveyed employers’ hiring difficulties by occupation, including reasons for difficulty finding qualified workers and the requirements on the job.

Table 2: Hiring Difficulties, Reasons for Having Difficulty in Finding Qualified Workers and Job Requirements

Occupation	Difficulty Hiring Workers?	Reasons for Having Difficulty in Finding Qualified Workers ²⁷	Job Requirements ²⁸
Commercial divers	Yes: 44% No: 56%	Relevant work experience: 75% Education level: 25% Technical skills specific to position/industry: 75% Interpersonal/social skills: 25% Other: 25% (clean driving record)	Security clearance: 22% Background check: 78% Physical movement: 78% Staring at computer screen: 11% Recent job experience: 67% Visual acuity or attention to detail: 22% Veteran status: 11% Over 18: 89% None: 0%
Computers systems analysts (including cyber security)	Yes: 50% No: 50%	Relevant work experience: 50% Education level: 50% Technical skills specific to position/industry: 100% Interpersonal/social skills: 50% Other: 0%	Security clearance: 25% Background check: 100% Physical movement: 75% Staring at computer screen: 50% Recent job experience: 50% Visual acuity or attention to detail: 75% Veteran status: 25% Over 18: 75% None: 0%
Drafters and mapping technicians	Yes: 50% No: 50%	Relevant work experience: 75% Education level: 50% Technical skills specific to position/industry: 100% Interpersonal/social skills: 25% Other: 0%	Security clearance: 38% Background check: 75% Physical movement: 100% Staring at computer screen: 63% Recent job experience: 50% Visual acuity or attention to detail: 50% Veteran status: 13% Over 18: 63% None: 0%
Electrical engineering technologists	Yes: 53% No: 47%	Relevant work experience: 75% Education level: 88% Technical skills specific to position/industry: 100% Interpersonal/social skills: 25%	Security clearance: 40% Background check: 67% Physical movement: 73% Staring at computer screen: 53% Recent job experience: 53% Visual acuity or attention to detail: 40% Veteran status: 0% Over 18: 67% None: 7%

²⁷ Employers could select all that apply, therefore, responses may not equal 100%. Denominator for percentages is based on number of employers indicating yes in having difficulty hiring qualified workers.

²⁸ Employers could select all that apply, therefore, responses may not equal 100%.

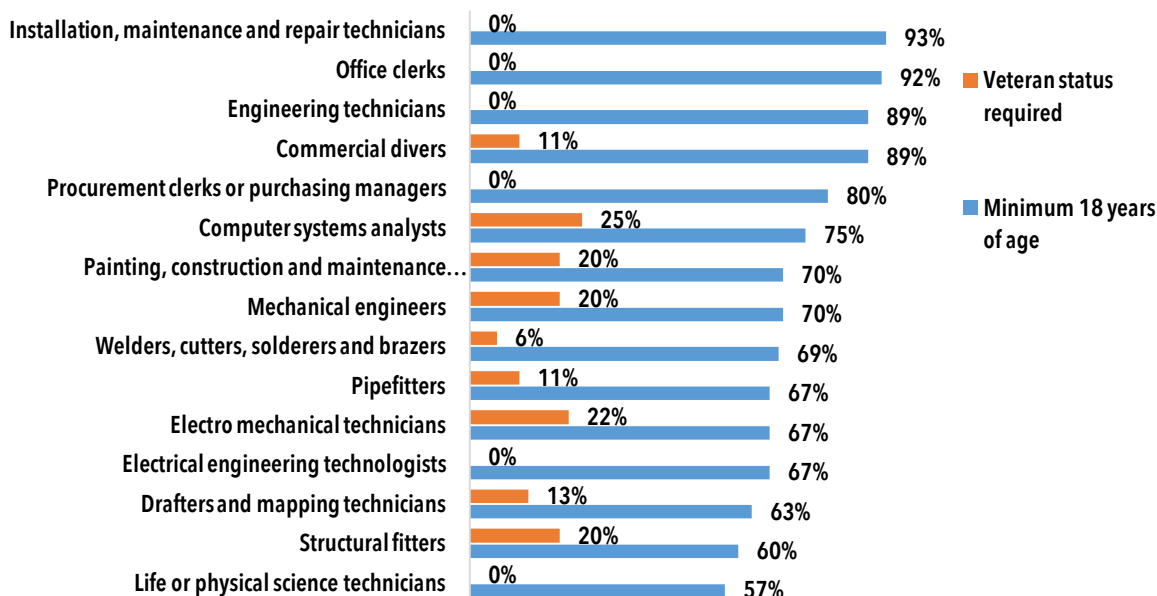
Electro mechanical technicians	Yes: 33% No: 67%	Relevant work experience: 100% Education level: 67% Technical skills specific to position/industry: 100% Interpersonal/social skills: 0% Other: 0%	Security clearance: 22% Background check: 89% Physical movement: 89% Staring at computer screen: 33% Recent job experience: 67% Visual acuity or attention to detail: 56% Veteran status: 22% Over 18: 67% None: 0%
Engineering technicians	Yes: 33% No: 67%	Relevant work experience: 67% Education level: 100% Technical skills specific to position/industry: 67% Interpersonal/social skills: 0% Other: 0%	Security clearance: 44% Background check: 78% Physical movement: 67% Staring at computer screen: 67% Recent job experience: 44% Visual acuity or attention to detail: 56% Veteran status: 0% Over 18: 89% None: 0%
Installation, maintenance and repair technicians	Yes: 33% No: 67%	Relevant work experience: 100% Education level: 60% Technical skills specific to position/industry: 80% Interpersonal/social skills: 0% Other: 0%	Security clearance: 33% Background check: 53% Physical movement: 80% Staring at computer screen: 13% Recent job experience: 47% Visual acuity or attention to detail: 27% Veteran status: 0% Over 18: 93% None: 7%
Life or physical science technicians	Yes: 43% No: 57%	Relevant work experience: 67% Education level: 67% Technical skills specific to position/industry: 67% Interpersonal/social skills: 0% Other: 0% None: 33%	Security clearance: 29% Background check: 71% Physical movement: 71% Staring at computer screen: 57% Recent job experience: 43% Visual acuity or attention to detail: 43% Veteran status: 0% Over 18: 57% None: 14%
Mechanical engineers	Yes: 60% No: 40%	Relevant work experience: 100% Education level: 83% Technical skills specific to position/industry: 83% Interpersonal/social skills: 50% Other: 0%	Security clearance: 50% Background check: 90% Physical movement: 80% Staring at computer screen: 50% Recent job experience: 60% Visual acuity or attention to detail: 60% Veteran status: 20% Over 18: 70% None: 10%
Office clerks	Yes: 67% No: 33%	Relevant work experience: 75% Education level: 25% Technical skills specific to position/industry: 75% Interpersonal/social skills: 100% Other: 0%	Security clearance: 50% Background check: 67% Physical movement: 42% Staring at computer screen: 83% Recent job experience: 50% Visual acuity or attention to detail: 25%

			Veteran status: 0% Over 18: 92% None: 0%
Painting, construction and maintenance technicians	Yes: 30% No: 70%	Relevant work experience: 67% Technical skills specific to position/industry: 100% Interpersonal/social skills: 0%	Security clearance: 20% Background check: 60% Physical movement: 70% Staring at computer screen: 10% Recent job experience: 60% Visual acuity or attention to detail: 70% Veteran status: 20% Over 18: 70% None: 0%
Pipefitters	Yes: 56% No: 44%	Relevant work experience: 100% Education level: 20% Technical skills specific to position/industry: 60% Interpersonal/social skills: 0% Other: 20% (commitment to an employer longer than 18 months)	Security clearance: 56% Background check: 89% Physical movement: 78% Staring at computer screen: 0% Recent job experience: 44% Visual acuity or attention to detail: 44% Veteran status: 11% Over 18: 67% None: 11%
Procurement clerks or purchasing managers	Yes: 40% No: 60%	Relevant work experience: 100% Education level: 50% Technical skills specific to position/industry: 75% Interpersonal/social skills: 75% Other: 0%	Security clearance: 10% Background check: 60% Physical movement: 30% Staring at computer screen: 70% Recent job experience: 40% Visual acuity or attention to detail: 20% Veteran status: 0% Over 18: 80% None: 0%
Structural fitters (including aircraft structure, surfaces, rigging and systems assemblers)	Yes: 40% No: 60%	Relevant work experience: 100% Education level: 50% Technical skills specific to position/industry: 75% Interpersonal/social skills: 0% Other: 0%	Security clearance: 20% Background check: 70% Physical movement: 80% Staring at computer screen: 10% Recent job experience: 50% Visual acuity or attention to detail: 60% Veteran status: 20% Over 18: 60% None: 10%
Welders, cutters, solderers and brazers	Yes: 44% No: 56%	Relevant work experience: 100% Education level: 14% Technical skills specific to position/industry: 14% Interpersonal/social skills: 14% Other: 14% (lack of work ethic)	Security clearance: 38% Background check: 63% Physical movement: 81% Staring at computer screen: 0% Recent job experience: 50% Visual acuity or attention to detail: 44% Veteran status: 6% Over 18: 69% None: 6%

Job Requirements

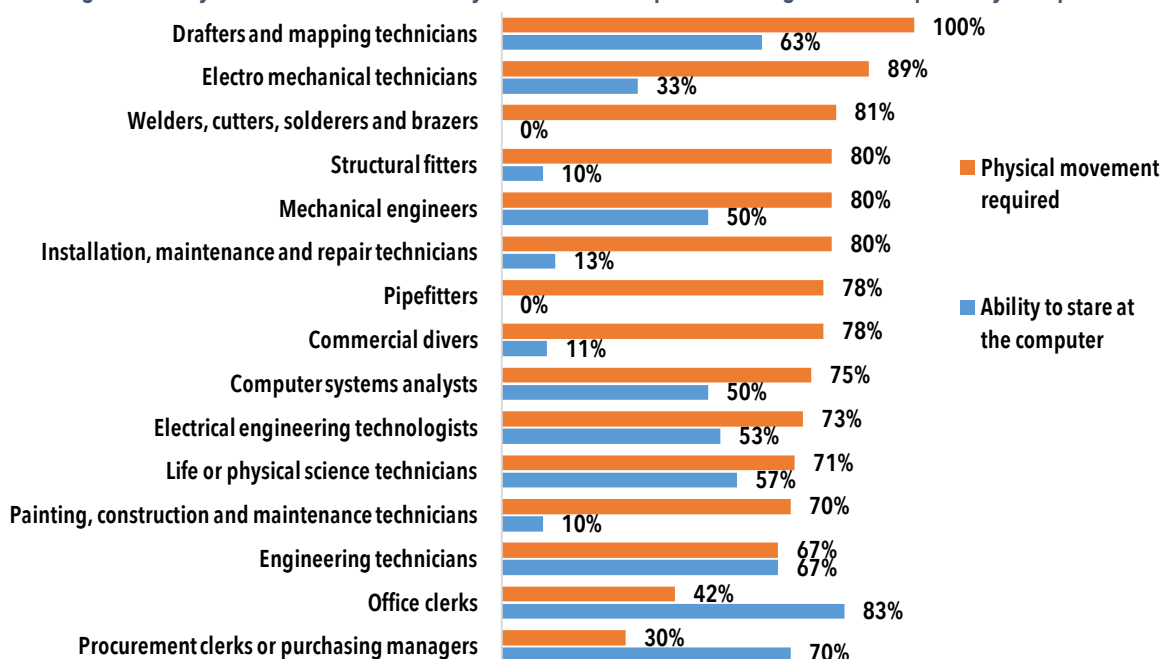
Although many of the job requirements differed among occupations, the majority of employers indicated that applicants for each occupation must be over 18 years of age and that the positions do not generally require veteran status (Figure 19).

Figure 19: Minimum 18 Years of Age and Veteran Status Required by Occupation



Thirteen out of 15 positions have 67 percent or more employers who require physical movement as part of the job requirements. Eight out of 15 positions have 50 percent or more employers who require workers to have the ability to stare at the computer for long periods of time (Figure 20).

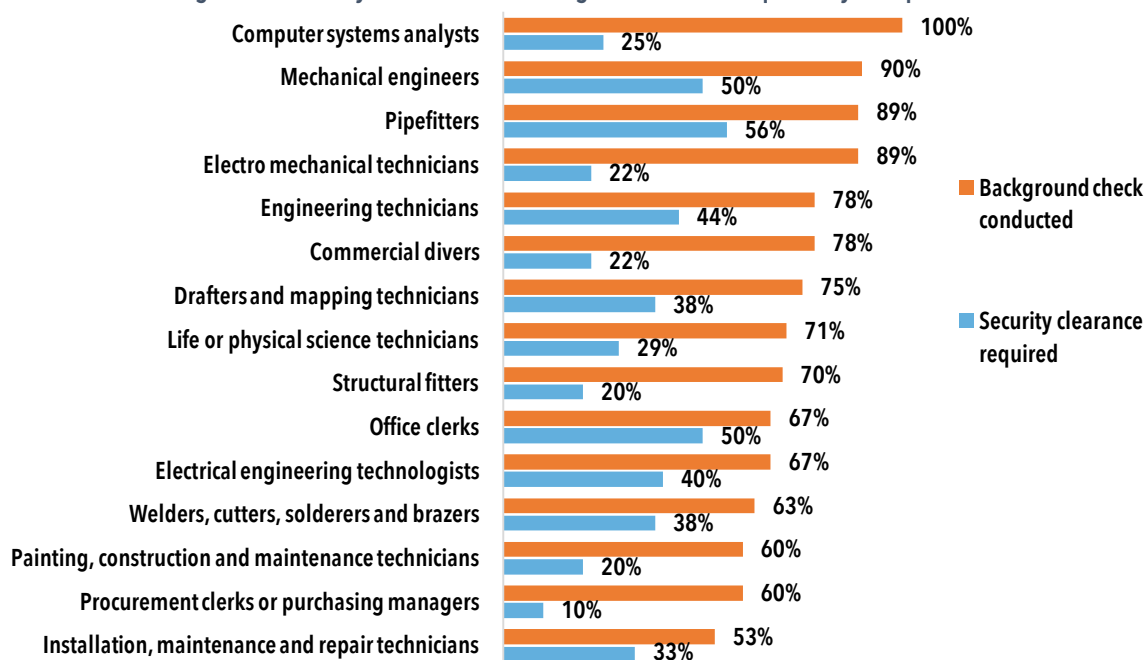
Figure 20: Physical Movement and Ability Stare at the Computer for Long Periods Required by Occupation



Background Checks and Security Clearances

It is also notable that a considerable number of employers required security and background checks for many of these occupations (Figure 21).

Figure 21: Security Clearances and Background Checks Required by Occupation



These checks could result in disqualification or elimination of prospective workers despite having all other qualifications in relevant training and work experience. Employers from the in-person interviews mentioned three types of checks commonly conducted for these occupations:

- U.S. Department of Justice (DOJ) background checks
- Secret clearances
- Transportation worker identification cards

While the majority of employers interviewed did not require formal security clearances, a certain degree of background checking remained a standard part of the hiring process. Employers in the in-depth interviews also mentioned that they do call references and/or conduct drug screenings of applicants. Employers also mentioned the following checks in the hiring process:

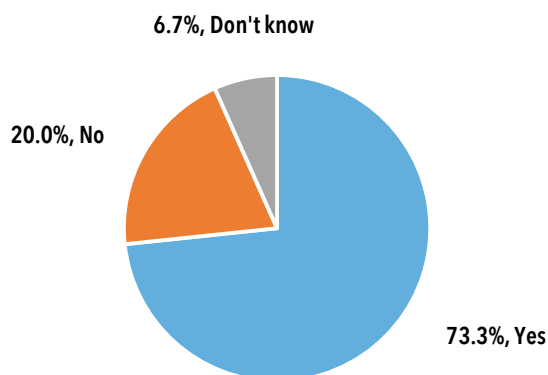
- Occupational checks for the past two to three occupations
- Educational background confirmations
- Reference checks and calls
- Drug screening and random drug tests
- Physical examinations
- Diving physicals
- Credit checks

Depending on the position and company, interviewed employers claimed to have conducted background checks that covered anywhere from seven to 10 years prior to the application date. Employers may conduct background checks either internally or outsourced to another company.

EDUCATION AND TRAINING PROGRAMS

When asked whether San Diego's training and education facilities were adequately serving employers' workforce needs, 73.3 percent of the employers interviewed felt that their needs were met, while 20 percent indicated that their needs were not met (Figure 22).

Figure 22: Percent of Employers Reporting Whether or Not San Diego's Training and Educational Facilities are Adequate²⁹



In interviews, employers listed the following skills and credentials that are considered valuable for the Blue Economy:

- Sonar Techs from the U.S. Navy, Penn State transducer engineering design program
- Electro-mechanical assembly training, soldering, quality assurance certifications for inspectors
- LEED Certifications
- Career Technical Education (CTE) courses for Geographic Information Systems (GIS)
- Personal Protective Equipment (PPE) for engineering
- SAP business enterprise system
- Welding, painting experience specific to maritime
- Crane operator certification in Bakersfield, CA
- Merchant Mariner Document
- Transportation Worker Identification Card³⁰
- SCUBA Diving Certification
- National University Polytechnic School of Diving
- ESRI GIS professional training
- Injection molding, forklift driving and scuba diving
- Knowledge of composites, Printed Circuit Board (PCB) construction, electronics and wiring, batteries, logistics, project management and software engineering
- University of California, San Diego's Bachelor of Science in environmental systems
- San Diego State University (SDSU) Coastal and Marine Institute Laboratory
- University of San Diego (USD) Marine Ecology

²⁹ n = 15

³⁰ tsa.gov/for-industry/twic

- California State University (CSU) Long Beach and the University of California (UC), Davis toxicology programs
- Simulator training
- NavSea standards
- Welder/mechanic CTE schools (e.g., Sweetwater High School, Mar Vista High School)
- Original Equipment Manufacturing (OEM) expertise
- Enterprise Resource Planning (ERP)
- HVAC training
- Program Logic Controllers (PLC)
- Lean manufacturing
- American Congress Survey & Mapping (ACSM) certified hydrographer
- Hydrographic academy at Plymouth University
- Food Safety Modernization Act (FSMA) certification through the Food and Drug Administration

Employers who responded to the online and phone surveys also mentioned the following training and education programs that they currently source from or use for employee professional development:

- | | |
|---|--|
| • Cal Maritime (Vallejo) | • SDSU Coastal and Marine Institute |
| • Cal State University, Long Beach | • The Maritime Institute |
| • Cal State University, San Marcos | • Training Resources Limited |
| • Dive schools | • University of California, Davis (UCD) Toxicology program |
| • High school CTE programs (e.g., Mar Vista, Sweetwater High) | • UC San Diego and SDSU |
| • Maine Maritime Academy | • University of Michigan |
| • Military Sealift Command | • USD Marine Ecology |
| • Mira Costa Community College | • Urban Corps |
| • Navy Autonomous Underwater Vehicles (AUV) courses | • Web Institute – New Jersey for Naval Architecture |
| • Penn State | • Workshop for Warriors |

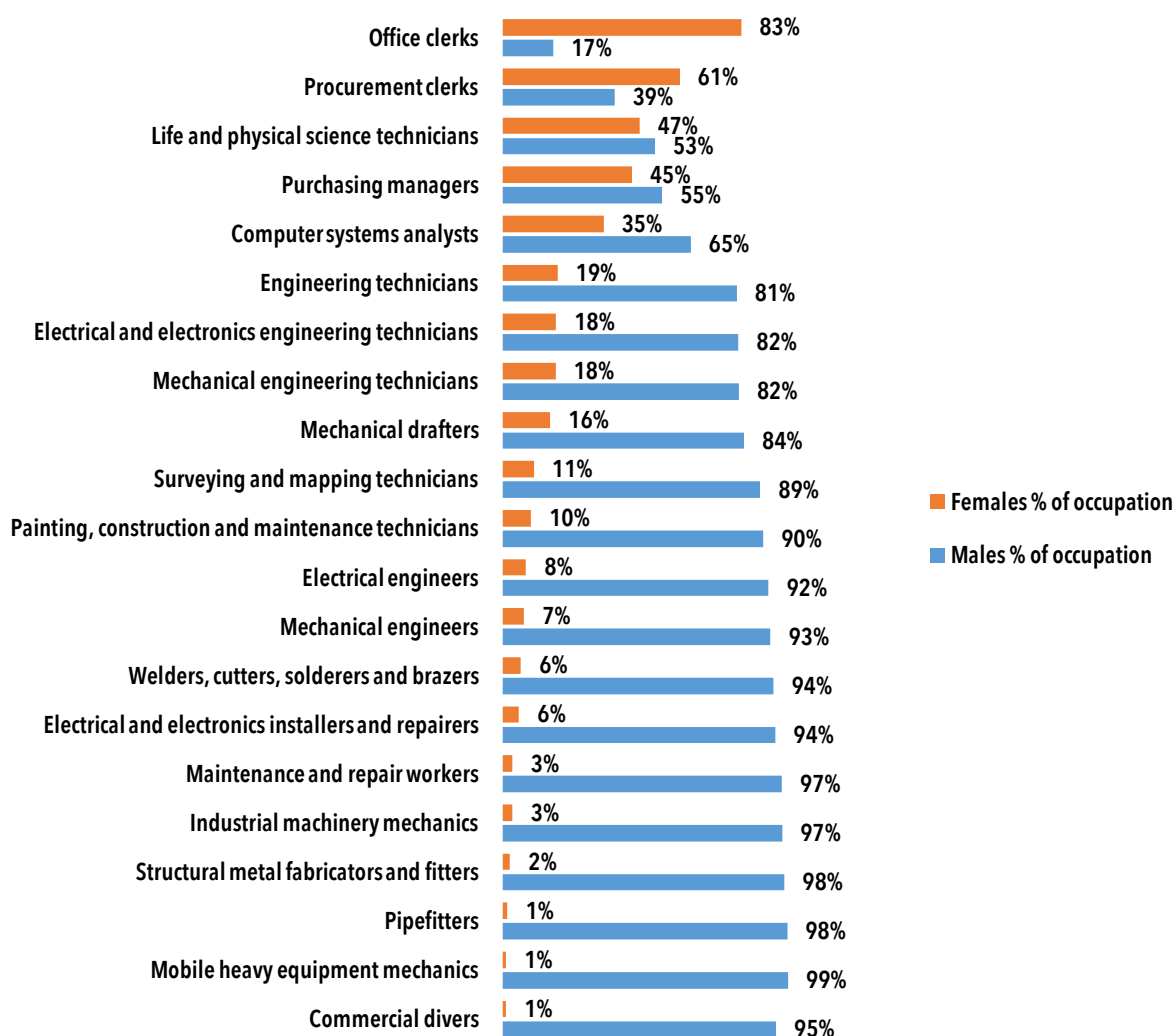
FINDINGS AND RECOMMENDATIONS

As with all of the San Diego Workforce Partnership's labor market reports, the information in this study is intended to help career counselors, educators, community partners and other workforce development professionals better understand the industry and its employers. The following section summarizes the findings from the data analysis, employer surveys and in-depth interviews and provides recommendations to help the workforce development system better respond to the labor market needs of the Blue Economy.

Career counselors, educators and other workforce development professionals should encourage more women to enter Blue Economy occupations and industries.

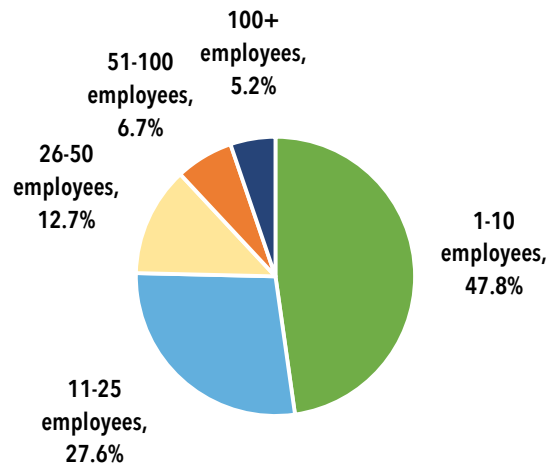
Because males dominate the majority of Blue Economy occupations (Figure 23), there is an opportunity to increase diversity in this industry sector by introducing more females to these companies and occupations.

Figure 23: Percent of Males and Females by Occupation



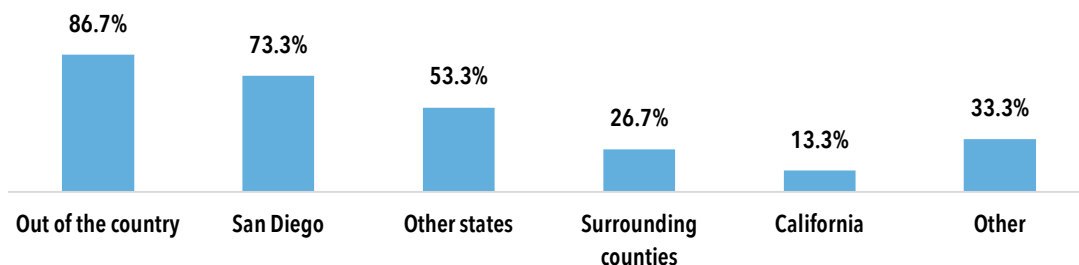
Career counselors and educators who have job seekers or students interested in the Blue Economy should develop techniques that help focus and conduct job search towards small companies.

The majority of businesses surveyed reported employing 25 employees or less, with only 5.2 percent of employers indicating that they employ more than 100 workers (Figure 24).

Figure 24: Employers Surveyed by Employee Size³¹

Employers believe employee retention and recruitment to be the number one challenge to their future growth. Small companies specifically mentioned in interviews that a major reason for that challenge is job seekers' lack of awareness of the existence of their company. Larger companies have more resources, presence in the community and marketing potential, while smaller companies rely primarily on word-of-mouth and networks of existing workers to attract new employees.

SDWP and its partners should conduct a follow-up study on supply chain management-related jobs. As illustrated by the employer survey responses, Blue Economy companies source primarily from San Diego County (Figure 25).

Figure 25: Percent of Employers Identifying Locations of Suppliers in San Diego's Blue Economy³²

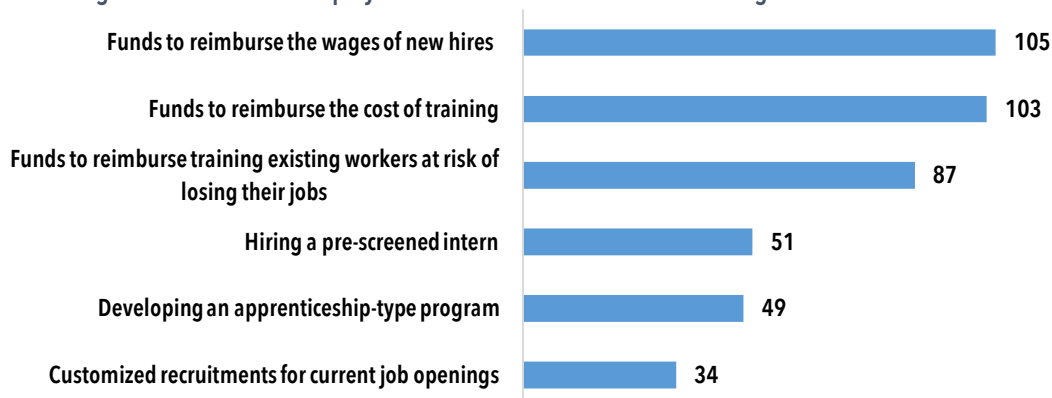
Industry-wide changes that affect Blue Economy employers consequently affect their suppliers and their suppliers' workers. By understanding what occupations lie in the Blue Economy's supply chain, the workforce development system could better prepare for ripple effects caused by layoffs or other industry-wide events (e.g., decline in oil and gas prices) experienced by the sector's employers.

³¹ n = 134³² n = 134

The workforce development system should follow up with employers and gain a better understanding of why employers plan to have more part-time than full-time workers.

The majority of employers surveyed expect to have more part-time workers in the next two years instead of than full-time workers. However, employers also indicated that they have difficulty with employee recruitment and retention and are interested in SDWP's programs (Figure 26).

Figure 26: Number of Employers Interested in SDWP's Business Programs and Services³³



This presents an opportunity for SDWP to recognize which part-time occupations could be developed into full-time opportunities and develop workforce programs accordingly.

Since employers are looking to fill more part-time positions, connect Blue Economy employers with more internship opportunities as a “try before you buy” hiring model.

Employers reported having difficulty encouraging youth to enter this sector. In interviews, employers described difficulties attracting and retaining young workers and high-quality workers. They attributed this struggle to San Diego's high living cost and lack of public awareness around this industry. Much of the work in the Blue Economy is offshore, “out of sight and out of mind,”³⁴ causing the general public to have a lack of understanding of what exactly Blue Economy businesses do. Employers find it difficult to find skilled workers with the specialized technology that is required, especially with a junior-level workforce that often does not have the basic applied knowledge or marine-related experience needed to work in the industry. Additionally, it is challenging to create “inter-generational connectedness” and adapt to other changing company dynamics due to a young/mobile workforce. The best way to remedy this is to allow young workers to job shadow or have internships at companies that could be their employers in the future.

For difficult-to-fill occupations requiring previous work experience, industry associations such as The Maritime Alliance could serve as intermediaries and encourage employers to participate in internships or other assistance programs from the San Diego Workforce Partnership.

Office clerks have the lowest median hourly earnings of the primary occupations studied in this research, yet employers have the most difficulty finding qualified applicants for this position. Its low hourly wage, coupled with the requirements of a security clearance background check, make office clerks surprisingly more difficult to find qualified applicants than other occupations. However, by

³³ n = 134

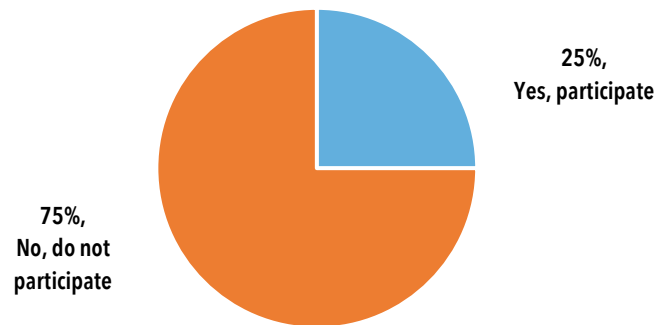
³⁴ Greg Trauthwein. “View from the top: Greg Murphy.” Marine Technology News. May 16, 2016. marinetechologynews.com/news/murphy-532833.

taking advantage of SDWP's subsidies for these hard-to-fill positions, employers could take less of a financial risk when hiring new candidates. Additionally, this occupation may be a good entry-level opportunity (for those who can pass background checks) to build a career pathway within a company and move towards higher paying jobs such as procurement clerks and purchasing managers.

In the follow up study to this report, identify specifically which companies actually want to engage in international trade and provide resources accordingly.

This study found that most of the employers surveyed are currently **not** engaged in international trade. Only 25 percent of the 134 employers surveyed conduct business internationally while 75 percent do not (Figure 27).

Figure 27: Blue Economy Companies that Participate in International Trade



Additionally, while the majority of employers interviewed (73.3 percent) reported procuring their supplies locally in San Diego County, they also reported procuring from outside of San Diego, specifically in other states (53.3 percent) and out of the country (86.7 percent). By identifying which companies actually want to engage in international trade, economic developers in the region can promote resources and provide guidance for interested employers on how to start exporting. This increased export activity could lead to more employment opportunities for San Diegans, specifically in the logistics, supply chain and trade occupations.

APPENDIX A – METHODOLOGY

The San Diego Workforce Partnership (SDWP), in collaboration with The Maritime Alliance (TMA) and the San Diego Regional Economic Development Corporation released the *San Diego Maritime Industry Report* in 2012. Since then, there has been much interest in the community to specifically identify and collect data on in-demand jobs in the Maritime, Blue Technology (BlueTech) or Blue Economy clusters, which include any ocean- or water-related company. This *Blue Economy: Labor Market Analysis* (2016) is a follow-up to the *San Diego Maritime Industry Report* (2012), and examines the greater Blue Economy and its in-demand jobs in San Diego County. SDWP commissioned ERISS Corporation to collect, clean and analyze the data, and to write the first draft of the report. SDWP made the final edits and published the report. TMA helped with the data collection and first draft of the report.

Telephone and Online Surveys

ERISS used a combination of databases from SDWP, TMA and its own proprietary databases to produce the select the sample of employers. ERISS conducted a census survey attempting contact with every known employer in the targeted “industry.”

Three data collection methods were used over a thirty-day period between April and May 2016: a telephone survey, an online survey and in-person interviews with select businesses. The purpose of the telephone and online surveys was to collect data on in-demand jobs and other related information. After the first round of calls to employers, the scope was widened to include suppliers and customers in the Blue Economy. After combining employer databases from ERISS, SDWP, TMA and this report’s advisory group, 1,747 employers were identified as the target population for this study. All 1,747 employers were contacted by phone (unless the employer had already participated online). A total of 134 employers participated in telephone and online surveys.

SDWP provided ERISS with 12 industries from which responding employers could select which fit them best, which included:

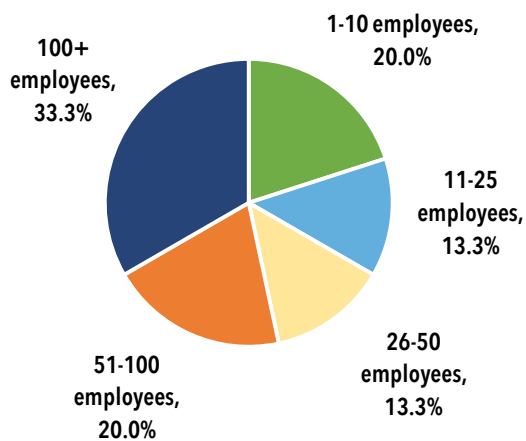
- Mining, Quarrying and Oil and Gas Extraction
- Construction
- Manufacturing
- Wholesale Trade
- Transportation and Warehousing
- Information
- Finance and Insurance
- Real Estate and Rental and Leasing
- Professional, Scientific and Technical Services
- Arts, Entertainment and Recreation
- Accommodation and Food Services
- Government
- Other

Employers were invited to complete the survey online hosted by TMA. Less than one percent completed the survey online. Please note that the data collected in this survey was not collected according to what “industry” the employer is part of. The survey results are for the industry as a whole, except where we had sufficient numbers responding from certain industries (post survey) to be able to present the data segmented by industry

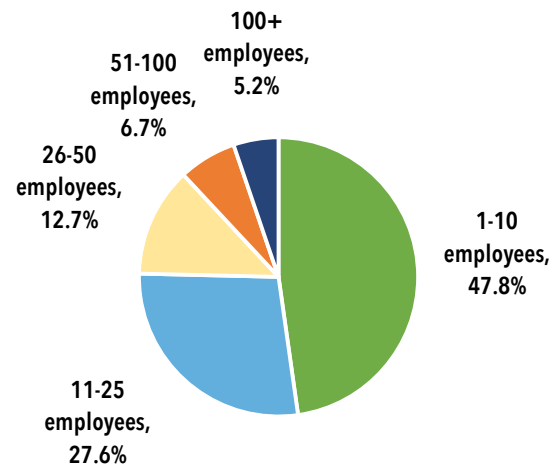
In-Person Interviews

TMA conducted a total of 15 in-person interviews, ranging from small to very large companies and organizations. The purpose of these interviews was to engage in an in-depth exploration of topics that could not be covered in the phone/online survey (such as discussions about career pathways). Due to the small sample size, these employers are not necessarily representative of the entire spectrum of the Blue Economy in San Diego County. The graphs below compare the company size and industry makeup of employers interviewed versus employers surveyed.

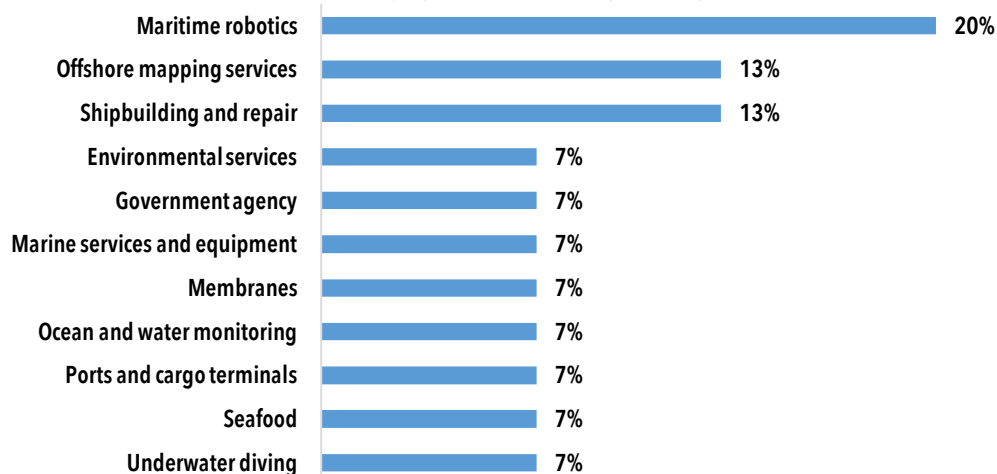
Employers Interviewed By Employee Size³⁵



Employers Surveyed By Employee Size³⁶



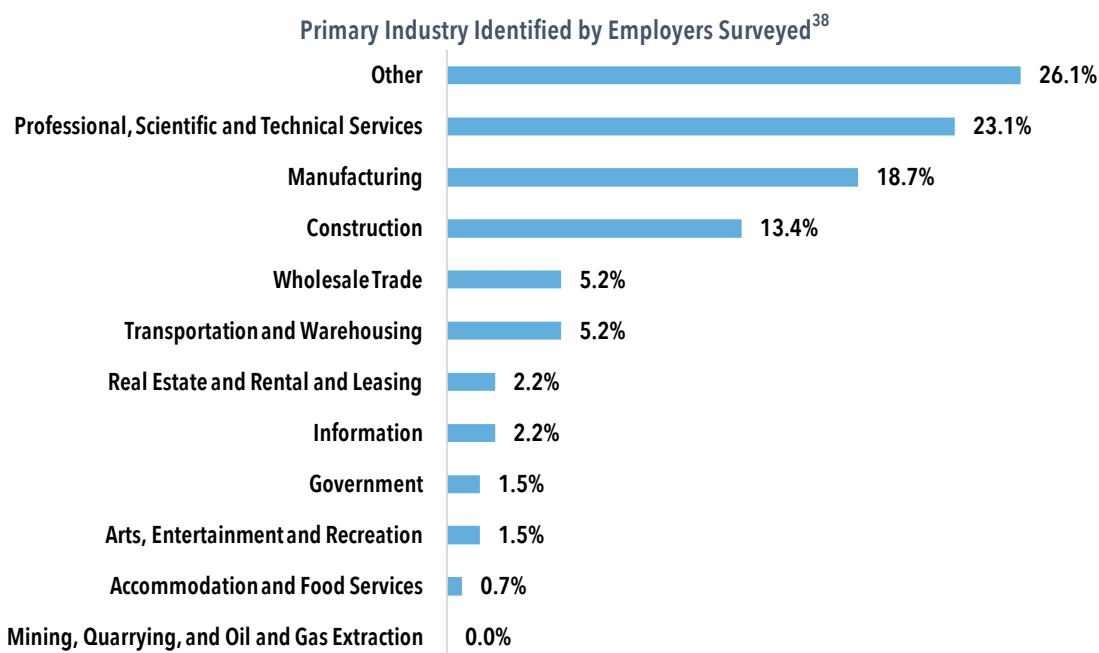
Employers Interviewed By Industry³⁷



³⁵ n = 15

³⁶ n = 134

³⁷ n = 15



The following employer responses were extracted from the in-person interviews and used in this study. When asked about the greatest challenges to growth, employers reported regulatory complexity, port strategy and zoning restrictions. In addition, employers mentioned a number of unique challenges, including:

- Finding skilled engineers in this specialized technology, government budget cuts
- Cost of doing business in CA, the decline in the oil & gas industry
- Funding for large infrastructure needs, recruiting and inter-generational connectedness
- Workforce development, access to investment capital, government budgets, access to international markets, sales window is long, a boat to test on
- Cost of living in San Diego, managing growth, and lack of space to grow
- Growth challenges including HR and managing systems
- Cost of living, minimum wage increases, cyclical nature of business, having a young/mobile workforce that change companies often
- Cost of doing business in CA is too high. Very few people understand the maritime industry
- Basic applied knowledge at the junior level workforce is an issue
- No room to grow on current site
- Lack of marine-related experience among job applicants and challenges associated with a rapidly growing workforce
- Lack of English-speaking qualified production employees in North County, leadership, change management, utility costs, access to water and municipal discharge limits, minimum wage increases, medical costs, and costs of doing business in CA
- Depressed oil & gas markets, finding skilled workers, cost of living in San Diego
- Lack of fishing industry promotion in San Diego, minimum wage increase, meeting demand for fish while properly managing the fishery, traceability
- Global growth of the world economy, and the depressed value of commodities

³⁸ n = 134

When asked to explain why those challenges constrain growth prospects, employers offered a number of reasons:

- Costs are high, and the oil and gas industry is a major buyer that is cyclical
- Balancing economic growth and environmental sustainability, creating a positive work environment
- As a startup company, they need access to investment capital and need to leverage existing resources, like a boat to test their product. They work with local fishermen, their future markets, but fishing boats are often gone 6 months at a time.
- Drives up costs
- It increases the cost of doing business and raises transaction costs
- Costs of doing business and making it impossible to grow in CA
- Millennial employees lack a broad understanding of toxicology, biological systems and problem solving skills
- They regularly have to defend maritime industrial zoning in Barrio Logan from external pressures
- Difficult to hire/train enough people and update management protocols, safety and technology updates. Generally, they are going from a small company to a medium sized company to work through the growing pains
- These challenges drive up costs
- It is very difficult to find and attract talent in San Diego. Declining oil prices reduces demand for services
- Local fish is being exported outside of the region instead of consumed locally. There is lack of awareness of local fish sustainability issues and they could be selling more product locally instead of exporting
- A slower economy, and depressed values of commodities, which is a major driver for ship traffic and terminal operations, makes company vulnerable

Then, in association with those challenges and reasons, employers interviewed were offered a chance to suggest solutions. Exact responses are listed below:

- Encourage regulatory changes, lobbying
- Influence elections of elected officials
- Alternative work environment, flexible work from home
- Work with the sport fishing fleet, find other ways to test the product
- Pre-screen applicants for their willingness to commit to a career in the maritime industry with a strong work ethic
- Hire HR/Admin support
- Offer a good benefits package with 401k, health, etc. Make it a family environment that employees enjoy.
- Move manufacturing and assembly to another state, or receive incentives to stay in CA
- Expand elsewhere, move non-water dependent activities to offsite areas, education decision makers
- Provide on the job training, enroll employees in Supervisory training
- Possibly work with a local university to provide specialized certifications and training programs. Diversify their product applications, encourage more regulation that requires ocean surveys and encourage more government funded research & surveys
- Promote consumption of local, sustainable seafood.
- Make operations more efficient

APPENDIX B – BLUE ECONOMY OCCUPATIONS

SDWP met with employers and employer groups in the Maritime and Blue Tech industries prior to the project in order to develop a list of targeted occupations. This study began with a list of 25 different occupations to be analyzed, but was reduced to a list of 15 occupations due to the small sample size of employer responses per occupation. For the purpose of this study, occupations were broken down into two categories: primary occupations and secondary occupations. Primary occupations were the focus of survey and interview questions; however, employers had the option to provide additional information for secondary occupations. Secondary occupations are lesser-known positions and thus targeted with a reduced set of questions in surveys. This secondary list was created after attempting contact with all known employers in the Blue Economy; these secondary occupations were initially on the primary occupations list, but moved to this secondary list because a majority of employers did not employ them. While these occupations have a small sample size of employer responses, they were included in the surveys to capture some labor market data about lesser-known Blue Economy jobs.

Original Occupational List

- Biological technicians
- Chemical technicians
- Commercial divers
- Composites technicians
- Electrical marine technologists
- Engineering technicians
- Environmental science and protection technicians
- Geographic Information System (GIS) specialists, surveyors or technicians
- Geological marine technologists
- Geospatial information scientists and technologists
- Industrial hygienists
- Information security analysts (cyber security specialists)
- Installation, maintenance and repair technicians
- Materials scientists
- Merchant mariners (sailors and marine oilers)
- Painting, coating, and decorating workers
- Parts assemblers
- Pipefitters
- Procurement clerk or purchasing managers
- Production, planning, and expediting clerks
- Regulatory affairs manager or specialists
- Robotics technicians
- Structural fitters
- Tank car, truck, and ship loaders
- Welders, cutters, solderers and brazers

The following table describes the “primary” occupations used in surveys and interviews. The Standard Occupational Classification (SOC) code is part of the United States government system of classifying occupations. It is used by U.S. federal government agencies collecting occupational data, enabling comparison of occupations across data sets. The occupation title is a descriptive title that corresponds to the SOC code.

SOC Code	Occupational Title	Median Hourly Earnings
49-9092	Commercial divers	\$38.40
15-1121	Computer systems analysts (including cyber security)	\$44.53
17-3023	Electrical engineering technologists Electro-mechanical technicians	\$30.38
17-2071	Electrical engineers	\$56.05
17-3029	Engineering technicians, except drafters, all other	\$30.62
49-0000	Installation, maintenance and repair technicians	\$22.29
49-2093	Electrical and electronics repairers, transportation equipment	\$27.94
49-2094	Electrical and electronics repairers, commercial and industrial equipment	\$28.90
49-9041	Industrial machinery mechanics	\$25.56
49-9071	Maintenance and repair workers, general	\$18.51
49-9043	Maintenance workers, machinery	\$21.86
49-3042	Mobile heavy equipment mechanics, except engines	\$26.01
19-4099	Life or physical and social science technicians, all other (Life or physical science technicians)	\$21.52
17-3013	Mechanical drafters (Drafters and mapping technicians)	\$28.95
17-3027	Mechanical engineers technicians	\$31.86
17-2141	Mechanical engineers	\$42.23
43-9061	Office clerks, general	\$15.51
47-2141	Painters, construction and maintenance technicians	\$18.08
47-2152	Plumbers, pipefitters and steamfitters (Pipefitters)	\$26.22
43-3061	Procurement clerks	\$20.94
11-3061	Purchasing managers	\$55.80
51-2041	Structural metal fabricators and fitters (Structural fitters, including aircraft structure, surfaces, rigging and systems assemblers)	\$19.42
17-3031	Surveying and mapping technicians	\$28.21
51-4121	Welders solderers, cutters and brazers	\$24.41

"Secondary" Occupations Used in Surveys and Interviews

- Chemical engineers
- Computer hardware engineers
- Computer network support specialists
- Computer programmers
- Computer systems analysts
- Computer user support specialists
- Database administrators
- Electrical engineers
- Materials engineers
- Network and computer systems administrators
- Robotics engineers
- Software developers, applications
- Software developers, systems software

"Other" Occupations Listed by Employers

- Business development specialists
- Civil engineers
- Decking technicians
- Engineering firm workers
- Equipment or rental sales persons
- Field supervisors
- Fishing manufacturing (tackle) workers
- Footing repairers (preparing land for concrete)
- Government workers
- In-house IT workers or specialists
- Land surveyors
- Maintenance and/or marina repairers
- Maintenance workers
- Marine engineers
- Maritime workers
- Merchant mariners
- Navy ship electrical repairers
- Office assistants
- Operator engineers
- Payroll management workers
- Plumbers
- Project managers
- Sail boat instructors
- Sales persons
- Sensor manufacturing workers
- Solar panel installers, maintenance workers
- Structural and civil engineers
- Surveyors
- Traders
- Tube and pipe fabricators
- Unskilled laborers
- Water meters manufacturing workers

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